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Trade destruction and deflection effects of US-China trade frictions on China's tariff-targeted products

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Trade destruction and deflection effects of US-China trade frictions on China's tariff-targeted products

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Abstract: This paper probes into the impacts of US-China trade rows on China's exports of products covered under the applicable tariff lines. We scrutinize the monthly trade data of China with the US and third-party markets from January 2017 to June 2019, employing the DID model. It is found firstly that the US levy of tariffs on $50 billion and $200 billion worth of Chinese products have produced a significant and adverse trade destruction effect on China's exports to the US. Meanwhile, the tariffs levied on these products have played a significant and positive role in deflecting China's export to third-party markets. Secondly, the US additional tariffs on $50 billion of China's products have produced greater trade destruction and deflection effects on China's export of tariff-targeted products to the US, whereas only the US additional tariffs on $200 billion of China's products have caused a net trade destruction effect. Thirdly, it is confirmed that the trade destruction effects of US additional tariffs on Chinese products exported to the US are mainly concentrated on high tech-intensive manufactures and primary goods, while the trade deflection effect of China's export to third-party markets is concentrated on differentiated products. The findings render crucial policy implications.

Keywords: US-China trade frictions; China's exports; trade destruction effect; trade deflection effect

JEL classification codes: F13; F14; F51

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1. Introduction

A phenomenal trade war has erupted between the US and China since March 2018, catching the world news headlines recurrently in the last two years. China has transpired as a leading emerging power over the last two decades. The country holds the second largest economy in the world and matches the Eurozone economy as a whole[①]. China's international trade is sensational, accounting for 12.74% of the world total exports of goods in 2017[②]. Although the current US administration has set off trade wars with almost all its trading partners, the US-China trade war is the most significant and dominant. It is between the world's leading industrialized economy and the largest emerging economy rapidly catching up. Differences in institutional arrangements embroiders the trouble further, complicating the search for dispute resolution. The present paper thus examines the recent US-China trade disputes thoroughly against this backdrop. It makes inquiry into the various trade effects on China's exports of the latest US-China trade disputes, providing corroborated evidence for trade policy implications and trade alleviation measures.

On March 22, 2018, the US Trade Representative (USTR) announced that they have been instructed to publish a proposed list of products and any tariff increases on approximately $50 billion worth of imports from China within 15 days of the announcement (USTR, 2018a). This posed to be the immediate prelude to the latest round in the US-China trade disputes. On April 3, 2018, the USTR published a proposed list of products imported from China that could be subject to additional tariffs (USTR, 2018b). On July 6, 2018, the USTR imposed additional tariffs of 25% on Chinese products imported under 818 tariff lines, covering a trade value of approximately $34 billion (USTR, 2018c). It was announced on August 17, 2018 that tariffs on an additional $16 billion will take effect on August 23, 2018 (USTR, 2018d). In response and in retaliation, China took countermeasures by imposing tariffs on imports from the US and filed lawsuits to the World Trade Organization (WTO). Then on September 18, 2018, the USTR further released a list of approximately $200 billion worth of Chinese imports that will be subject to additional tariffs of 10%, being effective from September 24, 2018 (USTR, 2018e). US-China trade disputes

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[①]According to IMF (2019a), China's nominal GDP was 10,535, 11,226, 11,222, 12,062 and 13,407 billion US dollars in the last five years ending 2018; whereas the nominal GDP of the euro area was 13,521, 11,690, 11,982, 12,652 and 13,669 billion US dollars in the same period; the US nominal GDP, being the world's largest, was 20494 billion US dollars in 2018.

[②]IMF (2019b) shows that China's exports of goods figure in 2017 was 2,216,458 million US dollars, while the figure for the world exports of goods in the same year was 17,396,594 million US dollars.

intensified and escalated to a full-blown "tit-for-tat" trade war. The US never lifted or revoked the imposed and proposed tariffs, despite rounds of negotiations between the two sides in search for dispute resolution and settlement. On May 10, 2019, the US increased the level of tariffs from 10% to 25% on approximately $200 billion worth of Chinese imports (USTR, 2019). The USTR press release went further: "The President also ordered us to begin the process of raising tariffs on essentially all remaining imports from China".

The US has become the largest destination for China's exports since 2000. China's exports to the US totaled $478.4 billion in 2018 according to China Statistical Yearbook, which accounted for 19.2% of China's total exports[①]. Thus, tariffs levied on imports from China to the US have exerted profound impacts on China's exports. It is then critically important to carry out timely research and assessment on the effects of US-China trade disputes. Most prior and recent literature pays attention primarily to the trade destruction effect arising from the imposed and increased import tariffs. That is, levying import tariffs results in a decline in imports, from the country whose goods are subject to the levied tariffs, to the destination country that has levied the import tariffs. Brenton (2001), Prusa (2001) and Park (2009), among others, have documented the trade destruction effect empirically. Specifically, Shen and Fu (2014) find that the US import tariffs against China have led to significant reductions in exports of products covered under the applicable tariff lines from China to the US. The findings of Chandra (2017) show that, on average, a 35% reduction has been observed in China's exports of products covered under the levied tariff lines to the tariff levying countries. Chandra and Long (2013) have reported a negative effect of the US anti-dumping tariffs against China on the labor productivity of China's exporting firms. Likewise, Lu *et al*. (2013) suggest that the US tariffs levied against imports from China have played a considerable role in reducing the number of Chinese firms engaged in exporting goods of applicable tariff lines into the US. All of the above studies demonstrate the adverse impact of the US trade sanctions and import tariffs against China on China's exports to the US to varied degrees. Nevertheless, the volumes and tariff lines involved in the previous rounds of trade disputes and covered in the prior studies are much smaller than the latest ongoing US-China trade war. It is then necessary to scrutinize the different effects in different product lines and tariff lines

[①] Trade data for China in the paper stands for Mainland China, excluding trade statistics for Hong Kong, Macao and Taiwan of China. However, Hong Kong SAR is regarded as one of third-party markets in our study.

on the reductions of China's export to the US, which the present study undertakes to reveal.

Levying import tariffs can produce trade deflection in addition to trade destruction. Imposed and increased tariffs would have positive effects on target countries' exports to third countries. Bown and Crowley (2006, 2007) have empirically found evidence of trade deflection, employing Japan's export data. The US anti-dumping tariffs levied on imports from Japan have caused exports of Japan to third countries to increase. The findings of Durling and Prusa (2006) and Hoai *et al*. (2017) have confirmed the trade deflection effect as well. However, there are considerable disagreements in currently available research findings on whether the trade deflection effect materializes in the case of China's exports. Examining the trade dispute cases in the earlier period of China's accession to the WTO, Bown and Crowley (2010) have found no evidence of trade deflection of China's exports to third countries, following the US and EU trade restriction policies imposed on imports from China. Similarly, no trade deflection of China's exports to third countries has been observed by Lu *et al*. (2013), analyzing the effect of US trade sanctions against China from 2000 to 2006. On the contrary, Chandra (2016) has found a surge of China's exports to third countries in the period 2002 to 2008 resulted from various interim trade barriers to imports from China by the US. Thus, scrutiny of detailed product tariff lines is required to discover whether the trade deflection effect exists in specific product tariff lines. It is also required to investigate the differences in the extent to which the trade deflection effect is observed in different product tariff lines.

Impacts of US-China trade disputes have mostly been examined from the perspective of the US in prior studies. Employing the data of US trade rows with various countries, Amiti *et al.* (2019) find a rising consumer price and deteriorations in social economic welfare. Fajgelbaum *et al*. (2020) also suggest that prices of imports targeted by US tariffs did not fall, implying complete pass-through of tariffs to duty-inclusive prices. Nicita (2019) has found that the US shifts or diverts its imports of products covered under affected the tariff lines from third countries, the EU, Mexico and Vietnam among others, following its levy of tariffs on imports from China[①]. In

[①] Nicita (2019) has estimated the destruction effect on China's exports to the US affected by the US levy of tariffs. Our study differs in three aspects. First, we employ monthly export data to prevent the cancellation effect in data aggregation, while Nicita (2019) uses quarterly export data. Second, we adopt the DID model to examine changes in China's exports and trade effects on China's exports, controlling effectively for the prior trends in China's exports of levied export products. Third, we further distinguish export products by technological categories, homogeneous and differentiated products. This offers new insights into trade effects, leading to the findings that the trade destruction contrast, the present study has a different focus. It pays attention to import tariff targeted counties and, in particular, examines the various trade effects from the perspectives of China.

Based on the monthly trade data of China, the US and third-party markets, we use the difference-in-differences (DID) method to examine how US-China trade frictions have taken effect on exports of China's tariff-targeted products. Compared with the existing literature, the present paper has made distinctive contribution as follows. First, it has been revealed in our study how US-China trade frictions had influenced the export of China's tariff-targeted products based on the real-imposed tariffs and trade statistics. This is different from the findings of Guo *et al.* (2018) and Li *et al.* (2018), which used numerical simulations to explore the economic effects on welfare of escalating tariffs. Our study has confirmed that the USTR's successively imposing tariffs on \$50 billion and \$200 billion worth of Chinese goods resulted in severe trade destruction effects on China's exports to the US, and meanwhile led to significant trade deflection effects, encouraging more Chinese goods to be exported to third-party markets. Second, we have focused our empirical analysis on the trade deflection effect on China's exports while Nicita (2019) paid attention to the trade diversion effect on the US's imports. Our results show that although the US imposed tariffs on imports from China, China's export losses had been mitigated to some extent since China exported more goods subsequently to third-party markets. Third, our research sheds new light on trade effects of imposed tariffs at product levels. Prior studies, including Lu *et al.* (2013) and Shen and Fu (2014), did not take product differentiation into consideration when they analyzed the trade effects triggered by the increase of tariffs due to the limited range of products involved in anti-dumping duties. We have found that the US' imposing tariffs on imports from China had more trade destruction effects on Chinese high-tech products and primary goods. During the same period, the trade deflection effects between China and third-party markets had mainly influenced differentiated products. Fourth, by collecting and analyzing the export changes of specific products, we have found that China's exports of machinery and electronics to the EU have increased dramatically during the period of trade frictions. On the other hand, China's exports of organic chemicals and cosmetics had been deflected to Japan significantly.

The rest of the paper is organized as follows. Section 2 provides descriptive statistics of

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effect is mostly on China's exports of high-tech products and primary goods.

exports of China's tariff-targeted products, exhibiting their trends. Next, Section 3 presents model set-up, introduces data samples and specifies variables for empirical examinations. Section 4 provides, analyzes and discusses the empirical results. Net trade effects are scrutinized in Section 5 while heterogeneity analysis is performed in Section 6. Changes in China's exports of specific products during the period of trade frictions are further probed in Section 7. Finally, Section 8 concludes and provides policy recommendations.

2. The Export Trade Trend of China's Tariff-targeted Products

Figure 1 illustrates China's exports of tariff-targeted products to the US before and after the tariff imposition in the trade frictions. First, before the outbreak of the US-China trade frictions, China's exports of $50 billion worth products to the US showed an overall upward trend in fluctuation. However, it had decreased sharply after the US imposed tariffs on imports from China in July 2018. From July 2018 to June 2019, China's exports of products covered by the $50 billion list to the US dropped by about 20.2% from the previous year. Second, before the outbreak of the Sino-US trade friction, China's exports of $200 billion worth products to the US were also on the upswing and continued growing after the tariffs imposed in September 2018. But they had fallen off a cliff since January 2019. From January to June 2019, China's exports of products on the $200 billion list to the US declined by approximately 19.0% from the previous year. According to these changing patterns, the additional tariffs imposed in trade frictions are likely to cast an adverse trade destruction effect on exports of China's tariff-targeted products. We will further test the trade destruction effect caused by trade frictions based on the DID model in the regression analysis hereafter.

{Figure 1 about here}

Figure 2 shows the patterns in exports of China's tariff-targeted products to third-party markets before and after the tariff imposition in the trade friction. First, before the outbreak of US-China trade frictions, China's exports of $50 billion worth products to third-party markets exhibited an overall steady trend. After the US imposed tariffs on imports from China in July 2018, China's exports of products covered by the $50 billion list to third-party markets have displayed an overall growth trend.[①] From July 2018 to June 2019, China's exports of $50 billion worth products to third-party markets increased by approximately 8.0% year-on-year. Second, before the outbreak of the US-China trade frictions, China's exports of products on the $200 billion list to third-party markets also showed a steady trend overall. After the US imposed additional tariffs on imports from China in September 2018, China's exports of $200 billion worth products to third-party markets have generally exhibited a slight growth trend. From September 2018 to June 2019, China's exports of $200 billion worth products to third-party markets increased by approximately 1.6% year-on-year. The changing patterns in exports of China's tariff-targeted products to third-party markets indicate that the additional tariffs imposed by the US may have positive trade deflection effects on exports of China's targeted products to third-party markets. We will perform regression analyses to further test the trade deflection effect caused by trade frictions based on the DID model.

{Figure 2 about here}

3. Data, Modeling and Variables

3.1 Research Design and Model Specifications

On July 6, 2018, and August 23, 2018, the USTR respectively imposed 25% tariffs on $34 billion worth of Chinese products and $16 billion worth of Chinese products (tariffs on $50 billion Chinese products). On September 24, 2018, the USTR imposed a third round of 10% tariffs on $200 billion worth of Chinese imports (tariffs on $200 billion Chinese products).[②] We take the US levy of tariffs on $50 billion and $200 billion Chinese products as examples to study how the increase of tariffs, which is caused by the US-China trade frictions, affects China's exports of tariff-targeted products.

One important premise of using the DID model is that the change over time in the dependent variables for the treatment group and the control group should be kept the same before exogenous shocks occur. As a result, when studying how tariff increases affect the exports of the tariff-

[①] It is notable that the exports of the two groups of products in Figure 2 showed a significant decrease in February 2018 and February 2019. This was caused by the suspension of China's foreign trade activities during the Spring Festival.

[②] On May 10, 2019, the US announced that tariffs on $200 billion Chinese products will increase to 25%. In most of the research time of this paper (2017.01-2019.06), the tariffs on $200 billion Chinese products is 10%. As a result, in the following part of the paper, we defined the tariff rate of $200 billion Chinese products as 10%.

targeted products, we need put products that have the same export trends with the tariff-targeted products into the control group. To this end, in examining the effects of tariffs on $50 billion and $200 billion worth of Chinese products, we take the HS 6-digit products on the two tariff lists as the treatment group respectively, while we use unlevied products that are in the same HS 2-digit product group with the targeted products as the control group.①② In order to accurately estimate the trade effects of the two tariff impositions, we excluded the HS 6-digit products that were included in both tariff lists from the samples.③ Specifically, according to the above literature review, the trade effects of U.S. tariffs on Chinese goods extend to the following hypotheses:

Hypothesis 1: The US additional tariffs on China's products will produce a trade destruction effect, namely, comparing to unlevied products, China's exports of tariff-targeted products to the US will reduce.

Hypothesis 2: The US additional tariffs on China's products will produce a trade deflection effect, namely, comparing to unlevied products, China's exports of tariff-targeted products to the third-party markets will increase.

To examine these hypotheses, we construct the following benchmarking regression model to test the trade destruction effects of China's exports to the US:

$$lnExport_{hit} = \alpha_0 + \beta Treat_i \times Post_{it} + \lambda_i + \psi_{ht} + \varepsilon_{hit} \quad (1)$$

where $Export_{hit}$ refers to the China's exports of product *i* of sector *h* to the US in month *t*. $Treat_i$ is a dummy variable. If product *i* is included in the tariff list, the $Treat_i$ is 1, otherwise the $Treat_i$ is 0. $Post_{it}$ is a dummy variable. When the tariff is applied to product *i* in *t* month and thereafter, the $Post_{it}$ is 1, otherwise the $Post_{it}$ is 0.④ Meanwhile, α_0 is the intercept,

① Lu *et al.* (2013) used unlevied products that were in the same HS 4-digit product group with the tariff-targeted products as the control group when studying the trade effects of anti-dumping duties. However, if we use the same control group as in Lu *et al.* (2013), the control group will have much fewer products than the treatment group so that we could not accurately control the change over time in the dependent variables for the treatment group. As a result, we use unlevied products that are in the same HS 2-digit product group with the products that are on the tariff lists as the control group. We thank the anonymous reviewer for his constructive comments.

② If there are tariff-targeted products in the control group, the estimated trade effects of the treatment group will to some extent be offset by the trade effects of the control group. Therefore, we restrict the control group to products that are not included in any of the tariff lists, which ensures more accurate estimates.

③ The conclusion of this paper is consistent with the test results which include products involved in both tariff lists. However, as the length limits, the test results are not listed in the paper.

④ Specifically, $Post_{it}$ takes the value of one when *t* is July 2018 and onwards for product *i* on the first bundle of the $34 billion tariff list, zero otherwise; $Post_{it}$ takes the value of one when *t* is August 2018 and onwards for product *i*

λ_i is the product fixed effect and ε_{hit} is the error term. To further ensure that the parallel trend hypothesis is feasible, we add the sector-time fixed effect ψ_{ht} to the model following Moser and Voena (2012).① In particular, λ_i controls the inherent characteristics of products that do not change over time, and ψ_{ht} controls the macro-effects of changes over time at the sector level, such as the real sector exchange rates between China and the US. We will use equation (1) to analyze the trade destruction effects of tariffs on \$50 billion and \$200 billion Chinese products.

Furthermore, we use the following benchmarking regression model to test the trade deflection effects of China's exports to the third-party markets:

$$lnExport_{jhit} = \alpha_0 + \beta Treat_i \times Post_{it} + \lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \quad (2)$$

where $Export_{hit}$ refers to the China's exports of product *i* of sector *h* to the third-party market *j* in month *t*. ψ_{jh} refers to country-sector fixed effects, and ψ_{jt} refers to country-time fixed effects.② The rest of the variables have the same meaning as that in equation (1). We will use equation (2) to analyze the trade deflection effects of tariffs on \$50 billion and \$200 billion Chinese products.

3.2 Variables and Data Description

First, the dependent variable $Export_{hit}$ (or $Export_{jhit}$) refers to the China's exports of product *i* of sector *h* to the US (or the third-party market *j*) in month *t*. In order to avoid that the follow-up tariffs on \$300 billion Chinese products affect the control group products, we use the monthly export data of the HS 6-digit products exported to the US and the third-party markets from January 2017 to June 2019 to examine the trade effects of tariffs on \$50 billion and \$200 billion Chinese products. Since China's monthly export data of HS 6-digit products are not available since 2018, we use the import data of each importing country (region) to make the empirical analysis. All trade data are taken from the UN Comtrade database. A logarithmic

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on the second bundle of the \$34 billion tariff list, zero otherwise. Given that the time of tariff imposition was the same for all the products on the \$200 billion tariff list, $Post_{it}$ can be simplified to $Post_t$ when analyzing the trade effects of the \$200 billion product tariffs. $Post_t$ takes the value of one when *t* is September 2018 and onwards for product *i* on the \$200 billion tariff list, zero otherwise.

① We determine the sector to which the product belongs based on its HS 2-digit. The sector-time fixed effect absorbs the time fixed effect in the traditional DID model.

② To further investigate whether trade deflection effects vary among different types of countries, we do not aggregate trade data from all third-party markets. Similar to Bown and Crowley (2007) and Chandra (2016), we use country-product-time level panel data to examine the trade deflection effect of China's exports to the third-party markets.

transformation is taken for the export variables to make them closer to conforming to normal distributions.

Second, the core explanatory variable $Treat_i \times Post_{it}$ is a dummy variable. The independent variable $Treat_i \times Post_{it}$ is a dummy variable. It takes the value of one when product i is levied the tariff in month t and thereafter, zero otherwise. There is a trade destruction effect on the products in the treatment group if the β estimate is found to be significantly negative in the regression of China's exports to the US. A trade deflection effect on the treatment group is observed if the β estimate is significantly positive in the regression of China's exports to third-party markets.

4. Empirical Results

4.1 Benchmark Regressions

The results of benchmark regressions are shown in Table 1. **First**, the regression coefficient of $Treat \times Post$ in column (1) is negative and statistically significant at the 1% level. Accordingly, the US additional tariffs on China's \$50 billion worth products has produced a significant and adverse trade destruction effect on exports of China's tariff-targeted products to the US. Compared with unlevied products, exports of China's \$50 billion products to the US decreased by about 37.0%. Besides, the regression coefficient of $Treat \times Post$ in column (3) is negative and statistically significant at the 1% level. Accordingly, the US additional tariffs on China's \$200 billion worth products has produced a significant and adverse trade destruction effect on exports of China's of tariff-targeted products to the US. Compared with unlevied products, exports of China's \$200 billion products to the US decreased by about 17.3%. These results support Hypothesis 1, that is, the US additional tariffs on China's products exported to the US have reduced exports of China's tariff-targeted products to the US, resulting in significant adverse trade destruction effects. The tariff rate on \$50 billion products is higher, resulting in a corresponding stronger trade destruction effect.

Second, the regression coefficient of $Treat \times Post$ in column (2) is positive and statistically significant at the 1% level. Accordingly, the US additional tariffs on China's \$50 billion products has produced a significant and positive trade deflection effect on exports of China's tariff-targeted products to the third-party markets. Compared with unlevied products, exports of China's $50 billion products to the third-party markets increased by about 5.1%. Besides, the regression coefficient of $Treat \times Post$ in column (4) is positive and statistically significant at the 5% level. Accordingly, the US additional tariffs on China's $200 billion products has produced a significant and positive trade deflection effect on China's export of tariff-targeted products to the third-party markets. Compared with unlevied products, exports of China's $200 billion products to the third-party markets increased by about 1.2%. These result support Hypothesis 2, that is, the US additional tariffs on China's products exported to the US have caused significant and positive trade deflection effects on exports of China's targeted products to the third-party markets, alleviating the loss from less exports of targeted products to the US. In comparison, the trade deflection effect of additional tariffs on $50 billion Chinese products is greater than that of $200 billion Chinese products. The reasons are as follows. First, the trade destruction effect of additional tariffs on $200 billion Chinese products is relatively small, so some Chinese firms can still maintain exports to the US without deflecting to the third-party markets. Second, in the following analysis, we find that the trade deflection effect on exports of China's targeted products to the third-party markets concentrates on differentiated products. In this way, since the proportion of differentiated products on $200 billion product tariff list is relatively low, the overall trade deflection effect is thus smaller than that of $50 billion products. [①]

{Table 1 about here}

4.2 Robustness Tests

4.2.1 Parallel Trend Tests

First, it is checked whether the settings of the treatment group and the control group meet the parallel trend requirements under the DID method. Specifically, we need to ensure that the exports of products in the treatment group and the control group have consistent trends over time before the US levy of tariffs on products imported from China. Referring to Lu *et al*. (2013), we add the interaction term $Treat_i \times Pre_{it}$ into the benchmark regression model. Pre_{it} is a dummy taking the value of one if month t is 12 months prior to the levy of tariffs on product i, zero otherwise. The regression coefficient of the variable $Treat \times Pre$ represents the differences

① The proportion of differentiated products on $50 billion product tariff list is 72.1%, while that on $200 billion product tariff list is 38.2%.

between the treatment group and the control group in export changes within 12 months before tariffs. If the coefficient in the regression result is not significant, it can be considered that there is no significant difference between the treatment group and the control group in the export changes before tariffs, which meets the requirements of parallel trends.

{Table 2 about here}

According to Table 2, the regression coefficients of $Treat \times Pre$ are not statistically significant for each group indicated by the regression results. Thus, the grouping settings and models in this paper meet the parallel trend requirements for the DID model. Besides, the size and significance of the regression coefficients of $Treat \times Post$ in each group are similar to those in the benchmark regression, further confirming the robustness of our research conclusions.

4.2.2 Total Sample Estimation

In the benchmark regression, in order to match the products in the treatment group and the control group as much as possible, we use different subsamples to estimate the trade effects of US additional tariffs on \$50 billion and \$200 billion Chinese products. However, the regression coefficients in the two sets of regression results may not be directly compared due to the use of different samples. To this end, we estimate the trade effects of US additional tariffs on \$50 billion and \$200 billion Chinese products on the basis of the total sample with the following models:

$$lnExport_{hit} = \alpha_0 + \theta_1 Treat500_i \times Post_{it} + \theta_2 Treat2000_i \times Post_{it} + \lambda_i + \psi_{ht} + \varepsilon_{hit} \quad (3)$$

$$lnExport_{jhit} = \alpha_0 + \theta_1 Treat500_i \times Post_{it} + \theta_2 Treat2000_i \times Post_{it} + \lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \quad (4)$$

where $Treat500_i$ is a dummy variable and equals one if product *i* is on \$50 billion product tariff list, otherwise equals zero; $Treat2000_i$ is a dummy variable and equals one if product *i* is on \$200 billion product tariff list, otherwise equals zero. Based on model (3), we compare the trade destruction effects of the two tariff levies, and model (4) to compare the trade deflection effects of the two.

{Table 3 about here}

According to Table 3, the regression coefficient of $Treat500 \times Post$ is negative in column

(1) while positive in column (2), and higher than that of $Treat2000 \times Post$ in column (1) while lower in column (2). This result confirms the conclusion above that the trade destruction and deflection effects of $50 billion product tariff are greater than those of $200 billion product tariff. Besides, in the regression result of each group, the size and significance of the regression coefficients of $Treat500 \times Post$ and $Treat2000 \times Post$ are similar to those in the benchmark regression, which further confirms the robustness of our research conclusions.

4.2.3 Controlling Export Trends of Products with Different Characteristics

In the benchmark regression, we control the time-independent characteristic indicator of each product through product fixed effects. However, if some type of products with certain characteristics has a different export trend from others, and this type of product is not evenly distributed between the treatment group and the control group, the export changes in two groups may also be different after the impact of US tariffs. Accordingly, we further control the export trends of products with different characteristics. First, we refer to the classification standards of the United Nations Conference on Trade and Development (UNCTAD) and classify export products into high technology-intensive manufactures (HTM), medium technology-intensive manufactures (MTM), low technology-intensive manufactures (LTM), labor and resource-intensive manufactures (LRM) and primary goods (PG) according to their degrees of manufacturing.[①] Second, we refer to the conservative classification standard proposed by Rauch (1999) and classify export products into homogeneous products, differentiated products and unclassified products on whether they have a reference price.[②] Based on this, we apply the following models to investigate whether the trade effects on China's tariff-targeted products exist when export trends of products with different characteristics controlled:

$$lnExport_{hit} = \alpha_0 + \alpha_1 Treat_i \times Post_{it} + \alpha_2 HTM_i \times Post_{it} + \alpha_3 MTM_i \times Post_{it}$$

$$+\alpha_4 LRM_i \times Post_{it} + \alpha_5 PG_i \times Post_{it} + \alpha_6 DIFF_i \times Post_{it} + \alpha_7 UC_i \times Post_{it}$$

[①] We define export products that cannot be classified into any manufacture type under the UNCTAD standard as primary goods. For example, products labeled 02 (Meat and edible meat offal) in HS 2-digit are all defined as primary goods.

[②] We define export products that cannot be classified under the standard of Rauch (1999) as unclassified products. For example, products labeled 60 (knitted fabrics and crocheted fabrics) in HS 2-digit are all defined as unclassified products. Due to the small number of organized exchange homogenous products, we combine them and reference priced homogenous products into homogenous products.

$$+\lambda_i + \psi_{ht} + \varepsilon_{hit} \quad (5)$$

$$lnExport_{jhit} = \alpha_0 + \alpha_1 Treat_i \times Post_{it} + \alpha_2 HTM_i \times Post_{it} + \alpha_3 MTM_i \times Post_{it}$$

$$+\alpha_4 LRM_i \times Post_{it} + \alpha_5 PG_i \times Post_{it} + \alpha_6 DIFF_i \times Post_{it} + \alpha_7 UC_i \times Post_{it}$$

$$+\lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \quad (6)$$

where HTM_i, MTM_i, LRM_i and PG_i are dummy variables, which equal one when product *i* is a high-tech manufacture, a medium-tech manufacture, a labor and resource manufacture or a primary good respectively; zero otherwise. The low-tech manufacture is used as the benchmark here. $DIFF_i$ and UC_i are dummy variables, which equal one when product *i* is a differentiated product or an unclassified product; otherwise, 0. The homogeneous product is used as the benchmark here. The specific regression results are shown in Table 4. It can be seen that with export trends of products with different characteristics controlled, the size and significance of the regression coefficients of $Treat \times Post$ in the regression result of each group are still similar to previous ones in the benchmark regression. These confirm that changes in the trade effect we find are indeed due to the impact of the US tariffs on China's imports, rather than differences between export trends of products with different characteristics.

{Table 4 about here}

4.2.4 Counterfactual Analysis

We also conduct counterfactual analysis on the trade effects of US additional tariffs on $50 billion and $200 billion Chinese products. To this end, we advance the implementation of the two tariffs by one year and delete the data from September 2018 and beyond in the sample. In accordance with the same setting of the treatment group and the control group, we test whether the hypothetical tariffs still lead to the corresponding trade effects in exports of China's targeted product. According to Table 5, in the regression result of each group, the core explanatory variable $Treat \times Post$ is not statistically significant, indicating that counterfactual tariff shock does not statistically affect exports of China's related product significantly. It further confirms that the trade effects found in the benchmark regression did not happen by chance. Therefore, the trade destruction effect of the US tariff on exports of China's products to the US and the trade deflection effect on exports to the third-party markets are indeed caused by the US additional tariffs on

China's products.

{Table 5 about here}

4.3 Extended Analysis

4.3.1 The Expectation Effect

There is an investigation period for two to three months from the announcement to the implementation of the US additional tariffs on China. Then, is there any expectation effect on the exports of China's tariff-targeted products during the investigation period? Although short-term expectation effects during the investigation period seem to have limited impact on long-term exports, clarifying this issue is helpful to better understand how companies counteracted to mitigate trade losses against US-China trade frictions. Thus we conduct research on the export changes of China's targeted products to the US and third-party markets during the investigation period based on the following models:

$$lnExport_{hit} = \alpha_0 + \varphi_1 Treat_i \times Annc_{it} + \varphi_2 Treat_i \times Post_{it} + \lambda_i + \psi_{ht} + \varepsilon_{hit} \quad (7)$$

$$lnExport_{jhit} = \alpha_0 + \varphi_1 Treat_i \times Annc_{it} + \varphi_2 Treat_i \times Post_{it} + \lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \quad (8)$$

where $Annc_{it}$ is a dummy variable and equals one when month *t* is within the investigation period between the announcement and the implementation of tariffs of product *i*; otherwise equals zero. The statistical coefficient φ_1 in the regression results represents the expectation effect of China's exports to the US and the third-party markets during the investigation period.

{Table 6 about here}

As shown in Table 6, **first**, the regression coefficient of $Treat \times Annc$ in column (1) is positive and statistically significant at the 10% level. Besides, the regression coefficient of $Treat \times Annc$ in column (3) is positive and statistically significant at the 1% level. Accordingly, the US additional tariffs on \$50 billion and \$200 billion worth of China's products have both led to positive expectation effects, that is, after the announcement of the US's tariff-levy on China, some Chinese firms increased their exports to the US before the deadline in order to avoid the higher tariff rates in the future. Although the tariff rate on \$50 billion products is higher, tariffs on

$200 billion products have produced stronger expectation effects. This reflects that when the US government first announced additional tariffs on exports of China's $50 billion products to the US, most firms were skeptical about whether such unexpected tariffs would be implemented, thus producing little expectation effects. When the US government again announced additional tariffs on exports of China's $200 billion products to the US, most firms believed that it would eventually be implemented, and the expectation effect is thus relatively large.[①]

Second, the regression coefficient of $Treat \times Annc$ in column (2) is not statistically significant. Besides, the result in column (4) shows that the regression coefficient of $Treat \times Annc$ is positive and statistically significant at the 1% level. Accordingly, the US additional tariffs on exports of China's $200 billion products has led to positive expectation effects of China's exports of tariff-targeted products to third-party markets. This reflects that after the announcement of additional tariffs on $200 billion Chinese product, some firms expanded exports to third-party markets in advance due to the suspension of future orders. In addition, there is no expectation effect following the announcement of $50 billion product tariff, which further confirms the conclusion above.

4.3.2 The Delay Effect of Additional Tariffs

Due to the long duration of trade orders, some firms might still execute their original orders even after the implementation of additional tariffs. In this way, the negative impact of the additional tariffs may not be fully reflected in the month of implementation, that is, there could be delay effects. Here we investigate the delay effect of additional tariffs by postponing the event point to the second month after the tariff implementation.[②]

{Table 7 about here}

As shown in Table 7, first, the regression coefficients of $Treat \times Post$ in column (1) and (3) are both positive and statistically significant at the 1% level and are smaller than those in the benchmark regression results. Therefore, the negative effects on China's exports of tariff-targeted

[①] The existence of the expectancy effects also explains why the exports of $200 billion products to the US have just declined significantly since January 2019 in Figure 1. On September 24, 2018, at the same time of imposing an additional 10% tariff on $200 billion Chinese imports, the US announced the plan to increase the tariff rate to 25% on January 1, 2019 (USTR, 2018e). Therefore, although the US additional 10% tariff has had a trade destruction effect, some Chinese firms still expanded their exports to the US in response to higher tariff rates in the future.

[②] For example, $Post_{it}$ takes the value of one when t is September 2018 and onwards for product *i* on the first bundle of the $34 billion tariff list, zero otherwise.

products do have delay effects. After Chinese firms completed long-term orders from the US, the trade destruction effects on China's exports to the US are fully reflected. Second, the regression coefficients of $Treat \times Post$ in column (2) and (4) are positive and statistically significant at the 1% and 10% level respectively and are slightly smaller than those in the benchmark regression. The reason may be that there are some firms that only clean up their inventories through the third-party markets in the short-term, rather than deflect their exports to the third-party markets continuously in the long-term, resulting in a slight decline in the trade deflection effects.

5. Analysis of Net Trade Effects

In our previous discussion, we confirm that the US levy of tariffs on \$50 billion and \$200 billion Chinese products have produced a significant and adverse trade destruction effect on China's exports to the US as well as a significant and positive trade deflection effect on China's export to third-party markets. Thus, under the interaction of the two trade effects, it is of interest to appreciate the net trade effect on exports of China's tariff-targeted products to the world.[①] Because the latest 6-digit China's monthly export data are not available, we can only aggregate the 6-digit import data published by the importing countries (regions) for our study. In the benchmarking regression sample, we collect data on imports from China from 66 countries (regions), including the US and other major third-party markets. Furthermore, we use trade data published by the EU and ASEAN to supplement the missing EU and ASEAN member states data in the original sample.[②] The supplementary aggregation data has accounted for as high as 89.5% of China's total exports in 2018. We estimate the net trade effects of tariffs on \$50 billion and \$200 billion products by using both pre- and post-supplement aggregation data.[③]

{Table 8 about here}

As shown in Table 8, first, the results in column (1) and (2) indicate that the regression coefficients for $Treat \times Post$ are not statistically significant. Accordingly, the US' imposing

① We thank the anonymous reviewer for his valued comments.

② Our supplementary method is to exclude the trade data of EU and ASEAN member countries from the original sample before adding the total trade data of EU and ASEAN. Since the overall trade data reported by the EU and ASEAN were not fully equivalent to the sum of the trade data reported by the member states, a small number of product data were missing after the data had been supplemented.

③ We also use the method mentioned above to examine the parallel trends of the treatment group and control group in the aggregation data panel. The results show that there is no significant difference in the export trend between the treatment group and the control group before the tariffs, which meets the requirement of the DID model.

tariffs on $50 billion worth of Chinese products does not lead to a significant net trade effect on China's total exports of tariff-targeted products. Second, the results in column (3) and (4) indicate that the regression coefficient of $Treat \times Post$ are negative and significant at 1% statistical level. Accordingly, the US tariffs on $200 billion worth of Chinese products have produced a significant negative net trade destruction effect on China's total exports of tariff-targeted products. In addition, the regression results of supplementary data in column (4) show that being imposed tariffs on $200 billion Chinese products, China's total exports of tariff-targeted products are about 6.9% lower than those of unlevied products.

In the above analyses, we find that the trade destruction effect caused by the tariffs on $50 billion Chinese products is much greater than the trade destruction effect caused by the tariffs on $200 billion Chinese products. So why the tariffs on $50 billion Chinese products did not lead to a significant net trade destruction effect on China's tariff-targeted products? First, in China's exports of $50 billion worth of goods, exports to the US account for a relatively small proportion of total exports. Take the non-friction year as an example. In 2017, China's exports of $50 billion worth of goods to the US accounted for only 12.8% of their exports to the world, while China's exports of $200 billion worth of goods to the US accounted for 18.9% of their exports to the world. As a result, although the US $50 billion product tariffs had a greater trade destruction effect, its impact on China's total exports is relatively limited. Second, benchmark results confirm that the US $50 billion product tariffs had a greater trade deflection effect than the US $200 billion product tariffs. Therefore, the deflection of exports of China's $50 billion worth targeted products to third-party markets has greatly eased the trade destruction effect of exports to the US, so as to weaken the net trade destruction effect.

6. Heterogeneity Analysis

6.1 Product Heterogeneity Analysis

Taking into account the large differences in the characteristics of different export products, would the effect from tariff levy differ from product to product? To answer this question, we carry out the analysis of product heterogeneity according to degrees of manufacturing, homogeneous and differentiated products.

6.1.1 Distinguishing among the Degrees of Manufacturing

In accordance with the classification criteria of the United Nations Conference on Trade and Development (UNCTAD), we classify export products into high tech-intensive, medium tech-intensive, low tech-intensive, labor and resource-intensive manufactures and primary goods by degrees of manufacturing. Only the trade effects of US $200 billion product tariffs on products in different technological categories are examined, as the products on the $50 billion product tariff list are predominantly in one technological category: over 65% of them are medium tech-intensive manufactures. Therefore, we refer to Yagan (2015) in specifying our models for testing whether the trade effects on the exports of China's targeted products vary across degrees of manufacturing:

$$\begin{aligned} lnExport_{hit} = \alpha_0 &+ \gamma_1 HTM_i \times Treat_i \times Post_t + \gamma_2 MTM_i \times Treat_i \times Post_t \\ &+ \gamma_3 PG_i \times Treat_i \times Post_t + \gamma_4 Treat_i \times Post_t + \gamma_5 HTM_i \times Post_t \\ &+ \gamma_6 MTM_i \times Post_t + \gamma_7 PG_i \times Post_t + \lambda_i + \psi_{ht} + \varepsilon_{hit} \end{aligned} \tag{9}$$

$$\begin{aligned} lnExport_{jhit} = \alpha_0 &+ \gamma_1 HTM_i \times Treat_i \times Post_t + \gamma_2 MTM_i \times Treat_i \times Post_t \\ &+ \gamma_3 PG_i \times Treat_i \times Post_t + \gamma_4 Treat_i \times Post_t + \gamma_5 HTM_i \times Post_t \\ &+ \gamma_6 MTM_i \times Post_t + \gamma_7 PG_i \times Post_t + \lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \end{aligned} \tag{10}$$

where HTM_i, MTM_i and PG_i are dummy variables, taking the value of one if the product is high tech-intensive, medium tech-intensive manufactures and primary goods respectively, zero otherwise.[①] The coefficients of concern are γ_1、γ_2 and γ_3 which represent the trade effects of high tech-intensive manufactures, medium tech-intensive manufactures and primary goods in trade frictions compared with low tech-intensive manufactures and labor and resource-intensive manufactured products, respectively. Here, since only 5.6% of labor and resource-intensive manufactures belong to the control group, we are unable to conduct independent studies on the trade effects of labor and resource-intensive manufactures. Considering that labor and resource-intensive manufactures and low tech-intensive manufactures are relatively close to each other, we combine them into the base category in our research.

{Table 9 about here}

[①] The product fixed effect in the regression equation λ_i absorbs the interaction terms $HTM_i \times Treat_i$, $MTM_i \times Treat_i$ and $PG_i \times Treat_i$ in the triple difference equation.

As shown in Table 9, firstly, according to the regression results of column (1), the regression coefficients of $HTM \times Treat \times Post$ and $PG \times Treat \times Post$ were negative at 1% and 5% level of significance respectively. Therefore, the trade destruction effect caused by the US additional tariffs on $200 billion of China's products is mainly concentrated on high tech-intensive manufactures and primary goods, among which the trade destruction effect of primary goods is the largest. Secondly, according to the regression results in column (2), the regression coefficients of the interaction terms are statistically insignificant. Therefore, we find no significant difference in the trade deflection effect caused by $200 billion product tariffs among products with different levels of manufacturing. Thirdly, according to the regression results in column (3), the regression coefficient of $PG \times Treat \times Post$ is negative and statistically significant at 10% statistical level.[①] As a result, the net trade destruction effect caused by the US additional tariffs on $200 billion of China's products is concentrated on primary goods. This is consistent with the findings that compared with other products, the export of primary goods has suffered the greatest trade destruction effect, with the trade deflection effect not statistically different from other products.

China's exports of high technological manufactures to the US are found to have a greater trade destruction effect. The reason is that processing trade accounts for a relatively high proportion of China's exports of high technological manufactures to the US. In other words, China tends to undertake the labor-intensive final assembly in the global production chain of high-tech manufactures. After the US imposed tariffs on imports from China, China's labor force no longer has a cost advantage compared to other developing countries. As a result, US companies moved the final assembly process of their products away from China to other countries, which in turn resulted in a greater impact on China's exports of high-tech manufactures to the US.

China's exports of primary goods to the US have endured the biggest trade destruction effect. It is because that the supply of primary goods is mainly related to a country's natural endowments, and there is no complicated technical entry barrier in providing primary goods. Meanwhile, there is no obvious quality or brand differences in primary goods. Thus, after the US imposed tariffs on imports from China, other countries can immediately export primary goods of similar quality with

[①] In the heterogeneity analysis, we only report the regression results of the post-supplement aggregation data, as the regression results obtained by using the pre- and post-supplement aggregation data are consistent.

relatively lower consumer price to the US, thus causing a significant adverse impact on China's exports of primary goods to the US.

6.1.2 Distinguishing between Homogeneous and Differentiated Products

According to the conservative classification standard proposed by Rauch (1999), we classify the export products into homogeneous products, differentiated products and unclassified products on whether they have a reference price. The $50 billion product tariff list is not used for further scrutiny, as over 72% of the products on the $50 billion list are differentiated products, with disproportionately insufficient homogeneous products. Therefore, we make further inquiry into the trade effects on homogeneous, differentiated and unclassified products of the US imposition of tariffs on the $200 billion worth of Chinese products. Similarly, based on Yagan (2015)'s model, we set up the following models to test whether the trade effects on the exports of China's targeted products vary across homogeneous and differentiated Products:

$$lnExport_{hit} = \alpha_0 + \delta_1 DIFF_i \times Treat_i \times Post_t + \delta_2 UC_i \times Treat_i \times Post_t$$
$$+\delta_3 Treat_i \times Post_t + \delta_4 DIFF_i \times Post_t + \delta_5 UC_i \times Post_t$$
$$+\lambda_i + \psi_{ht} + \varepsilon_{hit} \quad (11)$$

$$lnExport_{jhit} = \alpha_0 + \delta_1 DIFF_i \times Treat_i \times Post_t + \delta_2 UC_i \times Treat_i \times Post_t$$
$$+\delta_3 Treat_i \times Post_t + \delta_4 DIFF_i \times Post_t + \delta_5 UC_i \times Post_t$$
$$+\lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \quad (12)$$

where $DIFF_i$ is a dummy variable, taking the value of one if product *i* is a differentiated product, otherwise zero; UC_i is a dummy variable, taking the value of one if product *i* is an unclassified product, otherwise zero. Homogeneous products are the base category. δ_1 and δ_2 represent the trade effects on differentiated and unclassified products respectively relative to differentiated products, respectively.

{Table 10 about here}

As shown in Table 10, firstly, according to the regression results in column (1), the coefficients of the interaction terms are not statistically significant. As a result, the trade destruction effects on the exports of products covered under the $200 billion levied tariff lines are not significantly different between homogeneous and differentiated products. Secondly, according to the regression results in column (2), the regression coefficient of $DIFF \times Treat \times Post$ is positive and statistically significant at 1% statistical level. As a result, the trade deflection effect caused by the US additional tariffs on \$200 billion of China's products is concentrated on differentiated products. Thirdly, according to the regression results in column (3), the regression coefficient of $DIFF \times Treat \times Post$ is positive and significant at 10% statistical level. As a result, the net trade destruction effect of differentiated goods under \$200 billion product tariffs is the weakest. This is consistent with the findings that compared with homogeneous and reference priced products, the export of differentiated products has the largest trade deflection effect, with the trade destruction effect not statistically different from other products.

China's exports of differentiated products to the US have demonstrated the greatest trade deflection effect. Since there is no reference price, the transaction of differentiated products mainly depends on the quality and the brand of products. After the US imposes tariffs on imports from China, Chinese firms can effectively promote the sales of differentiated products in the third-party markets by marketing and relying on product quality advantages. In the transaction of homogeneous products, product prices play a decisive role, so reducing costs and prices is the main method to promote the sale of homogeneous products. However, due to US-China trade frictions, the costs for Chinese firms to produce homogeneous products were additionally increased. Thus Chinese firms have limited abilities to promote their sales of homogeneous products in third-party markets. Accordingly, the trade deflection effect of China's exports to the third-party markets is concentrated on differentiated products rather than homogeneous products.

6.2 Country Heterogeneity Analysis

Is there any difference in the trade deflection effects of China's exports to third-party markets among different countries (regions)? We classify the third-party markets according to their levels of economic development and trade relations with China, and investigate the country heterogeneity of trade deflection effects based on the following equation:

$$lnExport_{jhit} = \alpha_0 + \eta_1 Group_j \times Treat_i \times Post_t + \eta_2 Treat_i \times Post_t$$

$$+\eta_3 Group_j \times Treat_i + \lambda_i + \psi_{jh} + \psi_{jt} + \psi_{ht} + \varepsilon_{jhit} \qquad (13)$$

where $Group_j$ is a dummy variable, taking the value of one if third-party market j belongs to the corresponding country (region), otherwise zero.[1] We will define the grouping variable $Group_j$ with specific names in later analysis. The coefficient of concern is η_1 which represents the trade deflection effect of the corresponding category of third-party markets compared with other third-party markets in trade frictions.

6.2.1 Distinguishing between the Levels of Economic Development

Compared with developing countries, the economic and trade structures of developed countries are likely to be closer to those of the US. In this way, after the US levy of tariffs on Chinese imports, Chinese companies may be more inclined to shift products that are originally exported to the US to other developed markets. In order to study whether the trade deflection effect is more concentrated in the developed markets, we apply two scenarios. In the first scenario, we treat the OECD countries in our sample as developed markets; in the second one we treat countries (regions) recognized as high-income by the World Bank in our sample as developed markets. We re-define the grouping variable $Group_j$ as $OECD_j$ and HI_j, respectively. Where $OECD_j$ takes the value of one when third-party market j belongs to OECD countries, otherwise zero. HI_j takes the value of one when third-party market j belongs to high-income countries (regions), otherwise zero.

{Table 11 about here}

As shown in Table 11, firstly, according to the regression results in columns (1) and (4), the regression coefficient of $OECD \times Treat \times Post$ is not statistically significant. Therefore, there is no significant difference between OECD countries and non-OECD countries in the trade deflection effect of China's exports to the third-party markets. Secondly, according to the regression results in column (2) and column (5), the regression coefficient of $HI \times Treat \times Post$ is not statistically significant. On this basis, there is no significant difference in the trade deflection effect of China's exports to the third-party markets between high-income countries and other countries. Therefore, after the US levied import tariffs on imports from China, the export deflection of Chinese enterprises was not concentrated in developed markets. Similarly, Chandra (2016) also found that there is no significant difference in the trade deflection effect of Chinese

[1] Since the variable $Post_t$ in the triple difference model generally changes in the time dimension, in the $50 billion product tariff sample, we unify the value of $Post_t$ at one when *t* is August 2018 and onwards, otherwise zero. The country-time fixed effect in the regression equation absorbs the interaction term $Group_j \times Post_t$ in the triple difference equation.

exports between developed and developing countries. This finding suggests that when Chinese enterprises choose the third-party market, they focus more on the compatibility between the specific export products and the market, rather than the economic development level of the market.

6.2.2 Distinguishing between the Trade Relationships with China

The levy of import tariffs by the US on China may increase the concerns of Chinese exporters about the future international trade environment. In order to ensure the stability of the export market, exporters may take the trade relationship between the export market and China as an important consideration when choosing the third-party market. Countries that have established stable trade relationships with China are relatively less likely to adopt similar trade restrictions against China in the future. We believe that the third-party markets, which have signed regional trade agreements (RTA) with China, have more stable trade relationships with China. Here we re-define the grouping variable $Group_j$ as RTA_j, with a value of one when third-party market j has signed a regional trade agreement with China, otherwise zero.

According to the regression results in columns (3) and (6) in Table 11, the regression coefficient of $RTA \times Treat \times Post$ was not statistically significant. Therefore, there is no significant difference between the trade deflection effect of China's exports to third-party markets with and without regional trade agreements. This reflects that exporters were more inclined to treat US-China trade frictions as special events and remain optimistic about China's overall international trade environment in the long run. Based on the above results, we do not find that there is significant country heterogeneity in the trade deflection effect caused by the US levy of tariffs to China.

7. Analysis of Specific Products

Empirical evidence shows that US-China trade frictions have negative trade destruction effects on exports of China's tariff-targeted products to the US, and positive trade deflection effects on exports to third-party markets. This section goes further into detail, paying attention to the trade effects on individual products. As it is impractical to investigate every single third-party market, here we selected the EU and Japan as representative third-party markets for the following reasons: Firstly, the EU and Japan are both important export destinations of China, so it is of great economic significance to examine the trade deflection of tariff-targeted products to these markets. Secondly, although the EU and Japan are both developed economies, their structures of product trade with China are quite different, so there may be significant differences in the trade deflection of tariff-targeted products between the two markets.

7.1. Analysis of $50 billion tariff-targeted products

We analyze the changes in the export of China's tariff-targeted products covered under the $50 billion levied tariff lines. We select the top 50 products under the HS 6-digit with the highest export values from China to the US in 2017. The exports of these 50 products to the US accounted for approximately 72% of the $50 billion tariff-targeted products exported to the US in 2017, which are sufficiently representative. We calculate the export value of the selected products to the US, the EU and Japan from September 2018 to June 2019, and compare it with the export value from September 2017 to June 2018 to acquire the year-on-year rate of change of each product's exports to the US, the EU and Japan.[①]

Firstly, the exports of 39 products to the US, out of the top 50 tariff-targeted products, have declined year-on-year, confirming that the levy of $50 billion product tariffs has negatively affected the exports of most tariff-targeted products to the US. Exports of 19 tariff-targeted products to the US fell by more than 25% year-on-year, showing a large trade destruction effect. These products whose exports to the US have fallen sharply are mainly mechanical and electronic products covered by codes 84 and 85 at the HS 2-digit level. Secondly, the exports of 37 tariff-targeted products to the EU increased year-on-year, and exports of 16 products to the EU increased by more than 15% year-on-year, confirming that there is a trade deflection effect that promotes the exports of China's targeted products to the EU. These products with a sharp increase in exports to the EU are mainly mechanical products covered by codes 84 at the HS 2-digit level. Thirdly, the exports of 28 tariff-targeted products to Japan increased year-on-year, and exports of 9 products to Japan increased by more than 15% year-on-year. Overall, the export deflection of $50 billion of China's tariff-targeted products to Japan is smaller than the export deflection to the EU. The export deflection of representative $50 billion tariff-targeted products with a year-on-year decline in exports to the US is shown in Table 12. It can be observed that most of the products

[①] We use bar charts to illustrate each representative product's export changes to the US, the EU and Japan. Due to limited space, these figures are not presented in this paper, but are available from the authors if interested.

with declining exports to the US can alleviate part of the loss of exports to the US through the deflection of exports to the EU or Japan. At the same time, there are also a small number of products with declined exports to the US while failed to deflect exports to the EU and Japan. Need to note that, the exports of 847170, 852691 and 852990 to the US fell by more than 25% year-on-year, while failed to deviate their exports to the EU and Japan at the same time.

{Table 12 about here}

7.2. Analysis of $200 billion tariff-targeted products

7.2.1 Distinguishing among the degrees of manufacturing

In the regression analysis, we confirmed that the trade destruction effects of China's exports to the US are mainly concentrated on high-tech manufactures and primary goods. For each of the two categories, we select the top 50 products under the HS 6-digit with the highest export values from China to the US in 2017.

Among the top 50 tariff-targeted high-tech manufactures, exports of 34 products fell year-on-year, confirming that the $200 billion commodity tariffs have an adverse impact on most tariff-targeted high-tech manufactures. The exports of 12 products to the US fell by more than 25% year-on-year, showing a large trade destruction effect. These products whose exports to the US have fallen sharply are mainly organic chemicals and machinery products covered by codes 29 and 84 at the HS 2-digit level. On the other hand, the exports of 33 tariff-targeted high-tech manufactures to the EU increased year-on-year, and 20 of them increased by more than 15% year-on-year, confirming that the tariff-targeted products have positive trade deflection to the EU. These products whose exports to the EU have risen sharply are mainly organic chemicals and electronic products covered by codes 29 and 85 at the HS 2-digit level. Likewise, the exports of 35 tariff-targeted high-tech manufactures to Japan increased year-on-year, and exports of 12 products increased by more than 15% year-on-year, confirming that the tariff-targeted products have positive trade deflection to Japan. These products whose exports to Japan have risen sharply are mainly organic chemicals and cosmetics covered by codes 29 and 33 at the HS 2-digit level.[①]

The additional tariffs on $200 billion Chinese products have had an adverse impact on

[①] The exports of some organic chemical products to Japan, i.e. 292122, 292239, 292800 and 293139, have increased by more than 100%.

exports to the US among the top 50 tariff-targeted primary goods, which is evidenced by the year-on-year decline of exports of 32 products to the US, and exports of 13 products to the US fell by more than 25% year-on-year, showing a large trade destruction effect. The primary goods whose exports to the US have fallen sharply are mainly fish products covered by codes 02 at HS 2-digit level. Among the 50 main tariff-targeted primary goods, the exports of 23 products to the EU increased year-on-year, and the exports of 9 products to the EU increased by more than 15% year-on-year. Among 50 main tariff-targeted primary goods, the exports of 21 products to Japan increased year-on-year, and 7 of them increased by more than 15% year-on-year. On the whole, the export deflection of tariff-targeted primary goods to the EU and Japan is relatively weak.

7.2.2 Distinguishing between Homogeneous and Differentiated Products

We also classify the $200 billion tariff-targeted products into differentiated and homogeneous products, and select the top 50 HS 6-digit products with the highest export values from China to the US in 2017 for each categories of products. Firstly, among the top 50 tariff-targeted homogeneous products, the exports of 31 products to the US declined year-on-year, and exports of 13 products to the US declined by more than 25% year-on-year, showing a large trade destruction effect. Secondly, among the top 50 tariff-targeted homogeneous products, the exports of 17 products to the EU increased by more than 15% year-on-year, but there were also 19 products suffered a decline of export to the EU. Thirdly, among the top 50 tariff-targeted homogeneous products, the exports of 12 products to Japan increased by more than 15% year-on-year, but there was also a decline in 24 products' exports to Japan. On the whole, with the exception of organic chemicals, China's exports of homogenous products to the EU and Japan are relatively weak.

Among the top 50 tariff-targeted heterogeneous products, the exports of 28 products to the US declined year-on-year, and the exports of 6 products to the US dropped by more than 25% year-on-year, showing a large trade destruction effect. On the other hand, among the 50 main tariff-targeted differentiated products, 36 of them had an increase in export to the EU, among which the exports of 9 products to the EU increased by more than 15% year-on-year. Thirdly, among the 50 categories of tariff-targeted differentiated products, 36 of them had an increase in export to Japan, among which the exports of 9 tariff-targeted products to Japan increased by more than 15% year-on-year. In general, China's exports of differentiated products covered under the $200 billion levied tariff lines have a stronger trade deflection effect.

{Table 13 about here}

As shown in table 13, most of the decline in China's exports of products covered under the $200 billion levied tariff lines to the US can be alleviated through the export deflection to the EU and/or to Japan. However, compared with the $50 billion tariff-targeted products, most of the $200 billion tariff-targeted products have smaller trade deflection effects, and therefore the overall trade deflection effect is relatively small. At the same time, there are also many products whose exports to the US have declined while the defection effect to the EU and Japan hasn't shown up. For example, the exports of 12 tariff-targeted products including 030479, 030614, 030617, 051199, 071290, 291899, 481092, 710691, 810520, 847150, 852721 and 853120 have declined by more than 25% year-on-year to the US, neither have them been deflected to the EU or Japan, which needs full attention.

8. Main conclusions and policy recommendations

Since March 2018, the Trump administration has provoked increased trade frictions between China and the US. During the process, the US has levied tariffs on $50 billion and $200 billion Chinese products. What is the impact of US-China trade rows on China's exports of tariff-targeted products in trade disputes? The main conclusions of the study are:

Firstly, the US levy of tariffs on $50 billion and $200 billion Chinese products have produced a significant and adverse trade destruction effect on China's exports to the US. Meanwhile, the tariffs levied on these Chinese products have played a significant and positive role in deflecting China's exports to third-party markets. In comparison, the US additional tariffs on $50 billion of China's products has produced a greater trade destruction and deflection effects on China's exports of tariff-targeted products.

Secondly, the US levy of tariffs on $50 billion and $200 billion Chinese products has produced positive expectation effects on China's exports to the US. In comparison, the expectation effect is more significant on $200 billion Chinese products. Meanwhile, there are also negative delay effects on China's exports of tariff-targeted products to the US.

Thirdly, although the US additional tariff on $50 billion of China's products has produced a greater trade destruction effect on China's export of tariff-targeted products to the US, regression based on aggregation data shows that China's exports of products covered under the $50 billion levied tariff lines do not have a significant net trade effect. In contrast, China's exports of products covered under the $200 billion levied tariff lines has caused a significant net trade destruction effect.

Fourthly, distinguishing among product differentiation, we confirm that the trade destruction effects of US additional tariffs on Chinese products exported to the US are mainly concentrated on high-tech manufactures and primary goods, while the trade deflection effect on China's exports to third-party markets is concentrated on differentiated products. Moreover, distinguishing among country differentiation confirms that there is no significant difference in the trade deflection effect on China's exports of targeted products to third-party markets among countries with different levels of economic development and different trade relationship with China.

Fifthly, based on the statistical analysis on the export changes of specific products, we find that China's export of tariff-targeted products to the US have decreased significantly after the two rounds of tariff levy. During the same period, the positive deflection effects on China's exports to the EU are mainly concentrated on machinery and electronic products, while that on China's exports to Japan are mainly concentrated on organic chemicals and cosmetics.

Based on the above findings, the main policy recommendations are as follows. Firstly, it is necessary to be aware of the negative impact of US-China trade frictions on China's economy. Trade deflection of China's exports to other countries from the US is unable to be achieved in full. Thus, trade destruction would be greater than trade deflection, resulting in non-negligible reductions in China's exports. Therefore, it is necessary to promote high-level economic and trade consultations between China and the US, to carry out negotiations on the text of the agreement, to replace confrontation with cooperation, and to properly resolve trade disputes between China and the US. Secondly, China needs to promote cooperation in trade with major third-party markets actively. With observed trade deflection and given the prevailing trade protectionism in the US, it is necessary to actively promote trade cooperation with major third-party markets such as the EU and Japan, further promote tariff reciprocity policies, and promote the sustained and healthy development of bilateral trade with the concept of non-zero-sum cooperation. At the same time, it is also necessary to actively enhance trade liberalization and investment facilitation in order to explore overseas markets in depth.

References

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

Bown, C. P., & Crowley, M. A. (2006). Policy externalities: How US antidumping affects Japanese exports to the EU. *European Journal of Political Economy*, *22*(3), 696-714.

Bown, C. P., & Crowley, M. A. (2007). Trade deflection and trade diversion. *Journal of International Economics*, *72*(1), 176-201.

Bown, C. P., & Crowley, M. A. (2010). China's export growth and the China safeguard: Threats to the world trading system? *Canadian Journal of Economics*, *43*(4), 1353-1388.

Brenton, P. (2001). Antidumping policies in the EU and trade diversion. *European Journal of Political Economy*, *17*(3), 593-607.

Chandra, P. (2016). Impact of temporary trade barriers: Evidence from China. *China Economic Review*, *38*, 24-48.

Chandra, P. (2017). Trade destruction and trade diversion: Evidence from China. *China & World Economy*, *25*(3), 31-59.

Chandra, P., & Long, C. (2013). Anti-dumping duties and their impact on exporters: Firm level evidence from China. *World Development*, *51*, 169-186.

Durling, J. P., & Prusa, T. J. (2006). The trade effects associated with an antidumping epidemic: The hot-rolled steel market, 1996–2001. *European Journal of Political Economy*, *22*(3), 675-695.

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

Guo, M., Lu, L., Sheng, L., & Yu, M. (2018). The day after tomorrow: Evaluating the burden of Trump's trade war. *Asian Economic Papers*, *71*(1), 101-120.

Hoai, N. T., Toan, N. T., & Van, P. H. (2017). Trade diversion as firm adjustment to trade policy: Evidence from EU antidumping duties on Vietnamese footwear. *The World Economy*, *40*(6), 1128-1154.

IMF. (2019a). *World Economic Outlook, April 2019: Growth Slowdown, Precarious Recovery*. International Monetary Fund, Washington, D.C. (https://www.imf.org/en/Publications/WEO/Issues/2019/03/28/world-economic-outlook-april-2019).

IMF. (2019b). *World and Regional Tables: Balance of Payments and International Investment Position by Indicator (BPM6) (as of November 16, 2018)*. International Monetary Fund, Washington, D.C. (http://data.imf.org/regular.aspx?key=60961513).

Li, C., He, C., & Lin, C. (2018). Economic impacts of the possible China-US trade war. *Emerging Markets Finance and Trade*, *54*(7), 1557-1577.

Lu, Y., Tao, Z., & Zhang, Y. (2013). How do exporters respond to antidumping investigations? *Journal of International Economics*, *91*(2), 290-300.

Moser, P., & Voena, A. (2012). Compulsory licensing: Evidence from the trading with the enemy act. *American Economic Review*, *102*(1), 396-427.

Nicita, A. (2019). *Trade and trade diversion effects of United States tariffs on China*. UNCTAD Research Paper 37.

Park, S. (2009). The trade depressing and trade diversion effects of antidumping actions: The case of China. *China Economic Review*, *20*(3), 542-548.

Prusa, T. J. (2001). On the spread and impact of antidumping. *Canadian Journal of Economics*, *34*(3), 591-611.

Rauch, J. E. (1999). Networks versus markets in international trade. *Journal of International Economics*, *48*(1), 7-35.

Shen, G., & Fu, X. (2014). The trade effects of US anti-dumping actions against China post-WTO entry. *The World Economy*, *37*(1), 86-105.

USTR. (2019). *Statement by U.S. Trade Representative Robert Lighthizer on section 301 action*. Press Releases, Office of the US Trade Representative, Washington, D.C., May 10, 2019. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2019/may/statement-us-trade-representative)

USTR. (2018a). *President Trump announces strong actions to address China's unfair trade*. Press Releases, Office of the US Trade Representative, Washington, D.C., March 22, 2018. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/march/president-trump-announces-strong)

USTR. (2018b). *USTR releases proposed tariff list on Chinese products*. Press Releases, Office of the US Trade Representative, Washington, D.C., April 3, 2018. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/april/under-section-301-action-ustr)

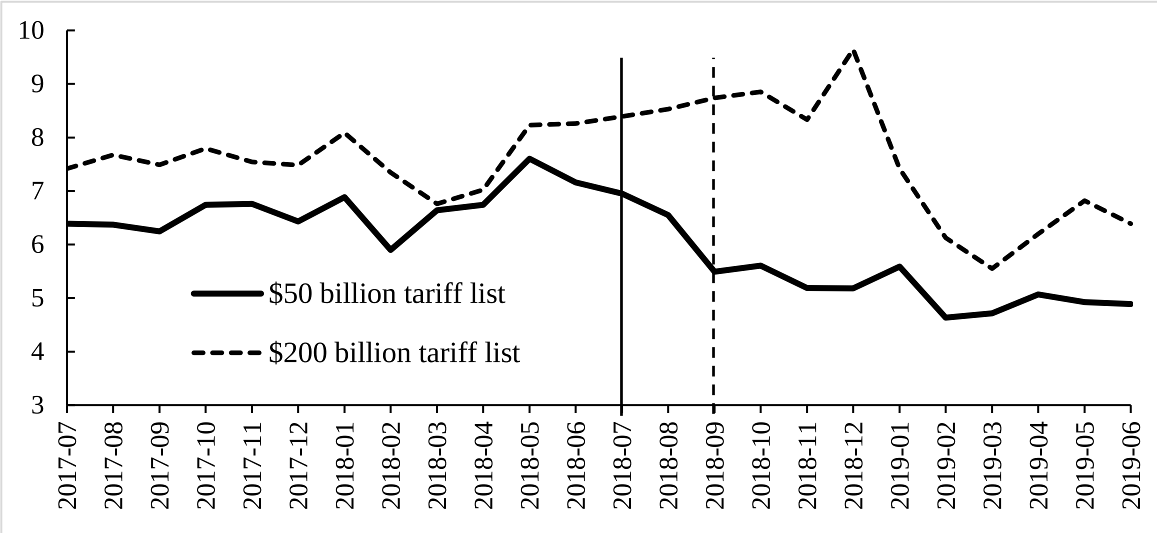
USTR. (2018c). *USTR releases product exclusion process for Chinese products*. Press Releases, Office of the US Trade Representative, Washington, D.C., July 6, 2018. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/july/ustr-releases-product-exclusion)

USTR. (2018d). *Public hearings on proposed section 301 tariff list*. Press Releases, Office of the US Trade Representative, Washington, D.C., August 17, 2018. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/august/public-hearings-proposed-section-301)

USTR. (2018e). *USTR finalizes tariffs on $200 billion of Chinese imports*. Press Releases, Office of the US Trade Representative, Washington, D.C., September 18, 2018. (https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/september/ustr-finalizes-tariffs-200)

Yagan, D. (2015). Capital tax reform and the real economy: The effects of the 2003 dividend tax cut. *American Economic Review*, *105*(12), 3531-3563.

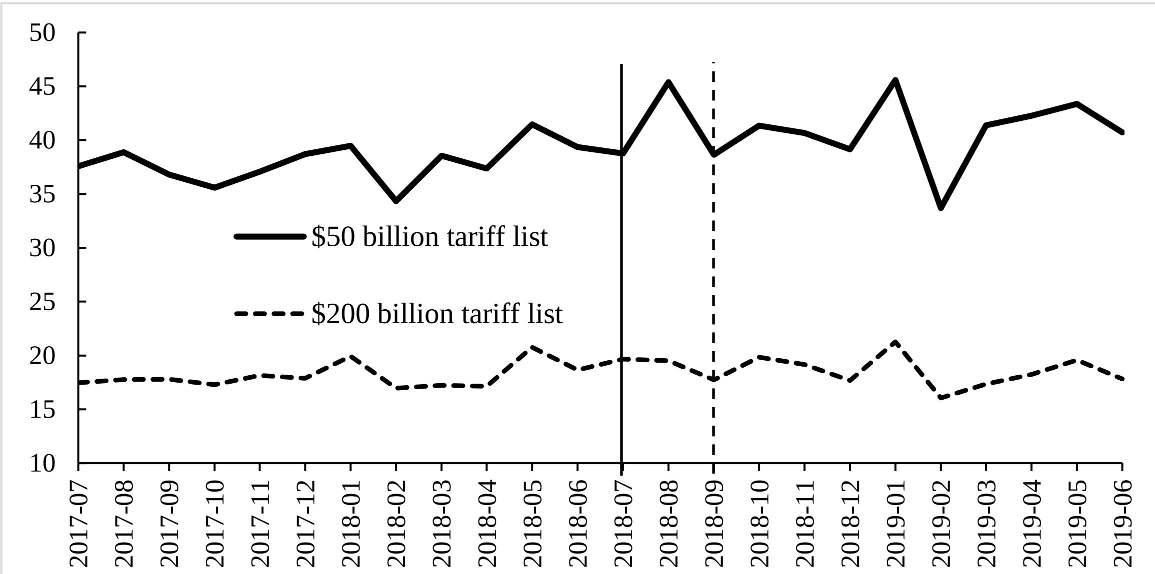
Figures



Notes: (i) The vertical axis is the average value of exports to the US of products on the tariff lists, in millions of dollars. (ii) The vertical solid line corresponds to the time when the US imposed the first round of tariffs on $50 billion products from China (July 2018). The vertical dotted line corresponds to the time when the US imposed tariffs on $200 billion in products from China (September 2018).

Source: UN Comtrade database, calculated by the authors.

Figure 1. China's exports of tariff-targeted products to the US



Notes: (i) The vertical axis is the average value of exports to the third-party markets of products on the tariff lists, in millions of dollars. (ii) The vertical solid line corresponds to the time when the US imposed the first round of tariffs on $50 billion products from China (July 2018). The vertical dotted line corresponds to the time when the US imposed tariffs on $200 billion in products from China (September 2018).

Source: UN Comtrade database, calculated by the authors.

Figure 2. China's exports of tariff-targeted products to third-party markets

Tables

Table 1. The impacts of US-China trade frictions on China's export of tariff-targeted products: Benchmark regression

Variables	Tariffs on \$50 billion goods (1) US	(2) Third markets	Tariffs on \$200 billion goods (3) US	(4) Third markets
$Treat \times Post$	-0.462***	0.050***	-0.190***	0.012**
	(0.044)	(0.008)	(0.029)	(0.006)
Intercept	14.057***	10.478***	13.217***	10.125***
	(0.011)	(0.007)	(0.007)	(0.004)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	24 953	1 066 263	82 788	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 2. The impact of US-China trade frictions on exports of China's tariff-targeted products: Parallel trend tests

Variables	Tariffs on \$50 billion goods (1) US	(2) Third markets	Tariffs on \$200 billion goods (3) US	(4) Third markets
$Treat \times Pre$	0.001	0.004	-0.027	0.002
	(0.038)	(0.009)	(0.025)	(0.006)
$Treat \times Post$	-0.462***	0.053***	-0.206***	0.013*
	(0.054)	(0.011)	(0.036)	(0.008)
Intercept	14.057***	10.476***	13.230***	10.140***
	(0.021)	(0.008)	(0.015)	(0.005)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	24 953	1 066 263	82 788	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 3. The impact of US-China trade frictions on exports of China's tariff-targeted products: Total sample estimation

Variables	(1) The US	(2) Third markets
$Treat500 \times Post$	-0.461***	0.047***
	(0.037)	(0.007)
$Treat2000 \times Post$	-0.166***	0.011*
	(0.027)	(0.006)
Intercept	13.328***	10.178***
	(0.007)	(0.004)
Product fixed effects	Yes	Yes
Country-sector fixed effects	No	Yes
Country-time fixed effects	No	Yes
Sector-time fixed effects	Yes	Yes
No. of observations	99 053	3 658 661

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) are the robust standard errors clustered at the product level; the bracketed values in column (2) are the robust standard errors clustered at the country-product level.

Table 4. The impact of US-China trade frictions on exports of China's tariff-targeted products: Controlling Export trends of products with different characteristics

Variables	Tariffs on \$50 billion goods		Tariffs on \$200 billion goods	
	(1)	(2)	(1)	(2)
	US	Third markets	US	Third markets
$Treat \times Post$	-0.500***	0.044***	-0.193***	0.012*
	(0.047)	(0.009)	(0.029)	(0.006)
$HTM \times Post$	0.003	-0.016	-0.026	-0.005
	(0.118)	(0.022)	(0.083)	(0.019)
$MTM \times Post$	0.133	0.043*	0.080	0.037**
	(0.128)	(0.023)	(0.075)	(0.018)
$LRM \times Post$	0.651***	0.004	-0.052	0.037*
	(0.161)	(0.114)	(0.097)	(0.022)
$PG \times Post$	-0.113	0.002	-0.125	0.036
	(0.204)	(0.059)	(0.079)	(0.022)
$DIFF \times Post$	0.122	0.001	0.030	0.027**
	(0.109)	(0.021)	(0.041)	(0.011)
$UC \times Post$	0.193*	-0.016	0.012	0.036***
	(0.113)	(0.022)	(0.041)	(0.011)
Intercept	-0.500***	0.044***	-0.193***	0.012*
	(0.047)	(0.009)	(0.029)	(0.006)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes

Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	24 953	1 066 263	82 788	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 5. The impacts of US-China trade frictions on China's export of tariff-targeted products: Counterfactual analysis

Variables	Tariffs on \$50 billion goods		Tariffs on \$200 billion goods	
	(1)	(2)	(3)	(4)
	US	Third markets	US	Third markets
$Treat \times Post$	-0.027	0.013	-0.026	0.002
	(0.038)	(0.009)	(0.025)	(0.006)
Intercept	14.000***	10.474***	13.198***	10.144***
	(0.017)	(0.008)	(0.011)	(0.005)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	16 695	704 216	55 469	1 978 036

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 6. The impacts of US-China trade frictions on China's export of tariff-targeted products: The expectation effect

Variables	Tariffs on \$50 billion goods		Tariffs on \$200 billion goods	
	(1)	(2)	(3)	(4)
	US	Third markets	US	Third markets
$Treat \times Annc$	0.070*	0.010	0.128***	0.026***
	(0.042)	(0.011)	(0.035)	(0.009)
$Treat \times Post$	-0.449***	0.052***	-0.177***	0.015**
	(0.046)	(0.009)	(0.030)	(0.006)
Intercept	14.050***	10.477***	13.207***	10.139***
	(0.013)	(0.007)	(0.008)	(0.004)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	24 953	1 066 263	82 788	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 7. The impacts of US-China trade frictions on China's export of tariff-targeted products: The delay effect of additional tariffs

Variables	Tariffs on \$50 billion goods		Tariffs on \$200 billion goods	
	(1)	(2)	(3)	(4)
	US	Third markets	US	Third markets
$Treat \times Post$	-0.474***	0.044***	-0.238***	0.011*
	(0.044)	(0.009)	(0.029)	(0.006)
Intercept	14.040***	10.481***	13.217***	10.141***
	(0.009)	(0.007)	(0.006)	(0.004)
Product fixed effects	Yes	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No	Yes
Country-time fixed effects	No	Yes	No	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	24 953	1 066 263	82 788	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) and (4) are the robust standard errors clustered at the country-product level.

Table 8. The impacts of US-China trade frictions on China's export of tariff-targeted products: Net trade effects

Variables	Tariffs on \$50 billion goods		Tariffs on \$200 billion goods	
	(1)	(2)	(3)	(4)
	Before supplement	After supplement	Before supplement	After supplement
$Treat \times Post$	-0.015	-0.016	-0.073***	-0.071***
	(0.025)	(0.023)	(0.025)	(0.026)
Intercept	16.000***	16.027***	14.725***	14.763***
	(0.006)	(0.006)	(0.006)	(0.006)
Product fixed effects	Yes	Yes	Yes	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes
No. of observations	29 436	29 459	114 619	114 326

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values are the robust standard errors clustered at the product level.

Table 9. The impacts of US-China trade frictions on China's export of tariff-targeted products: By degrees of manufacturing

Variables	(1) US	(2) Third markets	(3) Total export
$HTM \times Treat \times Post$	-0.173***	0.006	0.068
	(0.065)	(0.015)	(0.059)
$MTM \times Treat \times Post$	-0.086	-0.003	0.038
	(0.076)	(0.014)	(0.053)
$PG \times Treat \times Post$	-0.210**	-0.020	-0.124*
	(0.104)	(0.023)	(0.072)
$Treat \times Post$	-0.092**	0.012	-0.062
	(0.045)	(0.009)	(0.041)
$HTM \times Post$	0.105	-0.023	-0.128*
	(0.082)	(0.018)	(0.076)
$MTM \times Post$	0.160*	0.021	-0.026
	(0.087)	(0.017)	(0.068)
$PG \times Post$	0.050	0.020	-0.008
	(0.102)	(0.024)	(0.085)
Intercept	13.197***	10.141***	14.777***
	(0.015)	(0.005)	(0.016)
Product fixed effects	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No
Country-time fixed effects	No	Yes	No
Sector-time fixed effects	Yes	Yes	Yes
No. of observations	82 788	2 985 903	114 326

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) are the robust standard errors clustered at the country-product level.

Table 10. The impacts of US-China trade frictions on China's export of tariff-targeted products: Differentiated and homogeneous products

Variables	(1) US	(2) Third markets	(3) Total export
$DIFF \times Treat \times Post$	0.104	0.050***	0.111*
	(0.065)	(0.017)	(0.059)
$UC \times Treat \times Post$	0.088	0.029	0.093
	(0.086)	(0.020)	(0.065)
$Treat \times Post$	-0.266***	-0.025	-0.139***
	(0.057)	(0.016)	(0.053)
$DIFF \times Post$	-0.029	-0.015	-0.005
	(0.064)	(0.017)	(0.058)
$UC \times Post$	-0.046	0.008	-0.037
	(0.078)	(0.019)	(0.058)

Intercept	13.228***	10.144***	14.769***
	(0.017)	(0.006)	(0.015)
Product fixed effects	Yes	Yes	Yes
Country-sector fixed effects	No	Yes	No
Country-time fixed effects	No	Yes	No
Sector-time fixed effects	Yes	Yes	Yes
No. of observations	82 788	2 985 903	114 326

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values in column (1) and (3) are the robust standard errors clustered at the product level; the bracketed values in column (2) are the robust standard errors clustered at the country-product level.

Table 11. The impacts of US-China trade frictions on China's export of tariff-targeted products: Heterogeneity across countries

Variables	Tariffs on \$50 billion goods			Tariffs on \$200 billion goods		
	(1)	(2)	(3)	(4)	(5)	(6)
$OECD \times Treat \times Post$	-0.001			0.005		
	(0.015)			(0.010)		
$HI \times Treat \times Post$		-0.004			-0.004	
		(0.016)			(0.010)	
$RTA \times Treat \times Post$			0.010			0.015
			(0.019)			(0.013)
$Treat \times Post$	0.043***	0.045***	0.042***	0.009	0.014*	0.009
	(0.012)	(0.012)	(0.009)	(0.008)	(0.009)	(0.007)
$OECD \times Treat$	-0.380***			0.001		
	(0.032)			(0.021)		
$HI \times Treat$		-0.369***			0.043**	
		(0.032)			(0.021)	
$RTA \times Treat$			0.108**			0.111***
			(0.044)			(0.028)
Intercept	10.598***	10.608***	10.466***	10.140***	10.123***	10.123***
	(0.012)	(0.013)	(0.009)	(0.009)	(0.010)	(0.006)
Product fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-sector fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Country-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Sector-time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
No. of observations	1 066 263	1 066 263	1 066 263	2 985 903	2 985 903	2 985 903

Notes: (i) ***, ** and * denote significant at the 1%, 5% and 10% level respectively. (ii) The bracketed values are the robust standard errors clustered at the country-product level.

Table 12. Trade destruction vis-à-vis trade deflection effects on China's exports of $50 billion tariff-targeted products

	Fall in exports to US: 0-10%			Fall in exports to US: 10-25%			Fall in exports to US: >25%		
	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU
No trade deflection to Japan	844399, 850110, 854430			852550	841490, 848190, 853630, 853669, 853890	853650, 870323	847170, 852691, 852990	848690, 852560, 854239, 854370, 854449	903210
Small trade deflection to Japan		850440	843149	850131, 901380	901819	843120	840790, 847330	854231, 901819	271019, 730890, 843120, 854140, 903289
Large trade deflection to Japan		841391, 848390	841430				854232		

Notes: Products with no export deflection to EU or Japan refer to the products that fell or remained unchanged in China's exports to EU or Japan in period September 2018 – June 2019 relative to reference period. Small deflection to EU or Japan refers to increases ranging (0%, 15%] in China's exports to EU or Japan; large deflection to EU or Japan refers increases than exceeded 15% in China exports to EU or Japan.

Source: UN Comtrade database, calculated by the authors.

Table 13. Trade destruction vis-à-vis trade deflection effects on China's exports of $200 billion tariff-targeted products

	Fall in exports to US: 0-10%			Fall in exports to US: 10-25%			Fall in exports to US: >25%		
	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU	No trade deflection to EU	Small trade deflection to EU	Large trade deflection to EU
No trade deflection to Japan	030462, 030722, 030743, 190219, 380891, 853400	190230, 293090, 732399, 851981, 940179	732111, 900211	070320, 160521, 380893, 392620	420222, 440929, 441299, 481190, 550320, 710510	230990, 282110, 293190, 871200	030479, 030614, 030617, 051199, 071290, 291899, 481092, 710691, 810520, 847150, 852721, 853120	441239	252329, 851769
Small trade deflection to Japan	160540, 200830, 852869	210390, 330420, 381800, 420212, 830241, 841510, 851890, 852352, 870870, 900190, 901780, 940161, 940360, 940390	850811	320417, 330410, 392390, 481910, 847180	200899, 292249, 940171	851762, 851840	121190, 160419, 350790, 420221, 847190	200599	160414, 210610, 291469, 390931, 847329
Large trade deflection to Japan	290339, 330749	170490, 330499, 851220	481950	030749, 110620, 120991, 401120, 850220	441114, 540220		200979, 320611, 330491	681099, 940370	310210

Notes: Products with no export deflection to EU or Japan refer to the products that fell or remained unchanged in China's exports to EU or Japan in period September 2018 – June 2019 relative to reference period. Small deflection to EU or Japan refers to increases ranging (0%, 15%] in China's exports to EU or Japan; large deflection to EU or Japan refers increases than exceeded 15% in China exports to EU or Japan.
Source: UN Comtrade database, calculated by the authors.