EXPORTS IN DISGUISE?
TRADE REROUTING DURING THE US–CHINA TRADE WAR

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Countries increasingly deploy origin-specific tariffs as geopolitical instruments, and the 2018 US–China trade war is a leading example. Prior research has found that this conflict triggered substantial trade reallocation; however, the proportion of these changes attributable to evasive rerouting versus production relocation remains unclear. We address this gap by introducing a general, replicable rerouting measure, which we apply to transaction-level data from Vietnam during the 2018-2019 trade war. Exploiting variation in tariff exposure and timing, we show that

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the share of Vietnam's exports to the US rerouted from China increased by 1.74 percentage points for the average tariff hike, and the increase was driven by new establishments and Chinese-owned firms. Our decomposition of Vietnam's export growth to the US between 2018 and 2021 suggests that 8.8% of the $52.8 billion increase was due to rerouting whereas 39.8% reflected domestic value-added.

KEYWORDS: Trade rerouting, US–China trade war, Global value chains, Tariff circumvention.

1. INTRODUCTION

Amid rising geopolitical tensions, countries are increasingly embracing protectionist trade policies, with origin-specific tariffs emerging as a key instrument of economic statecraft. This trend reflects the growing importance of geoeconomics, where trade policy is used not merely for efficiency gains, but as a strategic tool of international influence (Clayton et al., 2025). A leading example is the 2018 US–China trade war, marked by successive waves of US tariffs on Chinese exports and retaliatory measures by China (Bown, 2021). A growing body of research has documented that this conflict reshaped global trade flows, triggering substantial trade reallocation and diversion (Alfaro and Chor, 2023, Fajgelbaum et al., 2024, Freund et al., 2023, Garred and Yuan, 2025, Peng et al., 2024). However, a key question remains: to what extent did tariff evasion through rerouting, rather than production relocation, drive this reallocation? This paper introduces a novel, general framework to measure such rerouting by leveraging transaction-level trade data. The approach directly quantifies rerouting behavior and identifies the firms, industries, and regions most actively engaged in this evasion.

Existing rerouting measures use two broad approaches. In the first, aggregate trade flows are used to infer the behavior: for example, an increase in exports from a tariff-targeted country to a third country and a concurrent increase in exports from the third country to the tariff-imposing country are taken as evidence of rerouting (DeBarros and Hayashi, 2023, Hayakawa and Sudsawasd, 2024). In the second, scholars detect rerouting using the product-level correlation between imports of third-country firms from the tariff-targeted country and exports of third-country firms to the tariff-imposing country (Rotunno et al., 2013, Liu and Shi, 2019). Recent work by Freund (2025) uses a hybrid strategy combining these two approaches to define rerouting as product flows that simultaneously satisfy several characteristics, including that aggregate flows are consistent with rerouting and that the third country's imports of a given product comprise more than three-quarters of that country's exports to the tariff sender in that product.

These existing measures have several strengths, including inferring evasive behavior, tractability, and generalizability. We view our approach as complementary to these efforts and capable of addressing some of their drawbacks. One drawback of aggregate measures is that they may overestimate the true extent of rerouting by conflating it with other legitimate activities also stimulated by tariffs, such as exporting from new foreign entrants into the third country (Shira, 2019, Wu, 2023) and increased consumption of imports by third-country consumers unrelated to export. Moreover, aggregate measures cannot reveal which places, industries, or firms perform rerouting. At the same time, correlational approaches generally cannot yield estimates of rerouting levels, which are essential for understanding the economic impact of tariffs.

In this paper, we address these points by proposing a measure of rerouting that leverages transaction-level trade data. First, our measure provides insight into the total level of rerouting activity and sheds light on the amount that aggregate measures likely overstate true rerouting. Second, it allows us to identify probable rerouting behavior at granular levels, including within specific industries, locations, and even particular firms. We implement our measure for Vietnam during the US–China trade war. We find that granular versus aggregate data lead to vastly different estimates of rerouting. From 2018 to 2021, Vietnamese exports to the US increased by \$52.8 billion. Our preferred province-level rerouting measure indicates that just 8.8% of this growth can be ascribed to rerouting. In contrast, relying on national-level trade flows yields a much higher estimate of 21.1%, a difference of \$6.4 billion.

We focus on Vietnam as a transit (or third) country for several 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 contiguity, cultural proximity, and similar economic and political institutions (Rotunno et al., 2013, Liu and Shi, 2019). Vietnam's matches on these dimensions make it a compelling candidate for rerouting. Second, of all US import partners, Vietnam was one of the most significant beneficiaries of the decline in US–China trade. Previous research found that Vietnam replaced almost half of China's lost market share in US imports between 2017 and 2022 (Alfaro and

Chor, 2023), and its total exports to the US rose from 46.4 billion in 2017 to 127.5 billion by 2022 (US Census Bureau, 2024). Vietnam has also witnessed a substantial rise in sourcing from China. During the same period, China's share of Vietnam's imports increased by 5.5 percentage points, the highest increase of all its source country partners (Alfaro and Chor, 2023). These trends have placed Vietnam at the center of debates over rerouting (Chau and Boudreau, 2019), and reflecting these concerns, the Trump administration imposed heavy reciprocal tariffs on Vietnam in April 2025. Together, these developments make Vietnam a critical context for studying tariff circumvention.

Our measurement strategy defines rerouting as flows of a given HS 8-digit product, through a single Vietnamese province, within a quarter, from China to the US. We argue this definition strikes the right balance: it excludes legitimate value-added flows that span multiple provinces and includes rerouting across firms within the same locality—anecdotally a common practice during the trade war. For comparison, we also present more and less conservative measures. One classifies all flows through Vietnam within the same product and quarter as rerouting, while the stricter measure requires them to pass through a single firm. Together, these alternatives provide useful upper and lower benchmarks.[1]

We use information from two micro datasets: firm outcomes from the Vietnam Enterprise Survey (VES) and trade transactions from S&P Global's Panjiva Supply Chain Intelligence Database (Panjiva). The VES, covering 2000 to 2021, provides data on firm ownership, investment, and production outcomes, including capital, employment, and revenue. Panjiva's Vietnam Trade Data, spanning 2018 to 2021, details nearly all trade transactions into and out of Vietnam at the 8-digit HS product level.

We validate our measure by testing whether flagged rerouters fulfill *a priori* expectations. Specifically, we test whether (1) rerouters produce more exports per employee, (2) industry capital share in China is correlated with more rerouting through Vietnam, and (3) rerouting is more prevalent in higher-tariff industries.

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 source country variation in tariff targeting. As expected, rerouting increases in response to trade war tariffs; we find that for the average US tariff increase on Chinese exports of 12.5 per-

[1] We explore alternative product aggregations and time frames in Section 4.

centage points, province-level rerouting increased by 1.74 percentage points. Given the 2018 average province-level rerouting share of 12.2%, this treatment effect represents a 14.3% increase in rerouting. We also find that the trade war induced a shift towards greater integration with China's global value chains. For the average tariff increase on China's exports, the Chinese imported content share of US exports rose by 1.82 percentage points.

We then document the characteristics and performance of rerouters. We find that Chinese and Hong Kong-owned firms accounted for more than half of the trade-war-induced rerouting. Second, we find that nearly the entire increase was due to newly established firms, suggesting that part of the firm-entry response to the trade war in Vietnam was motivated by rerouting rather than production relocation. Third, we provide evidence on how the trade war affected firms in Vietnam. We find that tariffs were a boon to firm profitability and output, and they also decreased the labor share of output and increased the materials share of output, consistent with a meaningful increase in rerouting.

Finally, we use our rerouting measure to decompose the total growth in Vietnam's exports to the US from 2018 to 2021. We ascribe 8.8% of the increase to rerouting and 39.8% to genuine increases in domestic value-added. Of the remainder, 20.4% and 31% were due to growth in imported content from China and the rest of the world, respectively.

This paper makes several contributions. First, we propose a general, replicable rerouting measure that enables us to estimate total rerouting levels, provide upper and lower bounds on rerouting levels, document the rerouting response to the US–China trade war, and identify the characteristics of rerouters. These properties complement existing studies that examine rerouting in response to the trade war without relying on transaction-level trade data (Freund, 2025, Ito, 2024). More broadly, our work adds to the large and growing literature on the US–China trade war,[2] which has documented negative effects on economic activity in both countries (Amiti et al., 2020a, Benguria and Saffie, 2020, Handley et al., 2025, Benguria et al., 2022, Chor and Li, 2024) and a major reallocation of supply chains (Fajgelbaum et al., 2024, Alfaro and Chor, 2023, Grossman et al., 2024, Freund et al., 2023, Garred and Yuan, 2025, Peng et al., 2024). We note that our finding that rerouting is less prevalent than aggregate data suggest aligns with evidence of near-complete tariff pass-

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

through to U.S. 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).

Second, we contribute to the literature on trade barrier circumvention. Prior work shows that firms often route trade through third countries to evade restrictions: for example, Chinese exports facing higher tariffs were more likely to pass through Hong Kong (Fisman et al., 2008), Canadian imports exhibited similar patterns under FTA preferences (Stoyanov, 2012), and discrepancies in trade statistics correlate with restrictive non-tariff measures, consistent with fraud (Kee and Nicita, 2022).[3] Related studies document rerouting to the U.S. in response to quotas and anti-dumping duties (Rotunno et al., 2013, Liu and Shi, 2019), as well as transshipment to evade sanctions on Russia (Tyazhelnikov and Romalis, 2024, Scheckenhofer et al., 2025, Li et al., 2024, Egorov et al., 2025). Our rerouting provides two advantages: (i) we more precisely distinguish legitimate trade reallocation from true rerouting and (ii) we can identify the firms most engaged in circumvention (disproportionately Chinese-owned and newly established).

Finally, our findings have direct implications for the estimation and interpretation of import-demand and foreign export-supply elasticities when varieties are defined by country of origin (Feenstra, 1994, Broda and Weinstein, 2006, Broda et al., 2008, Soderbery, 2015, Kee and Nicita, 2024). Origin-specific tariffs that induce rerouting create misclassification in customs data: shipments relabeled under third-country origins are misread as genuine substitution away from targeted source countries. This inflates estimates of how substitutable imports are across origin countries and the elasticity of foreign export supply, thereby attenuating the inferred scope for terms-of-trade-motivated tariffs (Johnson, 1953-54). The distortion carries through to incidence and pass-through estimates that rely on these elasticities (Amiti et al., 2019, Fajgelbaum et al., 2020), and to welfare calculations that attribute gains to country-variety entry and exit (Broda and Weinstein, 2006). In contrast, product-specific origin-agnostic tariffs would not induce the same sort of misclassification.

The remainder of the paper is organized as follows: Section 2 presents background information on the context. Section 3 introduces our main data sources. Section 4 presents

[3] Other forms of tariff evasion, such as under-invoicing and misclassification, are also well documented (Fisman and Wei, 2004, Mishra et al., 2008, Javorcik and Narciso, 2008, Jean and Mitaritonna, 2010, Javorcik and Narciso, 2017, Sequeira, 2016, Bussy, 2021).

our rerouting measures and validation exercises. Section 5 details our strategy for estimating the causal response of rerouting to trade war tariffs and Section 6 presents results from these analyses. Section 7 explores heterogeneity in firm rerouting responses. In Section 8, we decompose Vietnamese export growth to the US into rerouting, imported content, and domestic value-added. Section 9 documents the effect of tariffs and rerouting on firm performance. Finally, Section 10 concludes.

2. BACKGROUND

2.1. *The US–China Trade War*

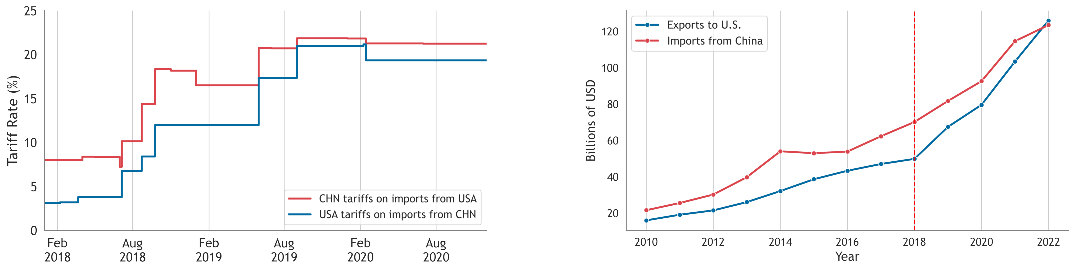
The US–China trade war began in February 2018, when the United States imposed tariffs on washing machines and solar panels after the US International Trade Committee found imports had harmed domestic producers. Soon after, the US added tariffs on steel and aluminum based on a Department of Commerce investigation. Although these tariffs applied to many countries, then-President Donald Trump emphasized that the ultimate target was China.

On June 15, 2018, President Trump invoked Section 301 of the 1974 Trade Act to impose 10 percent tariffs on a wide range of Chinese products (Bown, 2021), citing China's trade surplus and alleged unfair practices. Through 2018–2019, the US introduced five waves of tariffs on Chinese goods, which were each met with retaliatory measures from China. By the end of 2019, US tariffs covered about \$350 billion in imports, while China's tariffs hit roughly \$100 billion in US exports (Fajgelbaum and Khandelwal, 2022). In 2020, the two countries signed an agreement that paused further escalation but left existing tariffs in place, where they remained until mid-2024. Figure 1a shows average tariff rates during different phases of the trade war (Bown, 2021).

2.2. *Vietnamese Trade*

In Vietnam, the tariffs were welcomed as an opportunity to boost exports to the United States and deepen integration into global value chains. Following their imposition, Vietnamese exports to the US rose sharply, from \$3.8 billion in April 2018 to \$5.1 billion in April 2019, a 25% year-on-year increase (US Census Bureau, 2024). Figure 1b shows Vietnam's imports from China and exports to the US over time. After the onset of the trade war,

FIGURE 1.—Tariffs and Trade Flows



(a) US–China Trade-War Tariffs

Source: Bown (2021).

(b) Total Value of Key Vietnam Trade Flows

Source: CEPII BACI Dataset, 2010–2022.

both flows accelerated, with Vietnam's exports to the US surpassing $120 billion in 2022 (US Census Bureau, 2024).

While these patterns suggest possible rerouting, they are not conclusive. Vietnamese exports to the US were already rising before 2018, supported by the US–Vietnam Bilateral Trade Agreement in 2001 and WTO accession in 2007. At the same time, Vietnam's imports of Chinese consumption goods, construction materials, and intermediate inputs were also expanding rapidly (McCaig and Pavcnik, 2018, McCaig et al., 2022).

Second, the tariffs may have boosted legitimate production by firms with existing affiliates in Vietnam. Many foreign-owned firms, especially from Japan, Korea, and Taiwan, followed a "China-Plus-One" strategy, basing most of their value chains in China while maintaining some operations in Vietnam (Shira, 2019). These affiliates typically handled less skill-intensive tasks such as final assembly or low-tech inputs (Ha, 2019). The US tariffs created opportunities to shift more production to Vietnam, driving industrial upgrading (Amiti et al., 2019) and expanding labor and capital investment (Wu, 2023).

Third, MNCs in China began expanding investments in Vietnam by building new factories and hiring workers. By 2019, Japanese and Korean firms with Chinese operations were already exploring opportunities in Vietnam.[4] Several MNCs opened factories and shifted higher-value-added segments of their supply chains to Vietnam. For example, Taiwanese

[4]Some of the increased Korean investment in Vietnam may also reflect production reallocation from Korea (Ahn et al., 2025).

firms expanded tablet and smartphone production for Apple.[5] At the same time, established investors such as Samsung and Intel deepened their operations. While these factories continued sourcing raw materials and inputs from China, they added value in Vietnam, a pattern supply-chain experts have termed a "China Thru One" strategy (Gatehouse, 2024).

3. DATA

We use several data sources in our analysis.

3.0.0.1. *Tariffs.* We obtain HS6-digit country-month tariff values from Bown (2021).[6] 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. We focus on tariffs applied by the US exclusively on Chinese goods.[7] We assign the tariffs to products at the HS 6-digit level. Most 6-digit Vietnamese products were ultimately affected, constituting 93% of exported and imported product categories. Figure 2 displays the cumulative share of affected 6-digit products over time.

3.0.0.2. *Trade Flows.* We obtain transaction-level bill of lading data from S&P Global Panjiva.[8] 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 over all forms of transport (sea, air, and land). 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 firm's Vietnamese tax ID.

3.0.0.3. *Firms Operating in Vietnam.* We obtain firm characteristics from the Vietnam Enterprise Survey (VES), which includes annual information for more than 1.2 million

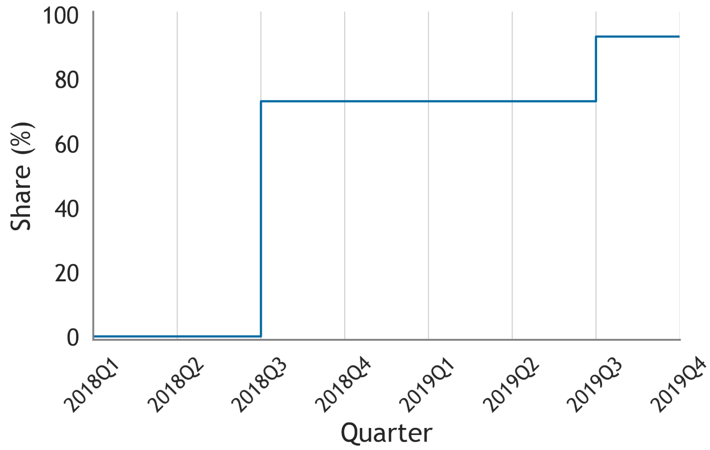
[5]https://www.reuters.com/technology/foxconn-gets-licence-invest-551-mln-more-vietnam-media-reports-2024-07-04/

[6]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 finest level at which product codes are comparable across countries.

[7]In particular, we exclude US Section 201 tariffs on solar panels and washing machines and Section 232 tariffs on steel and aluminum because they applied to countries other than China, including Vietnam.

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

FIGURE 2.—Targeted Share of Vietnamese HS 6-digit Products



Note: This figure shows the share of Vietnamese HS 6-digit products that were subject to US import tariffs on Chinese goods from 2018 Q1 to 2019 Q4. Tariff data are from Bown (2021).

unique firms from 2000 to 2021. We observe balance sheets and income statement items, such as revenue, profit, employment, and fixed assets. We also observe whether each firm is domestically-owned, foreign-owned, or a joint venture. Among foreign-owned firms, we observe the top three foreign capital source countries. We merge the VES with Panjiva using firms' Vietnamese tax IDs.

4. MEASUREMENT

4.1. *Rerouting Definition*

We define rerouting using the equation below. Here, $p_{(8)}$ indexes HS 8-digit products, c indexes partner countries, t indexes quarters, and v indexes an entity at the specified geographic level, which can be the entire country, a province, or a firm. The term x^{US} denotes Vietnamese exports to the US, and $m_{p_{(8)}ct}$ denotes Vietnamese imports of product $p_{(8)}$ from partner country c.

$$L_{vp_{(8)}ct} = \frac{\min\left\{x^{US}_{vp_{(8)}t},\, m_{vp_{(8)}ct}\right\}}{x^{US}_{vp_{(8)}t}}. \tag{1}$$

When c is set to China and v represents all of Vietnam, $L_{vp_{(8)}ct}$ provides a country-level measure of rerouting. It captures the maximum possible value of product $p_{(8)}$ flowing from

China to the US through Vietnam, normalized by Vietnamese exports of that product to the US.[9]

When v indexes provinces, the measure captures within-quarter flows of the same HS 8-digit product through a given Vietnamese province. Finally, when v indexes firms, we obtain the most restrictive measure: rerouting at the firm level. This version considers only product flows through a single firm in one quarter, and in doing so filters out nearly all legitimate trade, since it is conceptually unlikely that the same firm simultaneously imports and exports the same product for domestic consumption and foreign exports.

4.2. *Discussion*

Next, we assess the importance of the choice of time period, product level, and geographic level for aggregate rerouting. In particular, for c set to China, we sum up over all entities v, products p, sub-periods t within a given year.[10]

$$\frac{\sum_t \sum_p \sum_v L_{vpt} x_{vpt}^{US}}{\sum_t \sum_p \sum_v x_{vpt}^{US}} = \frac{\sum_t \sum_p \sum_v \min\{x_{vpt}^{US}, m_{vpt}\}}{\sum_t \sum_p \sum_v x_{vpt}^{US}} \tag{2}$$

Table I displays the values for 2018 and 2021 rounded to the first decimal point. Each row represents a different level of geographic aggregation: country, province, and firm. For now, we fix the time frame to quarters and focus on HS 8-digit products. This table highlights that the geographic unit has a significant impact on estimated rerouting. Comparing the first and second rows, we see that country-level rerouting is 2.5 times larger than province-level rerouting. On the other hand, firm-level rerouting reported in the third row is 4.1 times smaller than province-level rerouting. Interestingly, the percent change in each measure from 2018 to 2021 is similar across each of the three measures, at approximately 20-25%.

In the rest of the paper, we focus on the province-level measure of rerouting, for several reasons. On one hand, the country-level measure likely overstates rerouting because it

[9]Ideally, this measure would use traded quantities (e.g., kilograms or volumes). However, due to data limitations we rely on values, as bill of lading data do not report quantities in standard units. We also note that our measure likely underestimates the share of exports rerouted as export prices generally exceed import prices.

[10]We note that this aggregation is not equivalent to averaging across geographic units.

TABLE I

ALTERNATIVE PRODUCT AND PERIOD AGGREGATIONS

	(1) 2018	(2) 2021	(3) Change	(3) % Change
Country	15.1	18.2	3.1	20.4%
Province	5.8	7.4	1.5	26.5%
Firm	1.4	1.8	0.3	23.9%

Note: This table shows the percentage of total Vietnamese exports to the US identified as rerouted based on different levels of geographic aggregation. Rerouting is defined at the quarterly and HS 8-digit level.

counts legitimate value-added activities. For example, combed wool yarn (HS 5107.10.00) imported from China in 2021 was mainly used by apparel manufacturers in Nam Dinh and Tay Ninh, while most US exports of this product came from a Swiss-owned yarn factory in Lam Dong. The country-level measure misclassifies this flow as rerouting, whereas the province-level measure correctly excludes it.[11]

On the other hand, the firm-level measure likely understates rerouting. Subsidiaries of the same multinational can coordinate re-labeling, and these firms often cluster in the same province to reduce costs. For instance, Samsung, Vietnam's largest foreign investor, concentrated over half of its $22 billion investment, including seven factories, in Bac Ninh province. Similarly, ten Apple suppliers from Taiwan, China, and Korea established operations in neighboring Bac Giang. Additionally, transshipment cases are known to involve multiple firms, which the firm-level measure excludes. For example, in 2021, US Customs and Border Protection found that BGI Group (US Cabinet Depot) evaded tariffs by sourcing cabinets from a network of Chinese suppliers.[12] Importantly, all firms involved operated within Long An province, reflecting efforts to minimize domestic transport costs, and suggesting our province-level measure strikes a good compromise.

Based on Table I, we can compute how much aggregate measures would tend to overstate rerouting using a simple accounting exercise. Between 2018 and 2021, Vietnamese exports to the US rose from $49.14 to $101.94, a total increase of $52.80 billion (US

[11]The country-level measure is not an upper bound for rerouting involving multiple intermediate countries. We expect such cases to be rare, as additional intermediate countries raise shipping costs without clear benefits.

[12]https://www.cbp.gov/document/publications/eapa-case-7603-bgi-group-inc-dba-us-cabinet-depot-notice-determination-evasion

Census Bureau, 2024). Over the same period, country-level rerouting grew from $7.42 to $18.54 billion, and province-level rerouting grew from $2.87 to $7.54 billion. These figures imply that the province-level measure of rerouting can account for 8.8% of the increase in Vietnam's exports to the US. In contrast, using the country-level measure would yield 21.1%.

For transparency, we report how the time and product dimensions matter for our rerouting measure in Appendix Table IX. Temporal variation does not matter much: across all product and geographic levels, the highest ratio between the yearly and monthly estimates was 1.5. Product aggregation does matter: larger product categories generate larger rerouting estimates.[13] This pattern likely arises because many intermediate and final goods share the same HS codes at the 4- and 6-digit levels. As a result, substantial legitimate trade can be misclassified as transshipment when broader product categories are used. For example, a refrigerator manufacturer that imports condensers and evaporators (HS 8418.99.10) from China and exports refrigerated display cases (HS 8418.50.99) would be incorrectly flagged as a rerouter at the 4-digit level, though not at the more detailed 6- or 8-digit levels.

To summarize, the remainder of the paper presents results using our HS 8-digit, quarter-level, province-level rerouting measure. Here, we summarize some basic temporal, product, and geographic facts about the measure. Figure 3 shows rerouting as a share of Vietnamese exports to the US over time. The measure rises steadily from Q1 2018 through the end of 2021, peaking in Q3 2020, likely reflecting the rebound in exports after Vietnam's COVID lockdowns.

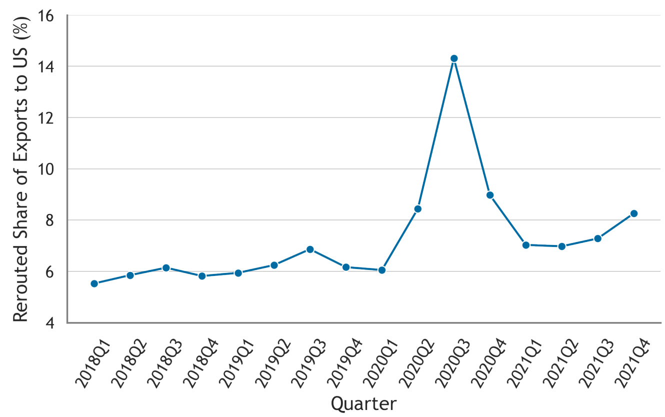
To highlight the products most affected, we compute a "Rerouting Growth Index," defined as the increase in rerouting between 2018 and 2021 divided by total US exports in 2021. This index captures how much rerouting expanded during the trade war relative to post-trade war export flows. Appendix Table X lists the top fifteen products by this metric.

We also map province-level rerouting as a share of total Vietnamese exports to the US in Appendix Figure 11. Rerouting is highly concentrated along key northern transport and industrial corridors. In the northwest, rerouting follows the Noi Bai–Lao Cai Expressway, which links Hanoi's main airport to the Chinese border. In the northeast, elevated shares

[13]For example, in Panel A, the HS 4-digit estimates are 1.5 to 2.5 times larger than their HS 8-digit counterparts. Similarly, in Panels B and C, this ratio ranges from 2.0 to 3.7 and 1.9 to 3.5.

appear around Bac Giang, a major industrial hub, and Lang Son, another border province. Taken together, these patterns suggest that rerouting increased most in areas where Vietnam's infrastructure are highly integrated with Chinese supply chains.

FIGURE 3.—Rerouting over Time



Note: This figure shows the share of total Vietnamese exports to the US flagged as rerouting from 2018 Q1 to 2021 Q4 based on our HS 8-digit, quarterly, province-level rerouting measure.

4.3. *Validation*

We validate our novel measure of rerouting by providing evidence that it is correlated with characteristics that we would *a priori* expect. Specifically, we examine whether (1) rerouters produce higher exports per worker, (2) industries with a higher share of capital of production experience more rerouting, and (3) rerouting is more prevalent in higher-tariff industries.

Because relabeling requires less labor than value-added production, one important diagnostic for our rerouting measure is that flagged firms should have higher exports per worker and higher revenues per worker. To test whether the data bears out this pattern, we estimate:

$$y_{ijt} = \alpha + \beta\, Rerouter_{it} + \gamma_t + \lambda_j + \epsilon_{ijt}. \tag{3}$$

Here, i indexes firms, j indexes ISIC 4-digit industries, and t indexes years. The outcomes y_{ijt} we consider are exports to the US per worker in thousands of USD and revenues per worker in thousands of USD. We regress these values onto an indicator for whether the firm is flagged as a rerouter in a given year (whether the firm engages a positive amount of rerouting according to our definition), $Rerouter_{it}$, as well as year fixed effects and industry fixed effects. Our expectation is that β should be positive for both outcomes. Consistent with the idea that rerouting is less labor-intensive than legitimate value-added production, we find that rerouters have $\$10,310$ more exports to the US per worker and $\$18,570$ more revenue per worker.

Another validation exercise relies on the logic that production requiring many fixed assets will be harder to relocate. Thus, we expect more rerouting activity in sectors with more capital as a share of sales. We construct a measure of the capital share of production using the Annual Survey of Industrial Production. We compute each industry's median capital share in 2005, before the trade war onset. We then use a crosswalk to match Chinese Industrial Codes to HS 6-digit products. Finally, we produce a binned scatterplot of our province-level rerouting share for each HS 6-digit product against our computed capital shares, using rerouting measures for 2018 and 2019. Subfigure 4a displays the results. We observe a strong positive correlation, as we would expect. To quantify this relationship, we then estimate:

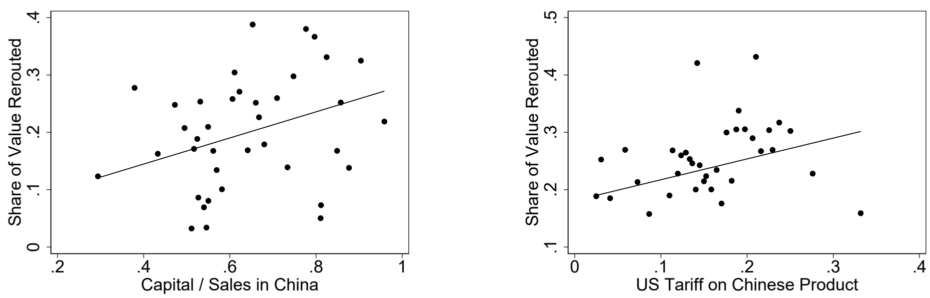
$$L_{pt} = \alpha + \beta\, k_p + \gamma_t + \epsilon_{pt}. \tag{4}$$

Here, $p_{(6)}$ indexes HS 6-digit products and t indexes years. The outcome variable, L_{pt}, is the percent of total Vietnamese exports to the US flagged by our province-level rerouting measure. Capital share at the HS 6-digit level from the Chinese data is given by k_p. Finally, we control for year fixed effects and cluster standard errors at the HS 6-digit level. The coefficient β represents the correlation between our rerouting measure and tariff increases, and equals 0.228 with $p = 6.9e-8$. This magnitude implies that moving from the 25th to 75th percentile value of capital share (0.53 to 0.71) is associated with 4.1 percentage point increase in the rerouted share of export value.

In another validation check, we leverage the intuition that rerouting through Vietnam should be higher for products with higher tariffs. To test this idea, we produce a binned scatterplot of rerouting value share against product-level tariffs in Subfigure 4b. Specifically, we sum our province-level rerouting measure to the HS 6-digit level and plot this value against the average US tariff level on Chinese goods for each HS 6-digit product for the years 2018 and 2019. We find a strong positive relationship between these two objects.

FIGURE 4.—Rerouting Is Associated with Higher Capital Shares and Higher Tariffs

(a) Capital Share (b) US Tariffs on China



Note: These binned scatterplots use data at the HS 6-digit product level. The y-axis represents the share of total export value to the US identified as province-level rerouting. Capital share is calculated using China's Annual Survey of Industrial Production from 2000 to 2008.

We also run a regression analogous to Equation 4, with the average HS 6-digit tariff in the place of k_p. We obtain $\beta = 0.209$ with $p = 0.033$.

5. EMPIRICAL STRATEGY

We use a difference-in-differences approach to estimate the causal effect of trade war tariffs on rerouting behavior. Conceptually, we compare the rerouting share before and after initial tariff increases for targeted (China) and untargeted (rest of the world) source countries. As discussed in Subsection 4.2, we focus on province-level rerouting. As our variation in tariff exposure is at the HS 6-digit level, we aggregate the HS 8-digit rerouting measure to the HS 6-digit and quarter level. This step retains the benefits of the granular 8-digit product definition of rerouting while allowing us to use HS 6-digit product-level tariffs. We compute:

$$L_{p_{(6)}ct} = \sum_{p_{(8)} \in \Omega_{p_{(6)}}} \sum_{v} \frac{\min\left\{x^{US}_{vp_{(8)}t},\, m_{vp_{(8)}ct}\right\}}{\sum\limits_{p_{(8)} \in \Omega_{p_{(6)}}} \sum\limits_{v} x^{US}_{vp_{(8)}t}}, \tag{5}$$

where v is the province, p is the product, c is the source country, t is the quarter, x is the value of exports, and m is the value of imports. $\Omega_{p_{(6)}}$ is the set of HS 8-digit products with the same HS 6-digit product code. We estimate:

$$L^V_{p(6)ct} = \sum_{j=-4}^{12} \beta_j \Delta\tau_{p(6)c} \times I\{t - s_{p(6)c} = j\} + \alpha_{p(6)t} + \alpha_{p(6)c} + \varepsilon_{p(6)ct} \quad (6)$$

In this equation, $p_{(6)}$ indexes HS 6-digit products, c indexes source countries, and t indexes quarters. The term $\Delta\tau_{p_{(6)}c}$ 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 with $s_{p_{(6)}c}$ denoting the quarter of the tariff announcement. We focus on the first tariff increase for each product as subsequent changes may have been anticipated. We cluster standard errors at the source country and 6-digit product level.

To document pre-trends and dynamic effects, we interact $\Delta\tau_{p_{(6)}c}$ with indicators for quarters before and after the tariff announcements. We express these indicators as $I\{t - s_{p_{(6)}c} = j\}$ for integers $j \in [-4, 12]$ with binning at the end-points. We note that, because Panjiva data begin Q1 2018, the composition of pre-treatment periods is not constant. For instance, tariffs imposed in Q3 2018 contribute variation only to the $j = -2$ and $j = -1$ pre-period coefficients.

The specification includes product-quarter fixed effects to account for product-specific changes in Vietnam's import demand over time. We also include source country-product fixed effects as some countries always trade more in certain products with Vietnam. As most products are treated at the 6-digit level, the main identifying variation comes from comparing China with other source countries for those products, rather than comparing treated to untreated products. The coefficient β_j represents the difference in rerouting share between China and untreated source 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.

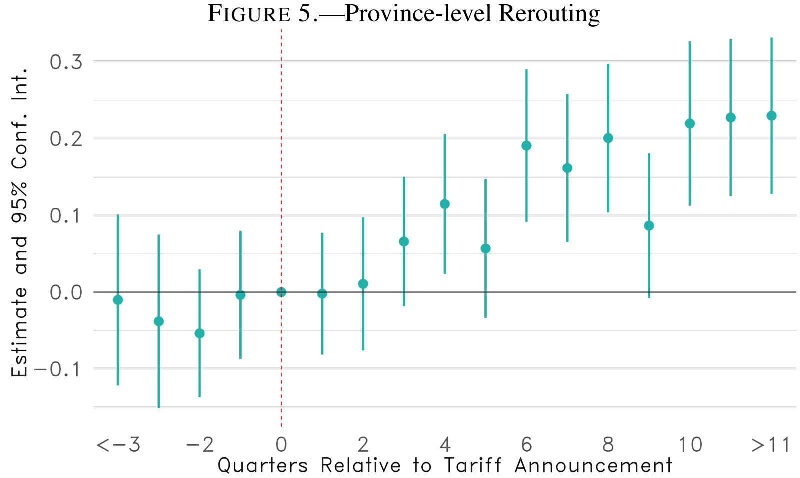
To more easily interpret the magnitude of the post-tariff increase, we also estimate Equation 7, which yields the average treatment effect over the entire post-announcement period. In the equation below, $I_{t \geq s}$ is an indicator that equals one on or after the announcement of a given product's tariff.

$$L_{p(6)ct} = \beta\Delta\tau_{p(6)c} \times I\{t \geq s_{p(6)c}\} + \alpha_{p(6)t} + \alpha_{p(6)c} + \epsilon_{p(6)ct} \quad (7)$$

6. RESULTS

Figure 5 displays estimates of β_j from Equation 6 for province-level rerouting. Again, we find that rerouting increases in response to tariffs, with a steady increase in province-level rerouting starting three to seven quarters after a tariff announcement and peaking after the eleventh quarter. We produce the analogous figures for country- and firm-level rerouting in Appendix Figure 12, Sub-figures 12a and 12b. Each of our country-, province-, and firm-level rerouting measures increase in response to trade war tariff hike.

FIGURE 5.—Province-level Rerouting



Note: This figure reports coefficients from the event study specification of Equation 6. Period zero is the time of tariff announcement.

To assess the increase in rerouting resulting from the trade war, we apply Equation 7 across three different measures of rerouting and summarize the outcomes in Table II. In Column (1), the country-level rerouting coefficient is 0.2065. To interpret this coefficient's magnitude, we multiply it by the average tariff increase on Chinese exports during this period, which is 12.48 percentage points. Consequently, country-level rerouting increased by approximately $0.2065 \times 12.48 = 2.58$ percentage points. This effect represents a 14.7% increase in country-level rerouting since 2018. Column (2) reports the province-level coefficient of 0.1397. This coefficient translates to a 1.74 percentage point increase in province-level rerouting for the average increase in tariffs at the HS 6-digit product level. The change indicates a 14.3% increase over 2018 province-level rerouting shares. Finally, column (3) shows that firm-level rerouting had a coefficient of 0.0781. For the average tariff increase, country-level rerouting increased by 0.97 percentage points. This treatment effect represents a 9.9% increase in firm-level rerouting since 2018.

TABLE II
THE RESPONSE OF REROUTING TO TRADE WAR TARIFFS

Rerouting Granularity	Rerouted Share of Exports to USA Country (1)	Province (2)	Firm (3)
Tariff $\times$ Post $=1$	0.2065***	0.1397***	0.0781***
	(0.0316)	(0.0274)	(0.0248)
Observations	444,848	444,848	444,848
R^2	0.58755	0.53486	0.50149
Within R^2	0.00061	0.00037	0.00013
Product-Origin fixed effects	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓

Note: This table shows the difference-in-differences estimates following Equation 7 for the country-level, province-level, and firm-level rerouting measures. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.1. *Robustness*

Next, we perform several robustness checks. One concern with our specification is that tariff announcements may have been anticipated after the first wave was implemented. To address this possibility, we redefine the treatment period: instead of using the quarter of the first tariff announcement for each HS 6-digit product, we assign Q3 of 2018 as the treatment time for all products. Column (1) of Table III shows that, even with this change, province-level rerouting still increases more in highly exposed products following the onset of tariffs.

Another concern is that the COVID-19 pandemic altered global trade patterns in a way that could spuriously generate an apparent increase in rerouting. To test this possibility, we construct an abridged sample that ends in Q1 of 2020. Column (2) of Table III shows that, although the magnitude of the main effect is about half as large, it remains positive and statistically significant. This decline is consistent with our finding in Figure 5 that the treatment effect grows steadily for seven quarters and remains elevated three years after the tariffs were introduced.

TABLE III

THE RESPONSE OF REROUTING TO TRADE WAR TARIFFS: ROBUSTNESS

	Rerouted Share of Exports to USA					
	Fixed Start	Pre-COVID	Regions	Close Provinces	No Automobiles	Retaliatory
	(1)	(2)	(3)	(4)	(5)	(6)
Tariff $\times$ Post = 1	0.1471***	0.1126***	0.1891***	0.1875***	0.1402***	0.1463***
	(0.0297)	(0.0286)	(0.0292)	(0.0286)	(0.0277)	(0.0279)
Observations	444,848	272,820	444,848	444,848	436,832	436,832
R^2	0.53485	0.55814	0.56100	0.55397	0.53475	0.53478
Within R^2	0.00033	0.00032	0.00060	0.00060	0.00037	0.00044
Product-Origin fixed effects	✓	✓	✓	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓	✓	✓	✓

Note: This table shows the difference-in-differences estimates following Equation 7 when we (1) fix tariff announcement time to 2018 Q3, (2) drop samples after 2020 Q1, (3) define rerouting at the regional level, (4) define rerouting by metropolitan areas, (5) drop automobiles from the sample, and (6) control for Chinese retaliatory tariffs of US goods. The dependent variable is the province-level rerouting share of exports to the US. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We also explore the possibility that meaningful rerouting occurs across provincial borders within Vietnam. To assess whether this matters for our estimates, we repeat the analysis using broader sub-national units. First, we group provinces into the government's six key economic regions (KER).[14] Next, we combine provinces within the same metropolitan area, under the assumption that these areas are especially likely to exhibit cross-border rerouting linkages.[15] Columns (3) and (4) display the corresponding estimates, which are positive and statistically significant. Also, the estimates are approximately one-third larger than the baseline province estimate in column (2) of Table II.

Another potential concern is that some products, due to their supply chain characteristics, naturally involve simultaneous imports for domestic consumption and exports to foreign markets. Automobiles are an important example. To test whether increases in auto-related trade drive our main findings, we exclude automobiles (HS 87) from the sample. Column (5) of Table III shows that our baseline estimates remain robust to this exclusion.

[14]The six regions are the Red River Delta, the Northern Midland and Mountainous Region, the North Central and Central Coast, the Central Highlands, the Southeast, and the Mekong Delta.

[15]Provinces are grouped into metropolitan areas as follows: the Ho Chi Minh City metro area includes Ho Chi Minh City, Binh Duong, Dong Nai, and Long An. The Hanoi metro area comprises Hanoi, Bac Ninh, Hung Yen, Hai Duong, Vinh Phuc, and Ha Nam. The Hai Phong metro area includes Hai Phong and Quang Ninh. The Da Nang metro area consists of Da Nang and Quang Nam. The Can Tho metro area encompasses Can Tho and Hau Giang.

One might also be concerned that China's retaliatory tariffs on US goods were correlated with both rerouting and US tariffs. To address this concern, we control for the HS 6-digit product-by-quarter tariff rates that China imposed on US goods during the sample period. As shown in column (6) of Table III, the resulting estimate remains positive, statistically significant, and closely aligned with the baseline result.

7. HETEROGENEITY

In this section, we explore heterogeneity in the rerouting response for several variables of interest. To do so, we compute the province-level rerouted share of total exports to the US at the HS8-quarter level for each firm and province. Then, we calculate the rerouted share of exports to the US at the HS6 product-quarter level by firms with each characteristic:

$$L_{pct}^{Fh} = \frac{\sum_i I\{h_i = h\} \min\left\{x_{ipt}^{US},\, m_{ipct}\right\}}{\sum_i x_{ipt}^{US}}, \tag{8}$$

where $I\{h_i = h\}$ is an indicator equal to one if a firm possesses the characteristic of interest. It is important to note that the denominator in this analysis represents total exports of a product to the US, not merely the exports of firms with the characteristic of interest.

One desirable property of this measure is that summing across all sub-groups defined by a characteristic yields the total headline rerouting amount. Mathematically, for firm-level rerouting, this property can be expressed as: $L_{pct}^{F} = \sum_{h \in H} L_{pct}^{Fh}$ for any partition $H = \{h\}$ of firms.

7.1. *Ownership*

A major policy concern during the trade war was that Chinese-owned firms could dominate rerouting, undermining the tariff's goal of curbing China's industrial output. To explore this issue, we disaggregate the main result by country of ownership. We define ownership nationality as the foreign country contributing the most capital to a firm.

TABLE IV

FIRM OWNERSHIP

Ownership	Domestic (1)	CHN (2)	HKG (3)	TWN (4)	JPN (5)	KOR (6)	USA (7)	Other Foreign (8)
	Rerouted Share of Exports to USA							
Tariff × Post = 1	0.0219*	0.0459***	0.0179***	0.0089	0.0075	-0.0336***	0.0057	0.0043
	(0.0112)	(0.0063)	(0.0051)	(0.0064)	(0.0067)	(0.0103)	(0.0087)	(0.0145)
Observations	444,848	444,848	444,848	444,848	444,848	444,848	444,848	444,848
R^2	0.44186	0.40376	0.27790	0.41304	0.48947	0.41370	0.47357	0.47098
Within R^2	4.07×10^{-5}	0.00085	0.00026	4.34×10^{-5}	1.49×10^{-5}	0.00030	5.63×10^{-6}	9.41×10^{-7}
Product-Origin FE	✓	✓	✓	✓	✓	✓	✓	✓
Product-Quarter-Year FE	✓	✓	✓	✓	✓	✓	✓	✓

Note: This table shows the difference-in-differences estimates following Equation 7 disaggregated by firms' country of capital ownership. The coefficients mechanically sum to the firm-level rerouting response reported in Table II. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table IV reports the results. Overall, we observe several patterns. First, rerouting increases the most in Chinese-owned firms with a coefficient of 0.0459, which implies a 0.57[16] percentage point increase in province-level rerouting at the mean tariff increase. This is more than twice as large as the increase among the next-most responsive group, domestically-owned Vietnamese firms, which increase their rerouting by 0.27[17] percentage points. Hong Kong increases by approximately one-quarter of a percentage point, while there is no significant change among Taiwanese, Japanese, and US-owned firms.

Rerouting among Korean firms declines by about 0.42 percentage points at the mean tariff increase. This decline may reflect that South Korean firms, such as Samsung, had already been shifting supply chains to Vietnam before the tariffs, and incumbent firms were well-positioned to expand output after 2018 (Cyrill, 2025, An, 2025).

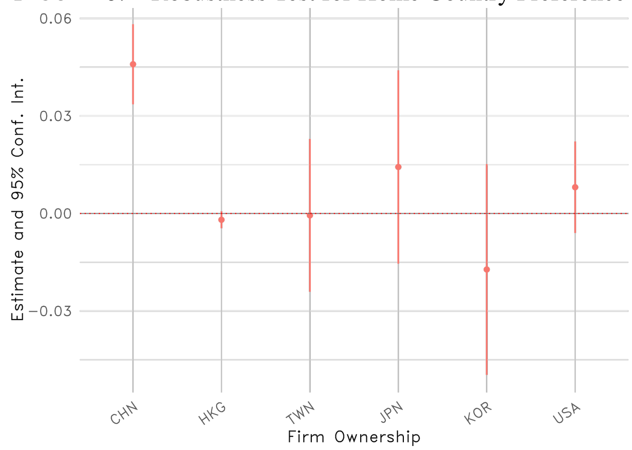
A natural question is whether multinational subsidiaries are rerouting goods from their home countries. To examine this possibility, we construct rerouting measures using each firm's headquarters location as the source country. For example, for a Chinese-owned firm, the outcome variable captures rerouting from China through Vietnam to the United States; for a Korean-owned firm, it captures rerouting from South Korea through Vietnam to the United States. Figure 6 reports coefficients from six separate regressions, corresponding to the six major ownership groups. If subsidiaries systematically reroute from their home

[16] $0.0459 \times 0.1248 \approx 0.0057$.

[17] $0.0219 \times 0.1248 \approx 0.0027$.

countries, we should see positive effects across all ownership groups. However, this pattern is unique to Chinese-owned firms.

FIGURE 6.—Robustness Test for Home Country Preference

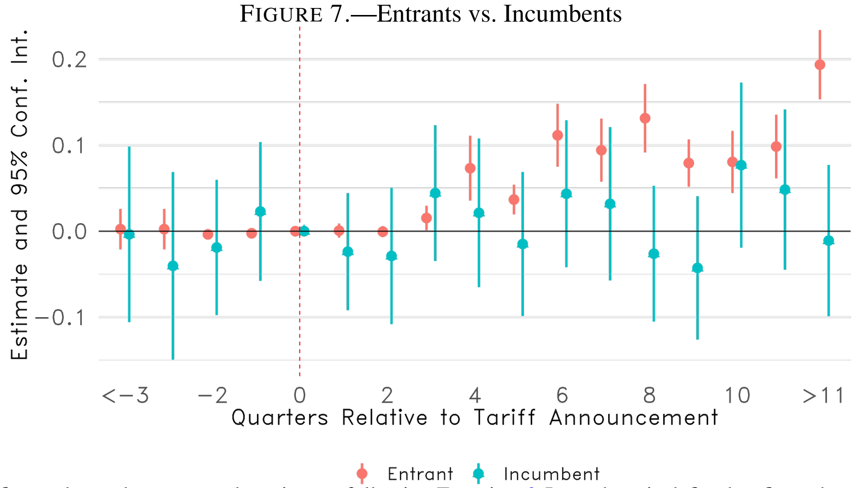


Note: This figure shows the difference-in-differences estimates following Equation 7 when we reassigned the source country in our rerouting measure to the firms' country of capital ownership.

7.2. *Firm Age*

Another key policy question was whether new firms were opened specifically to engage in rerouting. To test this idea, we define new entrants as firms that did not appear in the VES prior to 2018. Firms that enter the dataset before then are defined as incumbents.

FIGURE 7.—Entrants vs. Incumbents



Note: This figure shows the event study estimates following Equation 6. Incumbent is defined as firms that first appeared in the VES before 2018, and an entrant is defined as firms that first appeared in 2018 or afterwards.

Figure 7 displays the event study results and appendix Table XI reports the difference-in-difference estimates. We find that the increase in rerouting is almost entirely driven by new entrants rather than incumbent firms. The coefficient for rerouting by entrants is 0.0719 which represents 92% of the firm-level coefficient in Table II. This finding is consistent with new investors entering Vietnam to begin rerouting in response to the trade war.

We also perform the same exercise for ownership-by-incumbency categories. Appendix Figure 13 shows that Chinese and Hong Kong-owned entrants represent 66.8% of the total rerouting increase driven by new entrants.

8. REROUTING, IMPORTED CONTENT, AND DOMESTIC VALUE-ADDED

How much of Vietnam's export growth to the US is explained by increased rerouting rather than Chinese inputs used in production or domestic value-added? To answer this question, we perform a decomposition exercise using the vertical specialization framework of Hummels et al. (2001) and the firm-level approach of Flaaen et al. (2025). For each firm i in quarter q of year t, the imported content from source country c of 6-digit product $p_{(6)}$ exported to the US is:

$$GVC_{ip_{(6)}cqt} = \frac{\widetilde{m}_{ict}}{\widetilde{Y}_{it}} \times \widetilde{x}^{US}_{ip_{(6)}qt} \tag{9}$$

where $\widetilde{m}$, $\widetilde{Y}$ and $\widetilde{x}$ respectively represent imports, revenue and exports net of province-level[18] rerouted trade from China. This enables us to isolate trade and production net of rerouting activities.[19]

We compute product-level import content by aggregating across exporters i and normalizing by each product's total US exports in each year-quarter:[20]

[18]To assign province-level rerouted trade to firms, we first compute firm-level rerouting within the province, then allocate the additional province-level rerouted value proportionally to each exporter in that product-quarter.

[19]We subtract rerouted trade from China and not other source countries. This biases us towards finding a relative *decrease* in imported content from China compared to the rest of the world among rerouters.

[20]Intuitively, the resulting measure captures differences in the propensity of exporters of a given product to import inputs from source country c in each year relative to their gross output. We use annual rather than quarterly imports because sourcing, production and exporting likely takes more time than relabeling and may exhibit strong seasonablity.

$$gvc_{p(6)cqt} = \sum_{i \in I_{p(6)qt}} \frac{GVC_{ip(6)cqt}}{\sum_{i \in I_{p(6)qt}} \widetilde{x}^{US}_{ip(6)qt}} \tag{10}$$

We can decompose this measure further into the imported content attributable to rerouters and non-rerouters by summing over sets $I^{R}_{p(6)qt}$ and $I^{R'}_{p(6)qt}$, where the former is the set of exporters with at least 10% share their US exports ever rerouted.

Using these measures as outcomes in Equation 6, we test whether there was a differential increase in Chinese imported content of US exports relative to imported content from other source countries due to the trade war. We estimate Equation 6 and Equation 7 separately for all firms, rerouters, and non-rerouters. Column (1) of Table V indicates that, for the average product-level tariff increase of 12.48 percentage points, the relative Chinese imported content of US exports rose by 1.8 percentage points.

TABLE V

RESPONSE OF CHINESE IMPORTED CONTENT SHARE RELATIVE TO OTHER SOURCES

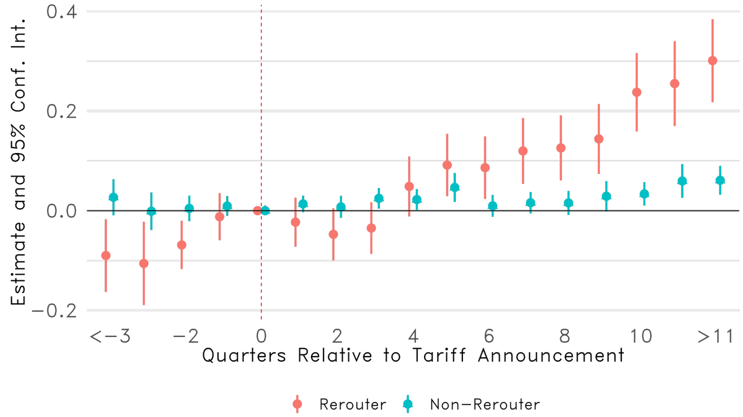
Firm Type	Imported Content Share of US Exports All (1)	Rerouter (2)	Non-Rerouter (3)
Tariff $\times$ Post $= 1$	0.1455***	0.1353***	0.0103
	(0.0208)	(0.0209)	(0.0098)
Observations	2,155,796	2,155,796	2,155,796
R^2	0.76355	0.74615	0.62175
Within R^2	0.00265	0.00257	6.71×10^{-5}
Product-Origin fixed effects	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓

Note: This table shows the difference-in-differences estimates following Equation 7 for the Chinese imported content share in exports to the US separately by all, rerouters, and non-rerouter firms. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We disaggregate this response by rerouters and non-rerouters. Columns (2) and (3) of Table V and Figure 9 show that, although non-rerouters show a modest increase in Chinese imported content, consistent with cheaper Chinese inputs following reduced US demand, rerouters exhibit a steady increase in Chinese global value chain integration.

Under the strong assumption that Vietnam engages in little back-and-forth trade with its source countries, $1 - gvc$ can be interpreted as the ratio of domestic value added in exports

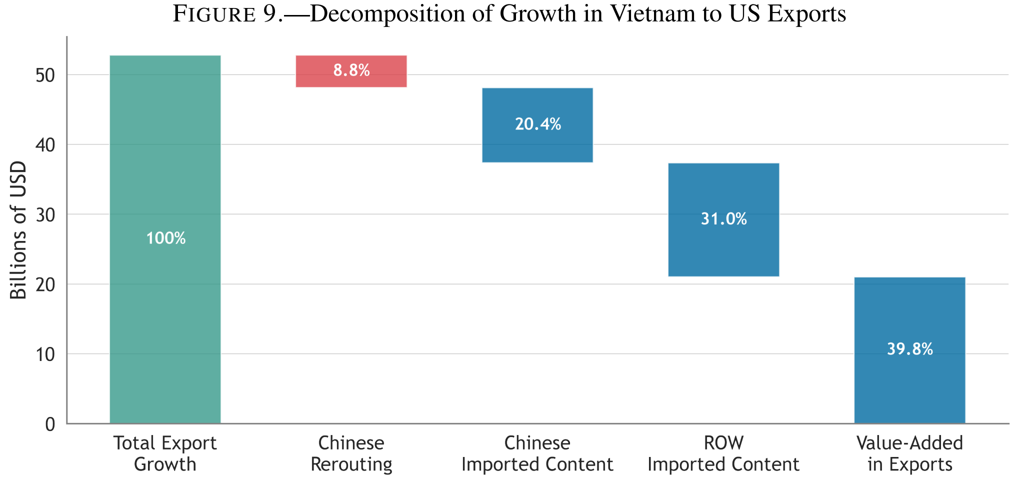
FIGURE 8.—Response of Chinese Imported Content Share relative to Other Sources



Note: This figure shows the event study estimates following Equation 6 for the Chinese imported content share in exports to the US separately by rerouters and non-rerouters.

to total exports (VAX ratio). This enables us to decompose Vietnam-to-US export growth from 2018 to 2021 into four parts: rerouting from China, Chinese imported content (excluding rerouting), growth in imported content from the rest of the world, and domestic value added. Figure 9 displays the results. As before, Chinese rerouting explains 8.8% of the total growth in Vietnam-to-US trade. Growth in other Chinese imported content represented 20.4% of the increase, whereas growth in rest-of-the-world imported content represented another 31.0%. Finally, domestic value added accounted for 39.8% of the growth.

FIGURE 9.—Decomposition of Growth in Vietnam to US Exports



Note: This figure shows the decomposition of total Vietnamese export growth to the US by rerouting from China, imported content from China, imported content from the ROW, and domestic value added.

These figures yield three insights. First, rerouting accounted for a meaningful share of Chinese import growth but did not explain it entirely. Second, even when production shifted, China remained an important source country for Vietnam. Third, domestic value added was significant, underscoring that the trade war brought tangible gains to the Vietnamese economy. This result is consistent with Wu (2023), who finds positive trade war spillovers to the Vietnamese economy, mainly in terms of real wage growth.

9. FIRM OUTCOMES

How is rerouting related to firm performance? We answer this question for manufacturing firms in Vietnam by estimating:

$$Outcome_{vj(4)t} = \beta\, L_{vj(4)t} + \alpha_{vt} + \gamma_{j(2)} + \nu_{vj(4)t}, \tag{11}$$

where v indexes Vietnamese provinces, $j(4)$ indexes ISIC 4-digit industries, and $j(2)$ indexes ISIC 2-digit industries. $Outcome_{vj(4)t}$ is the province-industry aggregate of a firm outcome in 2018-2021 and $L_{vj(4)t}$ is the share of rerouted export values from province v and industry $j(4)$ in year t. We control for province-year fixed effects, α_{vt}, to account for the possibility that firms in different provinces had different average performance due to, for example, local shocks. We control for ISIC 2-digit fixed effects, $\gamma_{j(2)}$, to account for differences in production across industries. Standard errors are clustered at the ISIC4 level. The coefficient of interest, β, captures the correlation between firm outcomes and rerouting share.

Table VI reports the coefficients for logged firm sales, employment, fixed assets, materials, and profits in the top panel. We use profit levels to accommodate negative values and report profits in thousands of USD. In the lower panel, the dependent variables are given as a share of sales. In the top panel, we see that rerouting is associated with improved firm performance: output, all inputs, and profits are positively associated with rerouting share. The lower panel shows that firms that reroute more have lower labor shares. However, they use more materials as a share of sales. Both patterns are consistent with the idea that rerouting requires less labor and more materials relative to true value-added activities. Material inputs go up as purchases of the rerouted good would likely be classified as material inputs into production.

TABLE VI

THE RELATIONSHIP BETWEEN REROUTING SHARE & FIRM OUTCOMES

	(1) Ln Y	(2) Ln L	(3) Ln K	(4) Ln M	(5) Profits
Rerouting Share	0.939***	0.714***	1.047***	0.997***	0.854***
	(0.142)	(0.122)	(0.158)	(0.153)	(0.146)
Observations	15,120	15,120	15,120	15,120	14,434
R-Squared	0.300	0.291	0.288	0.299	0.289
		L / Y	K / Y	M / Y	Profits / Y
Rerouting Share		-0.0185***	-0.0908	0.0180**	-0.000939
		(0.00706)	(0.0955)	(0.00771)	(0.00449)
Observations		15,013	14,967	14,995	14,983
R-Squared		0.098	0.077	0.183	0.072

Note: This table shows the correlation of firm outcomes and rerouting shares following Equation 11. Observations are at the province, ISIC 4-digit industry, and year level. The sample covers 2018 to 2021. We include year by province fixed effects and ISIC 2-digit fixed effects. The standard errors are clustered at the ISIC 4-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Finally, we test whether the trade war helped or hurt firms in Vietnam and the Vietnamese economy more generally. We do so for two reasons: first, the question is of inherent policy and scholarly interest, and second, we can use these results to infer whether rerouting affected firm behavior in the aggregate. We estimate an equation similar to Equation 11, except we replace rerouting at the industry, province, and year level with the industry-level change in tariffs due to the trade war. Specifically, we estimate:

$$Outcome_{vj(4)t} = \beta \, \Delta\tau_{j(4)} + \alpha_{vt} + \gamma_{j(2)} + \nu_{vj(4)t}, \tag{12}$$

where v indexes Vietnamese provinces and $j(4)$ and $j(2)$ index ISIC 4- and 2-digit industries, respectively. $Outcome_{vj(4)t}$ is the outcome in 2018-2021, and $\Delta\tau_{j(4)}$ is the average US import tariff change in 2017-2019 for a given ISIC4 sector.[21] We use the same fixed effects as before and cluster standard errors at the ISIC4 industry. The coefficient of interest, β, captures the relationship between firm outcomes and the intensity of tariff increases for each industry.

[21] $\Delta\tau_j \equiv \frac{1}{\#\Omega_j} \sum_{p \in \Omega_j} \Delta\tau_p$.

Table VII reports the results. Again, the top panel reports logged firm outcomes and the lower panel reports outcomes as a share of sales. Overall, larger tariff increases were associated with firm growth: firm output and profits both increased with the tariff change. Employment, fixed assets, and materials all increased as well. Next, we examine how profit rates and input shares responded to the trade war. We find that, consistent with the idea that the level of rerouting was economically significant, labor and fixed asset shares fell as a share of sales, but materials as a share of sales increased. We also find that, while firm profits grew, they grew proportionally less than sales.

TABLE VII

THE RELATIONSHIP BETWEEN TARIFF CHANGES & FIRM OUTCOMES

	(1)	(2)	(3)	(4)	(5)
	Ln Y	Ln L	Ln K	Ln M	Profits
Tariff Change	6.550***	4.807***	6.418***	7.004***	5.952***
	(1.426)	(1.301)	(1.489)	(1.498)	(1.440)
Observations	15,120	15,120	15,120	15,120	14,434
R-Squared	0.312	0.302	0.296	0.311	0.299
		L / Y	K / Y	M / Y	Profits / Y
Tariff Change		-0.223***	-1.959***	0.146*	-0.0388
		(0.0693)	(0.678)	(0.0766)	(0.0385)
Observations		15,013	14,967	14,995	14,983
R-Squared		0.100	0.078	0.184	0.073

Note: This table shows the response of firm outcomes to tariff changes following Equation 12. Observations are at the province, ISIC 4-digit industry, and year level. The sample covers 2018 to 2021. We include year by province fixed effects and ISIC 2-digit fixed effects. The standard errors are clustered at the ISIC 4-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

To translate these coefficients into predicted national growth rates, we compute implied national tariff exposure by aggregating industry-level changes. Specifically, we multiply the tariff change for each ISIC4 industry by its 2018 output share. This yields an implied national tariff change of 7.27%. The coefficient of 6.550 in column (1) indicates that industries facing the average tariff increase experienced output growth of 0.48 log points (62.0%). A similar calculation using column (3) shows that fixed assets rose by 0.47 log points (60.5%) for the average tariff increase. Finally, the coefficient of 7.004 in column (4) implies that material inputs increased by 0.52 log points (67.6%).

In the lower panel of Table VII, we find that input shares changed in response to trade war tariffs in a manner consistent with meaningful rerouting increases. Larger increases in tariffs were associated with larger decreases in employment as a share of sales, but larger increases in material inputs as a share of sales. The coefficient of -0.223 in column (2) indicates that the implied national tariff change of 7.27% led to a decline of 0.016 in the employment share, 10.7% of the baseline value 0.152 in 2018. The coefficient of -1.959 in Column (3) shows that the same tariff change lowered the fixed asset shares by 0.142, which is 11.9% relative to the 2018 average of 1.198. The coefficient of 0.146 in column (4) implies an increase of 0.011 in the material input share, an increase of 1.6% relative to the 2018 average of 0.699.

Taken together, these results reveal that rerouting was associated with better firm performance and shifts away from labor inputs into material inputs.

10. CONCLUSION

As the second Trump administration experiments with tariffs as a tool of economic statecraft, the implications for the US and target countries remain unclear. How effective will such policies be at achieving their desired goals? What will be the downstream effects on global trade and welfare? Will target countries evade tariffs by encouraging their firms to re-route products through third countries? To help answer these questions, this paper studied the 2018 US–China trade war, focusing on the extent of rerouting through the third country of Vietnam.

In our analysis, we developed a more precise measure of rerouting using transaction-level trade data. We defined rerouting as the same eight-digit product entering and existing the a given province of Vietnam within one quarter. We also considered country- and firm-level measures, which were less and more conservative, respectively. We find that the level of aggregation significantly influences the estimated extent of rerouting. Our preferred provincial measure indicates that increased rerouting accounts for approximately 8.8% of the growth in Vietnamese exports to the US from 2018 to 2021. In contrast, the country-level measure yields a substantially higher value of 21.1%.

We also provide causal evidence that the 2018 trade war intensified rerouting activities. For the average tariff increase, our preferred measure of rerouting rose by 14.3% compared to pre-trade war levels. Our heterogeneity analysis reveals that rerouters were new Chinese investors who relocated to Vietnam to rebrand Chinese-made products as Vietnamese. We also find that highly exposed Vietnamese firms outperformed their counterparts, and that rerouting shifted cost structures, reducing labor shares while increasing material input shares.

The findings of our paper carry important policy implications. First, we caution against relying on aggregate data to infer the extent of rerouting: in our case, country-level estimates were two-and-a-half times larger than our preferred measure. Second, while we find strong evidence that rerouting through Vietnam rose in response to the 2018 trade war, the absolute level and increase were modest relative to overall growth in China–U.S. trade flows and growth Vietnam's domestic value added. Third, rerouting activity was highly concentrated among Chinese-owned firms and new establishments, offering insight into how circumvention occurs and how enforcement strategies might be targeted.

More broadly, this paper lays the groundwork for future research on rerouting responses to trade policy. By introducing a transaction-level framework, we provide a systematic approach to identifying tariff evasion, quantifying its extent, and pinpointing the firms, sectors, and localities most involved. Our results also raise new questions about the organizational origins of rerouting firms and the relationship between value-added production and evasive rerouting.

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APPENDIX A: DATA CONSTRUCTION

A.1. *Panjiva*

Trade data used in this study is obtained from *Panjiva*, which collates transaction-level bill of lading and customs data from customs agencies in multiple countries. We use Panjiva data on Vietnam imports and exports from 2018 to 2021 which covers all modes of transportation including maritime, land and air. Key variables include firm ID, origin or destination, product, value, and date.

Firm IDs: The dataset contains Vietnamese tax IDs for each Vietnamese importer or exporter. Vietnamese tax IDs uniquely identify formally registered business establishments in the country. For multi-establishment firms, all establishments share the same first nine digits. We keep the first nine digits of the tax ID and aggregate to the firm level.

Origin/Destination: The country of origin (destination) indicates where the sender (recipient) of the shipment is located. For province information, we use the province of the Vietnamese firm's address. We drop observations with missing origin/destination.

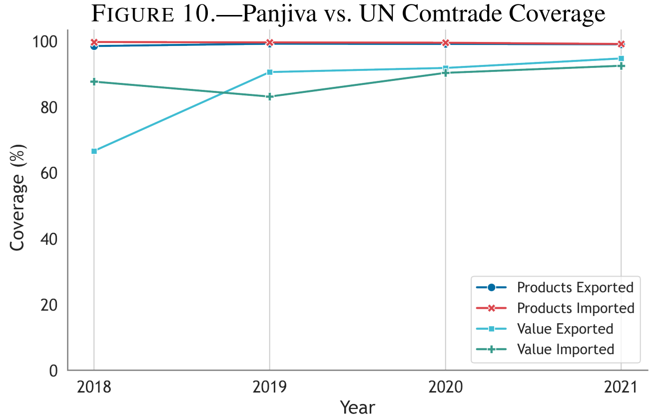
Products: Products in this study are categorized according to the Harmonized Commodity Description and Coding System (HS Code), established by the World Customs Organization. The HS Code assigns a six-digit numeric code to each product category which is standardized across countries. Many countries extend the HS Code by adding digits beyond the six-digit level to create national tariff classification systems. In our sample, we observe up to the HS 8-digit product level of the Vietnam Customs classification. We drop HS codes starting with "98" and "99" to exclude miscellaneous product categories. For computing rerouting at the 8-digit level, we use as reported product codes. For merging with other datasets, we use 6-digit product codes converted to the 2017 HS version.

Value and Quantity: Panjiva reports the value of each shipment in US dollars. We drop observations with missing and non-positive trade values. Quantities are in as-reported, non-standardized units such as packages and pieces, rather than weight, which prevents us from constructing unit values.

A.1.0.1. *Data Coverage* We assess the data coverage of the Panjiva data by comparing the percentage of value and products traded to publicly available UN Comtrade data.

Specifically, we consider the number of HS 6-digit products exported by Vietnam,[22] the number of HS 6-digit products imported by Vietnam, the total value of Vietnamese exports, and the total value of Vietnamese imports. We plot Panjiva's percent coverage of Comtrade's sample for each year of our sample in Figure 10.

FIGURE 10.—Panjiva vs. UN Comtrade Coverage



Overall, we find that product coverage is exceptionally high and consistent over time, never dropping below 98%. This indicates that our rerouting results are not due to the selective inclusion of specific products in Panjiva. Coverage of trade value is somewhat lower, with 67% coverage for exports and 88% coverage for imports in 2018. However, by 2021, these values increased to 95% and 93%, respectively.

A.2. *Vietnam Enterprise Survey (VES)*

Our analysis draws on the raw data compiled from the annual Vietnam Enterprise Survey, spanning the years 2000 to 2021. Each observation corresponds to a plant-year, and we aggregate this information to the firm-year level using the first nine digits of firm identifiers.[23] To ensure consistency across survey waves, we drop records with missing or incomplete firm IDs and harmonize key classification variables, including industry codes, province codes, and firm ownership types (state-owned, private, and foreign-invested).

[22]The finest product disaggregation in Comtrade is HS 6-digit.

[23]The firm identifiers are unique for firms, not plants.

All monetary variables, including wages, revenues, profits, and assets, are first converted into thousands of U.S. dollars using contemporaneous VND-USD exchange rates and then deflated to constant 2010 prices using Vietnam's annual consumer price index from Vietnam's National Statistics Office. Sectors are defined using the VSIC classification system[24], which is based on the ISIC Rev. 4 framework with limited modifications to accommodate Vietnam-specific industries, such as incense stick manufacturing.

To construct the analysis sample, we keep observations with positive values for employment, revenue, assets, wage bill, and cost of goods sold. We define material expenditures as the cost of goods sold minus the wage bill. All outcome variables are then aggregated by summation to the province-sector-year level.

A.3. *Panjiva - VES Merge*

For the imported content and heterogeneity analyses, we merge firm characteristics from the VES into Panjiva using Vietnam's nine-digit tax IDs. The table below documents the merge quality for the years 2018–2021. Overall, the match rate is high, with over 90% of Panjiva firms matching with a VES firm in all years.

TABLE VIII
PANJIVA AND VES MATCH QUALITY

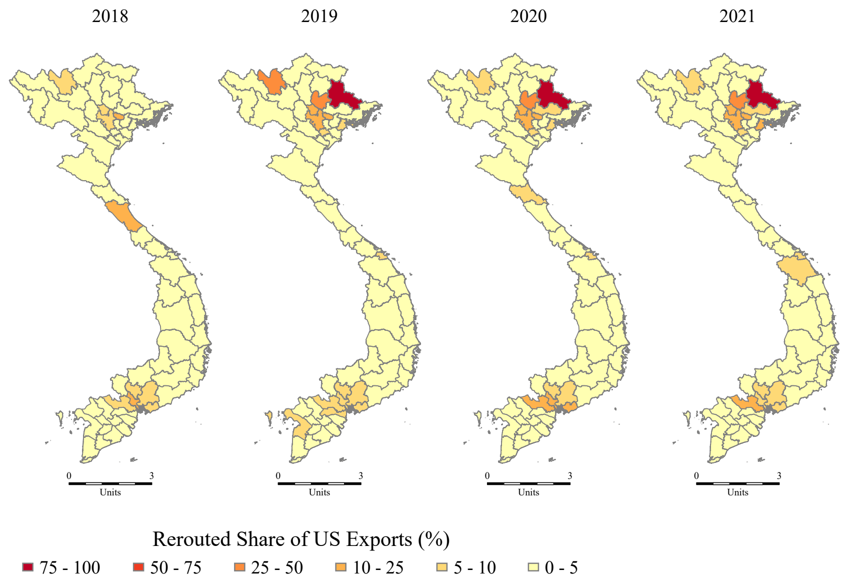
	(1) Matched	(2) Panjiva Only	(3) Total	(4) % Matched
2018	76,832	5,985	82,817	92.2%
2019	81,816	6,836	88,652	91.6%
2020	85,603	6,039	91,642	92.9%
2021	84,539	5,389	89,928	93.6%
Total	328,790	24,249	353,039	92.6%

Notes: This table shows the percentage of Panjiva firm-year observations matched VES firm-year observations.

[24] See https://classification.codes/classifications/industry/vsic.

APPENDIX B: APPENDIX FIGURES AND TABLES

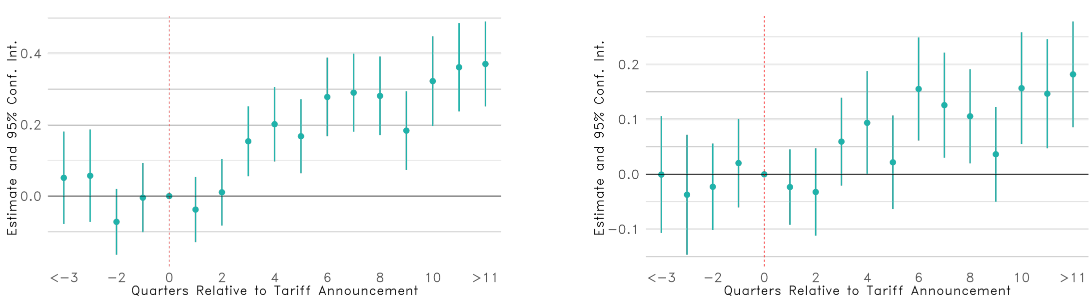
FIGURE 11.—Map of Provincial Rerouting



Note: This map plots annual province-level rerouting values as a share of total province exports to the US

FIGURE 12.—The Response of Rerouting to Tariff Intensity

(a) Country-level Rerouting (b) Firm-level Rerouting



Note: These figures report coefficients from Equation 6.

FIGURE 13.—Rerouting Response by Ownership and Age

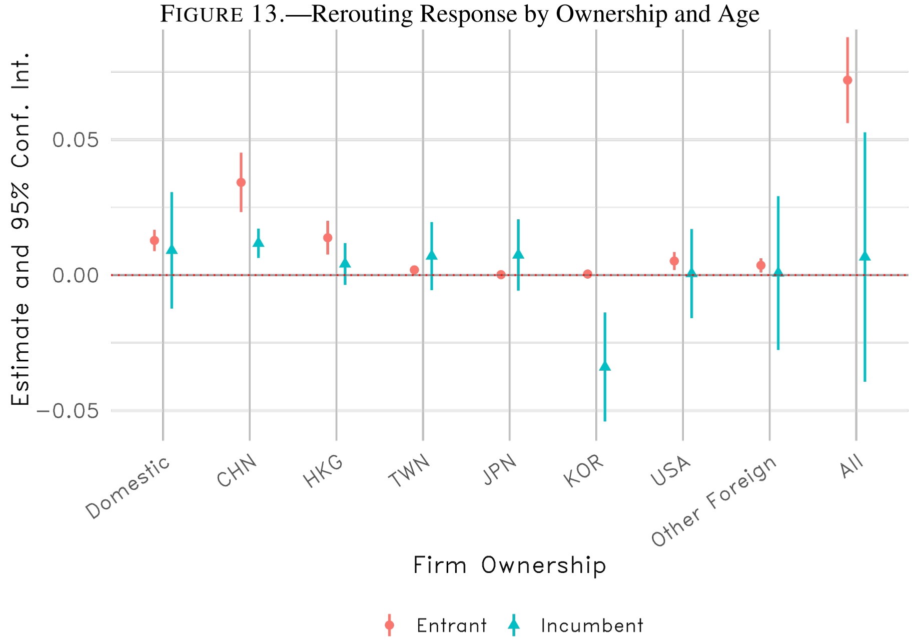


TABLE IX
ALTERNATIVE PRODUCT AND PERIOD AGGREGATIONS

	(1) Year	(2) Quarter	(3) Month	(4) Year	(5) Quarter	(6) Month
		2018			2021	
	Panel A: Country Level					
HS 4-digit	23.20	22.72	21.92	47.26	40.09	39.22
HS 6-digit	17.60	17.11	16.20	22.17	21.47	20.56
HS 8-digit	15.76	15.11	14.15	18.99	18.19	17.23
	Panel B: Province Level					
HS 4-digit	12.96	11.86	10.53	28.48	24.99	23.32
HS 6-digit	7.69	7.07	6.26	9.88	9.46	8.87
HS 8-digit	6.57	5.85	5.16	7.78	7.40	6.86
	Panel C: Firm Level					
HS 4-digit	3.46	2.90	2.35	6.35	6.06	5.65
HS 6-digit	1.89	1.71	1.53	2.43	2.23	2.05
HS 8-digit	1.69	1.42	1.25	1.92	1.76	1.62

Notes: This table reports the percent of total Vietnamese exports to the US flagged as rerouting using each set of geographic, product, and time aggregations.

TABLE X

TOP 15 PRODUCTS BY REROUTING GROWTH INDEX

(1) Rank	(2) HS6 Code	(3) Description	(4) Rerouting Growth Index
1	820160	Hedge shears and similar two-handed shears	1.00
2	820239	Hand tools including saw blades for cutting (non-steel)	1.00
3	844110	Cutting machines for paper pulp, paper or paperboard	1.00
4	902590	Parts and accessories for thermometers, etc	1.00
5	844790	Tulle, lace, embroidery, trimmings etc making machine	1.00
6	540490	Strip, straw, etc. synth textile material, 5 mm thic	1.00
7	741999	Articles of copper, nes	0.99
8	380891	Insecticides: put up in forms or packings for retail sale	0.98
9	847149	Complete Computer Systems	0.97
10	940510	Chandeliers	0.95
11	847160	Computer Units with Input/Output Features (with optional storage)	0.94
12	846799	Hand held tools nes, parts thereof	0.91
13	842121	Water filtering or purifying machinery or apparatus	0.91
14	850590	Electro-magnets nes and parts of magnetic devices	0.89
15	847190	Data Readers (Magnetic or Optical)	0.89

Notes: This table reports the top fifteen HS6 products by rerouting growth index, which we define as the total value rerouted in 2021 minus the total value rerouted in 2018, all divided by total exports to the US in 2021.

TABLE XI

ENTRANTS VS. INCUMBENTS

Incumbent	Rerouted Share of Exports to USA Entrant (1)	 Incumbent (2)
Tariff $\times$ Post = 1	0.0719***	0.0067
	(0.0081)	(0.0235)
Observations	444,848	444,848
R^2	0.34101	0.49997
Within R^2	0.00141	1.01×10^{-6}
Product-Origin fixed effects	✓	✓
Product-Quarter-Year fixed effects	✓	✓

Note: This table shows the difference-in-differences estimates following Equation 7 disaggregated by firms' timing of entry.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.