# Exports in Disguise?: Trade Rerouting during the US-China Trade War

Ebehi Iyoha[*] Edmund Malesky[†] Jaya Wen[‡] Sung-Ju Wu[§] Bo Feng[¶]

May 24, 2024

**Abstract**

Origin-specific tariffs are a common policy tool; however, critics claim that such tariffs are often circumvented by rerouting goods through intermediary countries. This study examines whether rerouting increased due to the 2018-2019 US-China trade war via Vietnam. We define rerouting at the product level as the maximum value of trade flows from China to the US, passing through Vietnam, for identical HS 8-digit products within the same quarter. Additionally, we employ a firm-level definition, which only considers such flows within the same firm.

Our findings indicate that the level of aggregation significantly impacts rerouting estimates. In 2021, 16.1% of Vietnamese exports to the US were identified as product-level rerouting, while only 1.8% were flagged as firm-level rerouting, equivalent to 15.5 billion and 1.7 billion current USD annually. Moreover, the average tariff increase on Chinese exports led to a 5.9 percentage point rise in product-level rerouting, compared to a 0.22 percentage point increase in firm-level rerouting. These increases represented 47.2% and 15.7% of their 2018 levels. These differences underscore the importance of microdata for designing trade policy and assessing compliance.

JEL Classification: F13, F14, F51

[*]Harvard Business School. Email: eiyoha@hbs.edu
[†]Department of Political Science, Duke University. Email: ejm5@duke.edu
[‡]Harvard Business School. Email: jwen@hbs.edu
[§]Department of Economics, Duke University. Email: sungju.wu@duke.edu
[¶]Harvard Business School. Email: bfeng@hbs.edu

# 1 Introduction

Countries around the world have recently turned toward protectionist trade policies. A popular form of these policies is the origin tariff, a tax on imports from specific origin countries. Policymakers and economists have debated the efficacy of these tariffs, with a major criticism being that they can be evaded via rerouting through third-party countries (Bohara et al., 2004). However, previous work has conflated rerouting with several legitimate business responses to tariffs.

In this paper, we provide both conceptual clarity and a precise test of rerouting by investigating the extent to which Chinese products were exported through Vietnam to the US due to the 2018 US–China trade war. The economic conflict began in February 2018 and comprised multiple waves of US tariffs on Chinese goods and Chinese tariffs on US goods (Bown, 2021). Throughout, policymakers expressed concerns that Chinese firms could circumvent origin-specific tariffs by shipping through third-party countries (Shi and Liu, 2019; Kyo Kitazume and Cho, 2019).

We focus on Vietnam for two reasons. First, prior work on the circumvention of trade barriers suggests that Chinese evasion is more likely to occur through countries that have relatively strong ties with China such as geographic proximity, a large ethnically Chinese population, and similar institutions (Rotunno et al., 2013; Liu and Shi, 2019). Vietnam's characteristics on these dimensions make it a compelling candidate for rerouting. Secondly, of all US import partners, Vietnam was the most significant beneficiary of the decline in US–China trade. Prior research found that Vietnam made up for almost half of China's lost market share in US imports between 2017 and 2022 (Alfaro and Chor, 2023). Vietnam has also witnessed a substantial rise in sourcing from China. During the same period, China's share of Vietnam's imports increased by 6 percentage points, the highest increase of all its source country partners (Alfaro and Chor, 2023). Unsurprisingly, the country has figured prominently in public debates about rerouting (Chau and Boudreau, 2019). This is therefore an important setting to investigate the extent of rerouting.

While aggregate patterns of China-Vietnam-US trade are striking, they do not sufficiently establish the existence or extent of rerouting. In principle, we wish to measure the relabeling of Chinese imports into Vietnam as Vietnamese goods and their subsequent export to the United States. However, other non-evasive activities may be observationally similar. For example, Vietnamese firms may use imported Chinese inputs and export different products to the United States, which does not constitute tariff evasion. This distinction is crucial because, even before the trade war, Vietnamese exports to the US and imports from China were already growing (McCaig and Pavcnik, 2018). The tariffs may have also stimulated legitimate export growth via, for example, new foreign investment in Vietnamese firms (Shira, 2019) or increasing investment from incumbent Vietnamese firms (Wu, 2023).

Our baseline strategy for measuring rerouting behavior uses information from two micro datasets:

firm outcomes from the Vietnam Enterprise Survey (VES) and trade transactions from S&P Global's Panjiva (Panjiva). The VES, covering 2000 to 2021, provides data on firm investment and production outcomes, including capital, employment, and revenue. Panjiva, spanning 2018 to 2021, details all trade transactions into and out of Vietnam at the 8-digit Harmonized System (HS) product level. Together, these data enable us implement two definitions of rerouting at different aggregations. The product-level measure tracks the flow of specific HS 8-digit products from China to the US through all of Vietnam within the same quarter. In contrast, the firm-level measure tracks the same HS 8-digit product flow within the same Vietnamese firm during the same quarter. The latter is a stricter, more conservative measure of rerouting.

We find that the level of aggregation substantially affects the level of estimated rerouting. In 2021, 16.1% of Vietnamese exports to the US were identified as product-level rerouting, while only 1.8% were identified as firm-level rerouting, a nine-fold difference in rerouting levels. These values are equivalent to 15.5 billion and 1.7 billion current USD rerouted annually.

Next, we estimate the causal impact of the US–China trade war on rerouting using temporal variation in tariff implementation, product variation in tariff intensity, and destination variation in tariff targeting. For the average tariff increase on Chinese exports, 12.48%, product-level rerouting increased by 5.9 percentage points, and firm-level rerouting increased by 0.22 percentage points. Given the 2018 measures of these values, 12.5% and 1.4%, these treatment effects represent a 47.2% increase in product-level rerouting and a 15.7% increase in firm-level rerouting.

Our evidence shows that the level of aggregation matters greatly for the estimated level of rerouting and its estimated response to trade policy. These facts suggest that microdata are essential to assess the compliance to and the consequences of trade policy.

We also perform a complementary exercise to leverage another property of rerouting: it should increase the correlation between Vietnam's US exports and Chinese imports. We again use variation in the timing of product-specific tariffs, the intensity of product-specific tariffs, and export destinations. We find that the correlation between Chinese imports and US exports was significantly higher among intensely treated products after tariff implementation than the correlation between Chinese imports and exports to other top destinations, like Korea, Japan, and the EU.

This paper makes two main contributions. First, we expand our understanding of the impact of the US–China trade war, particularly with respect to the global relocation of production and the decoupling of US-China trade. A large and growing literature on the impacts of the US–China trade war[1] has predominantly focused on the direct effects of the tariff increases on the US and, to a lesser extent, China, finding near complete pass-through to prices (Amiti et al., 2019, 2020b; Fajgelbaum et al., 2020; Flaaen et al., 2020; Cavallo et al., 2021; Chang et al., 2021; Ma et al., 2021) and negative effects on economic activity in both countries (Amiti et al., 2020a; Benguria

[1] See Fajgelbaum and Khandelwal (2022) for a review.

and Saffie, 2020; Handley et al., n.d.; Benguria et al., 2022; Chor and Li, 2024). A strand of this literature has documented the subsequent reorganization of supply chains and reallocation of global trade using aggregate product-level trade data Fajgelbaum et al. (2024); Alfaro and Chor (2023); Grossman et al. (2024); Freund et al. (2023). However, despite the substantial anecdotal discussion of rerouting, there has been scant empirical investigation of its occurrence during the trade war. A notable exception is Hayakawa and Sudsawasd (2024), who studied Thailand's introduction of a watchlist to curb the rerouting of Chinese goods to the US and EU in 2019. They found that the watchlist did not significantly affect Thailand's imports of surveilled goods from China, while exports of those goods increased to the US and decreased to the EU. To our knowledge, our paper is the first to provide empirical estimates of bounds on trade war-induced rerouting activity. This helps to contextualize how much of the observed aggregate trade reallocation responses are the result of tariff evasion through rerouting.

Secondly, we make a methodological contribution to the literature on trade barrier circumvention through rerouting by demonstrating the importance of firm-level data in examining this phenomenon. Much of the previous literature has provided suggestive evidence using bilateral trade data. Fisman et al. (2008) found that China was more likely to import goods through Hong Kong if it had higher import tariffs on the rest of the world, and posited tariff evasion as part of the rationale for indirect trade. Stoyanov (2012) also documented evidence of tariff evasion by showing that goods with greater preferential treatment under the Canada-US Free Trade Agreement were more likely to be transshipped through the US to Canada, suggesting violations of rules of origin requirements. Rerouting from China to the US has been examined in the context of quotas and anti-dumping duties. Rotunno et al. (2013) showed that African countries' imports from China and exports to the US were highly correlated for apparel products for which they had duty- and quota-free access to the US market through the African Growth and Opportunity Act (AGOA). Liu and Shi (2019) similarly found an increase in the Chinese import-US export correlation in third countries for products subject to US anti-dumping duties on Chinese products. However, these studies typically relied on product-level data which may overstate the extent of rerouting if there is unobserved value-added activity within a product code. Our firm-level approach refines the measurement of rerouting and allows us to validate this measure using production data.

The remainder of the paper is organized as follows: Section 2 presents background information on the trade war and Vietnamese trade. Section 3 introduces our main data sources and Section 4 presents our empirical measures of rerouting. Section 5 provides descriptive statistics based on our rerouting measures. Section 6 presents our strategy for estimating the causal response of rerouting to trade war tariffs, and Section 7 presents results from these analyses, alongside further validation exercises. Finally, Section 8 concludes.

# 2 Background

## 2.1 The US-China Trade War

The US-China trade war began in February 2018 when the United States imposed tariffs on washing machines and solar panels. These products were chosen because the US International Trade Committee found that their imports had harmed US producers. The US then levied tariffs on steel and aluminum following conclusions from a US Department of Commerce investigation. While both sets of tariffs applied to many countries, then-President Donald Trump communicated that the ultimate target was China.

The trade war grew more targeted, on June 15, 2018, when President Trump exerted his authority under Section 301 of the 1974 Trade Act to issue across-the-board retaliatory 10 percent tariffs on a wide range of Chinese products (Bown, 2021). President Trump justified the tariff decision by arguing that China's sizable trade surplus with the United States was largely the result of unfair trade practices and currency manipulation. Throughout 2018 and 2019, the US levied five waves of tariffs on a variety of Chinese products. In response to each wave, China raised tariffs on its imports from the United States. The US tariffs affected an estimated $350 billion worth of imports, and China's retaliatory tariffs targeted around $100 billion worth of US exports (Fajgelbaum and Khandelwal, 2022). In 2020, the two countries signed an agreement that paused further tariff increases in exchange for concessions. However, the existing tariffs remained in place and have not been repealed as of early 2024.[2] To illustrate the conflict's trajectory over time, Figure 1 plots average tariff rates during different phases of the trade war (Bown, 2021).

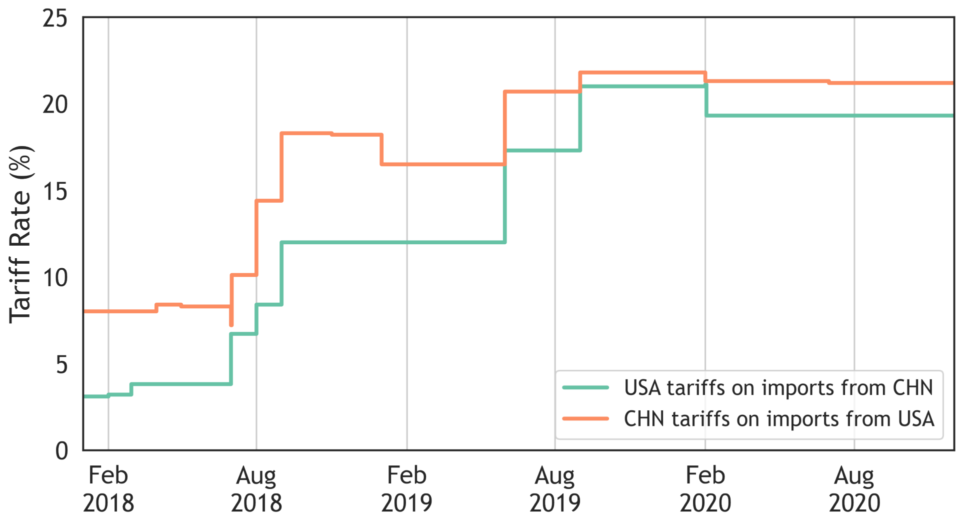
## 2.2 Vietnamese Trade

In Vietnam, these tariffs were greeted with marked enthusiasm, as some expected them to boost Vietnamese exports to the United States and further integrate Vietnamese companies into global value chains. Indeed, in the wake of the US tariffs, Vietnam significantly increased its exports to the United States. Total Vietnamese exports to the United States in April 2018 were $3.8 billion. By April 2019, exports had risen $5.1 billion, an impressive 25% year-on-year change (US Census Bureau, 2024). Figure 2 displays the value of Vietnam's total imports from China and total exports to the United States over time. The vertical line marks the onset of the trade war. Since its onset, Vietnam's imports from China and exports to the US have risen at a higher rate, reaching over 120 billion USD in 2022 (US Census Bureau, 2024).

While these patterns may circumstantially suggest rerouting, the evidence is far from conclu-

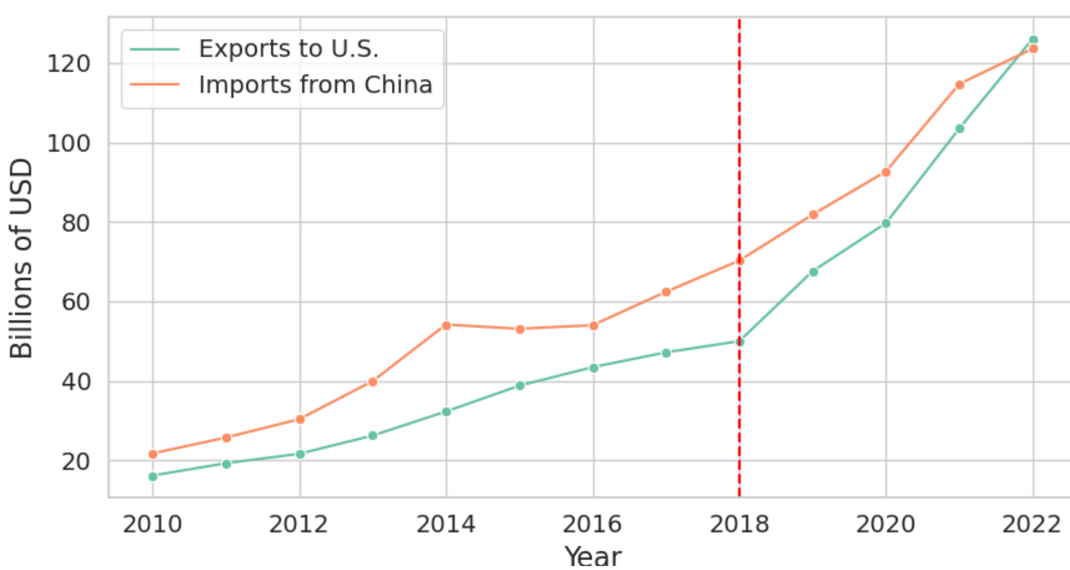
[2] In fact, in May 2024, the Biden administration announced further tariff increases for select products (Boak et al., 2024).

Figure 1: US-China Trade-War Timeline




Source: Bown (2021).

Figure 2: Vietnamese Exports to the US and Imports from China - Total Value




Source: CEPII BACI Dataset, 2010 - 2022.

sive. First, Vietnamese exports to the US were already increasing before 2018. The increase was driven by policies like the US Bilateral Trade Agreement (USBTA) in 2001 and Vietnam's entry into the World Trade Organization in 2007. At the same time, increasing growth in the Vietnamese market was leading to imports from China as consumption goods, construction materials, and intermediate components in manufactured goods (McCaig and Pavcnik, 2018; McCaig et al., 2022).

Second, the tariffs may have increased production by firms with pre-existing affiliates in Vietnam. Many foreign-owned firms in Vietnam (especially Japanese, Korean, and Taiwanese firms) employed a China-Plus-One strategy. These firms located most of their global value chains in China but, to address possible uncertainty associated with China located some operations in Vietnam (Shira, 2019). For the most part, the Vietnamese affiliates were involved in the less skill-intensive portions of the supply chain, engaging in either final assembly or providing the least technologically intensive inputs (Ha, 2019). US tariffs against Chinese products, however, offered opportunities to shift this balance toward Vietnam, prompting industrial upgrading (Amiti et al., 2019) and expansion of labor and capital (Wu, 2023).

Third, MNCs in China also began to increase new investment in Vietnam, building new factories and hiring new workers in the country. As early as 2019, Japanese and Korean firms with operations in China began visiting Vietnam to consider investments there. Some MNCs opened new factories and located higher value-added elements of their supply chains in Vietnam. Anecdotal evidence includes Taiwanese companies that migrated to Vietnam to increase the production of tablets and smartphones as part of Apple's supply chain. At the same time, existing foreign investors, such as Samsung and Intel, deepened and expanded their operations.

The Foreign Investment Agency under the Ministry of Planning and Investment of Vietnam shows that pledged and disbursed foreign direct investment (FDI) in Vietnam achieved ten-year highs in 2019, immediately after the tariffs. The amount of FDI licensed to enter the country grew 7.2% to 38 billion USD, including nearly 3,900 new projects. Among approved FDI projects, new and existing investors disbursed 20.4 billion USD, which also represents a 7 percent increase. The ratio of disbursed to approved and pledged investments stood at 54%, one of the highest proportions during Vietnam's reform era. Notably, foreign investments in science and technology surged sharply, ranking among the fastest-growing sectors in the country's FDI attraction. The surging foreign investment growth has continued after the tariffs with new highs reached in 2022 and 2023.

These two patterns are fundamentally different from rerouting, as they imply increased investment and labor market activity of the economic actors. With rerouting, a company simply imports the product into Vietnam and exports the same product out. No manufacturing labor or facilities are needed as this activity is simply a logistical exercise. Increasing investment in existing facilities and new investments, however, implies the hiring of new workers, the purchase or lease of business premises, and expenditures in manufacturing new products. Critically, these businesses are likely still connected to supply chains in China and may continue to import raw materials, intermediate goods, and potentially machinery from China for production. Below, we seek to distinguish rerouting behavior from these non-evasive activities.

# 3 Data

**Tariffs.** We obtain HS6-digit product-month tariff values from Bown (2021).[3] These data report monthly changes in US import tariffs at the product and trade partner level for 2017 through 2019. The data also contain monthly retaliatory tariffs implemented by US trade partners, which we control for in robustness checks.

In this study, we focus on tariffs applied by the US exclusively on Chinese goods.[4] We assign the HS6-digit tariff to each of its 8-digit subcategories. Most 8-digit Vietnamese products were ultimately affected, constituting 91% of exported products and 90% of imported products. Figure 3 displays the cumulative share of affected 8-digit products over time.

**Trade Flows.** We obtain transaction-level bill of lading data from S&P Global Panjiva.[5] The data cover over one billion international trade shipments and 17 total countries. In this project, we focus on inflows and outflows from Vietnam from January 2018 through 2021. The key variables we use are the unique shipment ID, the arrival date, the shipment value, the seller ID, the buyer ID, the shipper's country, the destination country, and the 8-digit HS code. Importantly, Panjiva reports each Vietnamese firm's domestic tax ID.

**Vietnamese Firms.** We obtain Vietnamese firm characteristics from the Vietnam Enterprise Survey (VES). Our data includes annual information for more than 1.2 million unique firms from 2000 to 2021. We observe balance sheet and income statement items, such as revenue, profit, employment, and fixed capital.

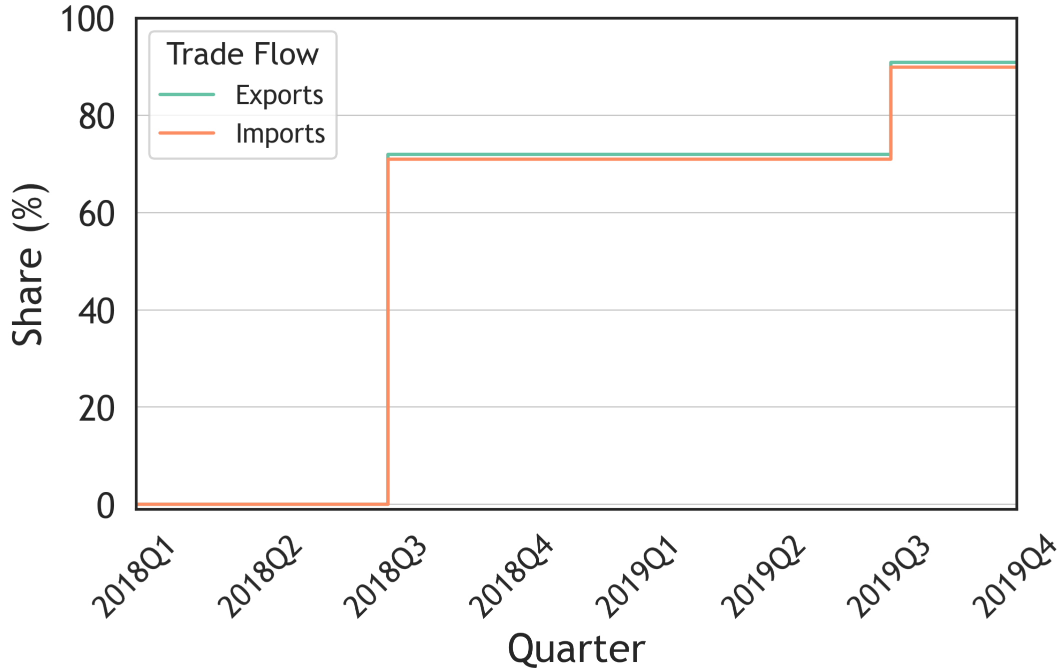
The VES also provides detailed information on firm ownership; we observe whether each firm is domestically-owned, foreign-owned, or a joint venture. Among foreign-owned firms, we also observe the top three foreign capital sources. We merge the VES with Panjiva using Vietnamese firms' tax IDs.

[3] Although US tariffs are generally set at the 8-digit level, we match with Vietnamese trade data on the 6-digit codes because this is the most disaggregated level at which product codes are comparable across countries.

[4] In our benchmark specifications, we exclude the US Section 201 tariffs on solar panels and washing machines and the section 232 tariffs on steel and aluminum because they applied to countries other than China, including Vietnam.

[5] Bills of lading are legal documents that confirm when shipments reach their destinations. In Vietnam, they are regulated and collected by Vietnam Customs.

Figure 3: Targeted Share of Vietnamese HS 8-digit Products




# 4 Measurement

## 4.1 Types of Rerouting

After the onset of the trade war, we observe that Vietnamese exports to the US increased substantially. This paper's central goal is to identify the share of that increase that is likely tariff evasion via rerouting. To do so, we need to provide a classification of Vietnamese exports and propose ways to measure rerouting empirically. Our ultimate goal is to estimate how these types of exports responded to the US–China trade war.

We present our classification Table 1. The most important distinction is between exports that evade tariffs (type A) and exports that do not (type B). In our context, tariff evasion involves the movement of finished goods from China into Vietnam, where the origin country is re-labeled. Then, the finished goods are exported from Vietnam to the United States. We refer to this behavior as "rerouting."

Rerouting can occur within incumbent firms that predate the trade war and new firms created after it. Both incumbent and new firms can be either domestically- or foreign-owned. In our data, we distinguish between these four groups and estimate the size of flows A1, A2, A3, and A4. These flows may have different economic and policy implications: for example, profits from foreign-owned companies may not stay in Vietnam, whereas profits from re-labeled goods in Vietnamese

Table 1: Types of Vietnamese Exports to the US

| Exports to the U.S. | | |
|---|---|---|
| A | | Tariff Evasion: Re-Routing |
| | A1 | Incumbent Domestically-owned |
| | A2 | Incumbent Foreign-owned |
| | A3 | New Domestically-owned |
| | A4 | New Foreign-owned |
| B | | Not Tariff Evasion: Value-Added |
| | B1 | Incumbent Domestically-owned |
| | B2 | Incumbent Foreign-owned |
| | B3 | New Domestically-owned |
| | B4 | New Foreign-owned |

companies may be reinvested in the local economy.

In contrast, exports genuinely produced in Vietnam do not constitute tariff evasion (type B). For simplicity, we will call these "value-added" flows, since their main difference from re-labeled flows is that some or all of their value was produced within Vietnamese borders. Value-added flows can originate from either incumbent or new firms and either domestically- or foreign-owned firms. Again, the effects on the Vietnamese economy may be quite different across these four types, B1, B2, B3, and B4.

Other distinctions within value-added flows are useful to understand, and we will also try to distinguish them in the data. First, value-added flows could also come from infra-marginal reallocation of exports from other destinations to the US, or intensive-margin increases in total production.

Second, value-added flows could use intermediate inputs from China, or use intermediate inputs from elsewhere. The share of inputs from China affects how much China still benefits from value-added flows. This possibility also means that the increase in Vietnamese imports of Chinese goods observed in Figure 2 may not all be tariff evasion: some of those flows could be part of legitimate changes in global supply chains.

## 4.2 Product-Level Rerouting

We employ several complementary methods to capture rerouting behavior (Type A flows in Figure 1). One way to measure rerouting is look at how much of the same product is flowing into Vietnam from China and out of Vietnam to the United States. Specifically, for each HS8 product, we can compute:

$$L_{pct} = \frac{min\left\{x_{pt}^{US}, m_{pct}\right\}}{x_{pt}^{US}}$$

In this equation, $p$ indexes HS8-digit products, $t$ indexes quarters, and $c$ indexes partner countries. $x^{US}$ are Vietnamese exports to the US, and $m_{pct}$ are Vietnamese imports from source country $c$. When $c$ is set to China, $L_{pct}$, our product-level measure of rerouting, captures the maximum possible value of product $p$ flowing from China to the US through Vietnam, normalized by Vietnamese exports of that product to the US.[6]

One benefit of this approach is that it can capture many forms of rerouting, including those that traverse through chains of Vietnamese firms. However, it is almost certainly an over-estimate of overall rerouting behavior, as some imports from China are legitimately used in Vietnam, and some exports to the US are legitimately produced in Vietnam.

Of course, there are caveats to this approach. As mentioned, this method cannot distinguish between re-labeled imports and domestically-consumed imports, or re-labeled exports and domestically-produced exports. Another possibility is that Vietnamese firms are adding value within HS8 product categories. Though 8-digit products are relatively granular, legitimate manufacturing could still occur within product categories. If this practice were widespread, it might lead to an overestimate of rerouting.

## 4.3 Firm-Level Rerouting

To address these drawbacks, we define another measure of rerouting using within-firm transactions from the Panjiva data. We can measure how much each firm imports and exports the same HS8-digit product from China to the US. This approach should eliminate a large share of legitimate churn in trade, as it is conceptually much less likely that a firm imports and exports the same product for domestic consumption and foreign sales. For each firm and HS8 product pair, we can compute:

$$L_{ipct} = \frac{min\left\{x_{ipt}^{US}, m_{ipct}\right\}}{x_{ipt}^{US}}$$

In this expression, $i$ indexes firms, $p$ indexes HS8-digit products, $t$ indexes quarters, and $c$ indexes source countries. $x^{US}$ are Vietnamese exports to the US, and $m_{ipct}$ are Vietnamese imports from source country $c$. When $c$ is set to China, $L_{ipct}$ captures the maximum possible value of product $p$ flowing from China to the US through Vietnam, normalized by Vietnamese exports of that product

[6] This would ideally be measured in traded quantities such as kilograms or volumes. However, we use trade values due to data limitations; quantities are not reported in standard units of measurement in the bill of lading data. Given that export prices tend to exceed import prices, our measure likely underestimates the share of exports rerouted.

to the US, all within a single firm.

It is worth noting that the firm-level measure also has caveats. First, it could underestimate rerouting that takes place across multiple Vietnamese firms. It may also over-estimate rerouting behavior if firms are adding value within HS8-digit product categories, or if firms are selling their Chinese imports in Vietnam and producing different exports to the US. Given the granularity of HS8 products and the potential costs of additional firm-to-firm transactions, we believe the firm-level measure is more likely to be an underestimate of total rerouting via Vietnam.

# 5 Descriptive Statistics

In this section, we provide basic descriptive statistics using our product- and firm-level measures of rerouting. First, we note that the level of aggregation makes an economically meaningful difference. The 2018 level of rerouting is 12.5% if we use the product-level measure, compared to 1.4% if we use the firm-level measure.[7] In 2021, the analogous figures were 16.1% and 1.8%. These patterns confirm that the firm-level rerouting measure is more conservative.

We also construct histograms of the two rerouting measures, $L_{pct}$ and $L_{ipct}$, to visualize the shape of their distributions. Figure 4 displays a histogram of $L_{pct}$ for Q1 of 2018 with $c$ set to China. There were 2,065 HS8 products in our data. The mean rerouting share is 0.65, the median rerouting share is 1.0, and the standard deviation is 0.45. Most HS8 products, over 58%, have a rerouting share of one. This distribution suggests that the product-level measure may overestimate true rerouting. Overall, we classify 10.9% of Vietnamese export flows to the US as product-level rerouting in Q1 of 2018, equivalent to 5.19 billion current USD.

Next, Figure 5 displays a histogram of $L_{ipct}$ with $c$ set to China. The graph covers the first quarter of 2018, before trade war tariffs were announced. There are 2065 HS8 products and 3481 unique firms in the data. The mean rerouting share is 0.055, the median rerouting share is 0.0, and the standard deviation is 0.22. In Q1 of 2018, 1.41% of Vietnamese exports to the US were classified as firm-level rerouting, equivalent to 670 million current USD in annual rerouting. In contrast to the product-level measure, nearly all firms (over 91%) have a rerouting share of zero.

[7] We explain the computation of these values in detail in Subsection 5.1.

Figure 4: Histogram of Product-level Rerouting from China, 2018 Q1

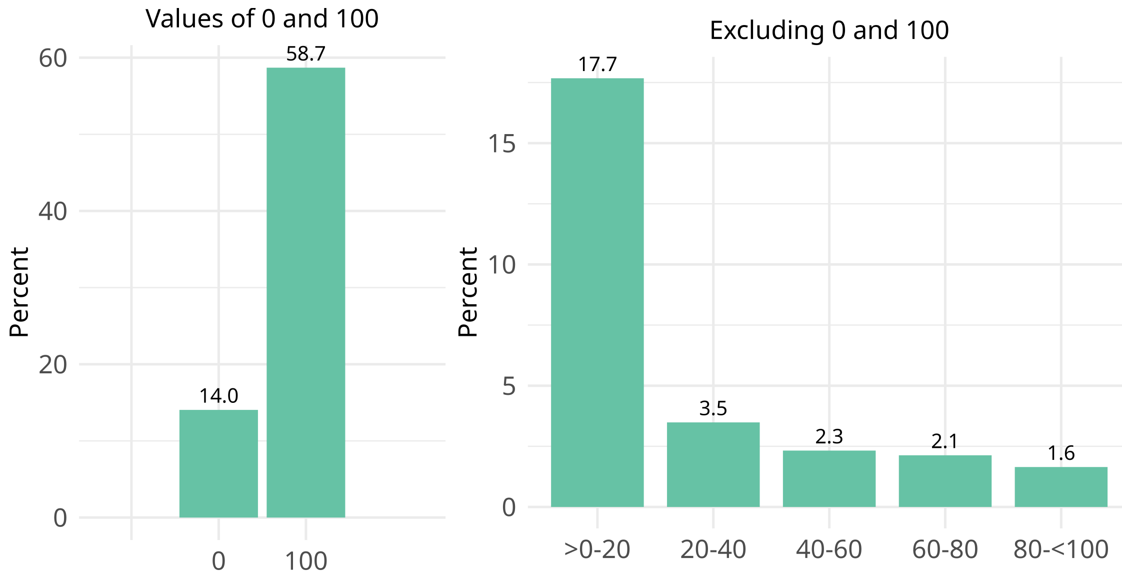
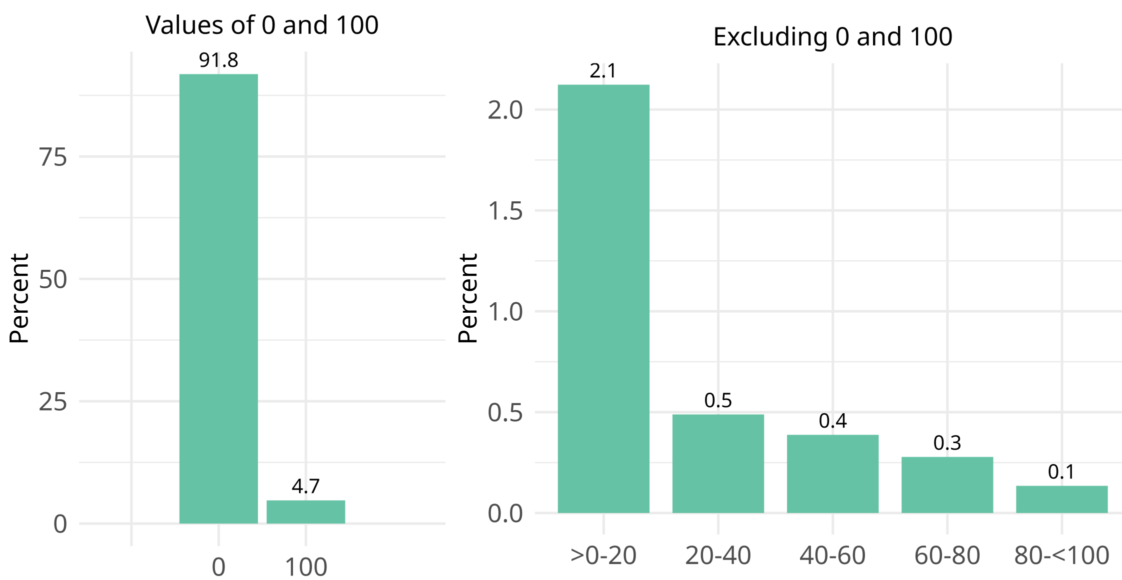



Figure 5: Histogram of Firm-level Rerouting from China, 2018 Q1




## 5.1 Alternative Product and Time Granularity

Thus far, we have defined rerouting as imports from China and exports to the US within the same HS 8-digit product and quarter. However, we could have chosen alternative product and time granularity for more or less conservative rerouting measures. For example, using larger product categories would mechanically flag more trade flows as rerouting, as would using longer periods.

To explore how these parameters affect the measure, we compute the share of Vietnam's US exports flagged as rerouting using nine combinations of product and time categories. We consider three product categories: HS 4-, 6-, and 8-digit, and three periods: year, quarter, and month.

We aggregate each measure to the country-year level for comparability. For the expressions below, we use $p \in \{HS4, HS6, HS8\}$ and $t \in \{year, quarter, month\}$. We set the source country $c$ equal to China and suppress the index for brevity. For the product-level measures, we obtain:

$$\frac{\sum_t \sum_p L_{pt} x_{pt}^{US}}{\sum_t \sum_p x_{pt}^{US}} = \frac{\sum_t \sum_p \min\{x_{pt}^{US}, m_{pt}\}}{\sum_t \sum_p x_{pt}^{US}}$$

For the firm-level measures, we obtain:

$$\frac{\sum_t \sum_p \sum_i L_{ipt} x_{ipt}^{US}}{\sum_t \sum_p \sum_i x_{ipt}^{US}} = \frac{\sum_t \sum_p \sum_i \min\{x_{ipt}^{US}, m_{ipt}\}}{\sum_t \sum_p \sum_i x_{ipt}^{US}}$$

Table 2 displays these measures for 2018 and 2021. Panel A presents product-level rerouting as a percent of total Vietnamese exports to the US. For 2018, we find a range of 11.7 to 18.8 percent, from the most granular measure at the HS 8-digit and month level to the coarsest measure at the HS 4-digit and year level. These values correspond to between 5.57 and 8.95 billion USD in rerouted goods.[8] Three years later, after the full onset of the trade war, the estimated rerouting share grew to between 15.5 to 41.3 percent, or between 14.9 and 39.8 billion USD.[9]

As expected, the firm-level measures are much smaller. In 2018, firm-level rerouting fell between 1.2 and 3.3 percent, equivalent to 0.57 and 1.57 billion USD. In 2021, this value increased to between 1.7 and 6.1 percent, equivalent to 1.64 and 5.87 billion USD.

Overall, Table 2 demonstrates the importance of several levels of disaggregation. First, the granularity of the product measure has a large effect on the extent of estimated rerouting. For example, in Panel A, the HS 4-digit estimates are between 1.45 and 2.47 times larger than their HS 8-digit counterparts. Similarly, in Panel B, this ratio ranges between 1.72 and 3.28. Within the data, we find examples of why the HS 4-digit values are likely overestimated. For example, a refrigerator manufacturer who imported condensers and evaporators (HS code 8418.99.10) from China, and exported refrigerated display cases (8418.50.99) in 2021 would be misclassified as a rerouting firm by the 4-digit product level rerouting measure, but not by the 6- or 8-digit measures.

The second level of granularity that Table 2 highlights is the difference between the product- and firm-level rerouting measures. Comparing Panel A with Panel B, the product-level measures are between 5.7 and 9.5 times larger than their firm-level counterparts. One reason for this major discrepancy is that the product-level measures likely include legitimate activities that are not evasive rerouting. For example, bicycle tires (HS code 4011.50.00) imported from China in 2021

[8] Vietnam exported 47.6 billion current USD in goods to the US in 2018.
[9] Vietnam exported 96.3 billion current USD in goods to the US in 2021.

Table 2: Alternative Product and Period Aggregations

| | 2018 | | | 2021 | | |
|---|---|---|---|---|---|---|
| | Year | Quarter | Month | Year | Quarter | Month |
| | Panel A: Product-Level Rerouting (%) | | | | | |
| HS 4-digit | 18.8 | 18.5 | 18.0 | 41.2 | 36.9 | 36.1 |
| HS 6-digit | 14.7 | 14.4 | 13.7 | 19.5 | 18.9 | 18.3 |
| HS 8-digit | 12.9 | 12.5 | 11.7 | 16.7 | 16.1 | 15.5 |
| | Panel B: Firm-Level Rerouting (%) | | | | | |
| HS 4-digit | 3.3 | 2.6 | 2.1 | 6.1 | 5.9 | 5.5 |
| HS 6-digit | 2.0 | 1.7 | 1.6 | 2.2 | 2.0 | 1.9 |
| HS 8-digit | 1.7 | 1.4 | 1.2 | 1.9 | 1.8 | 1.7 |

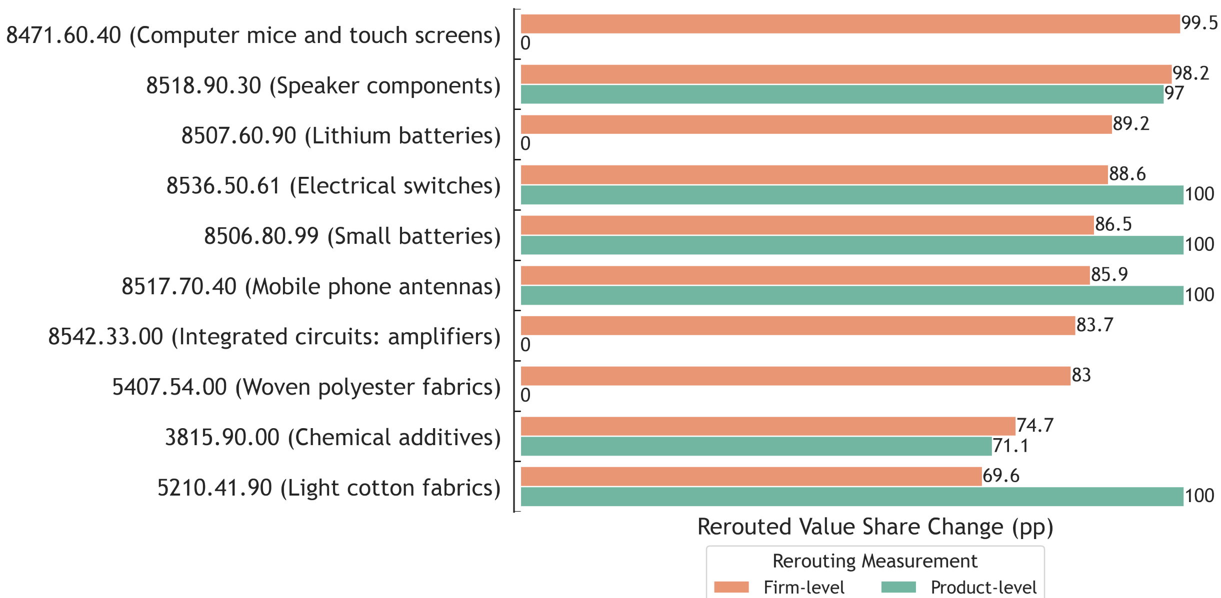
*Note:* This table reports the percent of total Vietnamese exports to the US in 2018 and 2021 flagged as rerouting using each set of product and time aggregations.

mostly went to a bicycle and motorcycle manufacturer in Ho Chi Minh City, while most bicycle tire exports to the US in that year were by tire manufacturers in Dong Nai province, one of Vietnam's largest rubber-producing provinces. This flow would be misclassified as rerouting under the product-level definition but not the firm-level measure.

Disaggregation also matters for capturing changes in rerouting over time. In Figure 6, we display the ten products with the greatest increase in US rerouting share between 2018 and 2021 as measured at the firm-HS8-quarterly level. The increase in firm-level rerouting is presented as the orange bars. We also show this change using the more aggregate HS8-quarterly rerouting measure using the green bars. For some products, the firm- and product-level measures produce similar changes, like speaker components, whose estimated rerouting value shares are 98.2 and 97 percentage points respectively. However, the firm- and product-level changes differ dramatically for other products. For example, the increase in firm-level rerouting share for computer mice was 99.5, but the increase in its product-level rerouting share was 0. This discrepancy is due to the 2018 product-level rerouting share, which was already 100. These facts highlight that aggregation may change which products we assess as rerouted more due to the trade war.

While the choice of product aggregation and product- or firm-level rerouting matters strongly, the time interval appears to matter less. For the rest of the paper, we focus on the HS8- and quarter-level figures, though all our results can be replicated with alternative parameters. When appropriate, we will continue to report product- and firm-level estimates to illustrate the importance of choosing the correct level of aggregation.

Figure 6: Comparison between Firm- and Product-level Rerouting Share Changes (2018-2021)




*Note:* This figure depicts HS 8-digit products with the highest changes in the annual rerouted share of value exported to the US from 2018 to 2021 by the firm-HS 8-digit-quarter rerouting measure. For each product, the rerouted share according to the HS 8-digit-quarter rerouting measure is shown for comparison. Product descriptions are abbreviated for clarity.

## 5.2 Rerouting by Nationality of Ownership

Are domestic or foreign-owned firms more likely to be flagged as rerouters? To shed light on this question, we decompose firm-level rerouting by nationality of ownership for the matched VES-Panjiva sample.

In Panel A of Table 3, we report the total number of Vietnamese firms in our matched sample that export to the United States. We also report counts by nationality of ownership: domestic (Vietnamese) firms, Chinese-owned firms, and other foreign-owned firms. The number of firms exporting to the US increased by 45.8% from 2018 to 2021. During the same period, the number of Chinese-owned firms exporting to the US increased by 178%. In Panel B of Table 3, we report the number of firms that participate in firm-level rerouting, as defined by $L_{ipct} > 0$. The number of rerouting firms increased by 80.8% from 2018 to 2021. During the same period, the number of rerouting Chinese-owned firms increased by a remarkable 318%. Panel C reports the percentage of rerouting firms among firms exporting to the US. For all firms, this value increases from 16.4% to 20.3% from 2018 to 2021. For Chinese-owned firms, this value grows from 30.6% to 46%.

While Table 3 focuses on the extensive margin of US exporters and rerouting, similar patterns are also evident on the intensive margin of rerouting. To visualize this fact, the green bars in Figure 7 display the change in the share of each ownership type in total Vietnamese export value to the US. From 2018 to 2021, domestic Vietnamese firms were responsible for a smaller share of exports to the US (19 percentage points less), whereas Chinese and other foreign-owned firms were responsible for a larger share.

The orange bars in Figure 7 display the change in the share of each ownership type in firm-level rerouting value from China to the US. Interestingly, the share of overall rerouting performed by domestic Vietnamese and other foreign-owned firms declined, but the share of rerouting performed by Chinese-owned firms increased by over 16 percentage points. This relative increase is especially dramatic considering that, as seen in Panel B of 3, all groups were increasing their rerouting behavior in absolute terms.

Together, these figures suggest that, while rerouting behavior increased across all ownership groups, Chinese-owned firms in Vietnam increased rerouting behavior to the US at the highest rate after the onset of the trade war.

## 5.3 Correlation between Rerouting and Tariff Changes

As a first step to understanding whether the trade war increased firm-level rerouting, we plot the share of rerouters in each product over that product's trade war tariff change. We expect a null relationship before the trade war and a strong positive relationship afterward. Figure 8 displays these correlations with 95% confidence intervals and Appendix Table A1 shows the regression

Table 3: Firm-level Rerouting by Ownership Nationality and Year

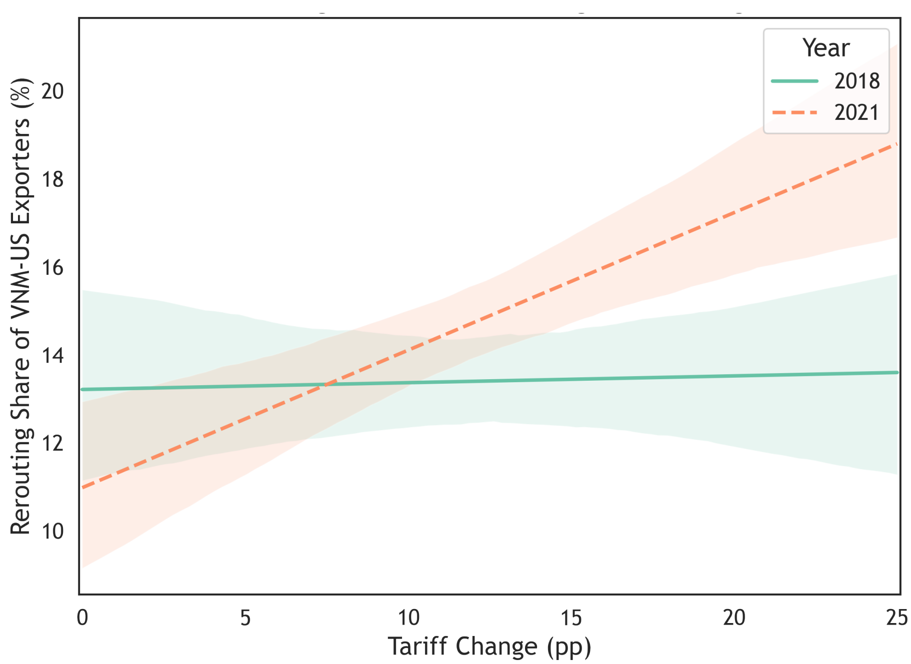
| | 2018 | 2019 | 2020 | 2021 |
|---|---|---|---|---|
| Panel A: Number of US Exporters | | | | |
| Total | 5,283 | 6,419 | 7,743 | 7,703 |
| Domestic | 3,445 | 4,110 | 5,178 | 5,083 |
| Chinese | 186 | 342 | 491 | 517 |
| Other Foreign | 1,652 | 1,967 | 2,074 | 2,103 |
| Panel B: Number of Firm-Level Rerouters | | | | |
| Total | 866 | 1,232 | 1,494 | 1,566 |
| Domestic | 331 | 417 | 521 | 534 |
| Chinese | 57 | 144 | 216 | 238 |
| Other Foreign | 478 | 671 | 757 | 794 |
| Panel C: % of Rerouters among US Exporters | | | | |
| Total | 16.4 | 19.2 | 19.3 | 20.3 |
| Domestic | 9.6 | 10.1 | 10.1 | 10.5 |
| Chinese | 30.6 | 42.1 | 44.0 | 46.0 |
| Other Foreign | 28.9 | 34.1 | 36.5 | 37.8 |

coefficients. As expected, the 2018 relationship is weak, as most tariffs were announced near the end of 2018 or later. In contrast, the 2021 correlation is positive and highly statistically significant. This pattern is consistent with the idea that the tariffs increased rerouting behavior.

Figure 7: Changes in Ownership Shares of Value Exported and Rerouted to the US (2018-2021)


*Note:* This figure depicts shifts from 2018 to 2021 in the shares of value exported and rerouted to the US, accounted for by each ownership nationality category. All bars within a metric sum to zero.

Figure 8: Correlation between Firm-level Rerouting and Tariff Changes



# 6 Empirical Strategy

While the above patterns suggest that trade war policies increased rerouting through Vietnam, they are not definitive evidence. Therefore, we turn to a difference-in-difference approach to estimate the causal effect of the trade war tariffs. Conceptually, we compare the rerouting share before and after initial tariffs for treated and untreated products across targeted (China) and untargeted (rest of the world) partners.

Specifically, for the product-level rerouting measure, we estimate:

$$L_{pct} = \sum_{j=-4}^{16} \beta_j \Delta\tau_{pc} \times I\{t - s_{pc} = j\} + \alpha_{pt} + \alpha_{pc} + \varepsilon_{pct} \tag{1}$$

In this equation, $p$ indexes HS 8-digit products, $c$ indexes source countries, and $t$ indexes quarters. The term $\Delta\tau_{pc}$ is the tariff increase on product $p$ from origin $c$ levied by the US during the trade war in percentage points. Since we only include China-specific origin tariffs, $\Delta\tau_{pc} = 0$ for all source countries other than China. We use the first increase for each product, and $s_{pc}$ denotes the period of the announced increase. We focus on the first tariff increase for each product as subsequent changes may be in response to further developments in the trade war, and thus endogenous to changes in trade flows. We cluster standard errors at the source country level and the HS6 product level since that is the underlying level of tariff variation.

To document pre-trends and dynamic effects, we interact $\Delta\tau_{pc}$ with indicators for quarters before and after the tariff increases. We express these indicators as $I\{t - s_{pc} = j\}$ for integers $j \in [-4, 16]$ with binning at the end-points. The specification also includes product-quarter fixed effects to absorb partner-invariant changes in the trade of specific goods over time. We also include product-partner fixed effects to control for the fact that some countries always trade more in certain products.

The coefficient $\beta_j$ represents the difference in rerouting share between treated and untreated products, China and untreated partner countries, in quarter $j$ relative to tariff implementation. If $\beta_j > 0$ for $j > 0$, this suggests that the trade war increased the rerouting of products through Vietnam.

To more easily interpret the magnitude of the post-tariff increase, we also estimate a version of Equation 1 using one post-announcement period. In this equation, $I_{t>s}$ is an indicator that equals one after the announcement of a given product's tariff. We again cluster standard errors at the HS 6-digit product and country level, as this is the underlying level of tariff variation.

$$L_{pct} = \beta \Delta\tau_{pc} I_{t \geq s_{pc}} + \alpha_{pt} + \alpha_{pc} + \varepsilon_{pct} \tag{2}$$

We also use a difference-in-differences setup to estimate the response of firm-level rerouting to the tariffs. We estimate:

$$L_{ipct} = \sum_{j=-4}^{16} \beta_j \Delta\tau_{pc} \times I\{t - s_{pc} = j\} + \alpha_{ipt} + \alpha_{ipc} + \varepsilon_{ipct} \tag{3}$$

In this equation, $i$ indexes firms, $p$ indexes HS 8-digit products, $c$ indexes partner countries, and $t$ indexes quarters. The terms $\Delta\tau_{pc}$ and $I\{t - s_{pc} = j\}$ are defined in the same way as in Equation 1. The first term represents the US tariff increase on product-origin pair $pc$ in percentage points. Indicators $I_{t-s=j}$ equal one $j$ quarters from the timing of tariff increase.

The coefficient $\beta_j$ represents the difference in trade flows within the same firm between treated and untreated products, treated and untreated partner countries, in period $j$ relative to tariff implementation. If the trade war increased within-firm rerouting, we should see $\beta_j > 0$ for $j > 0$.

To interpret the magnitude of the post-tariff increase, we estimate a version of Equation 3 using one post-announcement period, presented here in Equation 4. In this equation, $I_{t>s}$ is an indicator that equals one after the announcement of a given product's tariff. We cluster standard errors at the HS 6-digit and partner country level.

$$L_{ipct} = \beta_j \Delta\tau_{pc} I_{t \geq s_{pc}} + \alpha_{ipt} + \alpha_{ipc} + \varepsilon_{ipct} \tag{4}$$

# 7 Results

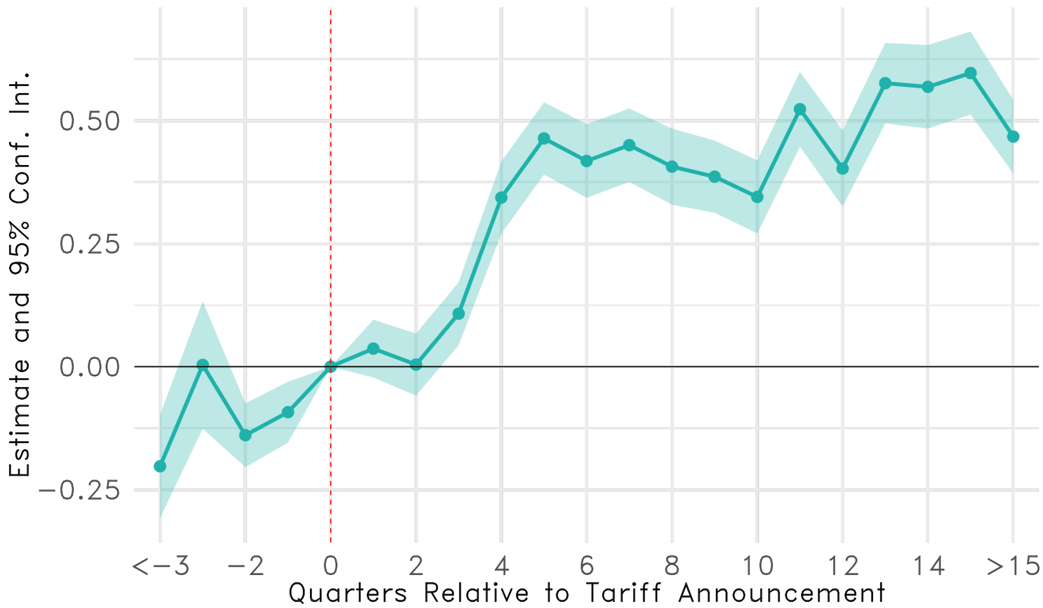
## 7.1 Product-Level Rerouting

In this subsection, we display results using the product-level rerouting measure. Figure 9 displays estimates of $\beta_j$ from Equation 1.[10] We find a sharp increase in product-level rerouting starting three to four quarters after a tariff announcement, suggesting that behavior takes time to adjust to sanctions. Following the implementation of tariffs, we observe a sustained rerouting increase between the fifth and fifteenth quarters. We also note a possible pre-trend in the months before the announcement. Later on, we perform robustness checks to ensure that the pre-period trends do not drive the later results.

To understand the overall post-tariff response, we estimate Equation 1 and report the results in Column (1) of Appendix Table A2. The average coefficient in the post-treatment period is 0.472 with $p < 0.01$. To interpret the magnitude of this coefficient, we multiply it by the average tariff increase on Chinese exports during this period, 12.48 percent. For the average tariff increase, product-level rerouting increased by $0.472 \times 12.48 = 5.9$ percentage points. This treatment effect represents a 47.2% increase in product-level rerouting since 2018.

[10] We report exact coefficients in Appendix Table A3, column (1).

Figure 9: The Response of Product-level Rerouting to Tariff Intensity




*Note:* This figure reports coefficients from Equation 1. The shaded region represents 95% confidence intervals.

## 7.2 Firm-Level Rerouting

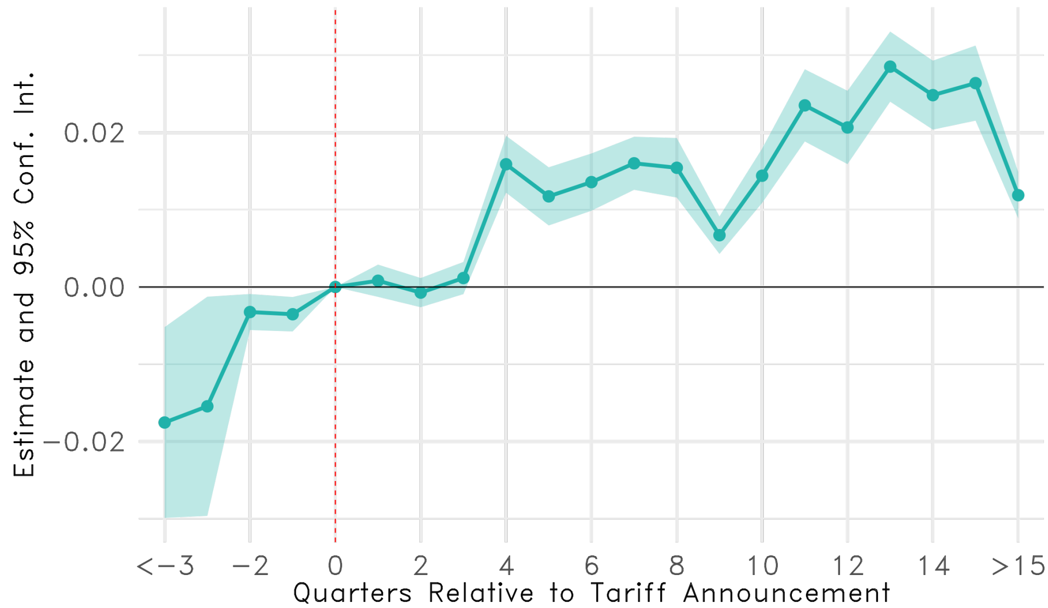
Next, we present the response of firm-level rerouting to the trade war tariffs. Figure 10 displays estimates of $\beta_j$ from Equation 3.[11] We find a strong and sustained increase in product-level rerouting starting four quarters after a tariff announcement, suggesting that firms take some time to set up rerouting behavior. The peak of the response, which is almost twice as large as the initial increase, takes place 13-15 months after implementation, suggesting that rerouting is persistent. We also note a potential pre-trend in the months before the announcement. Later, we perform robustness checks to ensure that the pre-period trends do not drive the main results.

We estimate the average post-treatment coefficient using Equation 4 and report the results in Column (2) of Appendix Table A2. The coefficient of interest is 0.018 with $p < 0.01$. Again, we evaluate this coefficient given the average tariff increase on Chinese exports, 12.48, and find that firm-level rerouting increased by $0.018 \times 12.48 = 0.22$ percentage points. This treatment effect represents a 15.7% increase in firm-level rerouting since 2018.

Overall, these results support several conclusions. First, the trade war tariffs did increase rerouting through Vietnam. Second, the rerouting response was persistent for four years after tariff implementation. Third, the response depends strongly on the aggregation at which rerouting is defined, and finer measures yield smaller tariff responses.

[11] We report exact coefficients in Appendix Table A3, column (2).

Figure 10: The Response of Firm-level Rerouting to Tariff Intensity




*Note:* This figure reports coefficients from Equation 3. The shaded region represents 95% confidence intervals.

### 7.3 Import-Export Co-Movement

One drawback of our rerouting measures is that they do not capture the co-movement of Chinese imports and US exports. However, rerouting should empirically manifest as increased co-movement between these two flows. Therefore, we perform an additional test to establish whether such co-movement is unusually high for China and the US during the trade war, relative to Vietnam's other trading partners. Specifically, we estimate:

$$\begin{aligned} \ln x_{ipct} = & \alpha_{ipc} + \alpha_{ipt} + \alpha_{pct} + \varepsilon_{ipct} \\ & + \sum_{k \in K} \beta_k I_{ipct}\{c = k\} \times \Delta\tau_{pc} \times D_{pt} \times \ln m_{ipt}^{CHN} \\ & + \sum_{k \in K} \gamma_k I_{ipct}\{c = k\} \times \Delta\tau_{pc} \times \ln m_{ipt}^{CHN} \\ & + \sum_{k \in K} \delta_k I_{ipct}\{c = k\} \times D_{pt} \times \ln m_{ipt}^{CHN} \\ & + \sum_{k \in K} \theta_k I_{ipct}\{c = k\} \times \ln m_{ipt}^{CHN} \end{aligned} \tag{5}$$

In this equation, $i$ indexes firms, $p$ indexes HS 8-digit products, $c$ indexes countries, and $t$ indexes quarters. The outcome variable, $x_{ipct}$, is the value of each firm's exports to destination $c$ of a given product in a given quarter. The variable $m_{ipt}^{CHN}$ is the value of each firm's imports from

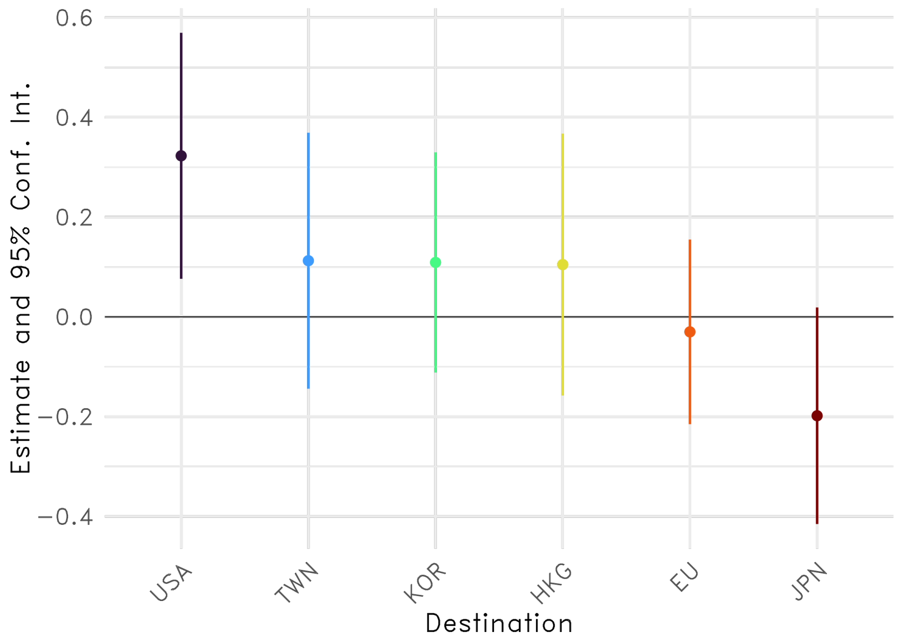
China of a given product in a given quarter, $D_{pt}$ is a post-tariff announcement dummy and $\Delta\tau_{pc}$ is the first announced trade war tariff increase when $c =$ China and zero otherwise. To compare the relative change in the import-export co-movement with other Vietnam's other top trading partners, we estimate separate coefficients for the US and 5 other export destinations: the EU, Hong Kong, Japan, Korea, Taiwan and Japan, denoted by the set $K$. Therefore, $I_{ipct}\{c = k\}$ indicates whether the firm is exporting to one of these top destinations $k \in K$.

Our coefficient of interest, $\beta_k$, measures the change relative to all other destinations in the firm-level correlation between exports to top destination $k$ and imports from China for products with higher tariff increases after the tariff announcement. We control for interactions between all combinations of $m^{CHN}_{ipt}$, $I_{ipct}$, $D_{pt}$ and $\Delta\tau_{pc}$. Note that most interactions are absorbed by firm-product-quarter fixed effects $\alpha_{ipt}$, which control for any aggregate changes in a firm's exports of each product over time, firm-product-destination fixed effects, which control for time-invariant factors influencing a firm's ability to export to a certain destination, and product-destination-quarter fixed effects, which control for any destination-specific macroeconomic factors such as transportation cost and exchange-rate fluctuations.

Table A4 reports estimates from Equation 5 and 11 plots the $\beta_k$ coefficients. We observe several things. First, we find that relative to other export destinations, the Vietnamese firms' exports of targeted products to the US are significantly more correlated with their imports from China after the tariff increases. This is consistent with similar tests for rerouting conducted in prior literature (Liu and Shi, 2019), we find that, among Vietnamese firms, imports from China are positively correlated with exports to the US. None of the other top export destinations exhibits such a marked increase, with Japan showing a negative correlation.

Additionally, products exposed to large tariff values exhibit a negative correlation between Chinese imports and US exports. This coefficient suggests that on average, intensely targeted products are different from other products.

Figure 11: The Co-movement of Exports and Chinese Imports for Top Destinations




*Note:* This figure reports $\beta_k$ from Equation 5. The shaded region represents 95% confidence intervals.

# 8 Conclusion

In this paper, we analyze the response of evasive rerouting behavior to origin-specific tariffs in the context of the 2018-2019 US-China trade war. We operationalize rerouting using two definitions: at the product level, considering the maximum value of HS 8-digit product flows from China to the US via Vietnam within the same quarter; and at the firm level, restricting our analysis to such flows within the same firm.

In 2021, 16.1% of Vietnamese exports to the US constituted product-level rerouting, compared to only 1.8% at the firm level, equivalent to 15.5 billion and 1.7 billion current USD annually. Additionally, we found that the average increase in tariffs due to the trade war led to a 5.9 percentage point increase in product-level rerouting, while firm-level rerouting increased by just 0.22 percentage points.

These findings emphasize the necessity of utilizing microdata to accurately measure rerouting behavior. Compared to product-level measures, firm-level rerouting is nine times lower in levels and responds twenty-five times less to trade war tariffs. Overall, the US–China trade war did increase rerouting through Vietnam, but to a much lesser extent than aggregate measures suggest.

Our findings have critical policy implications. First, re-routing through third countries could theoretically limit US price increases due to the 2018 tariffs. In that sense, re-routing may allow for the expressive political benefits of tariffs while mitigating their potentially damaging economic consequences (Autor et al., 2024). However, since we find lower levels of rerouting overall, this channel may be less important than previously thought.

Second, if rerouting is definitively documented, the US policymakers wish to take punitive measures against third parties that serve as routes for tariff evasion. These measures may be economically unwise, but they could be politically popular, as demonstrated by the Biden administration's May 2024 tariffs on Chinese electric vehicles and semiconductors. If broad punitive measures were taken based upon the coarser measures, which we show overstate actual re-routing, it could have negative consequences for the Vietnamese economy, undermining the strengthening economic relationship between Vietnam and the United States. In the next stage of our project, we empirically evaluate whether and how the trade war affected Vietnam's economy, including its domestic value-added activity.

Finally, our approach offers a different way forward on enforcement. In contrast with previous methods of measuring rerouting, our firm-level measure allows us to pinpoint specific rerouting firms. If combating tariff evasion is politically necessary, firm-level approaches may have advantages relative to broad-based sanctions. Finely-targeted punishments can avoid harming compliant firms and minimize costs for the Vietnamese economy at large.

# References


**Alfaro, Laura and Davin Chor**, “Global Supply Chains: The Looming “Great Reallocation",” Working Paper 31661, National Bureau of Economic Research September 2023.

**Amiti, Mary, Sang Hoon Kong, and David Weinstein**, “The Effect of the U.S.-China Trade War on U.S. Investment,” NBER Working Paper 27114, National Bureau of Economic Research 5 2020.

**_, Stephen J. Redding, and David E. Weinstein**, “The Impact of the 2018 Tariffs on Prices and Welfare,” *Journal of Economic Perspectives*, 2019.

**_, Stephen J Redding, and David E Weinstein**, “Who’s paying for the US tariffs? A longer-term perspective,” *AEA Papers and Proceedings*, 2020, *110*, 541–546.

**Autor, David, Anne Beck, David Dorn, and Gordon H Hanson**, “Help for the Heartland? The Employment and Electoral Effects of the Trump Tariffs in the United States,” Technical Report, National Bureau of Economic Research 2024.

**Benguria, Felipe and Felipe Saffie**, “The impact of the 2018-2019 Trade War on US local labor markets,” *Working Paper, Available at SSRN 3542362*, 2020.

**_, Jaerim Choi, Deborah L. Swenson, and Mingzhi (Jimmy) Xu**, “Anxiety or pain? The impact of tariffs and uncertainty on Chinese firms in the trade war,” *Journal of International Economics*, 2022, *137*, 103608.

**Boak, Josh, Fatima Hussein, Paul Wiseman, and Didi Tang**, “Biden hikes tariffs on Chinese EVs, solar cells, steel, aluminum â and snipes at Trump,” *Associated Press*, May 2024. Accessed: 2024-05-21.

**Bohara, Alok K, Kishore Gawande, and Pablo Sanguinetti**, “Trade diversion and declining tariffs: evidence from Mercosur,” *Journal of International Economics*, 2004, *64* (1), 65–88.

**Bown, Chad P**, “The US–China trade war and Phase One agreement,” *Journal of Policy Modeling*, 2021, *43* (4), 805–843.

**Cavallo, Alberto, Gita Gopinath, Brent Neiman, and Jenny Tang**, “Tariff pass-through at the border and at the store: Evidence from us trade policy,” *American Economic Review: Insights*, 2021, *3* (1), 19–34.

**Chau, Mai Ngoc and John Boudreau**, “Chinese exporters dodge tariffs with fake made-in-Vietnam labels,” *Bloomberg News*, 2019, *25.* Accessed: 2024-04-29.

**Chor, Davin and Bingjing Li**, "Illuminating the effects of the US-China tariff war on Chinaâs economy," *Journal of International Economics*, 2024, *150*, 103926.

**Fajgelbaum, Pablo D and Amit K Khandelwal**, "The Economic Impacts of the US–China Trade War," *Annual Review of Economics*, 2022, *14*, 205–228.

**_, Pinelopi K Goldberg, Patrick J Kennedy, and Amit K Khandelwal**, "The return to protectionism," *The Quarterly Journal of Economics*, 2020, *135* (1), 1–55.

**Fajgelbaum, Pablo, Pinelopi K Goldberg, Patrick J Kennedy, Amit Khandelwal, and Daria Taglioni**, "The US-China Trade War and Global Reallocations," *American Economic Review: Insights*, 2024. Forthcoming.

**Fisman, Raymond, Peter Moustakerski, and Shang-Jin Wei**, "Outsourcing Tariff Evasion: A New Explanation for Entrepôt Trade," *The Review of Economics and Statistics*, 08 2008, *90* (3), 587–592.

**Flaaen, Aaron, Ali Hortaçsu, and Felix Tintelnot**, "The production relocation and price effects of US trade policy: the case of washing machines," *American Economic Review*, 2020, *110* (7), 2103–2127.

**Freund, Caroline, Aaditya Mattoo, Alen Mulabdic, and Michele Ruta**, "Is US Trade Policy Reshaping Global Supply Chains?," Policy Research Working Paper WPS 10593, World Bank Group, Washington, D.C. 2023.

**Grossman, Gene M., Elhanan Helpman, and Stephen J. Redding**, "When Tariffs Disrupt Global Supply Chains," *American Economic Review*, 2024, *114* (4), 988–1029.

**Ha, Lam Thanh**, "Chinese FDI in Vietnam: Trends, Status and Challenges," *ISEAS Yusof Ishak Institute Perspectives*, 2019, *2019* (34), 1–10.

**Handley, Kyle, Fariha Kamal, and Ryan Monarch**, "Rising Import Tariffs, Falling Exports: When Modern Supply Chains Meet Old-Style Protectionism," *American Economic Journal: Applied Economics.*

**Hayakawa, Kazunobu and Sasatra Sudsawasd**, "Trade Effects of the US–China Trade War on a Third Country: Preventing Trade Rerouting from China," Technical Report, Institute of Developing Economies, Japan External Trade Organization (JETRO) 2024.

**Kitazume, Tomoya Onishi Kyo and Yusho Cho**, "Chinese Goods Navigate Alternate Trade Routes to US Shores," *Nikkei Asia, Datawatch*, 2019.

**li Chang, Pao, Kefang Yao, and Fan Zheng**, "The Response of the Chinese Economy to the U.S.-China Trade War: 2018-2019," Technical Report Paper No. 25-2020, SMU Economics and Statistics Working Paper Series 2021.

**Liu, Xuepeng and Huimin Shi**, "Anti-dumping duty circumvention through trade rerouting: Evidence from Chinese exporters," *The World Economy*, 2019, *42* (5), 1427–1466.

**Ma, Hong, Jingxin Ning, and Mingzhi Jimmy Xu**, "An eye for an eye? The trade and price effects of China's retaliatory tariffs on US exports," *China Economic Review*, 2021, *69*, 101685.

**McCaig, Brian and Nina Pavcnik**, "Export Markets and Labor Allocation in a Low-Income Country," *American Economic Review*, 2018, *108* (7), 1899–1941.

**_ , _ , and Woan Foong Wong**, "FDI Inflows and Domestic Firms: Adjustments to New Export Opportunities," Working Paper 30729, National Bureau of Economic Research, Cambridge, MA 2022.

**Rotunno, Lorenzo, Pierre-Louis Vézina, and Zheng Wang**, "The rise and fall of (Chinese) African apparel exports," *Journal of development Economics*, 2013, *105*, 152–163.

**Shi, Huimin and Xuepeng Liu**, "Still Made in China? How Tariff Hikes May Trigger Re-routing and Circumvention," *CEPR VoxEU Columns*, 2019.

**Shira, Dezan**, "US-China Trade War Likely to Tip Some China-Based American Manufacturers to Vietnam," *China Briefing*, May 2019.

**Stoyanov, Andrey**, "Tariff evasion and rules of origin violations under the Canada-US Free Trade Agreement," *Canadian Journal of Economics/Revue canadienne d'économique*, 2012, *45* (3), 879–902.

**US Census Bureau**, "U.S. Export and Import Statistics," 2024.

**Wu, Sung-Ju**, "Foreign Profit Shifting and The Welfare Responses to The US-China Trade War: Evidence from Manufacturers in Vietnam," 2023.

# A Appendix

Table A1: Correlation between Rerouting Exporter Firm Shares and Trade War Tariffs

| | Rerouting Share of Exporters | |
|---|---|---|
| Year | 2018 | 2021 |
| | (1) | (2) |
| Tariff Change | 0.0154 | 0.3126 |
| | (0.0854) | (0.0744) |
| Observations | 3,115 | 3,763 |
| $R^2$ | $1.05 \times 10^{-5}$ | 0.00467 |
| Adjusted $R^2$ | -0.00031 | 0.00440 |

Table A2: The Response of Rerouting to Trade War Tariffs: Difference-in-Difference Estimates

| | $L_{pct}$ Product-level (1) | $L_{ipct}$ Firm-level (2) |
|---|---|---|
| Tariff $\times$ Post $= 1$ | 0.4719 | 0.0183 |
| | (0.0246) | (0.0017) |
| Standard-Errors | Origin-HS6 | Firm-HS6 & Origin-HS6 |
| Observations | 3,442,600 | 21,212,120 |
| $R^2$ | 0.63103 | 0.63423 |
| Within $R^2$ | 0.00053 | $5.88 \times 10^{-5}$ |
| Product-Quarter-Year fixed effects | ✓ | |
| Product-Origin fixed effects | ✓ | |
| Firm-Product-Quarter-Year fixed effects | | ✓ |
| Firm-Product-Origin fixed effects | | ✓ |

Table A3: The Response of Rerouting to Trade War Tariffs: Event-Study Coefficients

| | $L_{pct}$ Product-level (1) | $L_{ipct}$ Firm-level (2) |
|---|---|---|
| Tariff × Quarters relative to tariff announcement = <-3 | -0.2025 | -0.0175 |
| | (0.0536) | (0.0063) |
| Tariff × Quarters relative to tariff announcement = -3 | 0.0036 | -0.0155 |
| | (0.0661) | (0.0072) |
| Tariff × Quarters relative to tariff announcement = -2 | -0.1394 | -0.0032 |
| | (0.0331) | (0.0012) |
| Tariff × Quarters relative to tariff announcement = -1 | -0.0925 | -0.0035 |
| | (0.0316) | (0.0011) |
| Tariff × Quarters relative to tariff announcement = 1 | 0.0367 | 0.0008 |
| | (0.0299) | (0.0011) |
| Tariff × Quarters relative to tariff announcement = 2 | 0.0042 | -0.0007 |
| | (0.0322) | (0.0010) |
| Tariff × Quarters relative to tariff announcement = 3 | 0.1077 | 0.0012 |
| | (0.0326) | (0.0011) |
| Tariff × Quarters relative to tariff announcement = 4 | 0.3436 | 0.0159 |
| | (0.0374) | (0.0019) |
| Tariff × Quarters relative to tariff announcement = 5 | 0.4639 | 0.0117 |
| | (0.0374) | (0.0019) |
| Tariff × Quarters relative to tariff announcement = 6 | 0.4180 | 0.0136 |
| | (0.0381) | (0.0019) |
| Tariff × Quarters relative to tariff announcement = 7 | 0.4501 | 0.0160 |
| | (0.0381) | (0.0018) |
| Tariff × Quarters relative to tariff announcement = 8 | 0.4066 | 0.0154 |
| | (0.0395) | (0.0020) |
| Tariff × Quarters relative to tariff announcement = 9 | 0.3861 | 0.0067 |
| | (0.0374) | (0.0012) |
| Tariff × Quarters relative to tariff announcement = 10 | 0.3450 | 0.0144 |
| | (0.0378) | (0.0018) |
| Tariff × Quarters relative to tariff announcement = 11 | 0.5233 | 0.0235 |
| | (0.0388) | (0.0024) |
| Tariff × Quarters relative to tariff announcement = 12 | 0.4028 | 0.0207 |
| | (0.0395) | (0.0024) |
| Tariff × Quarters relative to tariff announcement = 13 | 0.5761 | 0.0285 |
| | (0.0417) | (0.0023) |
| Tariff × Quarters relative to tariff announcement = 14 | 0.5687 | 0.0248 |
| | (0.0433) | (0.0023) |
| Tariff × Quarters relative to tariff announcement = 15 | 0.5967 | 0.0264 |
| | (0.0430) | (0.0025) |
| Tariff × Quarters relative to tariff announcement = >15 | 0.4676 | 0.0119 |
| | (0.0381) | (0.0015) |
| Standard-Errors | HS6-Origin | HS6-Firm & Origin-HS6 |
| Observations | 3,442,600 | 21,212,120 |
| $R^2$ | 0.63126 | 0.63428 |
| Within $R^2$ | 0.00117 | 0.00019 |
| Product-Quarter-Year fixed effects | ✓ | |
| Product-Origin fixed effects | ✓ | |
| Firm-Product-Quarter-Year fixed effects | | ✓ |
| Firm-Product-Origin fixed effects | | ✓ |

Table A4: The Co-movement of Exports and Chinese Imports for Top Destinations

| | ln(Exports)<br>(1) |
|---|---|
| ln(Chinese Imports) × EU | 0.0315 |
| | (0.0120) |
| ln(Chinese Imports) × HKG | 0.0762 |
| | (0.0183) |
| ln(Chinese Imports) × JPN | 0.0192 |
| | (0.0148) |
| ln(Chinese Imports) × KOR | 0.0468 |
| | (0.0135) |
| ln(Chinese Imports) × TWN | 0.0625 |
| | (0.0177) |
| ln(Chinese Imports) × USA | 0.0848 |
| | (0.0168) |
| ln(Chinese Imports) × Tariff × EU | -0.1422 |
| | (0.0944) |
| ln(Chinese Imports) × Tariff × HKG | -0.2723 |
| | (0.1377) |
| ln(Chinese Imports) × Tariff × JPN | 0.0099 |
| | (0.1034) |
| ln(Chinese Imports) × Tariff × KOR | -0.0914 |
| | (0.1075) |
| ln(Chinese Imports) × Tariff × TWN | -0.2789 |
| | (0.1312) |
| ln(Chinese Imports) × Tariff × USA | -0.4199 |
| | (0.1207) |
| ln(Chinese Imports) × Post × EU | -0.0101 |
| | (0.0118) |
| ln(Chinese Imports) × Post × HKG | -0.0101 |
| | (0.0177) |
| ln(Chinese Imports) × Post × JPN | 0.0233 |
| | (0.0155) |
| ln(Chinese Imports) × Post × KOR | -0.0068 |
| | (0.0143) |
| ln(Chinese Imports) × Post × TWN | -0.0197 |
| | (0.0176) |
| ln(Chinese Imports) × Post × USA | -0.0274 |
| | (0.0180) |
| ln(Chinese Imports) × Tariff × Post × EU | -0.0301 |
| | (0.0944) |
| ln(Chinese Imports) × Tariff × Post × HKG | 0.1048 |
| | (0.1340) |
| ln(Chinese Imports) × Tariff × Post × JPN | -0.1982 |
| | (0.1108) |
| ln(Chinese Imports) × Tariff × Post × KOR | 0.1091 |
| | (0.1126) |
| ln(Chinese Imports) × Tariff × Post × TWN | 0.1126 |
| | (0.1309) |
| ln(Chinese Imports) × Tariff × Post × USA | 0.3229 |
| | (0.1258) |
| Observations | 25,320,340 |
| $R^2$ | 0.81004 |
| Within $R^2$ | 0.00014 |
| Exporter-Product-Destination fixed effects | ✓ |
| Exporter-Product-Quarter-Year fixed effects | ✓ |
| Product-Destination-Quarter-Year fixed effects | ✓ |