"De Minimis" Trade is not Minimal: Tax Avoidance and US-China Trade Conflicts*

Jianpeng Deng†1, Jialin Li‡1, and Linke Zhu§1

1College of Business, Shanghai University of Finance and Economics

June 19, 2024

Abstract

To what extent are the effects of protectionist policies altered by tax avoidance? This paper provides the first quantitative assessment of such an alteration. We investigate a particular channel–the *de minimis* rule, which allows low-value shipments to enter US *duty-free* with a daily limit per person, and quantify its impacts on the effects of the US-China trade war. Guided by a model of customs entry, we estimate the causal impacts of tariff shocks from the trade war on the trade discrepancy between the US and China, specifically through the mechanism of de minimis imports. This causal estimate helps calibrate the key parameter in the model that measures the responsiveness of US importers to the tariff differences between the de minimis and regular entries. We apply the calibrated model to compute the values of de minimis imports at the product level, addressing the challenge posed by the lack of such product-level data. By embedding the model of customs entry into the general equilibrium model of Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), we demonstrate that tax avoidance through de minimis imports has a sizable impact on the aggregate effect of the US-China trade war.

Keywords: *De Minimis Rule; Tariff Avoidance; Trade War; Trade Discrepancy*

JEL classification: *F13; F14; H26*

*We are grateful for helpful comments from Costas Arkolakis, Robin Kaiji Gong, Bingjing Li, Kim Ruhl, Chang Sun, Rui Zhang, Yuan Zi, and participants at various seminars and conferences for valuable comments and suggestions.

†deng.jianpeng@mail.shufe.edu.cn

‡lijialin@stu.sufe.edu.cn

§zhu.linke@mail.shufe.edu.cn

1 Introduction

Protectionism, driven by geopolitical conflicts, is transforming global trade (Alfaro and Chor, 2023). With higher trade barriers, incidents of tax avoidance and evasion became prevalent. To what extent are the effects of protectionist policies altered by tax avoidance? This paper provides the first quantitative assessment of such alterations. Exploiting the discrepancy between US import statistics and Chinese export statistics induced by the *de minimis* rule, we quantify how such tax avoidance alters the effects of the US-China trade war.

E-commerce platforms that sell directly to consumers, coupled with the escalation of the US-China trade war, have significantly increased the volume of de minimis imports from China. In 2020, these imports were valued at approximately $45.5 billion, as estimated from data released by US Customs and Border Protection (CBP). This figure represents a sevenfold increase from 2016 before the trade war began, and accounts for about 10% of the total reported US imports from China in 2020.

The de minimis rule, established under Section 321 of the 1930 Tariff Act and codified in 1938, permits low-value shipments to bypass US duties, subject to a daily limit per person. This regulation is designed to alleviate the government's burden, offsetting the costs and logistical challenges associated with collecting minimal tariff revenues on these items. Shipments eligible for the de minimis exemption are quickly cleared by US CBP without requiring Harmonized System (HS) product codes, based solely on the manifest or bill of lading that details the origin, value, and description of the items. This expedited process, however, complicates the accurate assessment of the rule's impact on the effects of the US-China trade war, due to the lack of detailed product-level data for these imports.

To address this challenge and quantify the impacts of tax avoidance through de minimis imports, we exploit the trade discrepancy between US and China at the product level. Specifically, we proceed in five steps. First, we introduce the background of the de minimis rule in US, and provide estimates of the total value of de minimis imports from China from 2016 to 2020. Second, we develop a discrete choice model in which US importers can choose between regular and de minimis entries for foreign goods. Third, we identify the causal impact of tariff shocks–stemming from the trade war–on the trade discrepancy between the US and China only through the channel of the de minimis rule. This causal estimate helps calibrate the key parameter in the model that measures the responsiveness of US importers to the differences in tariffs between regular and de minimis entries, named "*the elasticity of substitution between customs entries*" in this paper. Fourth, we describe the calibration process and results of the parameters, which are then combined with the model to compute the shares of regular and de minimis imports at the product level. Fifth, we embed the model of customs entry into the general equilibrium model of Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020) (henceforth, FGKK), and quantify the impacts of tax avoidance through de minimis imports with the extended model.

To provide further details, in our model of customs entry, US importers choose the entry method that offers the lowest price. The cost associated with regular entry is determined by the combination of the producer price, non-tariff trade costs specific to regular entry, and applicable tariffs. In contrast, the cost for de minimis entry includes only the producer price and non-tariff trade costs related to de minimis entry. We model the inverse of these non-tariff trade costs as independent draws from Frechét distributions, with a common shape parameter θ but distinct scale parameters for each entry method. The model implies that the shares of regular and de minimis imports are influenced by two factors: the tariff difference between the regular and de minimis entries, and the relative average non-tariff trade costs for de minimis compared to regular entry. The parameter θ is the elasticity of substitution between customs entries, governing the responsiveness of US importers to the tariff differences between these two entries.

While product-level data on de minimis imports are unavailable, the rise in these imports manifests in the shifting US-China trade discrepancy. This change in trade discrepancy stems from the exclusion of de minimis imports in US import data at the product level, whereas corresponding exports are counted in Chinese statistics. We estimate the causal impacts of tariff shocks resulting from the trade war on this discrepancy through the de minimis imports, employing a difference-in-differences approach. This method compares the changes in trade discrepancy for items affected by the tariffs enacted during Trump's administration, eligible for de minimis entry, against those ineligible, before and after 2018. This causal estimate helps calibrate the elasticity of substitution between customs entries.

We calibrate the elasticity of substitution between customs entries and the relative average non-tariff trade costs for de minimis compared to regular entries simultaneously. We determine these parameters by exactly matching five moments. The first moment is the causal estimate. The remaining four moments are the ratios between de minimis imports from China and observed regular imports from China for each year from 2016 to 2019. We then apply the calibrated model to compute the shares of de minimis and regular imports at the product level. Further analysis shows that more than three-quarters of the increase in de minimis imports from 2016 to 2019 is driven by the reductions in relative average non-tariff trade costs for de minimis compared to regular entries.

We embed the model of customs entry into the FGKK general equilibrium framework, introducing extensions that allow US importers to choose between regular and de minimis entry methods when importing products from China. On the one hand, tax avoidance through de minimis imports mitigates the welfare losses via imports due to the tariff increases from the trade war. A distinctive feature of our model is that tax avoidance decreases the pre-tariff prices of products that are imported under regular entry. This occurs because higher US tariffs increase the benefits of importing under the de minimis entry, with importers opting for regular entry only when its non-tariff trade costs are comparatively lower, thereby leading to lower pre-tariff prices for products imported in this manner. We also provide empirical evidence for this model mechanism.

On the other hand, tax avoidance through de minimis imports reduces tariff revenue. It affects changes in tariff revenue not only by lowering the pre-tariff prices of products imported under regular entry but also by exempting certain imports from tariffs entirely. The first mechanism increases tariff revenue by boosting the value of imports, while the second mechanism diminishes tariff revenue by permitting duty-free entry for de minimis imports. In our quantitative analysis, we demonstrate that the exemption mechanism is more important than the price reduction mechanism, dominating the overall impact on tariff revenue. Therefore, the effects of tax avoidance through de minimis imports on aggregate welfare largely depend on the balance between gains from imports and reductions in tariff revenue.

The quantitative results from our extended model reveal that tax avoidance through de minimis imports considerably affects the aggregate effect of the US-China trade war. Specifically, the 2018 tariffs from the US-China trade war resulted in an aggregate loss of 0.019% of US GDP in 2016, which is 53% smaller than the losses suggested by a model excluding tax avoidance, indicating that tax avoidance mitigated the welfare losses caused by the 2018 tariffs. Similarly, tax avoidance also mitigated the welfare losses caused by the 2019 tariffs. As the 2019 tariffs were higher than those in 2018, the 2019 tariffs led to a larger aggregate loss of 0.108% of US GDP in 2016, 26% smaller than the loss suggested by a model without tax avoidance. However, tax avoidance through de minimis imports does not always mitigate the aggregate loss from tariff increases. Its impacts hinge on the elasticity of substitution between customs entries. Given the tariff increases, tax avoidance through de minimis imports is more likely to mitigate the aggregate loss when the elasticity of substitution between customs entries is small and is more likely to exacerbate the aggregate loss when the elasticity is large.

Related Literature. To the best of our knowledge, this paper is the first to quantify the extent to which tax avoidance alters the aggregate impacts of protectionist trade policies. This paper thus contributes to the vast literature on the impacts of trade policies, especially to the fast-growing strand that studies the impacts of trade protectionism following the 2018 US-China trade war.[1] Within the strand, a series of papers have quantified the aggregate impacts of the US-China trade war, for example, Amiti, Redding, and Weinstein (2019), Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), Caliendo and Parro (2022) and Ju, Ma, Wang, and Zhu (2024). However, none of these papers considers tariff avoidance via de minimis imports. Given the sizeable share of de minimis imports in the total imports from China to the US, we contribute to this line of literature by developing a discrete choice model of customs entry and estimating the de minimis imports at the product level. This approach addresses the empirical challenge posed by the lack of the product-level data. A novel mechanism from our model is that tax avoidance via de minimis imports can directly lower the pre-tariff prices for products entering under regular entry due to the substitution between these two entry methods.

This paper is also related to the literature on tariff avoidance and evasion, as well as trade discrepancies. We adopt the approach pioneered by Fisman and Wei (2004) using the trade discrepancy to estimate tariff evasion. This methodology has been applied in various other scenarios. For instance, Javorcik and Narciso (2008) analyzed trade interactions between Germany and ten Eastern European nations from 1992 to 2003, specifically examining differentiated products. Mishra, Subramanian, and Topalova (2008) explored the impacts of trade reforms in India during

[1] Goldberg and Pavcnik (2016) and Caliendo and Parro (2022) provide excellent reviews for the literature. Amiti, Redding, and Weinstein (2019), Amiti, Redding, and Weinstein (2020) Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), Cavallo, Gopinath, Neiman, and Tang (2021), and Flaaen, Hortaçsu, and Tintelnot (2020) study the response of US import prices to US tariffs. Jiao, Liu, Tian, and Wang (2022), Jiang, Lu, Song, and Zhang (2023), Ma and Meng (2023) and Huang, Lin, Liu, and Tang (2023) study the response of Chinese firms to US tariffs. Fajgelbaum and Khandelwal (2022) provides an excellent survey of the literature on the economic impacts of US-China trade war.

the 1990s. Ferrantino, Liu, and Wang (2012) investigated the trade discrepancy between China and the US from 2002 to 2008. Demir and Javorcik (2020) studied the effects of changes in import financing policies in Turkey. Additionally, Kee and Nicita (2022) conducted research on trade fraud related to non-tariff measures (NTMs). Our paper adds to the literature by studying a new channel of tariff avoidance through de minimis imports and estimating their values at the product level. This new channel is particularly relevant as it is driven by the new digital technology–the direct-to-consumer e-commerce platforms.

The rest of the paper is organized as follows. Section 2 discusses the background of de minimis rule and its impacts on the US-China trade discrepancy. Section 3 introduces the model of customs entry, and estimates the de minimis imports at the product level. Section 4 embeds the model of customs entry into the FGKK general equilibrium model, and quantifies the impacts of tax avoidance through de minimis imports on the effects of the US-China trade war. Section 5 concludes.

2 Background of the De Minimis Rule and US-China Trade Discrepancy

This section introduces the background of the de minimis rule in the US, provides aggregate estimates of de minimis imports from China based on US and Chinese trade statistics, respectively, and discusses the impacts of de minimis imports on the US-China trade discrepancy.

2.1 Background of the De Minimis Rule

The de minimis rule is a method of customs entry that exempts shipments below a certain value from tariffs. The daily limit per person is $800 in the US, with an increase from $200 in 2016. Unlike regular entry procedures, there is no requirement to provide the HS product code for imports using the de minimis entry. Such shipments are promptly released by the US CBP based on the manifest or bill of lading, which includes information such as the origin, value, and descriptions of the items.[2] As a result, the official US trade statistics based on the HS product classification

[2] Go to part 128.21(e), 128.24(e) and 143.23(k) in chapter I of title 19 of code of federal regulation for the required information. The following is the web page: https://www.ecfr.gov/current/title-19/chapter-I

does not include the de minimis imports.

Codified as Section 321 of the 1930 Tariff Act in 1938, the rationale behind the de minimis rule was to mitigate disproportionate costs and inconveniences for the government, particularly given the negligible tariff revenue from these low-value items.[3] However, the volume of de minimis shipments has exploded in recent years. Between 2016 and 2020, the number of de minimis packages surged from 224 million to 637 million, with 68% originating from mainland China and Hong Kong in 2020.[4] The estimated value of de minimis imports from China reached $45.5 billion in 2020. This number is 7 times more than the estimated value in 2016 and accounts for about 10% of the reported value of US imports from China in 2020. In the next subsection, we discuss how to estimate the aggregate value of de minimis imports from China.

The surge of de minimis imports has been facilitated by direct-to-consumer (DTC) e-commerce platforms and was further spurred by the US-China trade conflict. Platforms like Amazon, Shein, and Temu have enabled Chinese sellers to directly reach US consumers, allowing them to ship products from China to the US under the de minimis rule. While this rule offers savings on tariffs, it leads to increased logistics costs and extended delivery periods. Before 2018, the US applied minimal tariffs on Chinese goods, rendering this entry method of limited appeal. However, from 2018 onwards, the US introduced five rounds of punitive tariffs, affecting more than half of Chinese imports with rates between 10% to 25%. This shift encouraged greater use of the de minimis entry, as the significant savings on tariffs outweighed the drawbacks of higher logistics costs and longer shipping times.

This surge has also received widespread attention and sparked debate. On the one hand, some news articles highlighted the de minimis rule as a trade loophole that undermines US trade policy and called for tighter supervision to protect domestic products. On the other hand, critics argued that the de minimis rule is not a loophole but rather a fixture of US customs law intentionally passed by Congress to lower costs for consumers and improve supply chains for US small businesses.[5]

[3] To see Section 321 of the 1930 Tariff Act, go to the following web page: https://uscode.house.gov/view.xhtml?path=/prelim@title19/chapter4&edition=prelim

[4] US CBP publishes the total volume of de minimis shipments on its website annually. See: https://www.cbp.gov/newsroom/stats/trade

[5] See the news articles that described the de minimis rule as a trade loophole, for example, the following two reports from the Wall Street Journal: *"The $67 Billion Tariff Dodge Thats Undermining U.S. Trade Policy"* and *"U.S. Trade Loophole Fuels Rise of Chinas New E-Commerce Firms"*. See the opposite opinions, for example, *"CBP Trade Policy Director: de Minimis Is No Loophole"* on international trade online.

2.2 Total Value of De Minimis Imports from China

Based on US trade statistics, we first estimate the total value of de minimis imports from China from 2016 to 2020. As the US CBP did not directly provide the total value of de minimis imports by origin country, we use the following equation to compute the total value:

$$
\begin{aligned}
&\text{total value of de minimis imports from China} \\
&= \text{total value of all de minimis imports} \times \left(\frac{\text{number of de minimis packages from China}}{\text{number of all de minimis packages}} \right).
\end{aligned}
$$

The components on the right-hand side of the equation–specifically, the total value of all de minimis imports, number of de minimis packages from China, and number of all de minimis packages–are publicly available data from the US CBP.[6]

Column (1) in Table 1 shows the estimated total value of de minimis imports from China, based on US trade statistics. Before the trade war began in 2018, these values were relatively modest, at $ 6.4 billion in 2016 and $ 9.1 billion in 2017. However, starting in 2018, there was a significant increase: $ 22.6 billion in 2018, $ 38.6 billion in 2019, and $ 45.5 billion in 2020, marking a sevenfold increase from 2016. These values are calculated by multiplying China's shares of all de minimis packages, as shown in column (2), by the total value of de minimis imports from all countries listed in column (3). It's noteworthy that over two-thirds of de minimis packages originate from China. To provide further context, the ratio between de minimis imports from China and all reported imports from China was only 1.3% in 2016 and 1.7% in 2017. However, this ratio rose sharply from 2018 onward, reaching 4.0% in 2018, then increasing to 8.2% in 2019, and finally 10.0% in 2020, as indicated in column (4).

To triangulate the estimates based on US trade statistics, we provide an alternative set of estimates based on the Chinese trade statistics. Starting from 2018, to facilitate e-commerce exports, Chinese customs authorities have simplified customs declaration processes for firms operating within cross-border e-commerce pilot zones.[7] Exports by these firms are classified under two new HS-4 product codes, "9804" and "9805". Given that a large portion of e-commerce exports

[6] US official trade statistics on de minimis imports are sourced from CBP Publication No.2036- 1022 and CBP E-Commerce Statistics. See the Data Appendix for more details.

[7] See China's General Administration of Customs announcement No. 194 in 2018 "Announcement on Relevant Supervision Matters of Cross-Border E-Commerce Retail Import and Export Goods". The link of web page is https://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5447414.htm

Table 1: Estimates of the Total Value of De Minimis Imports from China ($ Billion)

	Estimates Based on Trade Statistics from					
	US				China	
	China (1)	China's Share of Packages (%) (2)	All Countries (3)	$\frac{\text{De Minimis Imports}}{\text{Regular Imports}}$ (%) (4)	China (5)	Growth Rate (%) (6)
2016	6.4	70.0	9.2	1.3	-	-
2017	9.1	70.0	13.0	1.7	-	-
2018	22.6	77.3	29.2	4.0	22.6	-
2019	38.6	68.7	56.2	8.2	37.8	67.5
2020	45.5	67.9	67.0	10.0	43.5	92.9

Notes: Table presents estimates of the total value of de minimis imports from China based on trade statistics from US and China. Column (1) shows the estimated total value of de minimis imports from China based on US trade statistics. Column (2) is China's shares of all de minimis packages. Notably, as the CBP only disclosed the total value of de minimis imports for 2016-2017, the share of packages from China for these years has been estimated at 70%, based on a rounded approximation of the simple average share from 2018-2020. Column (3) is the total value of de minimis imports from all countries. Column (4) is the ratio of de minimis imports to regular imports from China. Column (5) presents the estimated total value of de minimis imports from China for 2019 and 2020, based on the growth rates of total export values under "9804" and "9805" according to Chinese trade statistics. Column (6) is the corresponding growth rate. We exclusively use four municipalities (Beijing, Shanghai, Tianjin, and Chongqing) to calculate the growth rate for 2020, aiming to mitigate any bias resulting from the expansion of pilot zones during that period.

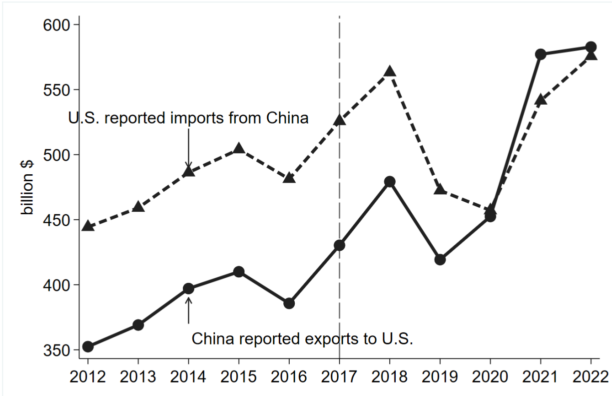
destined for US qualify for the de minimis entry, we use the growth rates of exports to US under these codes as a proxy for the growth rates of de minimis imports from China. However, we are not using the total export values under "9804" and "9805" to directly estimate de minimis imports from China because these exports account for less than 10% of de minimis imports from China. Additionally, before 2018, exports entering US through the de minimis entry were not distinguishable from regular exports in the Chinese trade statistics.

Column (5) in Table 1 presents the estimated total value of de minimis imports from China for 2019 and 2020, based on the growth rates of total export values under "9804" and "9805" according to Chinese trade statistics. The totals are $ 37.8 billion for 2019, and $ 43.5 billion for 2020, which align closely with the estimates from US trade statistics in column (1). The corresponding growth rates are shown in column (6), which is 67.5% from 2019 to 2018, and 92.9% for 2020 compared to 2018.

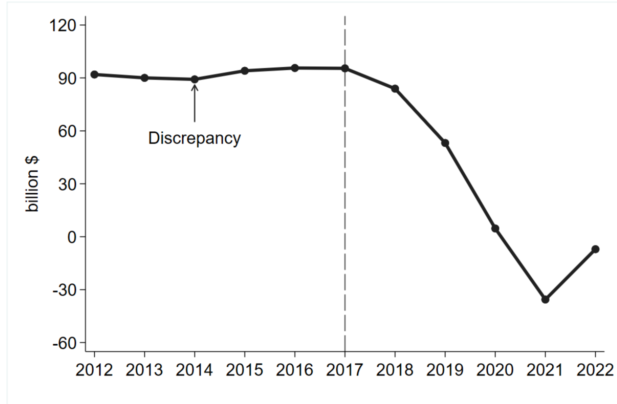
2.3 Impacts of De Minimis Imports on US-China Trade Discrepancy

The rise in de minimis imports is captured in the changes in trade discrepancy between US and China. This is because the de minimis imports from China are excluded in the US import statistics, while their mirror exports are counted in the Chinese export statistics.[8] Figure 1's Panel (a)

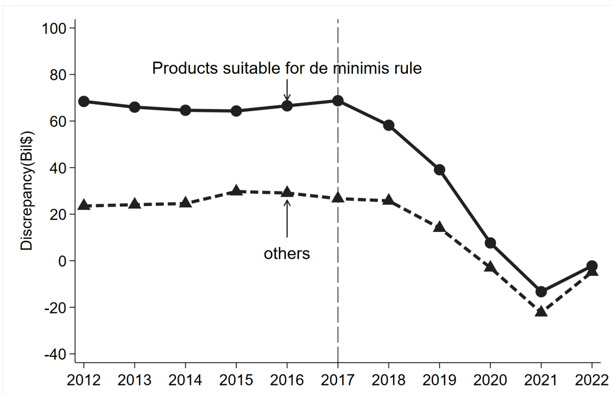
[8]Only 6.4% of total cross-border e-commerce retail exports in 2018 are processed through simplified clearance procedures and categorized under product codes "9804" and "9805". Thus, most cross-border retail exports undergo



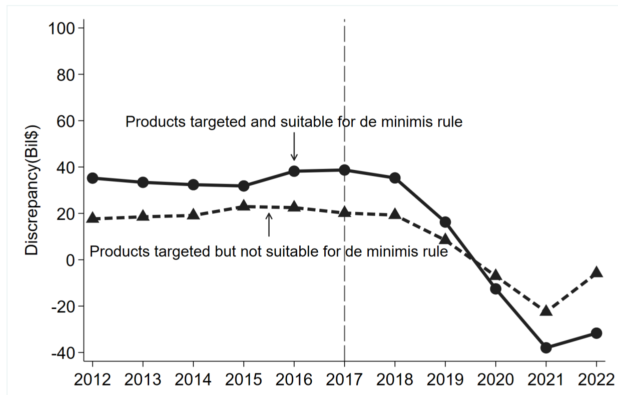
(a) US-China trade flows



(b) US-China trade discrepancy



(c) Trade discrepancy in products suitable and unsuitable for de minimis rule



(d) Trade discrepancy in products affected by Trump's tariffs that are suitable and unsuitable for de minimis rule

Figure 1: US-China Trade Discrepancy from 2012 to 2022

Notes: Panel (a) shows the imports reported by the US from China and the corresponding exports reported by China from 2012 to 2022. Panel (b) depicts the discrepancy between these reported figures. Panels (c) and (d) compare the discrepancies in products that are eligible and ineligible for the de minimis rule, and in products affected by Trump's tariffs that are suitable and unsuitable for the de minimis rule. The trade data is sourced from the UN Comtrade database, and the list of products suitable for de minimis rule is obtained from the "List of Cross-Border E-commerce Retail Import Commodities (2019 Edition)" issued by the Chinese Ministry of Finance.

displays US-reported imports from China alongside the mirror exports China reports from 2012 to 2022. Meanwhile, Panel (b) of the same figure plots the discrepancy between these two sets of statistics. Notably, before 2018, the discrepancy remained relatively constant at around $90 billion, but it shows a trend of decline from 2018 onward. The constant discrepancy before 2018 is commonly attributed to China's exports re-routed through Hong Kong and transportation costs.[9]

formal customs clearance and are included in corresponding HS product categories for exports to the US.

[9]See West (1995), Feenstra et al. (1998), Fung and Lau (1998) and Ferrantino et al. (2012) for reference.

The de minimis rule only affects products eligible for de minimis entry, likely leading to more significant changes in trade discrepancies for these products compared to those that are ineligible. Panel (c) of Figure 1 presents the trade discrepancies for both eligible and ineligible products. As expected, the discrepancies for both groups remained stable before the trade war; however, the discrepancy for eligible products declined more rapidly than for those that were ineligible. Furthermore, Panel (d) of Figure 1 illustrates the trade discrepancies for eligible products targeted by the Trump tariffs alongside those for ineligible products that are also targeted. The similar pattern observed in Panel (d) further supports our conjecture.

However, it is important to note that the post-2018 changes in the trade discrepancy are not exclusively due to de minimis imports. Based on the estimates of the total value of de minimis imports in the previous subsection, the rise in de minimis imports accounts for roughly 30% of the reduction in the US-China trade discrepancy from 2018 to 2020. Additional factors, such as the undervaluation of imported goods or its misclassification to evade elevated tariffs post-2018, may also contribute to the observed shifts in the trade discrepancy between the US and China.

Although the data of de minimis imports at the product level is unavailable, it could be inferred by exploiting the trade discrepancy between China and US. In the following section, we show how to estimate the value of de minimis imports at the HS-6 product level.

3 A Model of Customs Entry and Product-level Estimation

In this section, we first develop a discrete choice model of customs entry. Next, we identify the causal impact of tariff increases, triggered by the trade war, on the US-China trade discrepancy through the mechanism of the de minimis rule. This causal estimate helps calibrate the elasticity of substitution between customs entries that measures the responsiveness of US importers to the differences in tariffs between regular and de minimis entries. Finally, we detail the calibration process and results of the parameters, which are then combined with the model to compute the shares of regular and de minimis imports at the product level.

3.1 A Discrete Choice Model about Customs Entry

US importers can choose between two customs entry methods when bringing in foreign goods: regular entry or de minimis entry. Consider the case of importing product g from China. The cost to US importers using regular entry includes three elements: the producer price of product g in China, p_g^0, non-tariff trade costs associated with the regular entry, δ_g^R, and tariffs, τ_g. In contrast, the cost with the de minimis entry is limited to the identical producer price and non-tariff trade costs with the de minimis entry, δ_g^D. To simplify the exposition, we use R to denote the regular entry and D the de minimis entry. Let p_g^M denote the price that US importers pay for the products using entry method $M \in \{R, D\}$, and we have

$$p_g^M = \begin{cases} p_g^0 \delta_g^R (1+\tau_g) & \text{if } M = R; \\ p_g^0 \delta_g^D & \text{if } M = D. \end{cases} \tag{1}$$

US importers will choose the entry method that provides lower prices. Therefore, the decision of choosing the regular or the de minimis entry hinges on the trade-off between the non-tariff trade costs difference and tariffs.

To account for the fact that US importers import the same product with both the regular and the de minimis entry, we introduce idiosyncratic shocks on non-tariff trade costs and consider time as continuous. Specifically, we assume that $\frac{1}{\delta_g^M}$ draws from an independent Fréchet distribution

$$\Pr\left(\frac{1}{\delta_g^M} \leq \frac{1}{\delta}\right) = \exp\left(-T_g^M \left(\frac{1}{\delta}\right)^{-\theta}\right), \tag{2}$$

where the scale parameter $T_g^M > 0$ determines the inverse of the average non-tariff trade cost for product g from China using entry method M, and the shape parameter θ determines the dispersion of shocks. The probability that US importers choose the regular entry is

$$\pi_g^R = \frac{T_g^R (1+\tau_g)^{-\theta}}{T_g^R (1+\tau_g)^{-\theta} + T_g^D}. \tag{3}$$

For a given period of time such as a month or a year, the expected price that US importers pay for the same product is identical across the two entry methods. Let p_g denote the expected price. We have

$$p_g = \Lambda p_g^0 \left(T_g^R (1+\tau_g^R)^{-\theta} + T_g^D \right)^{-\frac{1}{\theta}}, \tag{4}$$

where $\Lambda \equiv \Gamma\left(\frac{1+\theta}{\theta}\right)$,and $\Gamma(t) \equiv \int_0^\infty x^{t-1} e^{-x} dx$ is the Gamma function. Therefore, the share of imports under regular entry is also π_g^R.

Rewriting equation (3), we obtain

$$\pi_g^R = \frac{(1+\tau_g)^{-\theta}}{(1+\tau_g)^{-\theta} + T}, \tag{5}$$

where $T \equiv \frac{T_g^D}{T_g^R}$ represents the ratio of non-tariff trade costs for regular entry versus de minimis entry, thus measuring the relative average non-tariff trade costs between these two types of entry. For our empirical analysis, we assume that these relative costs remain constant across all products. Equation (5) shows that the shares of regular imports, as well as de minimis imports, are influenced by two factors: the tariff difference between the regular and de minimis entries, and the relative average non-tariff trade costs for de minimis compared to regular entry.

The parameter θ is the elasticity of substitution between customs entries that governs the responsiveness of US importers to the tariff differences between regular and de minimis entries. The larger θ is, the more responsive US importers are to these differences. As the shares of regular imports and de minimis imports are not directly observable, we exploit the US-China trade discrepancy and identify the causal impacts of tariff increases, induced by the trade war, on this discrepancy through the mechanism of the de minimis imports. This causal impact, detailed in Section 3.2, helps calibrate the parameter θ. With the values of θ and T known, we can directly use equation (5) to compute the shares of both regular and de minimis imports. The calibration of these parameters is further discussed in Section 3.3.

3.2 Estimating the Causal Impacts of De Minimis Imports on US-China Trade Discrepancy

Although de minimis imports at the HS-6 product level are not directly observable, their surge is reflected in the changes in the US-China trade discrepancy. In this subsection, we aim to isolate the causal impact of the tariff increases, triggered by the trade war, on this discrepancy via the de minimis imports. This analysis will assist in calibrating the elasticity of substitution between customs entries. The calibration will be detailed in the next section. In this subsection, we start by describing the empirical strategy to establish this causal relationship. Following this, we discuss the baseline results. Lastly, we conduct validity and robustness checks to confirm the reliability of our findings.

3.2.1 Empirical Strategy

We begin by dividing the observed US-China trade discrepancy into two parts: one induced by de minimis imports, and the other by factors other than the de minimis imports. Specifically, we define the observed trade discrepancy between US and China for a specific HS-6 product g, denoted by Gap_g^{Data}, as the discrepancy between the logarithm of US reported imports of product g from China, $\ln(Imports_g^{Data})$, and the logarithm of China reported mirror exports to US, $\ln(Exports_g^{Data})$. Hence, it is expressed as

$$Gap_g^{Data} = \ln(Imports_g^{Data}) - \ln(Exports_g^{Data}). \tag{6}$$

Additionally, we adjust the trade discrepancy between the US and China for de minimis imports:

$$Gap_g = \ln(Imports_g) - \ln(Exports_g). \tag{7}$$

where $Imports_g$ is the sum of US imports from China with both regular and de minimis entries, and $Exports_g$ is the mirror exports of China to the sum of these two type imports. We refer to Gap_g as the adjusted US-China trade discrepancy.

It's important to note that since de minimis imports are not included in $Imports_g^{Data}$, there is a discrepancy between $Imports_g^{Data}$ and $Imports_g$ for products eligible under the de minimis rule. Therefore, we have:

$$Imports_g^{Data} = Imports_g \times \pi_g^R. \tag{8}$$

Conversely, the mirror exports of de minimis imports are included in the reported Chinese exports to the US, which means $Exports_g^{Data} = Exports_g$. Consequently, the observed US-China trade discrepancy can be represented as:

$$Gap_g^{Data} = \ln(\pi_g^R) + Gap_g. \tag{9}$$

Equation (9) indicates that the observed trade discrepancy is composed of two parts: the logarithm of the share of regular imports and the adjusted trade discrepancy. The former results from the de minimis imports, while the latter captures all other factors excluding the de minimis imports.

We then have the following estimation specification implied by equation (5) and (9)

$$Gap_{gt}^{Data} = \beta ln(1+\tau_{gt}) \times Mini_g + \phi_1 ln(1+\tau_{gt}) + \phi_2 Rebate_{gt} + \lambda_g + \lambda_t + \epsilon_{gt} \tag{10}$$

where $Mini_g$ is a dummy variable, with a value of 1 indicating that a HS-6 product g is suitable for the de minimis rule, and a value of 0 implying it is not;[10] $Rebate_{gt}$ is 1 if the export value-added tax (VAT) rebate rate is raised for product g in year t and onwards, and 0 otherwise;[11] λ_g is the product fixed effect, and λ_t is the year fixed effect; ϵ_{gt} is the error term. We cluster the standard errors at the HS-6 product level.

Several things are worth discussing for this specification. Firstly, we use a difference-in-differences approach to estimate the causal impact of Trump tariffs on the US-China trade discrepancy due to the de minimis imports. In particular, we compare changes in the US-China trade discrepancy for products both targeted by Trump tariffs and suitable for de minimis entry with those for products also targeted by Trump tariffs but not suitable for de minimis entry before and after being targeted.

Secondly, our estimation specification accounts for two factors beyond the de minimis imports that could influence the US-China trade discrepancy. The first is tariffs, represented by the second term on the right-hand side of equation (10). This is because US importers might be motivated to under-report the value of imported goods or misclassify them to avoid tariffs. The second factor is the export VAT rebate, indicated by the third term on the right-hand side of equation (10). This inclusion is due to the possibility that Chinese exporters may inflate the reported value of their

[10]The list of products suitable for de minimis rule is obtained from the "List of Cross-Border E-commerce Retail Import Commodities (2019 Edition)" issued by the Chinese Ministry of Finance. See Data Appendix for more details.

[11]The list of products eligible for increased Chinese export VAT rebates is sourced from the Ministry of Finance's announcement of the "Product List for Increasing Export Tax Rebate Rates". See Data Appendix for more details.

exports to falsely claim VAT rebates.

Thirdly, the product fixed effects control all the non-varying product characteristics that may affect the US-China trade discrepancy, such as the level of differentiation, as it is easier to misreport the value of more differentiated products. The year fixed effects control all the time-varying common shocks.

Finally, the identifying assumption is that, conditional on a full list of controls, the interaction term $ln(1+\tau_{gt}) \times Mini_g$ is uncorrelated with the error term. Put differently, US-China trade discrepancy for products both targeted by the Trump tariffs and suitable for de minimis rule would follow the same trend as for products also targeted by the Trump tariffs but not suitable for de minimis rule if the de minimis rule was not allowed. We provide supporting evidence for this assumption in subsection 3.2.3, where we do validity checks including an event study and placebo test.

3.2.2 Baseline Results

Table 2 reports the results of the causal impacts of tariff shocks on US-China trade discrepancy due to de minimis imports. The standard errors are clustered at the HS-6 level. Data is from 2016 to 2019. The first column includes $\ln(1+\tau_{gt})$, and product and year fixed effects. The second column adds the interaction term of interest $\ln(1+\tau_{gt}) \times Mini_g$, while the third column further adds the control variable capturing the changes in export VAT rebate rates. The third column is our baseline specification.

As shown in the first row of Table 2, estimates of β are negative and statistically significant in all specifications, indicating that the tariff shocks decrease the US-China trade discrepancy through the de minimis imports. The estimate of β in the third column is -0.66.

The second row of Table 2 shows that the estimated coefficients of the variable the logarithm of 1 plus tariff rates are also negative and statistically significant in all specifications. These results are consistent with our conjecture that US importers have the incentive to under-report the import value or misclassify products when facing high US tariffs, decreasing the US-China trade discrepancy. The third row in column (3) shows the changes in export VAT rebate rates have a negative but statistically insignificant effect on the changes in US-China trade discrepancy. The negative sign is aligned with our hypothesis that Chinese exporters may inflate the reported export value to falsely claim VAT rebates, also reducing the US-China trade discrepancy.

Table 2: Baseline results

Dependent variable:	Gap_{gt}^{Data}		
	(1)	(2)	(3)
$\ln(1+\tau_{gt}) \times Mini_g$		-0.68***	-0.66***
		(0.24)	(0.24)
$\ln(1+\tau_{gt})$	-0.96***	-0.93***	-0.91***
	(0.24)	(0.24)	(0.24)
$Rebate_{gt}$			-0.02
			(0.03)
Product FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
R^2	0.78	0.78	0.78
Observations	14,700	14,700	14,700

Notes: This table reports the impacts of Trump tariffs on the US-China trade discrepancy due to the de minimis rule. The dependent variable is the observed US-China trade discrepancy, defined as the discrepancy between the logarithm of US reported imports of HS-6 product g from China and the logarithm of China reported mirror exports to US. The independent variable representing the effect due to the de minimis rule is the interaction term $\ln(1+\tau_{gt}) \times Mini_g$, where $Mini_g$ is a dummy variable, with a value of 1 indicating that an HS-6 product g is suitable for the de minimis rule, and a value of 0 implying it is not. Data span 2016 to 2019. Standard errors are clustered at the HS-6 product level. Significance: *0.10,** 0.05,*** 0.01.

3.2.3 Validity Checks and Robustness

This subsection provides supporting evidence for the identifying assumption, and robustness checks to the baseline results. To provide supporting evidence for the identification assumption, we run two validity checks, including an event study and a placebo test. We conduct an event study according to the following specification

$$Gap_{gt}^{Data} = \sum_{j=-3}^{1} \beta_{1j}\mathbb{I}(event_{gt}=j) \times Mini_g + \sum_{j=-3}^{1} \beta_{2j}\mathbb{I}(event_{gt}=j) + \phi_1 ln(1+\tau_{gt}) + \phi_2 Rebate_{gt} + \lambda_g + \lambda_t + \epsilon_{gt}, \tag{11}$$

where $event_{gt}$ for a product g hit by tariff increases is defined as the difference between year t and the year when product g is first hit, for example, $event_{g,2016} = 2016 - 2018 = -2$ if the product g is first hit in 2018, and $event_{g,2016} = 2016 - 2019 = -3$ if the product g is first hit in 2019; $event_{gt}$

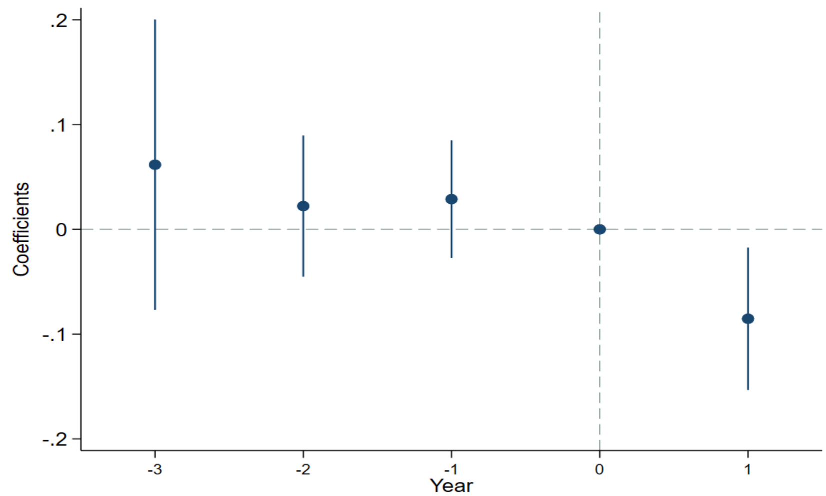


Figure 2: Event study

Notes: Figure plots event time coefficients β_{1j}. Standard errors are clustered by HS-6, and error bars show 95% confidence intervals. Data span 2016 to 2019.

for a product g not hit by tariff increases is defined the same as the event year of a product g that is first hit by tariff increases in 2018. β_{1j} is the event year coefficient. We set the year affected by the trade war as the base year and drop it from the regression. Standard errors are clustered by HS-6.

Figure 2 plots the event year coefficients β_{1j}. Prior to being hit by tariff increases, there was no significant difference in trade discrepancy between products suitable and not suitable for de minimis entry. However, after the tariff increase, the trade discrepancy of products suitable for de minimis entry decreases significantly than that of products not suitable, lending support for our identifying assumption.

We perform a placebo test by randomly assigning products' suitability for de minimis entry for 1000 times. Figure 3 displays the results of the placebo test. The curve illustrates the kernel density distribution of coefficients, with the randomly sampled coefficients having a mean of zero and positioned to the right of our baseline estimate -0.66. The scatter plot represents p-value distribution, where the majority of coefficients after randomization lie above the line where the p-value equals 0.1. This suggests that most coefficients are not statistically significant at the 10% level, confirming the successful passing of the placebo test.

We conduct a series of robustness checks to the findings of our baseline specification. Table 3 presents the results. Column (1) extends the sample period from 2016-2019 to 2012-2019.

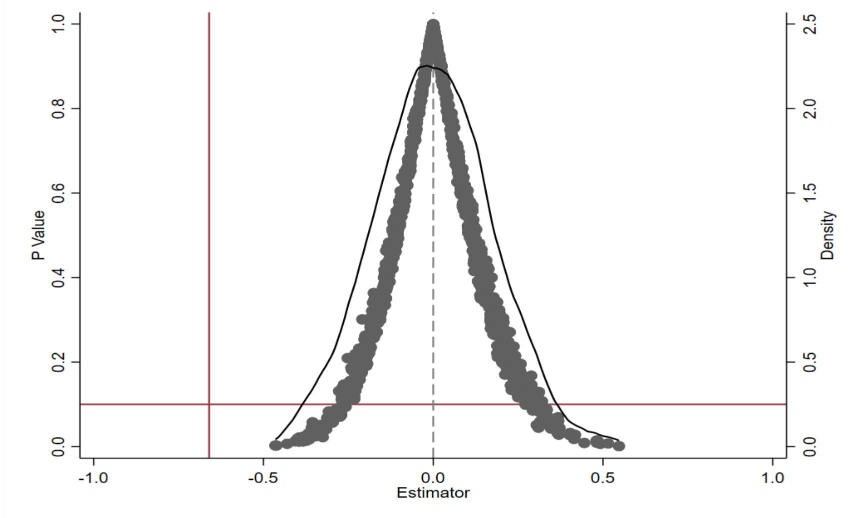


Figure 3: Placebo test

Notes: Figure shows the results of the placebo test. The kernel density distribution curve indicates that the randomly sampled coefficients have a mean of zero and are positioned to the right of -0.66. The scatter plot represents the p-value distribution, showing that the majority of coefficients after randomization lie above the p-value = 0.1 line.

Columns (2) and (3) employ alternative criteria to identify products suitable for the de minimis rule. Specifically, Column (2) uses the 2016 Edition of List of Cross-Border E-commerce Retail Import Commodities instead of the 2019 Edition, and Column (3) excludes products with an average price exceeding $800. Column (4) uses the increases in tariff rates $\Delta\tau_{gt}$ to replace the levels. Column (5) uses the levels of the export VAT rebate rates instead of the dummy variable in the baseline to indicate their increases. The new variable is denoted as $Rebate2_{gt}$, defined as the logarithm of 1 plus the export VAT rebate rates. Column (6) introduces an additional interaction term, $\ln(1+\tau_{gt}) \times Diff_g$, to control for the possibility that differentiated goods are more prone to tariff evasion with tariff hikes. Here, $Diff_g$ represents a binary variable assigned a value of 1 for HS-6 products g identified as differentiated.[12] Column (7) introduces $Post_{gt}$ and the interaction term $Post_{gt} \times Mini_g$ to capture changes in non-tariff trade costs for products eligible for the de minimis rule entry to those with regular entry, before and after being targeted by Trump tariffs. $Post_{gt}$ is a dummy variable, with a value of 1 indicating that product g falls under the Trump tariff in year t, and a value of 0 otherwise. As demonstrated in Table 3, the coefficients for the interaction terms of interest are consistently negative, similar in magnitude, and statistically significant across all

[12]The differentiation of products is based on classifications from Rauch (1999). See the Data Appendix for more details.

Table 3: Robustness results

Dependent variable:	Gap_{gt}^{Data}						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\ln(1+\tau_{gt}) \times Mini_g$	-0.57**				-0.64**	-0.65***	-0.65**
	(0.26)				(0.25)	(0.24)	(0.29)
$\ln(1+\tau_{gt}) \times Mini_g(2016list)$		-0.70***					
		(0.23)					
$\ln(1+\tau_{gt}) \times Mini_g(avg.price \leq \$800)$			-0.66***				
			(0.24)				
$\ln(1+\Delta\tau_{gt}) \times Mini_g$				-0.64***			
				(0.23)			
$\ln(1+\tau_{gt})$	-1.29***	-0.92***	-0.91***		-0.92***	-0.89***	-1.09***
	(0.23)	(0.24)	(0.24)		(0.25)	(0.32)	(0.28)
$\ln(1+\Delta\tau_{gt})$				-0.89***			
				(0.24)			
$Rebate_{gt}$	0.02	-0.02	-0.02	-0.02		-0.02	-0.03
	(0.03)	(0.03)	(0.03)	(0.03)		(0.03)	(0.03)
$Rebate2_{gt}$					-0.25		
					(0.79)		
$\ln(1+\tau_{gt}) \times Diff_g$						-0.03	
						(0.28)	
$Post_{gt}$							0.10***
							(0.03)
$Post_{gt} \times Mini_g$							-0.01
							(0.04)
Product FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.70	0.78	0.78	0.78	0.78	0.78	0.78
Observations	27,856	14,700	14,700	14,700	13,940	14,700	14,700
Sample period	2012-2019	2016-2019					

Notes: This table reports the robustness results of the baseline specification. Column (1) extends the sample period from 2016-2019 to 2012-2019. Columns (2) and (3) employ alternative criteria to identify products suitable for the de minimis rule. Specifically, Column (2) utilizes the List of Cross-Border E-commerce Retail Import Commodities (2016 Edition), and Column (3) excludes products with an average price exceeding \$800. Columns (4) and (5) use different measurements for τ_{gt} and $rebate_{gt}$. Column (4) uses tariff increase rates $\Delta\tau_{gt}$. Column (5) uses the levels of the export VAT rebate rates instead of the dummy variable in the baseline to indicate their increases. The new variable is denoted as $Rebate2_{gt}$, defined as the logarithm of 1 plus the export VAT rebate rates. Column (6) introduces an interaction term, $\ln(1+\tau_{gt}) \times Diff_g$, to control the difficulty for tax evasion.$Diff_g$ is a dummy variable, with a value of 1 indicating that ann HS-6 product g is differentiated product, which may be subject to greater tariff evasion due to the difficulties associated with assessing their quality and price. Column (7) introduces $Post_{gt}$ and the interaction term $Post_{gt} \times Mini_g$ to capture changes in non-tariff trade costs with de minimis entry relative to those with regular entry before and after being targeted by Trump tariffs. $Post_{gt}$ is a dummy variable, with a value of 1 denoting that product g is subject to the Trump tariff in year t, and a value of 0 otherwise. Standard errors are clustered at the HS-6 product level. Significance: $^{*}0.10,^{**}0.05,^{***}0.01$.

robustness checks.

3.3 The De Minimis Imports at the Product Level

In this subsection, we estimate de minimis imports at the HS-6 product level for the period from 2016 to 2019. First, we calibrate the parameters $\{\theta, T_{2016}, T_{2017}, T_{2018}, T_{2019}\}$ simultaneously. Second, we use the equation below to calculate the share of regular imports for product g in year t:

$$\pi_{gt}^{R} = \frac{(1+\tau_{gt})^{-\theta}}{(1+\tau_{gt})^{-\theta} + T_t}, \tag{12}$$

which is adapted from equation (5), with the addition of a time subscript. Subsequently, the share of de minimis imports for the same product in year t is given by $1-\pi_{gt}^{R}$. The corresponding value of de minimis imports is derived by multiplying the ratio $\frac{1-\pi_{gt}^{R}}{\pi_{gt}^{R}}$ by the data on regular imports, $Imports_{gt}^{Data}$.

We proceed by calibrating the parameters $\{\theta, T_{2016}, T_{2017}, T_{2018}, T_{2019}\}$ to exactly matching 5 moments. The first four moments are the ratios between the de minimis imports from China and the observed regular imports from China for each year from 2016 to 2019, as reported in column (4) of Table 1. The fifth moment is the causal estimate $\hat{\beta} = -0.66$ as presented in column (3) of Table 2, which captures the causal impact of tariff shocks induced by the trade war on the trade discrepancy between the US and China, specifically through the mechanism of de minimis imports.

The moments implied by the model are calculated as follows. The ratios between the de minimis imports from China and the observed regular imports from China are given by $\frac{\sum_g \frac{1-\pi_{gt}^{R}}{\pi_{gt}^{R}} Imports_{gt}^{Data}}{\sum_g Imports_{gt}^{Data}}$, for $t = 2016, 2017, 2018$ and 2019. According to the model, the numerator of the fraction is the total value of de minimis imports from China in year t, while the denominator is the total value of regular imports from China in year t. The causal estimate implied by the model is obtained by running the following regression with a sample of products eligible for de minimis entry from 2016 to 2019

$$\ln(\pi_{gt}^{R}) = \beta^{M} \ln(1+\tau_{gt}) + \epsilon_{gt}^{M}, \tag{13}$$

where ϵ_{gt}^{M} is the error term. We solve for these five parameters simultaneously by matching the model implied moments to the observed moments.

Table 4 presents the calibrated parameters. The value of T_{2016} is 0.018, indicating that the average non-tariff trade costs for de minimis entry were nearly 55 times higher than for regular

Table 4: Calibrated Parameters and Targeted Moments

Parameters	Value	Targeted Moments	Data	Model
T_{2016}	0.018	$\frac{\text{De minimis imports}}{\text{Regular imports}}$ in 2016	0.013	0.013
T_{2017}	0.024	$\frac{\text{De minimis imports}}{\text{Regular imports}}$ in 2017	0.017	0.017
T_{2018}	0.053	$\frac{\text{De minimis imports}}{\text{Regular imports}}$ in 2018	0.040	0.040
T_{2019}	0.088	$\frac{\text{De minimis imports}}{\text{Regular imports}}$ in 2019	0.082	0.082
θ	3.15	The causal estimate $\hat{\beta}$	-0.66	-0.66

Notes: This table reports calibrated parameters and targeted moments. The parameters $\{\theta, T_{2016}, T_{2017}, T_{2018}, T_{2019}\}$ are calibrated to precisely match five moments. Column (2) lists the parameter values, column (3) shows the targeted moments, and columns (4) and (5) compare the data and model simulated moments.

entry in 2016. The small value of T_{2016} is consistent with the observation that products directly shipped from China by Chinese sellers on e-commerce platforms incur higher logistics costs and experience longer delivery periods. By 2017, T_{2017} increased to 0.024, a 33% rise from the previous year. With the onset of the trade war in 2018, T_{2018} surged to 0.053. This upward trend continued into 2019, when T_{2019} reached 0.088, marking a 380% increase since 2016. This substantial rise indicates a significant decrease in the relative average non-tariff trade costs for de minimis compared to regular entry over these years, which can be the result of the improvement in the logistics infrastructure associated with direct-to-consumer e-commerce platforms.

The value of the elasticity of substitution between customs entries is 3.15. For a clearer understanding, we log-linearize the equation (5) for the year 2019:

$$d\pi^D_{g,2019} = \underbrace{\theta \pi^D_{g,2019} \pi^R_{g,2019}}_{3.15 \times 0.12 \times 0.88 = 0.33} [d \ln(1 + \tau_{g,2019})] + \pi^D_{g,2019} \pi^R_{g,2019} d \ln(T_{2019}). \tag{14}$$

By inserting the average values $\pi^D_{g,2019} = 0.12$ and $\pi^R_{g,2019} = 0.88$, the resulting coefficient for the log-change in tariffs is 0.33. This calculation suggests that a hypothetical 10% increase in tariffs in 2019 would correspondingly increase the average share of de minimis imports by 3.3%.

Having calibrated the parameters, we present the average values of π^D_g for all products qualified for de minimis entry in column (2) of Table 5. The average share of de minimis imports was 2.1% in 2016, which increased to 2.7% in 2017. With the tariff hikes resulting from the trade war

Table 5: the De Minimis Imports at the Product Level from 2016 to 2019

Year	Average Tariffs	Average Share of De Minimis Imports			$\frac{\text{De Minimis Imports}}{\text{Regular Imports}}$	
		Calibrated	Constant T	Constant τ	Constant T	Constant τ
	(1)	(2)	(3)	(4)	(5)	(6)
2016	0.045	0.021	0.021	0.021	0.013	0.013
2017	0.045	0.027	0.021	0.027	0.013	0.017
2018	0.060	0.061	0.022	0.058	0.014	0.038
2019	0.131	0.116	0.027	0.092	0.017	0.066

Notes: This table presents the de minimis imports at the product level from 2016 to 2019, focusing on 1107 unique HS-6 products suitable for de minimis rule. Column (1) displays the simple average tariff rates on these products, which include the sum of MFN tariff rates and the announced tariff rate increases due to the trade war in 2018 and 2019, scaled by the number of months they were in effect. Columns (2)-(4) show the simple average share of de minimis imports with changes in T_t and τ_{gt}, changes in only τ_{gt}, and changes in only T_t, respectively. Columns (5) and (6) display the proportion of de minimis imports on total regular imports with changes in only τ_{gt} and changes in only T_t, respectively. These figures are computed using calibrated parameters $\{T_{2016} = 0.018, T_{2017} = 0.024, T_{2018} = 0.053, T_{2019} = 0.088, \theta = 3.15\}$.

and a significant decrease in relative average non-tariff trade costs for de minimis compared to regular entry, this average share jumped to 6.1% in 2018 and further rose to 11.6% in 2019.

To discern the distinct impacts of tariff increases and changes in relative average non-tariff trade costs, we examine two hypothetical scenarios: one where the relative average non-tariff trade costs remain at their 2016 levels, and another where tariffs are unchanged from 2016. Column (3) of Table 5 reports the average shares of de minimis imports with only the tariff increases, showing an increase to 2.7% in 2019. In contrast, the average share would increase to 9.2% in 2019 with only the reductions in relative average non-tariff trade costs, as shown in Column (4) of the same table. These results suggest that the reductions in relative average non-tariff trade costs are more important than the tariff increases in driving up the de minimis imports.

To assess their distinct aggregate impacts, we calculate the ratios between the total value of de minimis imports from China and the total value of observed regular imports from China for the two scenarios. As indicated in Columns (5) and (6) of Table 5, the ratio increases to 1.7% in 2019 with only the tariff increases, while it increases to 6.6% in 2019 solely due to reductions in relative average non-tariff trade costs. The observed ratio in 2019, reported as 8.2% in Table 1, shows a rise from 1.3% in 2016 to 2019. Of this increase, 6% is attributed to the changes only through tariffs, 77% is due to the changes only through reductions in relative average non-tariff trade costs, and the remaining 17% results from the interaction between these two factors.

4 The Impacts of Tax Avoidance via De Minimis Imports

This section shows how to incorporate the model of customs entry into the FGKK model, discusses the intuition of the impacts of tax avoidance via de minimis imports, and presents the quantitative results.

4.1 Embedding the Model of Customs Entry into the FGKK Model

Our quantitative model builds upon the FGKK model, introducing extensions that allow US importers to choose between regular and de minimis entry methods for importing products from China, as outlined in Section 3.1's model of customs entry. For imports from countries other than China, we assume that US importers are limited to regular entry, aligning with the original FGKK model's assumptions. This is because we focus on the impacts of tax avoidance via de minimis imports on the effects of the US-China trade war. Thus, the distinct aspects between our extended model and the FGKK model are centered on US import demand for Chinese products, China's export supply, and US tariff revenue for Chinese products. We detail these distinctions below and provide the full description of the extended model in Appendix B.1.

The quantity of product g imported from China is given by

$$m_g = (p_g)^{-\sigma} \mathcal{D}_g, \tag{15}$$

where p_g is the domestic price of product g from China, σ is the elasticity of substitution, and $\mathcal{D}_g$ is the demand shifter for the product.[13] Here we omit the country subscript for brevity. As was shown in Section 3.1, the domestic price of product g is identical between the two entry methods, and

$$p_g = \Lambda p_g^0 \left(T_g^R (1 + \tau_g^R)^{-\theta} + T_g^D \right)^{-\frac{1}{\theta}}. \tag{16}$$

It is worth reiterating that p_g^0 is the producer price of product g excluding the non-tariff trade costs and tariffs, which can also be considered as the FOB price of product g. Let p_g^{*M} denote the

[13] The expression of $\mathcal{D}_g$ is provided in Appendix B.1.

CIF price of product g for entry method M, and we have

$$p_g^{*M} = \begin{cases} p_g/(1+\tau_g), & \text{if } M = R, \\ p_g, & \text{if } M = D. \end{cases} \tag{17}$$

The CIF prices differ between the two entry methods since tariffs are exempt for the de minimis entry while not for the regular entry. The CIF prices are directly affected by the tariffs in our extended model. Imposing higher tariffs can directly lower CIF prices for regular entry because the US importers will only choose regular entry when non-tariff trade costs with regular entry are comparatively lower. In contrast, imposing higher tariffs can only lower CIF prices when facing upward-sloping export supply curves in the FGKK model.

The inverse Chinese export supply curve is given by

$$p_g^0 = z_g^*(m_g)^{\omega^*}, \tag{18}$$

where z_g^* is a Chinese marginal cost shifter, and ω^* is the inverse foreign export supply elasticity. In contrast, the inverse Chinese export supply curve is defined by using CIF prices in the FGKK model. In the FGKK model, the inverse foreign export supply curve can be defined based on CIF or FOB prices. These two ways are isomorphic. However, in our extended model, it is more reasonable to define the export supply based on FOB prices as we introduce idiosyncratic shocks on non-tariff trade costs.

The tariff revenue of product g from China is given by

$$R_g = p_g^{*R}\left(m_g \pi_g^R\right)\tau_g, \tag{19}$$

where π_g^R is the share of regular imports. This is because US only collects tariffs for imported products under regular entry.

4.2 The Impacts of Tax Avoidance via De Minimis Imports on Prices and Tariff Revenue

We start by discussing how tax avoidance via de minimis imports alters the impacts of US tariff increases on the prices of products from China. We use a first-order approximation of equation (15), (16) and (18) to obtain the log-change of the domestic price for product g from China. Define $\hat{x} \equiv d \ln x$. The log-change of the domestic price for product g is given by

$$\hat{p_g} = \underbrace{\frac{w^*}{1+w^*\sigma}\hat{\mathcal{D}_g} \quad + \quad \frac{1}{1+w^*\sigma}\frac{d\tau_g}{1+\tau_g}}_{\text{log-change attributed to tariff increases}} \quad + \quad \underbrace{\frac{1}{1+\omega^*\sigma}\frac{\hat{\pi_g^R}}{\theta}}_{\text{log-change attributed to tax avoidance}} \quad . \tag{20}$$

The first and second terms on the right-hand side capture the log-change in the domestic price due to tariff increases, while the third term represents the log-change attributed to de minimis imports. When tariffs increase ($d\tau_g > 0$) or both tariffs rise and non-tariff trade costs for de minimis imports decrease relative to regular entry, the share of regular imports for product g decreases ($\hat{\pi_g^R} < 0$). Therefore, equation (20) illustrates that the increase in domestic prices due to tariff increases is mitigated by tax avoidance via de minimis imports.

However, it's important to clarify that the domestic prices under the de minimis entry are not lower than those under regular entry. In our model, these two prices are the same. Tax avoidance via de minimis imports reduces the CIF prices for products entering under regular entry. This can be illustrated by expressing the log-change in CIF prices as follows:

$$\hat{p_g^{*R}} = \underbrace{\frac{w^*}{1+w^*\sigma}\hat{\mathcal{D}_g} \quad - \quad \frac{\omega^*\sigma}{1+w^*\sigma}\frac{d\tau_g}{1+\tau_g}}_{\text{log-change attributed to tariff increases}} \quad + \quad \underbrace{\frac{1}{1+\omega^*\sigma}\frac{\hat{\pi_g^R}}{\theta}}_{\text{log-change attributed to tax avoidance}} \quad . \tag{21}$$

The third term on the right-hand side of the equation demonstrates how tax avoidance via de minimis imports affects CIF prices with regular entry. It suggests that an increase in US tariffs increases the share of imports entering under the de minimis entry, thus reducing the CIF prices with regular entry. This occurs because higher US tariffs increase the benefits of importing under the de minimis entry, and importers will choose regular entry only when the non-tariff trade costs associated with it are comparatively lower, resulting in lower CIF prices for products entering this way. We provide supporting evidence for this channel in Table 6.

Table 6: Impacts of Tariff Shocks on CIF Prices Due to the De Minimis Rule

Dependent variable:	Δlnp^*_{igt}		
	All (FGKK)	$Mini_g = 1$	$Mini_g = 0$
	(1)	(2)	(3)
$\Delta ln(1+\tau_{igt})$	0.00	-0.33*	0.06
	(0.08)	(0.20)	(0.11)
Product × Time FE	Yes	Yes	Yes
Country × Time FE	Yes	Yes	Yes
Country × Sector FE	Yes	Yes	Yes
R^2	0.11	0.10	0.12
N	2,454,023	1,095,534	1,357,434

Notes: Table reports the impacts of tariff increases on CIF prices due to the de minimis entry. The dependent variable is the difference of the logarithm of the CIF price for HS-10 product g from country i in time t, and the independent variable is the difference of the logarithm of the sum of the corresponding tariff rate and 1. Column (1) use the full sample that includes monthly US import data at the HS-10 product level across 71 countries from January 2017 to April 2019. Column (2) uses a sub-sample in which only the products suitable for the de minimis rule are included, while column (3) uses a sub-sample in which products are not suitable for the de minimis rule. Standard errors clustered by country and HS-8. Significance: *0.10,** 0.05,*** 0.01.

Column (2) in Table 6 reports the impacts of tariff shocks on CIF prices due to tax avoidance via de minimis imports, with columns (1) and (3) provided for comparison. From column (1) to (3), we use the same estimation specification with different samples. Specifically, we analyze the impacts by regressing the difference of the logarithm of the CIF price for HS-10 product g from country i in time t against the difference of the logarithm of the sum of the corresponding tariff rate and 1, controlling for product-time, country-time, and country-sector fixed effects. Column (1) uses the same dataset and specification as Column (3) from Table IV in FGKK, which includes monthly US import data at the HS-10 product level across 71 countries from January 2017 to April 2019. Column (2) uses a sub-sample of this dataset, in which only the products suitable for the de minimis rule are included, while column (3) uses a sub-sample of products not suitable for the de minimis rule.

Column (1) in Table 6 replicates the key finding in FGKK that there is no impact of tariff increases on before-duty CIF prices, which suggests a complete pass-through of tariffs to the duty-inclusive domestic prices and an estimate $\hat{\omega}^*$ equal to 0. Our model implies that tariff increases can still reduce the CIF prices due to tax avoidance even if $\hat{\omega}^* = 0$. Column (2) in Table 6 shows that there is indeed a negative and statistically significant impact of tariff increases on the before-duty CIF prices for products suitable for the de minimis entry, which is consistent with our model's prediction. Column (3) in Table 6 shows that there is a slightly positive but statistically insignificant impact of tariff increases on the before-duty CIF prices for products not suitable for the de minimis entry. This is largely consistent with the finding of FGKK that there is no impact of tariff increases on before-duty CIF prices.

We now explore how tax avoidance via de minimis imports alters the impacts of tariff increases on tariff revenue. The reduction of pre-tariff prices for products imported under regular entry is not the only way tax avoidance through de minimis imports affects tariff income. The other impact arises from the allowance for de minimis imports to be exempt from tariffs. These two impacts can be demonstrated by expressing the log-change of tariff revenue for product g as follows

$$\begin{aligned}\hat{R}_g = & \underbrace{\left[d\tau_g + (\tau_g + d\tau_g)\left(\frac{1+\omega^*}{1+\omega^*\sigma}\hat{\mathcal{D}}_g - \frac{\omega^*\sigma+\sigma}{1+\omega^*\sigma}\frac{d\tau_g}{1+\tau_g}\right)\right]}_{\text{log-change attributed to tariff increases}} \\ & + \underbrace{(\tau_g + d\tau_g)\frac{-(\sigma-1)}{\theta(1+\omega^*\sigma)}\hat{\pi_g^R} + (\tau_g + d\tau_g)\hat{\pi_g^R}}_{\text{log-change attributed to tax avoidance}}.\end{aligned} \tag{22}$$

The first term in the second line denotes the log-change in tariff revenue through the mechanism where tax avoidance reduces the pre-tariff prices for products imported under regular entry, while the second captures the exemption mechanism provided by the de minimis rule. The first mechanism increases tariff revenue by boosting the value of imports, whereas the second mechanism reduces tariff revenue by permitting the de minimis imports to enter duty-free. When $\theta(1+\omega^*\sigma) > \sigma - 1$, which is the case of our quantitative analysis, the tariff exemption mechanism dominates the price reduction mechanism.

4.3 Quantitative Experiments

To quantify the impacts of tax avoidance through de minimis imports on the effects of the US-China trade war, we conduct a series of counterfactual experiments based on the 2016 US economy. We apply US and retaliatory tariffs from the trade war while incorporating the de minimis rule, and account for reductions in relative average non-tariff trade costs between de minimis and regular entries. These reductions, as discussed in Section 3.3, also contribute to the rise in de minimis imports following the trade war. Additionally, we explore scenarios where these tariffs are implemented without both the de minimis rule and these reductions, to clearly delineate the impacts of tax avoidance.

Following FGKK, we use a first-order approximation of equilibrium conditions. We provide a full characterization of the equilibrium conditions in changes in Appendix B.2, and the details of model calibration in Appendix B.3. We also use the same welfare measure as FGKK so that our results can be directly compared with theirs. The change of welfare is given by

$$\Delta W = \underbrace{\left[\sum_{i,g} m_{ig,2016}(\Delta p_{ig})\right]}_{\text{Imports}} + \underbrace{\left[\sum_{i,g} x_{ig,2016}(\Delta p^{X}_{ig})\right]}_{\text{Exports}} + \underbrace{\sum_{i,g} \Delta R_{ig}}_{\text{Tariff Revenue}}, \tag{23}$$

where Δp_{ig} is the change in the duty-inclusive price of product g from country i, with $m_{ig,2016}$ the associated imported quantities in 2016 both under regular and de minimis entry; Δp^{X}_{ig} is the change in export price of product g to country i, with $x_{ig,2016}$ the associated quantities exported in 2016; ΔR_{ig} is the change in tariff revenue for product g from country i. The levels of exports and regular imports in 2016 are directly observed in the data, the levels of de minimis imports in 2016 are computed by using our calibrated model of customs entry, and the changes in import and export prices and tariff revenue are calculated by the system of equilibrium conditions in changes.

Panel (a) of Table 7 presents the welfare changes resulting from 2018 US and retaliatory tariffs from the trade war, with and without both the de minimis rule and the reductions in relative average non-tariff trade costs from 2016 to 2018. Columns (1) to (3) show the components corresponding to imports, exports, and tariff revenue, respectively, while Column (4) displays the aggregate impacts.

Rows (a1) and (a2) of Panel (a) show the results with and without both the de minimis rule and the reductions, respectively. Starting from column (1), US buyers have a loss of 0.249% of GDP, which is smaller than the loss of 0.277% of GDP without tax avoidance, because tax avoidance reduces domestic prices. Turning to columns (2) and (3), US producers have a smaller gain (0.049% of GDP) compared to that without tax avoidance (0.051% of GDP), as the reallocation of

Table 7: The Impacts of Tax Avoidance on Welfare

Change (% US GDP in 2016)	Imports	Exports	Tariff Revenue	ΔW
	(1)	(2)	(3)	(4)
	(a) 2018 trade war			
Tariff Increases + De Minimis Rule + Reductions: (a1)	-0.249	0.049	0.180	-0.019
Tariff Increases + No De Minimis Rule: (a2)	-0.277	0.051	0.185	-0.041
Differences between (a1) and (a2): (a3)	0.028	-0.001	-0.005	0.022
	(b) 2018-2019 trade war			
Tariff Increases + De Minimis Rule + Reductions: (b1)	-0.525	0.109	0.309	-0.108
Tariff Increases + No De Minimis Rule: (b2)	-0.590	0.115	0.330	-0.145
Differences between (b1) and (b2): (b3)	0.065	-0.006	-0.022	0.038

Notes: Table reports welfare changes resulting from US and retaliatory tariffs during the trade war, with and without both the de minimis rule and the reductions in relative average non-tariff trade costs. Panel (a) reports the results of transitioning from the observed 2016 economy to a counterfactual scenario applying the 2018 tariffs. Rows (a1) and (a2) of Panel (a) show the results with and without both the de minimis rule and the reductions, respectively. Row(a3) illustrates the welfare differences with and without tax avoidance. Panel (b) reports the results of moving from the 2016 economy to a counterfactual scenario where the 2019 tariffs are applied. Rows (b1) and (b2) of Panel (b) show the results with and without both the de minimis rule and the reductions, respectively. Row(b3) illustrates the welfare differences with and without tax avoidance. Columns (1) to (3) show the components corresponding to imports, exports, and tariff revenue, respectively, while Column (4) displays the aggregate impacts.

domestic demand to US goods induced by tariff changes is weaker. The increase in tariff revenue is also smaller, at 0.180% versus 0.185% of GDP, mainly due to the exemption of de minimis imports from tariffs.

The 2018 trade war resulted in an aggregate loss of 0.019% of GDP, with tax avoidance via de minimis imports reducing this loss by 0.022%, as detailed in Column (4) of Panel (a). Row (a3) illustrates the welfare differences with and without tax avoidance, demonstrating that tax avoidance increases welfare via imports by 0.028% of GDP, which offsets losses in exports and tariff revenue. Tax avoidance via de minimis imports mitigated the aggregate loss from 2018 tariffs by 53%.

Panel (b) of Table 7 presents the welfare changes resulting from 2019 tariffs, with and without both the de minimis rule and the reductions from 2016 to 2019. Since these tariffs were higher than those in 2018, the 2019 tariffs caused a larger aggregate loss of 0.108% of GDP. Similar to the 2018 tariffs where tax avoidance mitigated the welfare loss, it also mitigated the welfare loss caused by the 2019 tariffs, adding a gain of 0.038% of GDP. As shown in Row (b3) of Panel (b), tax avoidance increases welfare via imports by 0.065% of GDP, which offsets losses in exports and tariff revenue. Tax avoidance counteracted the aggregate loss due to 2019 tariffs by 26%.

However, tax avoidance does not always mitigate the aggregate loss from tariff increases. We can show that when tariffs are low, the welfare gains from imports due to tax avoidance exceed the welfare losses from reduced tariff revenue; conversely, when tariffs are high, the gains from imports are smaller than the losses from reduced tariff revenue, exacerbating the aggregate loss from tariff increases. According to equation (20), the welfare gains from imports of product g due to tax avoidance are calculated as $\left(-p_{g,2016}m_{g,2016} \times \frac{1}{1+\omega^*\sigma}\frac{\hat{\pi_g^R}}{\theta}\right)$. The corresponding losses from tariff revenue are given by $\left[p_{g,2016}m_{g,2016}\pi^R_{g,2016} \times (\tau_g + d\tau_g)(\frac{(\sigma-1)}{\theta(1+\omega^*\sigma)} - 1)\hat{\pi_g^R}\right]$ according to equation (22). Thus, if $\tau_g + d\tau_g < \frac{1}{[\theta(1+\omega^*\sigma)-(\sigma-1)]\pi^R_{g,2016}}$, the gains are larger than the losses. Conversely, if $\tau_g + d\tau_g > \frac{1}{[\theta(1+\omega^*\sigma)-(\sigma-1)]\pi^R_{g,2016}}$, the reverse is true. In other words, given the levels of tariff increase, tax avoidance through de minimis imports is more likely to mitigate the welfare losses when θ is small and is more likely to exacerbate the welfare losses when θ is large.

5 Conclusion

This paper provides the first quantitative assessment of how tax avoidance alters the effects of protectionist policies by studying the impacts of tax avoidance through de minimis imports on the effects of the US-China trade war. Guided by a discrete choice model of customs entry, we estimate the causal impacts of tariff shocks from the trade war on the trade discrepancy between the US and China, specifically through the mechanism of de minimis imports. This causal estimate helps calibrate the elasticity of substitution between customs entries. We apply the calibrated model to compute the values of de minimis imports at the product level, overcoming the challenge posed by lack of the product-level data. Incorporating the model of customs entry into the general equilibrium model of Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020), we show that tax avoidance through de minimis imports has a sizable impact on the aggregate effect of the US-China trade war.

These findings suggest potential avenues for future research. First, although our study focuses on the impacts of tax avoidance through de minimis imports on the effects of protectionist policies, our customs entry model could be extended to examine alternative tax avoidance or evasion channels. Our analysis indicates that a crucial step in exploring these impacts involves estimating the elasticity of substitution between regular import entry and other tax avoidance or evasion channels. Second, the calibrated significant decline in non-tariff trade costs under de minimis entry likely reflects reduced trade costs on cross-border e-commerce platforms. Future studies should dissect how much of this decline is due to lower transportation costs versus reduced matching friction between sellers and buyers facilitated by the platforms.

References

Alfaro, L. and D. Chor (2023). Global Supply Chains: The Looming Great Reallocation. Technical report, National Bureau of Economic Research.

Amiti, M., S. J. Redding, and D. E. Weinstein (2019). The Impact of the 2018 Tariffs on Prices and Welfare. *Journal of Economic Perspectives 33*(4), 187–210.

Amiti, M., S. J. Redding, and D. E. Weinstein (2020). Whos Paying for the US Tariffs? A Longer-Term Perspective. In *AEA Papers and Proceedings*, Volume 110, pp. 541–546. American Economic Association 2014 Broadway, Suite 305, Nashville, TN 37203.

Caliendo, L. and F. Parro (2022). Trade Policy. *Handbook of International Economics 5*, 219–295.

Cavallo, A., G. Gopinath, B. Neiman, and J. Tang (2021). Tariff Pass-through at the Border and at the Store: Evidence from US Trade Policy. *American Economic Review: Insights 3*(1), 19–34.

Demir, B. and B. Javorcik (2020). Trade Policy Changes, Tax Evasion and Benford's Law. *Journal of Development Economics 144*, 102456.

Fajgelbaum, P. D., P. K. Goldberg, P. J. Kennedy, and A. K. Khandelwal (2020). The Return to Protectionism. *The Quarterly Journal of Economics 135*(1), 1–55.

Fajgelbaum, P. D. and A. K. Khandelwal (2022). The Economic Impacts of the US–China Trade War. *Annual Review of Economics 14*, 205–228.

Feenstra, R. C., W. Hai, W. T. Woo, and S. Yao (1998). The US-China Bilateral Trade Balance: Its Size and Determinants, National Bureau of Economic Research Working Papers Series No. 6598.

Ferrantino, M. J., X. Liu, and Z. Wang (2012). Evasion Behaviors of Exporters and Importers: Evidence from the US–China Trade Data Discrepancy. *Journal of international Economics 86*(1), 141–157.

Fisman, R. and S.-J. Wei (2004). Tax Rates and Tax Evasion: Evidence from Missing Imports in China. *Journal of political Economy 112*(2), 471–496.

Flaaen, A., A. Hortaçsu, and F. Tintelnot (2020). The Production Relocation and Price Effects of US Trade Policy: the Case of Washing Machines. *American Economic Review 110*(7), 2103–2127.

Fung, K.-C. and L. J. Lau (1998). The China–United States Bilateral Trade Balance: How Big Is It Really? *Pacific Economic Review 3*(1), 33–47.

Goldberg, P. K. and N. Pavcnik (2016). The Effects of Trade Policy. In *Handbook of commercial policy*, Volume 1, pp. 161–206. Elsevier.

Huang, Y., C. Lin, S. Liu, and H. Tang (2023). Trade Networks and Firm Value: Evidence from the US-China Trade War. *Journal of International Economics 145*, 103811.

Javorcik, B. S. and G. Narciso (2008). Differentiated Products and Evasion of Import Tariffs. *Journal of International Economics 76*(2), 208–222.

Jiang, L., Y. Lu, H. Song, and G. Zhang (2023). Responses of Exporters to Trade Protectionism: Inferences from the US-China Trade War. *Journal of International Economics 140*, 103687.

Jiao, Y., Z. Liu, Z. Tian, and X. Wang (2022). The Impacts of the US Trade War on Chinese Exporters. *Review of Economics and Statistics*, 1–34.

Ju, J., H. Ma, Z. Wang, and X. Zhu (2024). Trade Wars and Industrial Policy Competitions: Understanding the US-China Economic Conflicts. *Journal of Monetary Economics 141*, 42–58.

Kee, H. L. and A. Nicita (2022). Trade Fraud and Non-tariff Measures. *Journal of International Economics 139*, 103682.

Ma, H. and L. Meng (2023). Heterogeneous Impacts of the Section 301 Tariffs: Evidence from the Revision of Product Lists. *Canadian Journal of Economics/Revue canadienne d'économique 56*(1), 164–190.

Mishra, P., A. Subramanian, and P. Topalova (2008). Tariffs, Enforcement, and Customs Evasion: Evidence from India. *Journal of public Economics 92*(10-11), 1907–1925.

Rauch, J. E. (1999). Networks versus Markets in International Trade. *Journal of International Economics 48*(1), 7–35.

West, L. A. (1995). *Reconciling China's Trade Statistics*. Number 76. International Programs Center, Population Division, US Bureau of the Census.

A Data Appendix

This section describes the data sources and variable construction used for the estimation of the total and the product-level value of de minimis imports from China, and for the quantitative analysis.

Data for the Estimation of Total Value

- US official trade statistics on de minimis imports are sourced from CBP Publication No.2036-1022 and CBP E-Commerce Statistics.[14] We obtain the following variables: the total number of de minimis packages from all countries, the number of de minimis packages from China including Hong Kong, and the total value of de minimis imports from all countries.

- Chinese official trade statistics for product codes "9804" and "9805" are sourced from the General Administration of Customs of China. We aggregate the province-level annual export values to the US under these codes to calculate the growth rate in 2019. To prevent potential overestimation of growth rates caused by the expansion of pilot zones in 2020, we focus exclusively on four municipalities: Beijing, Shanghai, Tianjin, and Chongqing to calculate the growth rate in 2020.

[14]The following is the link:The following is the link: https://www.cbp.gov/sites/default/files/assets/documents/2022-Oct/FY2018-2021_De%20Minimis%20Statistics%20update.pdf

Data for the Estimation of Product-level Value

- US imports and Chinese exports from 2016 to 2019 at the HS-6 level are sourced from the UN Comtrade database. We use these two sets of statistics to obtain the US-China discrepancy. We drop the HS-6 products if data on either US imports or Chinese exports are missing.
- US tariffs on products from China are calculated as the sum of the US MFN rates and the announced tariff rate changes due to the US-China trade war. The MFN rates are obtained from WTO tariff database, while the tariff rate changes are from the replication package of FGKK downloaded from Fajgelbaum's personal website.[15] These tariff rate changes are specified at the HS-10 level and scaled by the number of months that were in effect. We aggregate the tariff changes from HS-10 to HS-6 level weighted by 2017 annual import values from China, which are also from FGKK.
- The list of products suitable for the de minimis entry is obtained from the "List of Cross-Border E-commerce Retail Import Commodities (2019 Edition)" issued by the Chinese Ministry of Finance.[16] This original list is at the HS-8 level. We aggregate the list to the level of HS-6, assuming that a HS-6 product is eligible for the de minimis rule if at least one HS-8 products beneath it are on the list. Moreover, for robustness, we also use the 2016 edition.[17] For more detailed information, Table 8 presents the top 20 HS-2 products according to the share of HS-6 products suitable for the de minimis entry within the HS-2 category.
- The list of products eligible for Chinese export VAT rebate increase is sourced from the Ministry of Finance's announcement of the "Product List for Increasing Export Tax Rebate Rates" since 2018.[18] In the robustness checks, we use the levels of export VAT rebate rates from the Export Tax Refund Rate Library Version 2021B issued by the State Administration of Taxation.[19]
- The classification of differentiated products is from Rauch (1999), based on the facts that the products whether have reference prices or whose prices are quoted on organized exchanges.

[15] Fajgelbaum's personal website:http://www.econ.ucla.edu/pfajgelbaum/

[16] To see the list, go to the following web page:http://images.mofcom.gov.cn/cws/202001/20200110143527533.pdf

[17] The link for the 2016 edition:https://www.gov.cn/xinwen/2016-04/09/content_5062650.htm

[18] The list of products for increasing export VAT rebate rates is from https://www.gov.cn/fuwu/2018-10/31/content_5336063.htm and https://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5441320.htm

[19] The levels of export VAT rebate rates are from: https://guangdong.chinatax.gov.cn/gdsw/rjxz/2021-04/29/content_ded1d27673674e6c8c8fe67884e0f85f.shtml

Table 8: Description of the Top 20 HS-2 Products Suitable for the De Minimis Entry

Top 20	HS-2	Description	Number of HS-6 Products			Share(%)	
			All	2019 List	2016 List	2019 List	2016 List
1	42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut)	20	19	19	95	95
2	19	Preparations of cereals, flour, starch or milk; pastrycooks' products	19	18	18	95	95
3	33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	29	27	26	93	90
4	22	Beverages, spirits and vinegar	22	20	7	91	32
5	64	Footwear; gaiters and the like; parts of such articles	25	22	20	88	80
6	61	Apparel and clothing accessories; knitted or crocheted	106	92	91	87	86
7	62	Apparel and clothing accessories; not knitted or crocheted	112	96	94	86	84
8	34	Soap, organic surface-active agents; washing, lubricating, polishing or scouring preparations; artificial or prepared waxes, candles and similar articles, modelling pastes, dental waxes and dental preparations with a basis of plaster	23	19	17	83	74
9	21	Miscellaneous edible preparations	16	13	13	81	81
10	20	Preparations of vegetables, fruit, nuts or other parts of plants	52	42	41	81	79
11	35	Albuminoidal substances; modified starches; glues; enzymes	15	11	10	73	67
12	17	Sugars and sugar confectionery	17	12	8	71	47
13	04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included	32	22	15	69	47
14	96	Miscellaneous manufactured articles	48	32	30	67	63
15	18	Cocoa and cocoa preparations	11	7	7	64	64
16	15	Animal or vegetable fats and oils and their cleavage products; prepared animal fats; animal or vegetable waxes	48	29	14	60	29
17	08	Fruit and nuts, edible; peel of citrus fruit or melons	66	38	20	58	30
18	95	Toys, games and sports requisites; parts and accessories thereof	31	17	14	55	45
19	09	Coffee, tea, mate and spices	39	20	20	51	51
20	65	Headgear and parts thereof	8	4	4	50	50
Total of the top 20			739	560	488	76	66
Total			5206	1107	938	21	18

Notes: Table presents the top 20 HS-2 products suitable for the de minimis entry. Column (1) ranks these products based on the proportion of HS-6 products suitable for the de minimis entry within each HS-2 category according to the 2019 edition of the "List of Cross-Border E-commerce Retail Import Commodities". Columns (2) and (3) show the HS-2 code and description. Column (4) displays the total count of HS-6 products within each HS-2 category. Columns (5) and (6) show the number of HS-6 products suitable for the de minimis entry according to the list of 2019 and 2016, respectively. Columns (7) and (8) show the proportion of HS-6 products within each HS-2 category that are suitable for de minimis entry, according to the list of 2019 and 2016, respectively.

Data for the Quantitative Analysis

Data for the quantitative analysis are from the replication package of FGKK, including sector-level revenues and expenditures on labor and intermediates, labor income and employment shares by regions, import and export flows by variety, and tariff shocks.

B Appendix for Section 4

B.1 General Equilibrium Model

We develop a general equilibrium model of US economy, by extending FGKK's model to incorporate both de minimis entry and regular entry. Countries are indexed by $i \in \mathcal{I}$. The US is divided into R regions, indexed by $r \in \mathcal{R}$. In each region, there are S traded sectors and one nontraded sector, indexed by $s \in \mathcal{S}$ and NT, respectively. Traded sectors are freely traded within US but incur trade costs internationally. Labor is the only primary factor of production and it is immobile across regions and sectors in the short term. In each region r there are L_r workers and the associated wage rate is w_{rs}. US importers can choose between regular and de minimis entry channels for importing products from China, while imports from countries other than China are limited to the regular entry.

Preference

For a representative household in US, preferences are characterized by a nested CES utility function. At the top tier, a distinction is made between nontradable goods(C_{NT}) and tradable goods(C_s). Within each tradable sector, further differentiation occurs between the nest of domestic(D_s) and imported(M_s) goods, with product $g \in \mathcal{G}_s$ in each sector. Imported products(m_g) are further distinguished by country of origin i. Specifically, we have

$$U = (C_{NT})^{\beta_{NT}}(C_T)^{1-\beta_{NT}}, \tag{24}$$

$$C_T = \prod_{s \in \mathcal{S}} (C_s)^{\beta_s}, \tag{25}$$

$$C_s = \left(A_{Ds}^{\frac{1}{\kappa}} D_s^{\frac{\kappa-1}{\kappa}} + A_{Ms}^{\frac{1}{\kappa}} M_s^{\frac{\kappa-1}{\kappa}} \right)^{\frac{\kappa}{\kappa-1}}, \tag{26}$$

$$D_s = \left(\sum_{g \in \mathcal{G}_s} a_{Dg}^{\frac{1}{\eta}} d_g^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \tag{27}$$

$$M_s = \left(\sum_{g \in \mathcal{G}_s} a_{Mg}^{\frac{1}{\eta}} m_g^{\frac{\eta-1}{\eta}} \right)^{\frac{\eta}{\eta-1}}, \tag{28}$$

$$m_g = \left(\sum_{i} a_{ig}^{\frac{1}{\sigma}} m_{ig}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}, \tag{29}$$

where β_{NT},β_s,A_{Ds},A_{Ms},a_{Dg},a_{Mg}, and a_{ig} denote exogenous preference shifters, κ is the elasticity of substitution between domestic consumptions and imports within a given sector, η denotes the elasticity of substitution across products, and σ is the elasticity of substitution across different foreign sources within a given product.

Solving the utility maximization problem yields demand in each tier as a function of prices and aggregate expenditure:

$$M_s = E_s A_{Ms} P_{Ms}^{-\kappa} P_s^{\kappa-1}, \tag{30}$$

$$D_s = E_s A_{Ds} P_{Ds}^{-\kappa} P_s^{\kappa-1}, \tag{31}$$

$$m_g = M_s a_{Mg} p_{Mg}^{-\eta} P_{Ms}^{\eta}, \tag{32}$$

$$d_g = D_s a_{Dg} p_{Dg}^{-\eta} P_{Ds}^{\eta}, \tag{33}$$

$$m_{ig} = m_g a_{ig} p_{ig}^{-\sigma} p_{Mg}^{\sigma}, \tag{34}$$

where E_s is the aggregate US expenditures in sector s from both final consumers and firms, P_s is the sector level price index, $P_s = \left(A_{Ds} P_{Ds}^{1-\kappa} + A_{Ms} P_{Ms}^{1-\kappa}\right)^{\frac{1}{1-\kappa}}$, P_{Ms} and P_{Ds} represent the price indexes of imported and domestic goods in sector s, $P_{Ms} = \left(\sum_{g \in \mathcal{G}_s} a_{mg} p_{Mg}^{1-\eta}\right)^{\frac{1}{1-\eta}}$ and $P_{Ds} = \left(\sum_{g \in \mathcal{G}_s} a_{dg} p_{Dg}^{1-\eta}\right)^{\frac{1}{1-\eta}}$, p_{Mg} is the price index of imported product g, $p_{Mg} = \left(\sum_{i \in \mathcal{I}} a_{ig} p_{ig}^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$, and p_{Dg} is the price of the domestic variety of good g.

Combining equations (30)-(34), the import of variety ig is given by

$$m_{ig} = A_{Ms} a_{Mg} a_{ig} P_s^{\kappa-1} P_{Ms}^{\eta-\kappa} p_{Mg}^{\sigma-\eta} E_s p_{ig}^{-\sigma} = \mathcal{D}_{ig} p_{ig}^{-\sigma}, \tag{35}$$

where $\mathcal{D}_{ig} = A_{Ms} a_{Mg} a_{ig} P_s^{\kappa-1} P_{Ms}^{\eta-\kappa} p_{Mg}^{\sigma-\eta} E_s$ represents the demand shifter for the variety.

Technology

The production of tradeable goods uses labor L_{sr}, a bundle of intermediate inputs I_{sr}, and fixed capital. For short-run analysis, we assume capital and labor are immobile across regions and sectors, while intermediate inputs can be adjusted freely. US producers maximize their profits by selecting the optimal levels of intermediate inputs I_{sr},

$$\Pi_{sr} = \max_{Q_{sr}} p_s Q_{sr} - (1-\alpha_{K,s}) \left(\frac{\phi_s^{\alpha_{I,s}} w_{sr}^{\alpha_{L,s}}}{Z_{sr}} Q_{sr}\right)^{\frac{1}{1-\alpha_{K,s}}}, \tag{36}$$

$$Q_{sr} = Z_{sr} \left(\frac{I_{sr}}{\alpha_{I,sr}}\right)^{\alpha_{I,sr}} \left(\frac{L_{sr}}{\alpha_{L,sr}}\right)^{\alpha_{L,sr}}, \tag{37}$$

$$\phi_s \propto \prod_{s' \in \mathcal{S}} P_{s'}^{\frac{\alpha_S^{S'}}{\alpha_{I,s}}}, \tag{38}$$

subject to the feasibility constraint for products in sector s,

$$\sum_{g \in \mathcal{G}_s} \frac{q_g}{z_g} = Q_s, \tag{39}$$

where p_s represents the producer price in tradeable sector s, w_{sr} is the wage per worker in sector s and region r, ϕ_s denotes the cost of the bundle of intermediates used by sector s, Z_{sr} is local productivity, $\alpha_{K,s}$, $\alpha_{I,s}$, $\alpha_{L,s}$, and $\alpha_s^{s'}$ are production shares, z_g is a product-level productivity shock, and Q_s is the national supply in sector s. Therefore, the optimal levels of intermediate inputs I_{sr} are given by

$$I_{sr} = \alpha_{I,s}\alpha_{L,s} p_s^{\frac{1-\alpha_{K,s}}{\alpha_{I,s}\alpha_{K,s}}} Z_{sr}^{\frac{1-\alpha_{K,s}}{\alpha_{I,s}\alpha_{K,s}}} \phi_s^{-\frac{1}{\alpha_{K,s}}} w_{sr}^{-\frac{\alpha_{L,s}}{\alpha_{I,s}\alpha_{K,s}}} L_{sr}^{-\frac{\alpha_{L,s}}{\alpha_{I,s}}}. \tag{40}$$

In each US region r, the production function of firms in the non-tradable sector ($s = NT$) is given by

$$Q_{NT,r} = Z_{NT,r} L_{NT,r}. \tag{41}$$

Prices, Import Tariffs, and Transfers

To simplify exposition, we divide all imported varieties into two sets. The first set includes imported varieties which are exclusively imported under regular entry, denoted as $\mathcal{N}_1$, and $\mathcal{N}_1 \equiv \{(i,g)|i \neq c\} \cup \{(i,g)|i = c \text{ and } Mini_g = 0\}$. The second set includes imported varieties which can be imported under regular or de minimis entry, denoted as $\mathcal{N}_2$, and $\mathcal{N}_2 \equiv \{(i,g)|i = c \text{ and } Mini_g = 1\}$.

Price and US tariffs: For varieties exclusively imported through the regular entry, the ad valorem tariffs τ_{ig} imposed by the US government create a wedge between the domestic price faced by US households and firms (p_{ig}) and the CIF price (p_{ig}^*), akin to FGKK's model. However, for varieties accessible through both regular and de minimis entry, the domestic price is the same for both entry methods when importing from China, as demonstrated in Section 3.1. The domestic price is given by:

$$p_{ig} = \begin{cases} (1+\tau_{ig})p^*_{ig}, & \text{if } (i,g) \in \mathcal{N}_1; \\ \Lambda p^0_{ig} \left(T^R_{ig}(1+\tau^R_{ig})^{-\theta} + T^D_{ig} \right)^{-\frac{1}{\theta}}, & \text{if } (i,g) \in \mathcal{N}_2. \end{cases} \tag{42}$$

It is worth noting that p^0_{ig} is the producer price of product g excluding the non-tariff trade costs and tariffs, which can also be considered as the FOB price of product g.

Let $p^{*M}_{ig}((i,g) \in \mathcal{N}_2)$ denote the CIF price of product g for entry method M, and we have

$$p^{*M}_{ig} = \begin{cases} p_{ig}/(1+\tau_{ig}), & \text{if } (i,g) \in \mathcal{N}_2, \text{ and } M = R; \\ p_{ig}, & \text{if } (i,g) \in \mathcal{N}_2, \text{ and } M = D. \end{cases} \tag{43}$$

The CIF prices differ between the two entry methods due to the fact that tariffs are exempt for the de minimis entry while not for the regular entry.

Price and foreign tariffs: The price faced by household in foreign country i is $(1+\tau^*_{ig})p^X_{ig}$, where τ^*_{ig} is the ad valorem tariff imposed by foreign country i on US exports, p^X_{ig} denotes the CIF price faced by import country i of product g, $p^X_{ig} = \delta_{ig} p_{Dg}$, and p_{Dg} is the price of the domestically produced variety of good g, $p_{Dg} = \frac{p_s}{z_g}$.

Transfer: The US government rebates total tariff revenues to the representative household through a lump-sum transfer Tr. Total tariff revenue is distributed to each region in proportion b_r equal to its national population share. DE denotes the trade deficit. The US government's budget constraint is:

$$TR = \sum_{r \in \mathcal{R}} b_r (DE + \sum_s \sum_{g \in \mathcal{G}_s} \sum_i R_{ig}), \tag{44}$$

$$R_{ig} = \begin{cases} \tau_{ig} m_{ig} p^*_{ig}, & \text{if } (i,g) \in \mathcal{N}_1; \\ \tau_{ig} m_{ig} \pi^R_{ig} p^{*R}_{ig}, & \text{if } (i,g) \in \mathcal{N}_2, \end{cases} \tag{45}$$

where π^R_{ig} is the share of imports under regular entry based on the discrete choice model of customs entry in section 3.1.

Foreign Import Demand and Export Supply

The rest of the world is modeled as a series of import demand and export supply curves that determine the quantities x_{ig} and m_{ig} of any product g that a country $i \in \mathcal{I}$ imports from and exports to the US, respectively.

Foreign import demand: Each foreign country demands a quantity x_{ig} of US exports of good g. The import demand is:

$$x_{ig} = a^*_{ig} \left((1 + \tau^*_{ig}) p^X_{ig} \right)^{-\sigma^*}, \tag{46}$$

where p^X_{ig} is the export price received by exporters, $p^X_{ig} = \delta_{ig} p_{Dg}$, τ^*_{ig} is the ad valorem tariff set by country i on US exports of good g, a^*_{ig} is a foreign demand shock, which is as given and σ^* is the foreign import demand elasticity.

Foreign export supply: Each foreign country supply a quantity m_{ig} to US household and firms. The foreign export supply is:

$$m_{ig} = \begin{cases} (p^*_{ig})^{\frac{1}{\omega^*}} (z^*_{ig})^{-\frac{1}{\omega^*}}, & \text{if } (i,g) \in \mathcal{N}_1; \\ (p^0_{ig})^{\frac{1}{\omega^*}} (z^*_{ig})^{-\frac{1}{\omega^*}}, & \text{if } (i,g) \in \mathcal{N}_2, \end{cases} \tag{47}$$

where p^*_{ig} is CIF import price of product g and p^0_{ig} is the producer price excluding the non-tariff trade costs and tariffs, which can also be considered as the FOB price of product g, z^*_{ig} is a foreign marginal cost shifter, which is also as given. ω^* is the inverse foreign export supply elasticity.

Market Clearing

Market clearing conditions comprise: (1) the US supply of product g equals the sum of US domestic demand and foreign import demand; (2) the foreign supply of product g from country i equals the US import demand; (3) production in the non-traded sector in region r matches its consumption; (4) total expenditure equals total income,

$$q_g = d_g + \sum_{i \in \mathcal{I}} x_{ig} = a_{Dg} D_s \left(\frac{p_{Dg}}{P_{Ds}} \right)^{-\eta} + \sum_{i \in \mathcal{I}} a^*_{ig} \left((1 + \tau^*_{ig}) \delta_{ig} p_{Dg} \right)^{-\sigma^*}, \tag{48}$$

$$m_g a_{ig} \left(\frac{p_{ig}}{p_{Mg}} \right)^{-\sigma} = \begin{cases} (p^*_{ig})^{\frac{1}{\omega^*}} (z^*_{ig})^{-\frac{1}{\omega^*}}, & \text{if } (i,g) \in \mathcal{N}_1; \\ (p^0_{ig})^{\frac{1}{\omega^*}} (z^*_{ig})^{-\frac{1}{\omega^*}}, & \text{if } (i,g) \in \mathcal{N}_2, \end{cases} \tag{49}$$

$$Q_{r,NT} = C_{r,NT}, \tag{50}$$

$$X_r = w_{NT,r} L_{NT,r} + \sum_{s \in \mathcal{S}} w_{sr} L_{sr} + \sum_{s \in \mathcal{S}} \Pi_{sr} + b_r (DE + \sum_{s} \sum_{g \in \mathcal{G}_s} \sum_{i} R_{ig}), \tag{51}$$

$$E_s = \sum_{r \in \mathcal{R}} \beta_s X_r + \sum_{r \in \mathcal{R}} \sum_{s' \in \mathcal{S}} \alpha^s_{s'} p_{s'} Q_{s'r}. \quad (52)$$

Competitive Equilibrium

Given tariffs $\tau \equiv \{\tau_{ig}, \tau^*_{ig}\}$, a competitive equilibrium involves prices$\{p^*_{ig}, p^{*R}_{ig}, p^{*D}_{ig}, p_{Dg}, w_{sr}, w_{NT,r}\}$ and price indexes $\{P_s, P_{Ds}, P_{Ms}, p_{Mg}, \phi_s\}$ such that: (1) The US representative household maximizes its utility, subject to its budget constraint, as described in (24)-(29). (2) US producers maximize their profits subject to technological constraints, as described in (36)-(39). (3) Import and export prices satisfy the non-arbitrage conditions (42)-(43). (4) The US government's budget is balanced, as described in (44)-(45). (5) The foreign demand and supply shifters z^*_{ig} and a^*_{ig} in (46)-(47) are taken as given. (6) Goods markets clear, as described in (48)-(52).

B.2 General Equilibrium System in Changes

We derive the model solution by constructing a system of first-order approximations around a pre-war equilibrium. Denoting the log-difference of variable x as $\hat{x}$, this system describes the change in each endogenous variable resulting from shocks to US and foreign tariffs, $d\tau_{ig}, d\tau^*_{ig}$. All equilibrium conditions are expressed in log-changes, and the resulting outcomes depend on endogenous variables, initial shares, elasticities, and tariff shocks. We organize the system in changes into three blocks for clarity.

Wages, Producer Prices and Input Prices

The first block characterizes $\{\hat{w}_{sr}, \hat{w}_{T,r}, \hat{w}_{NT,r}, \hat{p}_s, \hat{\phi}_s\}$ given $\{\hat{X}_r, \hat{E}_s, \hat{P}_s, d\tau^*_{ig}\}$.

$$\hat{w_{sr}} = \frac{1}{1 - \alpha_{I,s}} \left(\hat{p}_s - \alpha_{I,s} \hat{\phi}_s \right), \quad (53)$$

$$\hat{w}_{T,r} = \sum_{s \in \mathcal{S}} \left(\frac{w_{sr} L_{sr}}{w_{T,r} L^T_r} \right) \frac{\hat{p}_s - \alpha_{I,s} \hat{\phi}_s}{1 - \alpha_{I,s}}, \quad (54)$$

$$\hat{w}_{NT,r} = \hat{X}_r, \quad (55)$$

$$\hat{\phi}_s = \sum_{s' \in \mathcal{S}} \frac{\alpha^{s'}_s}{\alpha_{I,s}} \hat{P}_{s'}. \quad (56)$$

Adding up (48) across all varieties within a sector and using the sector supply $Q_s = \sum_{g \in \mathcal{G}_s} q_g$, the producer price in sector s changes according to:

$$\hat{p_s} = \frac{\frac{P_{Ds}D_s}{p_s Q_s}\left(\hat{E}_s + (\kappa-1)\hat{P}_s\right) - \sigma^* \sum_g \sum_i \frac{p_{Dg}x_{ig}}{p_s Q_s}\frac{d\tau^*_{ig}}{1+\tau_{ig}} + \frac{\alpha_I}{\alpha_K}\hat{\phi}_s + \frac{\alpha_L}{\alpha_K}\sum_r \frac{p_s Q_{sr}}{p_s Q_s}\hat{w_{sr}}}{\frac{1-\alpha_k}{\alpha_k} + \kappa\frac{P_{Ds}D_s}{p_s Q_s} + \sigma^*\left(1 - \frac{P_{Ds}D_s}{p_s Q_s}\right)}. \tag{57}$$

Consumer Prices,Import Prices, and Tariff Revenue

The second block characterizes $\{\hat{P}_s, \hat{P}_{Ms}, \hat{p}_{Mg}, \hat{\pi^R_g}, \hat{p}_{ig}, \hat{R}\}$ given $\{\hat{E}_s, d\tau_{ig}\}$.

$$\hat{P}_s = \frac{P_{Ds}D_s}{E_s}\hat{p}_s + (1 - \frac{P_{Ds}D_s}{E_s})\hat{P_{Ms}}, \tag{58}$$

$$\hat{P_{Ms}} = \sum_{g \in \mathcal{G}_s}\left(\frac{p_{Mg}m_g}{P_{Ms}M_s}\right)\hat{p_{Mg}}, \tag{59}$$

$$\hat{p_{Mg}} = \sum_{i \in \mathcal{I}}\left(\frac{m_{ig}p_{ig}}{m_g p_{Mg}}\right)\hat{p_{ig}}. \tag{60}$$

The US domestic price changes according to:

$$\begin{aligned}\hat{p_{ig}} &= \frac{w^*}{1+w^*\sigma}\left((\kappa-1)\hat{P}_s + (\eta-\kappa)\hat{P_{Ms}} + (\sigma-\eta)\hat{p_{Mg}} + \hat{E}_s\right) + \frac{1}{1+w^*\sigma}\frac{d\tau_{ig}}{1+\tau_{ig}} + \frac{\hat{\pi^R_{ig}}}{\theta(1+\omega^*\sigma)} \\ &= \frac{w^*}{1+w^*\sigma}\hat{\mathcal{D}}_g + \frac{1}{1+w^*\sigma}\frac{d\tau_{ig}}{1+\tau_{ig}} + \frac{\hat{\pi^R_{ig}}}{\theta(1+\omega^*\sigma)},\end{aligned} \tag{61}$$

where $\hat{\mathcal{D}}_g = (\kappa-1)\hat{P}_s + (\eta-\kappa)\hat{P_{Ms}} + (\sigma-\eta)\hat{p_{Mg}} + \hat{E}_s$, represents the log-changes of demand shifter for the variety. Additionally, $\hat{\pi^R_{ig}}$ denotes the log-changes of the share of regular imports calculated based on equation (12). For varieties imported exclusively under the regular channel (i.e. $(i,g) \in \mathcal{N}_1$), we have $\hat{\pi^R_{ig}} = 0$.

The total tariff revenue R can be decomposed into two parts: the tariff revenue collected from imported varieties that only can be imported under regular entry, denoted as R_1, and the tariff revenue collected from imported varieties that can be both imported under regular and de minimis entry, denoted as R_2. We have $R_1 = \sum_{(i,g) \in \mathcal{N}_1} \tau_{ig}p^*_{ig}m_{ig}$ and $R_2 = \sum_{(i,g) \in \mathcal{N}_2} \tau_{ig}p^{*R}_{ig}m_{ig}\pi^R_{ig}$. A second order approximation to the change in R_1 is given by:

$$\hat{R}_1 = \sum_{(i,g)\in\mathcal{N}_1} \frac{p^*_{ig} m_{ig}}{R_1} d\tau_{ig} + \sum_{(i,g)\in\mathcal{N}_1} \frac{p^*_{ig} m_{ig}}{R_1} (\tau_{ig} + d\tau_{ig}) \left(\hat{p^*_{ig}} + \hat{m_{ig}} \right) + \frac{1}{2} \sum_{(i,g)\in\mathcal{N}_1} \tau_{ig} d^2 (p^*_{ig} m_{ig}), \quad (62)$$

where we set the product of initial tariffs and the second order term $\frac{1}{2}\tau d^2(p^* m)$ to zero. Using the solution for $\hat{p}^*_{ig}$ and $\hat{m}_{ig}$ computed from combining equation (35), (42), (47), and (61), we have

$$\begin{aligned}
\hat{R}_1 = & \sum_{(i,g)\in\mathcal{N}_1} \frac{p^*_{ig} m_{ig}}{R_1} (\tau_{ig} + d\tau_{ig}) \frac{1 + w^*}{1 + w^* \sigma} \left((\kappa - 1)\hat{P}_s + (\eta - \kappa)\hat{P_{Ms}} + (\sigma - \eta) p\hat{_{Mg}} + \hat{E}_s \right) \\
& + \sum_{(i,g)\in\mathcal{N}_1} \frac{p^*_{ig} m_{ig}}{R_1} \left(1 - \frac{\tau_{ig}(\sigma - 1)}{1 + w^* \sigma} \right) \frac{d\tau_{ig}}{1 + \tau_{ig}} \\
& - \sum_{(i,g)\in\mathcal{N}_1} \frac{p^*_{ig} m_{ig}}{R_1} \frac{(1 + w^*)\sigma}{1 + w^* \sigma} \frac{(d\tau_{ig})^2}{1 + \tau_{ig}}.
\end{aligned} \quad (63)$$

A second order approximation to the change in R_2 is given by

$$\hat{R}_2 = \sum_{(i,g)\in\mathcal{N}_2} \frac{p^{*R}_{ig} m_{ig} \pi^R_{ig}}{R_2} d\tau_{ig} + \sum_{(i,g)\in\mathcal{N}_2} \frac{p^{*R}_{ig} m_{ig} \pi^R_{ig}}{R_2} (\tau_{ig} + d\tau_{ig}) \left(\hat{p^{*R}_{ig}} + \hat{m_{ig}} + \hat{\pi^R_{ig}} \right) + \frac{1}{2} \sum_{(i,g)\in\mathcal{N}_2} \tau_{ig} d^2 (p^{*R}_{ig} m_{ig} \pi^R_{ig}), \quad (64)$$

where we also set the product of initial tariffs and the second order term $\frac{1}{2}\tau d^2(p^{*R} m \pi^R)$ to zero. We have

$$\begin{aligned}
\hat{R}_2 = & \sum_{(i,g)\in\mathcal{N}_2} \frac{p^*_{ig} m_{ig} \pi^R_{ig}}{R_2} (\tau_{ig} + d\tau_{ig}) \frac{1 + w^*}{1 + w^* \sigma} \left((\kappa - 1)\hat{P}_s + (\eta - \kappa)\hat{P_{Ms}} + (\sigma - \eta) p\hat{_{Mg}} + \hat{E}_s \right) \\
& + \sum_{(i,g)\in\mathcal{N}_2} \frac{p^*_{ig} m_{ig} \pi^R_{ig}}{R_2} \left(1 - \tau_{ig} \frac{(\sigma - 1)}{1 + w^* \sigma} \right) \frac{d\tau_{ig}}{1 + \tau_{ig}} \\
& - \sum_{(i,g)\in\mathcal{N}_2} \frac{p^*_{ig} m_{ig} \pi^R_{ig}}{R_2} \frac{\sigma(\omega^* + 1)}{1 + w^* \sigma} \frac{(d\tau_{ig})^2}{1 + \tau_{ig}} + (\tau_{ig} + d\tau_{ig}) \frac{\theta + \theta\omega^*\sigma - (\sigma - 1)}{\theta(1 + \omega^*\sigma)} \hat{\pi^R_{ig}}.
\end{aligned} \quad (65)$$

Finally, a second order approximation to the change in total tariff revenue is given by

$$\hat{R} = \frac{R_1}{R}\hat{R}_1 + \frac{R_2}{R}\hat{R}_2. \quad (66)$$

Sector and Region Demand Shifters

The third block characterizes the sector and region level expenditure shifters $\{\hat{E}_s, \hat{X}_r\}$ given $\{\hat{R}, \hat{p}_s, \hat{\phi}_s, w\hat{_{NT,r}}, \hat{w_{sr}}\}$. Sector-level expenditures are defined as $E_s = P_s C_s + P_s I_s$, and $P_s C_s = X = Y + R$. Hence, they change according to:

$$\hat{E}_s = \frac{P_s C_s}{E_s} \hat{P_s C_s} + \left(1 - \frac{P_s C_s}{E_s}\right) \hat{P_s I_s}, \tag{67}$$

$$\hat{P_s C_s} = \hat{X} = \frac{Y}{X}\hat{Y} + \frac{R}{X}\hat{R}, \tag{68}$$

$$\hat{Y} = \sum_{r \in \mathcal{R}} \left(\frac{P_{NT,r} Q_{NT,r}}{Y}\right) \hat{X}_r + \sum_{s \in \mathcal{S}} (1 - \alpha_{I,s}) \left(\frac{p_s Q_s}{Y}\right) \sum_{r \in \mathcal{R}} \left(\frac{p_s Q_{sr}}{p_s Q_s}\right) \left(\hat{p}_s + \hat{Q_{sr}}\right), \tag{69}$$

$$\hat{P_s I_s} = \sum_{s' \in \mathcal{S}} \alpha^{s}_{s'} \sum_{r \in \mathcal{R}} \frac{p_{s'} Q_{s'r}}{P_s I_s} (\hat{p_{s'}} + \hat{Q_{s'r}}), \tag{70}$$

$$\hat{p}_s + \hat{Q_{sr}} = \frac{1}{\alpha_{K,s}} \hat{p}_s - \frac{\alpha_{I,s}}{\alpha_{K,s}} \hat{\phi}_s - \frac{\alpha_{L,s}}{\alpha_{K,s}} \hat{w_{sr}}, \tag{71}$$

$$\hat{X}_r = \frac{\sum_s \frac{(1-\alpha_{I,s}) p_s Q_{sr}}{X_r} (\hat{p}_s + \hat{Q_{sr}}) + \frac{b_r R}{X_r} \hat{R}}{1 - \frac{P_{NT,r} Q_{NT,r}}{X_r}}. \tag{72}$$

B.3 Calibration

The system in Appendix B.2 gives the change in every outcome as a function of the elasticities $\{\sigma, \sigma^*, \omega^*, \eta, \kappa, \theta\}$, the preference and technology parameters $\{\beta_{NT}, \beta_s; \alpha_s^{s'}, \alpha_{K,s}, \alpha_{L,s}, T_{2016}, T_{2017}, T_{2018}, T_{2019}\}$, distributions of sales and employment across sectors and regions, and the imports and exports across varieties.

Following FGKK, we calibrate the model to 2016 data for 3,067 US counties, 88 traded sectors (4-digit NAICS), 71 trade partners, 10,228 imported HS-10 products, 213,578 imported varieties (unique product-country), 3,684 exported products, and 53,508 unique product-country.

We merge the data on US imports from China with the "List of Cross-Border E-commerce Retail Import Commoditie (2019 Edition)" at the HS-6 level. As the US import data is at the HS-10 level, we assume that if an HS-6 product is eligible for the de minimis rule, all HS-10 products beneath it are also eligible for the de minimis rule. For varieties suitable for the de minimis rule, we use equation (12) and parameters $\{\theta = 3.15, T_{2016} = 0.018, T_{2017} = 0.024, T_{2018} = 0.053, T_{2018} =$

0.088}to calculate the share of regular imports π_{cg}^{R} from 2016 to 2019, and the log changes $\hat{\pi_{cg}^{R}}$. For other varieties, $\hat{\pi_{cg}^{R}} = 0$.

The elasticities $\{\sigma, \sigma^{*}, \omega^{*}, \eta, \kappa\}$ are directly obtained from FGKK. Specifically, σ and ω^{*} capture US import and foreign export variety elasticities ($\sigma = 2.53$ and $\omega^{*} = -0.00$). η describes the product elasticity ($\eta = 1.53$). κ describes the elasticity between domestic and imported products within sectors ($\kappa = 1.19$). σ^{*} denotes the foreign import variety elasticity ($\sigma^{*} = 1.04$).