EXPORTS IN DISGUISE? TRADE REROUTING AND PRODUCTION RELOCATION DURING THE US–CHINA TRADE WAR*

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Abstract

Governments increasingly use tariffs to pursue economic decoupling from targeted countries, yet the extent to which trade and supply-chain links persist through third countries remains unclear. Measuring these links is difficult: firms have incentives to conceal the rerouting of goods to evade tariffs, and a good's country of export does not reveal where its inputs were produced. Using linked Vietnamese customs, production, and ownership records, we study Chinese production reaching the US through Vietnam during the US–China trade war. We provide the first transaction-level decomposition into rerouted Chinese goods and Chinese inputs used in Vietnamese production. Between 2018 and 2022, US imports from Vietnam increased by $78.3 billion. Together, the input and rerouting channels accounted for 27.1% of this increase, with the input channel contributing 16.6% and the rerouting channel contributing 10.5%. To isolate tariff effects from broader trends, we exploit variation in the timing and intensity of tariff increases across products and Vietnam's source countries. We find that US tariffs on Chinese goods raised the rerouted and imported-content shares relative to other source countries. Rerouting increased across ownership groups, whereas Chinese input use rose primarily among firms owned by investors from mainland China or Hong Kong, including incumbent and new exporters. The growth in these channels offset 13% of the decline in China's direct share of US imports. Vietnam's growing intermediary role therefore reflected both tariff circumvention and expanded Vietnamese production using Chinese inputs, showing how third countries can sustain supply-chain links even as direct trade declines.

JEL Classification: F13, F14, F51

Keywords: Trade rerouting; Geoeconomics; US–China trade war; Global value chains; Tariff circumvention

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1 Introduction

Governments increasingly use tariffs to pursue economic decoupling from geopolitical rivals. As tensions between the US and China have intensified, US import sourcing has shifted from China toward "connector" economies such as Vietnam and Mexico, whose exports to the US have risen alongside their imports from China (Alfaro and Chor, 2023; Freund et al., 2023; Gopinath et al., 2025). These aggregate shifts do not reveal how much production has actually moved away from China. Growth in third-country exports may reflect three distinct margins: Chinese goods rerouted[1] through third countries to the US; Chinese inputs embodied in goods produced in those countries; and production based on domestic or non-Chinese inputs. The first represents potential tariff circumvention, the second combines production outside China with continued reliance on Chinese supply chains, and the third represents broader diversification away from Chinese production. Distinguishing among these margins is difficult because firms have incentives to conceal the rerouting of goods to evade tariffs, and a good's country of export does not reveal where its inputs were produced.

The distinction between rerouting and imported content has become increasingly important in policy debates. A 2026 White House report emphasized the risks of illegal transshipment, while related commentary by senior White House adviser Peter Navarro characterized a Chinese motor installed in a recliner manufactured in and exported from Vietnam as rerouting for tariff evasion rather than imported content.[2] The two channels share an important implication: together, they measure the extent to which US exposure to Chinese production persists through third countries. However, distinguishing them is essential because they reflect different economic behavior and call for different policy responses. For policymakers, rerouting calls for improved customs enforcement[3] and rules-of-origin compliance, whereas

[1] Throughout the paper, we use the terms "rerouting" and "transshipment" interchangeably to describe potential same-product pass-through trade. These terms refer to our empirical measure rather than a legal determination of tariff evasion.

[2] White House Office of Trade and Manufacturing Policy (2026); Navarro (2026).

[3] In October 2025, the US administration awarded a multimillion-dollar contract for an artificial intelligence-enabled "Detective Border" to curb rerouting (Exiger, 2025).

imported content calls for industry- or firm-specific approaches to addressing dependence on Chinese upstream suppliers. For researchers, rerouting introduces measurement error in origin classification and may bias estimates of bilateral trade and price responsiveness to tariffs and trade costs. Increased imported content instead reflects changes in production location and input sourcing that fit more naturally within models of global value chain integration.

This paper provides the first transaction-level quantification of potential rerouting and imported content from China in Vietnam's exports to the US during the US–China trade war. Vietnam provides a natural setting because both channels are likely to be economically important. Following the 2018–2019 tariff escalations in the US–China trade war, Vietnam's exports to the US expanded sharply, China's share of Vietnam's imports rose more than that of any other source country, and Chinese foreign direct investment in Vietnam increased substantially.[4] Geographic proximity and economic integration with China make rerouting plausible, consistent with prior evidence that tariff evasion is more likely through closely connected third countries (Rotunno et al., 2013; Liu and Shi, 2019). At the same time, Vietnam has attracted investment from US-aligned economies, including South Korea and Japan, as multinational firms have pursued "China-plus-one" strategies. These strategies may move production outside China while preserving reliance on Chinese upstream suppliers. Vietnam therefore allows us to study both potential rerouting and substantive production outside China that continues to use Chinese inputs.

Our analysis links S&P Global's Panjiva Supply Chain Intelligence Database, which provides Vietnamese customs records from 2018 to 2022, to the Vietnam Enterprise Survey, which provides firm-level information on ownership, investment, and production from 2000 to 2022. We use these linked data to construct two measures. First, our proxy for potential rerouting matches imports and exports of identical, finely disaggregated HS 8-digit products from China into Vietnam and from Vietnam to the US within the same province and quarter. Second, following the vertical specialization approach of Hummels et al. (2001) and Flaaen

[4]Ministry of Planning and Investment of Vietnam (2020).

et al. (2025), we quantify Chinese intermediate inputs embodied in Vietnamese exports to the US after netting out potential rerouting.

We conduct two validation exercises that support the economic interpretation of these measures. First, transactions classified as rerouted were more likely to connect Chinese exporter–US importer pairs that had traded directly before the trade war. Second, firms with more rerouted exports were less labor- and capital-intensive than otherwise similar exporters, consistent with limited production in Vietnam. By contrast, firms with greater Chinese imported content had factor shares consistent with substantive production within Vietnam. These patterns help distinguish the pass-through of Chinese-made goods from Vietnamese production using Chinese inputs.

We use the measures derived from the linked microdata in two complementary exercises. First, we decompose the growth in Vietnam-to-US exports into potential rerouting, Chinese imported content, imported content from the rest of the world, and a domestic value-added residual. This exercise measures the aggregate contribution of Chinese production and inputs to Vietnam's export expansion. Second, we estimate the causal effect of US trade-war tariffs on the two Chinese-linked channels. We exploit variation across quarters in the timing of tariff announcements, across source countries in whether the tariffs targeted China rather than other origin countries, and across products in tariff intensity. Intuitively, the design asks whether China-linked flows increased disproportionately when the corresponding Chinese products became subject to larger announced US tariff increases, using analogous flows from other source countries as a comparison. This design separates tariff-induced responses from broader trends in Vietnam's export growth and supply-chain reorganization.

Between 2018 and 2022, US imports from Vietnam increased by $78.3 billion. We estimate that 27.1% of this increase reflected the two China-linked channels: 10.5% came from rerouted Chinese goods, while 16.6% came from Chinese inputs embodied in Vietnamese exports. Chinese production therefore made a sizable but not dominant contribution to Vietnam's export expansion, and the imported-input channel was larger than the rerouting

channel. Imported content from the rest of the world accounted for another 16.3% of export growth, or approximately $12.8 billion, while the domestic value-added residual accounted for 56.5%, or approximately $44.3 billion. Together, the observed increases in rerouting and Chinese inputs embodied in Vietnamese exports replaced the equivalent of 13% of China's lost direct share of US imports.

The tariff-induced responses were economically meaningful along both China-linked margins. In the product-level regressions, the average 12.24-percentage-point announced tariff increase raised the shares of Vietnam's US-bound exports attributable to rerouting from China and Chinese imported content by 1.27 and 0.67 percentage points, respectively, relative to the corresponding shares attributable to other source countries. Compared with their pre-tariff China-origin means of 12.1% and 2.6%, these estimates represent increases of 10.5% and 25.8%, respectively. US tariffs therefore contributed both to the rerouting of Chinese goods through Vietnam and to the increased use of Chinese inputs in Vietnamese exports.

Ownership patterns further distinguish the two margins. The rerouting response occurred across ownership groups. Domestic Vietnamese firms accounted for the largest positive contribution, followed by other foreign-owned firms and firms owned by investors from mainland China or Hong Kong. The domestic contribution was concentrated among incumbent exporters and primarily involved networks in which different firms imported from China and exported to the US. By contrast, among firms owned by mainland Chinese or Hong Kong investors, the same firm typically conducted both the importing and exporting. This pattern appeared among both incumbent exporters and new entrants to exporting from Vietnam to the US. The increase in Chinese imported content was more concentrated by ownership: firms owned by mainland Chinese or Hong Kong investors accounted for approximately 79% of the aggregate imported-content response, with roughly equal contributions from incumbents and entrants. These findings imply that potential rerouting is not confined to new Chinese investments. An enforcement strategy focused exclusively on Chinese-owned entrants would

therefore miss a substantial share of the measured response.

Taken together, these findings enrich our understanding of Vietnam's rise as a connector economy. Although rerouting was economically sizable, it accounted for less than half of the China-linked content in Vietnam's export expansion. The larger China-linked channel was Chinese imported content embodied in Vietnamese production. At the same time, our accounting assigns most of the increase in Vietnam–US exports to either the domestic value-added residual or imported inputs from countries other than China. Vietnam's export expansion therefore combined the rerouting of Chinese goods, inputs from China and other countries, and substantive production within Vietnam. Its growing intermediary role reflected neither tariff circumvention alone nor complete US decoupling from Chinese production.

This paper makes four contributions. First, we contribute to the emerging literature on geoeconomics, which studies how states use tariffs, sanctions, export controls, and investment restrictions as instruments of statecraft (Hirschman, 1945; Clayton et al., 2024; Broner et al., 2025; Mohr and Trebesch, 2025; Clayton et al., 2026). A key determinant of the effectiveness of economic policies as geopolitical tools is how easily targeted countries can circumvent them, and a central question in this literature is how third countries mediate that circumvention. Aggregate evidence on the shift of trade and investment toward connector economies during US–China tensions leaves this question open (Gopinath et al., 2025; Garred and Yuan, 2025) because it provides an incomplete mapping between these countries' imports from China and their exports to the US. If their US-bound exports primarily use intermediate inputs from US allies and domestic value added, while their imports from China are predominantly intended for domestic consumption, then the shift in US import sourcing would represent meaningful decoupling from China. If connector economies instead serve as conduits for Chinese goods or rely heavily on Chinese inputs to produce goods for the US, aggregate trade statistics would overstate the extent of decoupling. We provide micro-level evidence on this distinction. Tariffs induced both rerouting and the use of Chinese inputs

in third-country production, but the two channels through Vietnam replaced only part of China's lost direct US import share. Along the Vietnam margin, US tariffs were therefore partially effective at reducing exposure to Chinese production.

Second, we contribute a measurement framework for studying trade rerouting. Prior work infers evasion from discrepancies in trade statistics, changes in aggregate bilateral flows and prices, or coarse product-country correlations (Rotunno et al., 2013; Liu and Shi, 2019; Kee and Nicita, 2022; Hayakawa and Sudsawasd, 2025; Ito, 2024; Freund, 2025; Artuc et al., 2026). Recent micro-level approaches demonstrate the value of transaction-level data for improving on aggregate measures. For example, Chalendard et al. (2023) use information on customs officer assignment in Madagascar to infer and quantify revenue losses from tariff evasion. We propose a transaction-level approach that matches import and export flows. This approach produces a transparent measure of likely rerouting through intra- and interfirm networks, permits sensitivity analysis across spatial units and matching periods, and allows us to examine closely the role of multinational firms in rerouting and production reorganization.

Third, we contribute to the literature on the US–China trade war by documenting its effects on third-country supply chains.[5] This literature has documented effects on prices, welfare, firm outcomes, and trade flows in the US and China (Amiti et al., 2019, 2020; Benguria and Saffie, 2020; Fajgelbaum et al., 2020; Benguria et al., 2022; Chor and Li, 2024; Handley et al., 2025), but much less is known about the mechanisms through which third countries absorbed and reorganized trade diverted from China (Alfaro and Chor, 2023; Freund et al., 2023; Fajgelbaum et al., 2024; Grossman et al., 2024; Hsu et al., 2024; Garred and Yuan, 2025; Agarwal et al., 2026). Our results show that Vietnam's export expansion reflected both rerouting and production that relocated to or expanded in Vietnam while remaining linked to Chinese suppliers. Third-country export growth therefore need not imply either complete tariff evasion or full decoupling from China.

Fourth, our findings have implications for empirical trade models that infer demand sub-

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

stitution and export-supply elasticities from bilateral trade flows classified by customs origin. For example, Fajgelbaum et al. (2024) find that, when interpreted through their model, Vietnam's exports are consistent with a downward-sloping export supply curve in response to US tariffs on Chinese goods but an upward-sloping export supply curve in response to China's tariffs on US goods during the US–China trade war. Their baseline model requires additional heterogeneity to accommodate this reversal. The two margins we quantify illustrate why such inferences can be sensitive to the composition of measured exports. Rerouting causes Chinese goods to appear in Vietnam's recorded exports, creating measurement error in bilateral trade flows. Production relocation can shift export supply rather than simply generate movement along a fixed supply curve. More generally, customs-based estimates of trade elasticities may conflate structural demand and supply responses with changes in routing, production location, and input sourcing. This distinction has implications for estimates of tariff incidence, welfare losses, and optimal trade policy (Feenstra, 1994; Broda and Weinstein, 2006; Broda et al., 2008; Soderbery, 2015; Kee and Nicita, 2024).

The remainder of the paper proceeds as follows. Section 2 provides background on Vietnam's role as a connector economy. Section 3 describes the data, and Section 4 outlines our measurement strategy for potential rerouting and imported content from China. Section 5 presents descriptive patterns and decomposes Vietnam–US export growth along the two China-linked margins. Section 6 introduces our empirical framework and estimates how trade-war tariffs affected rerouting and imported content. Section 7 examines the firms and ownership groups contributing to each response. Section 8 concludes.

2 Background

2.1 The US–China Trade War

The broader US tariff escalation began in early 2018, when the US imposed safeguard tariffs on washing machines and solar panels after a US International Trade Commission (USITC)

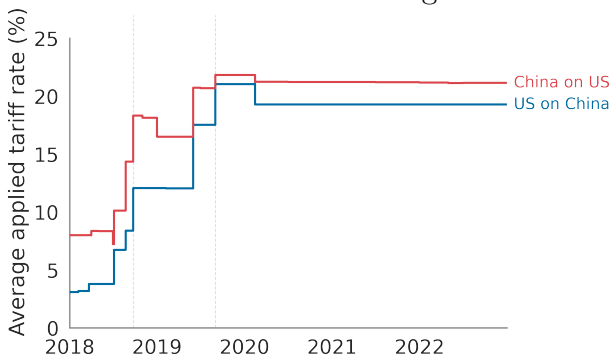
determination that imports had harmed domestic producers. Soon after, the US added tariffs on steel and aluminum following a Department of Commerce investigation. These initial tariffs applied to multiple countries.

On June 15, 2018, the Office of the US Trade Representative announced additional 25% tariffs on products from China following its Section 301 investigation into China's policies related to technology transfer, intellectual property, and innovation. The first tranche took effect on July 6, 2018 (Bown, 2021). From 2018 through 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 most tariffs in place. The US maintained and modified its Section 301 tariffs in 2024 (Office of the United States Trade Representative, 2024). Figure 1a shows average tariff rates during different phases of the trade war (Bown, 2021).

2.2 Vietnamese Trade

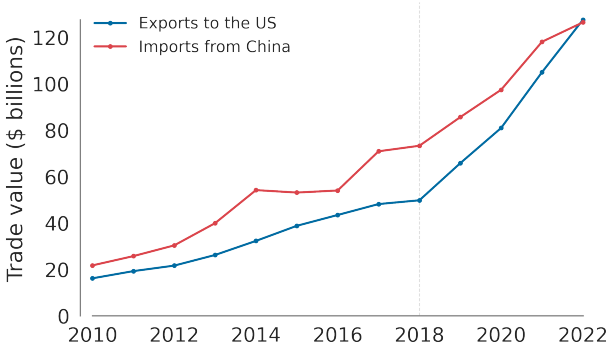
In Vietnam, the tariffs were welcomed as an opportunity to boost exports to the US and deepen integration into global value chains. Following their imposition, Vietnamese exports to the US rose sharply, from $3.6 billion in April 2018 to $4.7 billion in April 2019, a 31% year-on-year increase (US Census Bureau, 2024). Figure 1b shows Vietnam's imports from China and exports to the US over time. After the onset of the trade war, both flows accelerated, with Vietnam's exports to the US surpassing $120 billion in 2022 (US Census Bureau, 2024). Figure 1c puts Vietnam's experience in context: for each major US trading partner, we plot the change between 2017 and 2022 in the country's share of US imports, equivalently its export-market share in the US, against the change in China's share of the country's own imports. Thus, moving to the right indicates greater export-market share in the US, while moving upward indicates greater import sourcing from China. Vietnam

Figure 1: Tariffs and Trade Flows



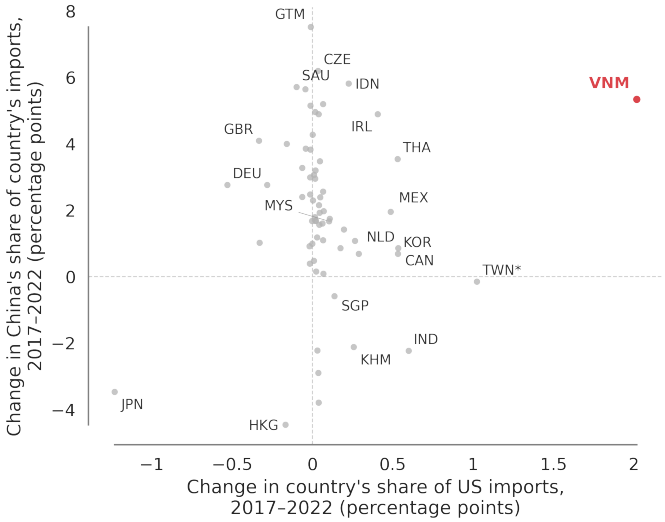
(a) US–China Trade-War Tariffs, 2018–2022

Notes: This figure shows average tariff rates during different phases of the US–China trade war (Bown, 2021).



(b) Annual Vietnamese Exports to the US and Imports from China, 2010–2022

Notes: This figure shows annual Vietnamese exports to the US and imports from China from 2010 to 2022 using the CEPII BACI dataset.



(c) Changes in US Export-Market Share and Import Sourcing from China across US Trading Partners, 2017–2022

Notes: This figure shows the change from 2017 to 2022 in each US trading partner's share of US imports, equivalently its export-market share in the US, against the change in China's share of the partner's own imports, using destination-reported UN Comtrade values. The sample is 66 countries with at least $1 billion in exports to the US and in imports from China in 2017, excluding China and the US. Vietnam is highlighted. TWN* denotes Comtrade's Other Asia, nes category, used as a proxy for Taiwan.

stands out along both dimensions. Its share of US imports rose by 2 percentage points, the largest gain among US trading partners. This increase accounted for about 42% of China's 4.8 percentage point decline in its share of US imports. At the same time, China's share of Vietnam's imports rose by 5.3 percentage points.

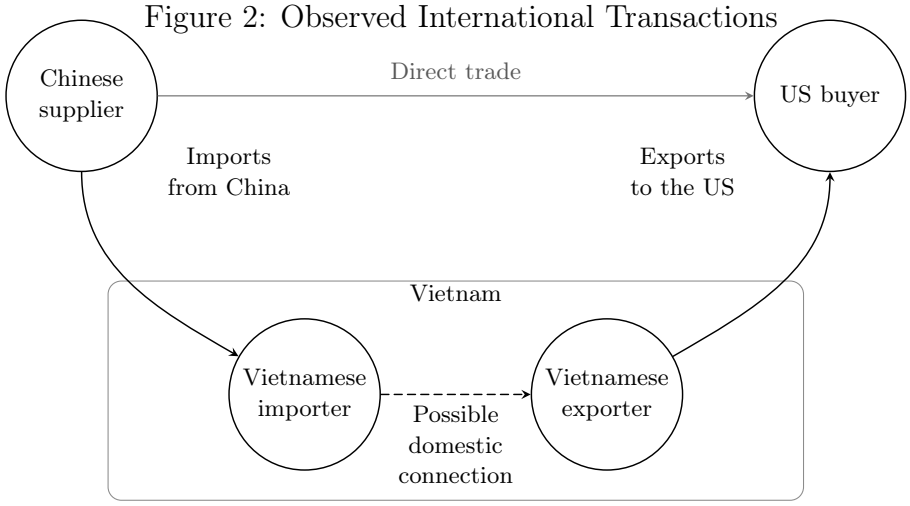
Several developments contributed to these trade patterns. First, Vietnamese exports to the US were already rising before 2018, following the US–Vietnam Bilateral Trade Agreement in 2001, which expanded export opportunities, firm entry, and formal employment (McCaig and Pavcnik, 2018; McCaig et al., 2022). Second, the tariffs may have encouraged firms already operating in Vietnam to expand production. Some China-based American manufacturers adopted a "China-plus-one" strategy, shifting part of their production to Vietnam while retaining operations in China (China Briefing, 2019). Third, the tariffs may have induced multinational firms operating in China to enter Vietnam by building new factories and hiring workers. These factories can continue sourcing inputs from China while adding value in Vietnam, a pattern supply-chain analysts have termed a "China Thru One" strategy (Gatehouse, 2024).

2.3 Rerouting and Relocation Patterns

To understand how to measure China-linked trade reallocation to Vietnam, it is instructive to examine how rerouting and relocation have occurred in practice. We highlight key patterns from documented tariff circumvention investigations by Vietnamese and US customs authorities.

Figure 2 shows the international transactions typically observed by customs officials prior to commencing an investigation. Vietnamese customs officials can observe the declared identities of the Chinese supplier and the Vietnamese importer in an import record; an export record identifies the Vietnamese exporter and the US buyer. US customs officials can observe imports by US buyers from both Vietnam and China. The open question is about what happens within Vietnam.

Figure 2: Observed International Transactions

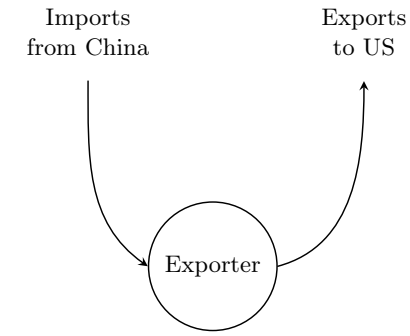


Notes: This figure is a stylized depiction of information typically observed by Vietnamese and US customs authorities prior to an investigation. Dashed lines represent unobserved flows.

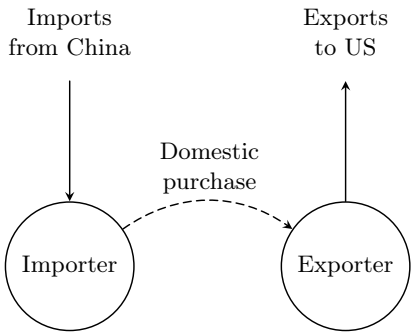
In a 2019 guidance document aimed at identifying origin misclassification of onward exports, Vietnamese customs authorities distinguished between activities that could constitute rerouting and those that reflected genuine production (General Department of Vietnam Customs, 2019, Section II). Figure 3 illustrates three possible arrangements. In Figure 3a, rerouting is carried out by the same firm that is both the importer and exporter of record. For example, Vietnamese customs investigated Pute Production and Trading because some of its shipments of coaxial cable imported from China were found, upon inspection, in packages marked "Made in Vietnam," presumably to facilitate onward reexport while disguising the goods' true origin (Lê Ngân, 2023; Thái Bình, 2023).

In Figure 3b, rerouting involves domestic purchases between multiple firms: an exporter buys products from one or more firms that import the goods from China. A 2019 US customs investigation found that some imports of plywood from Vietnam actually originated from China because, upon inspection, the Vietnamese exporter's observed production capacity was not commensurate with its exports (U.S. Customs and Border Protection, 2019, pp. 4–5). Instead, a trading company in Vietnam imported the plywood and delivered those shipments to the exporter's premises (U.S. Customs and Border Protection, 2020, pp. 6–7). Another

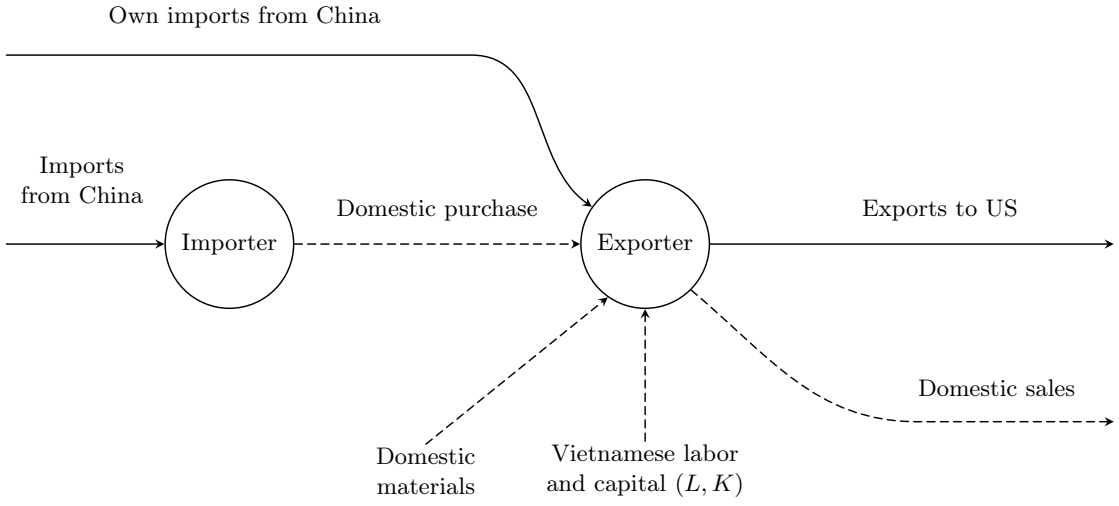
Figure 3: Rerouting and Production by Vietnamese Exporters



(a) Rerouting through a single firm



(b) Rerouting through multiple firms



(c) Production using Chinese inputs

Notes: These figures illustrate rerouting through one firm, rerouting through multiple firms, and production using Chinese inputs. A firm may combine these activities. Solid arrows identify border transactions available in customs records. Dashed arrows depict domestic transfers, input use, and sales.

US customs investigation found evasion involving quartz-surface products shipped through affiliated firms in Vietnam under common Chinese management (U.S. Customs and Border Protection, 2023).

The third pattern in Figure 3c depicts genuine production: the exporter uses imported materials in production alongside domestic inputs, labor, and capital, and sells output both domestically and abroad. Chinese materials can reach it through its own imports or through domestic suppliers. In 2022, US customs officials initially suspected that wooden cabinets imported into the US by BGI Group from HOCA Kitchen and Bath Products in Vietnam were actually produced in China because of HOCA's substantial imports from China (U.S. Customs and Border Protection, 2022b, p. 5). However, after US customs authorities conducted a surprise visit to HOCA's Vietnamese factory, the agency ruled that HOCA's exports did not constitute transshipment because its inputs imported from China went through eleven production stages that substantially transformed them (U.S. Customs and Border Protection, 2022a, pp. 7–9).

These illustrations are stylized for ease of exposition, but actual arrangements can be more complex, combining several of these activities. For example, in 2020 Vietnamese customs authorities suspected Hong Trien Co., Ltd. of engaging in rerouting because it imported colored rubber bands in packaging bearing "Made in Vietnam" labels, matching the pattern in Figure 3a; however, it also had a manufacturing plant in Bac Giang that produced rubber bands, plastic bags and fabric handbags, and imported raw materials consistent with the pattern in Figure 3c (General Department of Vietnam Customs, 2020, pp. 1–2).

These examples show that rerouting and production can each involve one or several firms. Physical proximity and common ownership can reduce the costs of moving goods and coordinating transactions. These distinctions guide the construction and validation of our measures.

3 Data

All dollar amounts are in US dollars. In this study, we combine the following data:[6]

Trade Flows. We obtain transaction-level customs data from S&P Global Panjiva (Panjiva). The data cover over one billion international trade shipments across 17 countries. In this project, we focus on inflows and outflows from Vietnam from January 2018 through December 2022 across all modes of transport (sea, air, and land). The key variables we use are the unique shipment ID, arrival date, shipment value, unit value, quantity, importer name and ID, exporter name and ID, source and destination countries, and the 8-digit HS code. These data enable us to construct transaction-based measures of rerouting. Crucially, Panjiva reports each Vietnamese firm's tax ID, which enables us to link the customs data with firm-level characteristics in the Vietnam Enterprise Survey. Import records contain consignee addresses and export records contain shipper addresses, which allow us to assign shipments to the Vietnamese firm's recorded province. To validate our rerouting measure constructed from the Vietnam customs data, we use linked Chinese exporter–US importer transactions from data on US maritime import bills of lading from 2016 to 2022, also obtained from Panjiva.

Firms Operating in Vietnam. We obtain firm characteristics from the Vietnam Enterprise Survey (VES) conducted by the General Statistics Office of Vietnam, which includes annual information for more than 1.2 million unique establishments from 2000 to 2022. We observe firm founding year and balance sheet 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, and among foreign-owned firms, the top three foreign capital source countries. We merge the VES with Panjiva using firms' Vietnamese tax IDs. This allows us to construct imported content measures at the firm level and to examine

[6] Appendix A provides additional details on data construction.

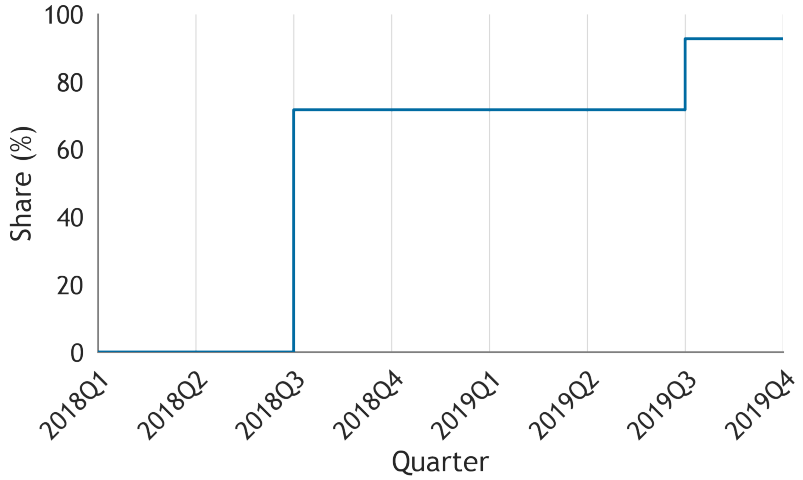
how firm ownership and entry status contributed to the tariff-induced changes in rerouting and imported content.

Tariffs. We obtain HS 6-digit country-month tariff values from Bown (2021).[7] We use reports of monthly changes in US import tariffs at the product and trade partner level in 2018 and 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.[8] We assign the tariffs to products at the HS 6-digit level; throughout the paper, HS 6-digit codes are harmonized to the 2017 revision of the Harmonized System. We consider only the first announced tariff increase for each product, as these increases were widely considered to be unanticipated and plausibly exogenous to firm decisions. Ultimately, 92.6% of the HS 6-digit product categories appearing in Vietnam's exports and imports were affected. Figure 4 displays the cumulative share of affected 6-digit products over time. Therefore, our empirical analysis primarily exploits variation between source countries and in the timing of tariff announcements, rather than variation across affected and unaffected products.

[7]Although US trade war tariffs were generally set at the 8-digit and 10-digit levels, we match with Vietnamese 6-digit codes because this is the finest level at which product codes are comparable across countries.

[8]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.

Figure 4: Share of Vietnamese HS 6-Digit Products Targeted by US Tariffs on China



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

4 Measurement

In this section, we present our approach to developing empirical proxies for the domestic channels depicted in Figure 3 through which imports from China may contribute to Vietnam's exports to the US. First, we construct a measure of potential rerouting using import and export transaction flows for the same product, period, and spatial unit. Next, we use exporters' own intermediate import shares to estimate Chinese imported content in exports net of potential rerouting. Finally, we present evidence to support the interpretation of these measures as consistent with rerouting and domestic production linked to China.

4.1 Measuring Potential Rerouting

Potential rerouting measures how much of Vietnam's exports to the US could be accounted for by imports of the same product. Let g index goods under a chosen product classification, o index origin countries for imports, t index time windows, and v index spatial units, such as firms or provinces, used to match import flows, M^o, with export flows to the US, X^{USA}.

For product g, period t, and spatial unit v, potential rerouting is:

$$R^o_{vgt} = \min\{X^{USA}_{vgt},\, M^o_{vgt}\} \tag{1}$$

Therefore, R^{CHN}_{vgt} is the value of exports to the US that can potentially be accounted for by contemporaneous imports of the same product from China. The minimum operator imposes the accounting restriction that potentially rerouted exports cannot exceed exports to the US or imports from China. We construct the measure using trade values because transaction quantities are not reported in comparable physical units across transactions.[9]

For R^o_{vgt} to be informative about tariff-induced changes in rerouting, the product definition, period, and spatial unit would ideally accommodate relevant import and export transactions while limiting overlap between unrelated flows. Our preferred approach is to use 8-digit HS codes for the product classification, quarters for the temporal window, and provinces as the spatial unit. We discuss each of these choices in the following subsections.

To facilitate comparison across rerouting defined at varying levels of granularity, we construct a common annual rerouted share of exports to the US by aggregating Equation (1) across units, products, and time periods within a calendar year. For a given source country o and calendar year a, the aggregate rerouting share of exports to the US is:

$$r^o_a = \frac{\sum_{t\in a}\sum_g\sum_v R^o_{vgt}}{\sum_{t\in a}\sum_g\sum_v X^{USA}_{vgt}} \tag{2}$$

where the sum over $t \in a$ runs over the periods in year a.

[9]Using values instead of quantities understates the rerouted share when export prices exceed import prices, as is likely the case for many rerouted shipments. Therefore, the levels of our rerouted-share measure are likely biased downward, but changes may still be measured accurately if the gap between export and import prices is relatively stable over time. In Section 6.3, we check robustness using a quantity-based measure on lines with standardizable quantity units; Table A.11 reports the comparison.

4.1.1 Choosing the Product Level

Our preferred measure matches flows at the HS 8-digit level to limit comparisons between inputs and the goods produced from them. Intermediate and final goods can share an HS 4- or HS 6-digit code. For example, a refrigerator manufacturer importing condensers and evaporators (HS 8418.99.10) from China and exporting refrigerated display cases (HS 8418.50.99) to the US could be classified as rerouting at the HS 4-digit level, but not at the HS 6- or HS 8-digit level.

However, rerouted goods can also be declared under a different product code either through strategic misdeclaration or because of minimal processing that would still be legally considered rerouting. To assess sensitivity to these exclusions, we repeat our main analyses using a grouping of similar products in Section 6.3 and report broader product definitions in Appendix Table A.2.

4.1.2 Choosing the Temporal Window

We use quarters as the baseline temporal window. A short window can miss connected imports and exports separated by customs processing, transport, or inventory holding. A longer window accommodates these lags but also allows more unrelated imports and exports to overlap. Quarters balance these considerations.

In practice, the choice of temporal window is not empirically consequential. Table A.2 shows that across product and spatial definitions, the largest ratio between rerouting measured at yearly and monthly levels is about 1.5.

4.1.3 Choosing the Spatial Unit

We consider three nested spatial resolutions based on the identities and addresses in customs records: firm, province, and country. Firm-level matching requires the same firm within a province to conduct both transactions.[10] Province-level matching allows for rerout-

[10]In principle, firm-level matching could also connect the same firm's establishments across provinces. Such flows are captured only by the country-level measure. Table A.2 suggests that including these connec-

ing through multiple firms within the same province. Country-level matching allows for connections across provinces.[11]

Table 1: Aggregate Rerouting Shares at Varying Spatial Units

	2018 (1)	2022 (2)	Change (3)	% Change (4)
Country	14.3	22.0	7.7	53.8%
Province	5.5	8.6	3.1	56.5%
Firm	1.4	1.7	0.3	21.8%

Notes: This table shows the percentage of total Vietnamese exports to the US identified as potentially rerouted from China at the quarterly and HS 8-digit levels with varying spatial units of measurement.

Unlike our choice of temporal window, the spatial unit has large quantitative implications for the measured rerouting share. Table 1 reports aggregate rerouting shares in 2018 and 2022 for country-, province-, and firm-level definitions, fixing the product level at HS 8 digits and the time window at quarters. In both years, the country-level measure is about 2.6 times the province-level measure, and the province-level measure is 3.9 to 5.1 times the firm-level measure. The growth rate between 2018 and 2022 does not vary monotonically with the spatial unit: province-level matching yields the highest growth rate, 56.5%, while firm-level matching yields the lowest, 21.8%. Broader matching risks pairing imports intended for domestic consumption or production with unrelated exports. For example, in combed wool yarn (HS 5107.10.00), transaction and enterprise records suggest that imports were mainly used by apparel manufacturers in Nam Dinh and Tay Ninh, while most US-bound exports in 2021 came from a Swiss-owned yarn factory in Lam Dong.

To guide our choice of spatial unit, we conduct two exercises. First, we examine whether potential routes through Vietnam connect Chinese suppliers and US buyers who traded the same product directly before the trade war. This is consistent with rerouting substituting for direct trade. We construct a candidate route by pairing an import from a Chinese

tions has little effect on aggregate rerouting.

[11]Rerouting could also occur through firms in multiple intermediate countries, but that is beyond the scope of this study. In practice, the trade costs of rerouting through multiple countries are likely to be too high relative to within-country rerouting.

supplier with an export to a US buyer of the same HS 8-digit product in the same quarter, applying each spatial matching rule. Appendix Figure A.4 illustrates the construction: two matched suppliers selling to a Vietnamese importer and two matched buyers purchasing from a Vietnamese exporter in the same province generate four eligible supplier–buyer pairs.

We match the Chinese suppliers and US buyers to US maritime import records from 2016–2017. For this comparison, both firms must have traded the same HS 6-digit product in the pre-trade war US data, but they need not have traded with one another. Each eligible supplier–buyer–product combination is counted once, at the narrowest spatial level connecting it during the product's eight-quarter validation window: within a firm, otherwise within a province, otherwise across provinces. We report the share of these combinations that traded directly before the trade war. Thus, the province and country comparisons measure the additional relationships recovered by broader matching. Appendix B.5 gives the product-specific windows and sample details.

Suppliers and buyers with more trading partners are more likely to be connected by chance. We therefore compare the observed share with shares from 1,000 reshuffles of the pre-trade war network. The network includes all pre-trade war links between Chinese suppliers and US buyers observed anywhere in the cleaned Vietnamese trade data over 2018–2022, across all products, including firms without a candidate route. Following Maslov and Sneppen (2002), each reshuffle changes trading partners while preserving each supplier's and buyer's number of partners within an HS 6-digit product. For spatial level h, let N_h be the number of eligible combinations, N_h^{obs} the number that traded directly before the trade war, and N_{hj}^{sim} the number connected in reshuffle j. We report the observed share N_h^{obs}/N_h, the mean simulated share $J^{-1}\sum_{j=1}^{J} N_{hj}^{\text{sim}}/N_h$, and their ratio:

$$\frac{N_h^{\text{obs}}}{J^{-1}\sum_{j=1}^{J} N_{hj}^{\text{sim}}}, \qquad J = 1{,}000. \tag{3}$$

A ratio above one means that candidate routes recover more pre-trade war relationships than

the reshuffled networks do. Rerouting is still defined at HS 8 digits; we pool the candidate combinations to HS 6 digits for comparison with the US data.

Our second exercise compares unit values on the Vietnamese import and export legs of candidate routes. Rerouting is more likely to be profitable if the same good is imported at a lower price than it is exported. For spatial level h, let $\mathcal{P}_h$ be the set of candidate route-quarters with comparable unit values on both legs. For observation $n \in \mathcal{P}_h$, let p_n^M and p_n^X denote the import and export unit values. We report the share with import unit value at or below export unit value and the median log price difference:

$$\phi_h = \frac{1}{|\mathcal{P}_h|} \sum_{n \in \mathcal{P}_h} \mathbf{1}\{p_n^M \leq p_n^X\}, \qquad \text{median}_{n \in \mathcal{P}_h} \left(\log \frac{p_n^X}{p_n^M} \right). \tag{4}$$

Here $|\mathcal{P}_h|$ is the number of route-quarter observations with usable price data.

True rerouting need not satisfy either condition.[12] These exercises provide evidence on how the additional connections admitted by broader spatial matching compare with those within a firm. Table 2 reports the results; Appendix B.5 provides additional details.

In columns (1)–(3) of Table 2, 27.61% of eligible combinations within a firm recover a pre-trade war relationship, compared with 5.46% in the reshuffled networks, a ratio of 5.06. The additional relationships recovered within a province and across provinces are 1.38 and 1.23 times their respective benchmarks. Columns (4)–(6) compare import and export unit values. The share with import unit value at or below export unit value is 68.4% within a firm, 58.1% between firms in the same province, and 56.8% across provinces. These results suggest that country-level matching may not capture many additional true rerouting cases relative to our province-level measure, while introducing noise from possibly unrelated transactions. Therefore, we choose the province-level measure as a baseline.

For the remainder of the paper, our benchmark rerouting measure defines v as a Viet-

[12]For example, new US affiliates established to facilitate rerouted imports would not have traded with any Chinese supplier before the trade war. Transfer pricing or underinvoicing may also produce export unit values below import unit values. Therefore, we do not impose these conditions when constructing the rerouting measure.

Table 2: Pre-trade War Trading Partners and Price Differences by Spatial Unit

	Pre-trade War Trading Partners			Import-Export Price Differences		
	Observed share (%) (1)	Simulated share (%) (2)	Observed / Simulated (3)	Priced Route-Quarters (4)	Share $p^M \leq p^X$ (5)	Median $\log(p^X/p^M)$ (6)
Firm	27.61	5.46	5.06***	14,808	0.6836***	0.634***
			(0.17)		(0.0051)	(0.024)
Province (cross-firm only)	1.44	1.04	1.38***	1,100,873	0.5810***	0.447***
			(0.07)		(0.0006)	(0.004)
Country (cross-province only)	0.75	0.61	1.23***	7,574,637	0.5679***	0.336***
			(0.05)		(0.0002)	(0.001)

Notes: Columns (1)–(3) report the observed match share, mean share across 1,000 reshuffles, and their ratio. Each eligible supplier–buyer–HS6 combination is assigned once to its narrowest spatial level. Parentheses in column (3) contain the ratio's standard deviation under reshuffling. Column (4) counts priced route-quarters; columns (5) and (6) report the share with $p_n^M \leq p_n^X$ and the median log price difference. Price standard errors resample complete routes in 1,000 bootstrap draws. The trading-partner test uses the share of reshuffles at or above the observed match share. We conduct two-sided tests of a price share of one half and a median log price difference of zero. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

namese province, g as an HS 8-digit product, and t as a calendar quarter; $g_{(6)}$ denotes an HS 6-digit product and a a calendar year.

4.2 Measuring Chinese Imported Content

We measure Chinese inputs embodied in Vietnam-to-US exports, net of potential rerouting, using a firm-level vertical-specialization approach in the spirit of Hummels et al. (2001) and Flaaen et al. (2025). In the production arrangement in Figure 3, imported materials enter production alongside domestic inputs, labor, and capital, and output is sold both domestically and abroad. Attributing those materials to exports requires an assumption about their use across sales.

For this measure, firm f denotes a tax-ID-level firm formed by aggregating all of its establishments in Vietnam. For each firm, source country o, and quarter t, we construct an import intensity m_{ft}^o, the share of intermediate imports in revenue:

$$m_{ft}^o = \frac{\widetilde{M}_{ft}^o}{Y_{ft}}, \tag{5}$$

where $\widetilde{M}^o_{ft}$ denotes firm f's intermediate imports from source country o in quarter t, net of allocated potential rerouting, and Y_{ft} denotes annual firm revenue allocated to the quarter. Intermediate inputs are identified via the Classification by Broad Economic Categories (BEC). Appendix B.2 describes the revenue construction.

Imported content from source country o embodied in firm f's exports of product $g_{(6)}$ to the US is the amount:

$$C^o_{fg_{(6)}t} = m^o_{ft} \times \widetilde{X}^{USA}_{fg_{(6)}t}, \tag{6}$$

where $\widetilde{X}^{USA}_{fg_{(6)}t}$ is firm f's exports of product $g_{(6)}$ to the US in quarter t, net of allocated potential rerouting. We allocate potential rerouting to firms and subtract it from imports and exports, leaving revenue unchanged; Appendix B.1 describes the allocation.

We then aggregate across exporters and divide by total exports to the US to obtain the share:

$$c^o_{g_{(6)}t} = \frac{\sum_{f \in \mathcal{F}_{g_{(6)}t}} C^o_{fg_{(6)}t}}{\sum_{f \in \mathcal{F}_{g_{(6)}t}} X^{USA}_{fg_{(6)}t}}, \tag{7}$$

where $\mathcal{F}_{g_{(6)}t}$ is the set of firms exporting product $g_{(6)}$ to the US in quarter t. The denominator is the product's total exports to the US in the quarter, so the rerouting share and the imported-content share of a product-quarter have the same denominator and can be added. Our main measure of Chinese imported content is $c^{CHN}_{g_{(6)}t}$, the share of Vietnam-to-US exports in a product-quarter accounted for by Chinese imported inputs, excluding goods classified as rerouted.[13]

This approach has two limitations. First, it cannot account for indirect Chinese imports purchased through domestic suppliers, as depicted in Figure 3c. Second, it relies on the assumption that imported inputs are used in production in proportion to their share of

[13]Intuitively, this measure captures differences across exporters in their propensity to source inputs from country o, relative to their gross output.

revenue. However, it can capture changes over time in the kinds of trade linkages that firms exporting to the US tend to have with China, and the firm-level approach avoids some of the aggregation bias that may arise from using industry-level trade and input-output measures, as discussed in Bems and Kikkawa (2021).

4.3 Measure Validation

How consistent are our constructed measures with the two margins of China-linked production that we aim to capture? To fix ideas, we first revisit the example of the HOCA investigation described in Section 2.3: the initial evasion finding was overturned after a review of evidence on the firm's production process (U.S. Customs and Border Protection, 2022a). Figure A.2 in the appendix illustrates the trade and production patterns we observe in our data for HOCA. Our preferred province-HS8-quarter rerouting measure classifies 4.4% of HOCA's exports to the US from 2018 to 2022 as potentially rerouted from China, while imported content from China accounts for 27.9% of its US exports. It employed about 332 workers annually on average over 2019–2022, the years observed in the enterprise survey, with average capital of $3.6 million relative to average annual revenue of $40.8 million.

Contrast this with Pute, illustrated in Figure A.3, where Vietnamese customs reported Chinese-origin cable bearing Vietnamese-origin labels (Lê Ngân, 2023; Thái Bình, 2023). Our measure classifies 43.3% of its coaxial-cable exports to a single US buyer in the eleven matched quarters between 2019Q4 and 2022Q3 as potentially rerouted from China, while imported content from China accounts for 20.3% of its coaxial-cable exports to all US buyers over 2018–2022. It employed about 35 workers annually on average over 2019–2022, the years observed in the enterprise survey, with average capital of $0.35 million relative to average annual revenue of $14.0 million. Furthermore, the Chinese supplier and US buyer on the matched transactions traded about $41.4 million in coaxial cable directly in 2016–2017, and $6.8 million from 2019Q4, when we first observe the matched Pute transactions, through 2022Q4.

In this section, we conduct three exercises to assess whether our empirical proxies vary in ways consistent with rerouting and production relocation and can meaningfully distinguish between the two margins. Both measures refer to trade from China.

In our first exercise, we examine the operating profiles of firms by the rerouting and imported-content measures. If rerouting involves limited processing, while China-linked production may still involve substantial processing, then we should expect rerouters to have disproportionately high exports and revenue relative to their production capacity, while imported-content exporters should have comparable production profiles to other exporters.

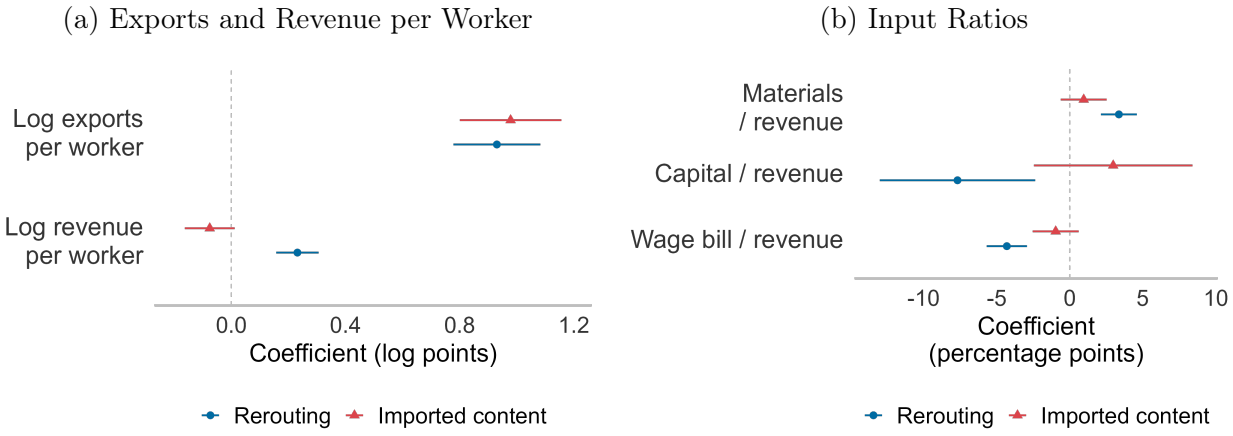
We compare three groups of US exporters over 2018–2022: rerouters, whose potentially rerouted share of gross US exports, pooled over products and years, is above the median across US-exporting firms; non-rerouting firms with positive Chinese imported content; and other US exporters. Appendix B.6 provides further details on the sample construction. For each firm-year we estimate

$$y_{fa} = \beta_R \, \mathbf{1}\{f \in \mathcal{R}\} + \beta_C \, \mathbf{1}\{f \in \mathcal{C}\} + \alpha_{g^*(f),a} + \varepsilon_{fa}, \tag{8}$$

where y_{fa} is one of five outcomes: $\log(X_{fa}/L_{fa})$ and $\log(Y_{fa}/L_{fa})$, which measure total exports and revenue per worker, or K_{fa}/Y_{fa}, Z_{fa}/Y_{fa}, and W_{fa}/Y_{fa}, which measure capital (long-term assets), materials, and the wage bill relative to revenue; $\mathcal{R}$ and $\mathcal{C}$ are the sets of rerouters and imported-content firms, so other US exporters are the omitted group; and $\alpha_{g^*(f),a}$ is a fixed effect for the firm's main HS 6-digit product by year.

The results are shown in Figure 5. The estimates imply that rerouters have about 154% higher total exports per worker and 26% higher revenue per worker than other exporters of the same main product in the same year. They also appear to be more intermediate-input-intensive and less capital- and labor-intensive than other exporters. By contrast, Chinese imported-content firms also export more per worker but do not appear to have significantly different production profiles from other exporters of the same products. Their lower revenue

Figure 5: Sales per Worker and Input Use



Notes: This figure reports coefficients on the rerouter and imported-content indicators, both defined using trade from China, relative to other US exporters, from firm-year regressions on VES firms exporting to the US, 2018 to 2022, with main-HS6 by year fixed effects and clustering by main HS6. Panel (a) shows exports and revenue per worker in log points and Panel (b) the ratios of capital, materials and the wage bill to revenue in percentage points, with 95% confidence intervals.

per worker despite higher exports per worker suggests that they are export-oriented rather than involved in producing for the domestic market.

Our second exercise is premised on the idea that rerouting should be more attractive when Vietnam is a poor substitute for Chinese production while production relocation is more attractive when Vietnam is a good substitute. If production relocation to Vietnam is driven by relatively lower labor costs, producers of capital-intensive goods may be more likely to choose rerouting over production relocation. We measure capital intensity as the ratio of total assets to sales using pre-trade war data from China's 2005 Annual Survey of Industrial Production. Appendix B.7 describes its construction. We estimate

$$y_{vg_{(6)}a} = \beta z_{g_{(6)}} + \alpha_a + \varepsilon_{vg_{(6)}a}. \tag{9}$$

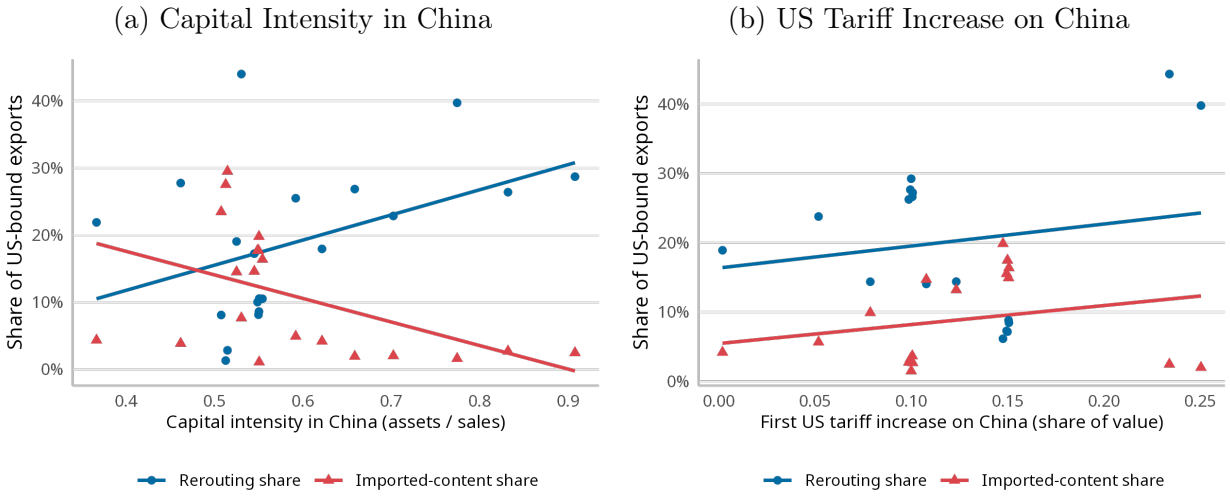
Here, v indexes provinces, $g_{(6)}$ indexes HS 6-digit products, and a indexes years. The outcome $y_{vg_{(6)}a}$ is either the rerouted share, $r^{CHN}_{vg_{(6)}a}$, or the imported-content share, $c^{CHN}_{vg_{(6)}a}$; both use gross exports to the US in the same province–HS6–year observation as the denomina-

tor. The explanatory variable $z_{g_{(6)}}$ is capital intensity, $k_{g_{(6)}}$, in this exercise and the tariff change, $\Delta\tau_{g_{(6)}}$, in the next. We estimate four separate regressions, one for each outcome and explanatory variable, allowing the coefficient β, year fixed effects α_a, and error term $\varepsilon_{vg_{(6)}a}$ to differ across regressions. Standard errors are clustered at the HS 6-digit product level. The estimated association between rerouting and capital intensity is positive and statistically significant: $\hat{\beta} = 0.375$ with a standard error of 0.061, as shown in Figure 6a. Moving from the 25th to the 75th percentile of capital intensity across products in the estimation sample, from 0.53 to 0.72, is associated with an increase of about 7.1 percentage points in the rerouted share. On the contrary, imported content has a negative association with capital intensity in China, with a slope of -0.351.

In our third exercise, both rerouting and imported content should be more common for products facing larger US tariff increases on Chinese goods. We estimate Equation (9) with $z_{g_{(6)}} = \Delta\tau_{g_{(6)}}$, each product's first announced US tariff increase on Chinese goods. Figure 6b shows the corresponding binned scatterplot. Both rerouting and imported content are positively associated with the trade war tariff increases, with similar slopes.

In Figure A.6 and Table A.6 in the appendix, we also examine direct China–US trade after a supplier and buyer first become connected by a possible rerouter in Vietnam. Direct trade in the potentially rerouted product falls relative to the same China–US dyad's other products facing tariff increases. The estimated decline is \$144,600 per product-quarter, and the probability of a shipment falls by 9.46 percentage points. These results are consistent with rerouting through Vietnam replacing some direct China–US trade following the tariff increases.

Figure 6: Rerouting and Imported Content from China by Capital Intensity and Tariffs



Notes: This figure shows binned scatters of the rerouted and imported-content shares of US-bound exports against (a) the product's capital intensity in China and (b) the US tariff increase on China. Both outcomes refer to China. The regression coefficients are reported in Table A.8.

5 Descriptive Patterns

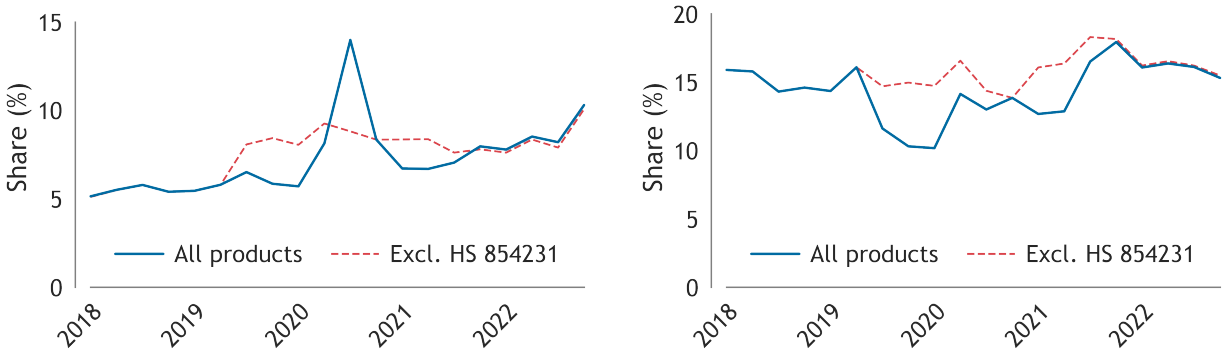
We begin by describing the aggregate evolution of the two China-linked margins. Figure 7a plots the share of Vietnamese exports to the US that we classify as rerouted under our preferred HS 8-digit, quarterly, province-level definition. The series increases gradually after the onset of the trade war, followed by a pronounced peak in 2020Q3. Because this peak coincides with the COVID-19 period, when trade flows were unusually volatile, we examine whether it reflects a broad increase in rerouting or the behavior of a narrow set of products.

The second series in Figure 7a excludes electronic integrated circuits, HS 854231, which experienced large pandemic-period supply-chain disruptions.[14] The comparison shows that integrated circuits account for the sharp spike in 2020Q3. Once this product is removed, the rerouted share increases moderately around 2019Q3 and remains at a higher level, reaching 10.30% in 2022Q4.

Figure 7b depicts the analogous time series for Chinese imported content embodied in

[14]For contemporaneous discussions of pandemic-related disruptions in semiconductor supply chains, see Suckling et al. (2021) and U.S. Government Accountability Office (2022).

Figure 7: Aggregate Rerouting and Imported Content from China over Time



(a) Rerouting

(b) Imported Content

Notes: This figure shows potential rerouting from China under the province, HS 8-digit, quarterly definition as a share of Vietnam's exports to the US from 2018Q1 to 2022Q4. The dashed series excludes electronic integrated circuits (HS 854231).

Notes: This figure shows imported content from China, net of potential rerouting, as a share of Vietnam's exports to the US from 2018Q1 to 2022Q4. The dashed series excludes electronic integrated circuits (HS 854231).

Vietnamese exports to the US. In the all-products series, the share is 15.90% in 2018Q1, reaches 17.94% in 2021Q4, and declines to 15.32% in 2022Q4. The second series excludes integrated circuits. Because imported content is measured net of rerouting, the 2020 rerouting spike depresses the measured imported-content share during that period. Excluding integrated circuits, the Chinese imported-content share was fairly stable until 2021, when it began to rise.

Additional figures in the appendix highlight variation by product end-use. Figure A.7 decomposes both margins by the Broad Economic Categories code (BEC). Figure A.7a shows that specific intermediates are the largest component of potential rerouting. In the customs data, potential rerouting rises from $0.83 billion in 2018 to $3.07 billion in 2020, $3.30 billion in 2021, and $3.54 billion in 2022.

Chinese imported content is larger in dollar terms, with consumer goods its largest component (Figure A.7b). It rises from $2.30 billion in 2018 to $4.17 billion in 2020 and $6.97 billion in 2021, then falls to $6.63 billion in 2022. These figures are customs values before the scaling used in the export-growth accounting below.

Figure A.8 shows potential rerouting as a share of each province's own exports to the US.

High shares appear along northern transport and industrial corridors, including provinces near the Noi Bai–Lao Cai Expressway, Bac Giang, and Lang Son, consistent with the idea that rerouting is facilitated by proximity to China.

5.1 Decomposing Export Growth

Between 2017 and 2022, China's share of US imports fell by 4.8 percentage points, while Vietnam's rose by 2.0 points, about two-fifths of China's loss (Figure 1c). The accounting in this subsection asks how much of Vietnam's growth remained linked to China through rerouting and Chinese inputs. We combine the rerouting and imported-content measures to decompose the growth of US imports from Vietnam between 2018 and 2022 into potential rerouting from China, Chinese imported content, imported content from the rest of the world, and a domestic value-added residual. Appendix F gives the scaling identity and assumptions.

Figure 8 reports the decomposition. US imports from Vietnam increased by $78.3 billion between 2018 and 2022. Rerouted goods from China account for 10.5% of this increase, or approximately $8.2 billion. Chinese imported content accounts for an additional 16.6%, or approximately $13.0 billion. Together, these two China-linked components account for 27.1% of Vietnam's export growth to the US.

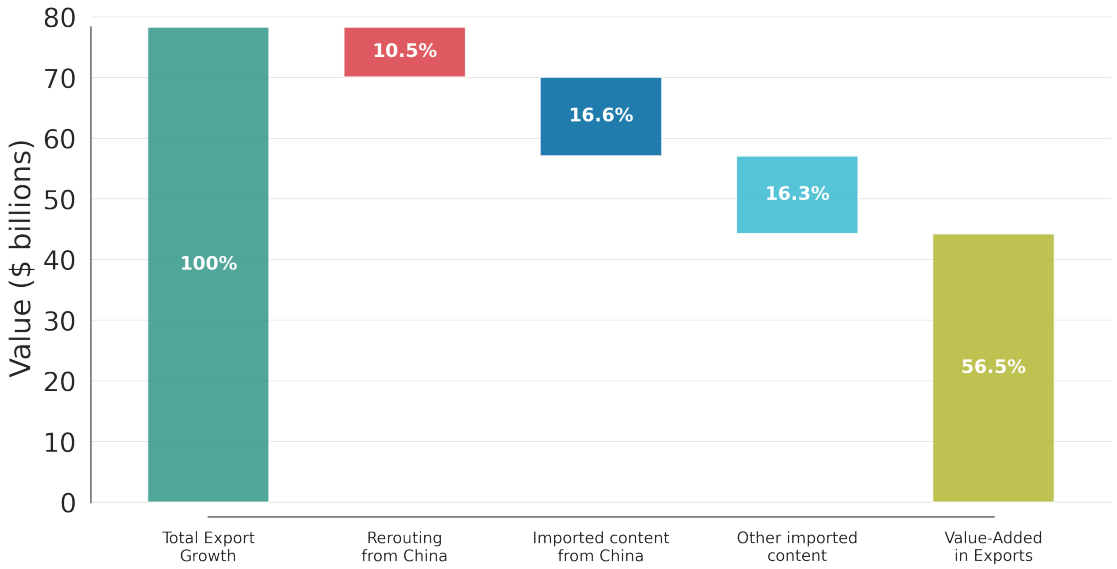
Our measures attribute 28% of Vietnam's gain in US import share between 2018 and 2022 to potential rerouting and Chinese inputs embodied in Vietnamese exports. The China-linked contribution is 0.59 percentage points of Vietnam's 2.06-point gain, equivalent to 13% of the decline in China's direct share over the same period. Appendix F.2 gives the calculation.

Imported content from the rest of the world accounts for 16.3% of export growth, or approximately $12.8 billion, while the domestic value-added residual accounts for 56.5%, or approximately $44.3 billion. Agarwal et al. (2026) estimate a domestic value-added share of about two-thirds for Vietnam's manufacturing exports, rising by more than 2 percentage points from 2018 to 2020.[15] Thus, rerouting was quantitatively meaningful but smaller

[15]Their estimates are shares of export levels; ours are shares of US-bound export growth.

than the increase in Chinese inputs embodied in Vietnamese production. The expansion combined rerouting, production in Vietnam, and inputs from China and other countries. These patterns are consistent with evidence that the trade war generated real economic gains in Vietnam (Wu, 2025).

Figure 8: Decomposition of Growth in US Imports from Vietnam



Notes: This figure decomposes the growth of US imports from Vietnam from 2018 to 2022 (USITC import values, billions of dollars) into potential rerouting from China, imported content from China, other imported content, and a residual labeled value added in exports. Bar labels are shares of total growth.

Table A.9 in the appendix reports the fifteen products with the largest growth of US imports from Vietnam between 2018 and 2022 and splits each product's growth into rerouting, Chinese imported content, and the remainder using the export-growth accounting; Appendix F describes the product-level calculation. The fifteen products account for 47.3% of the growth of US imports from Vietnam; rerouting accounts for 4.9% of their growth and Chinese content for 16.3%, compared with 10.5% and 16.6% in the aggregate accounting. For communication apparatus and telephones, the two largest products, Chinese content accounted for 27% and 15% of growth, respectively, while rerouting accounted for almost none. Static converters and processors are the only large products for which rerouting exceeds a quarter of growth. Footwear and the listed furniture products show little rerouting, but their Chinese imported-content shares vary.

6 The Impact of the US–China Trade War on China-Linked Exports to the US

6.1 Empirical Strategy

We estimate the effect of US trade-war tariffs on two China-linked margins in Vietnam's exports to the US: rerouting and imported content. The empirical design exploits three sources of variation. First, US tariff increases varied across HS 6-digit products. Second, tariff increases were implemented at different dates across products. Third, the tariffs we study applied to Chinese-origin goods rather than other source countries. The main comparisons ask whether, within the same product and quarter, China-linked flows through Vietnam increased relative to analogous flows from other source countries after US tariffs on Chinese goods rose.

This approach also addresses a limitation of our descriptive exercises in Section 5: our measure cannot distinguish between legitimate reexports and tariff circumvention through rerouting.[16] To the extent that legitimate reexport patterns are product-specific, source countries unaffected by US import tariff changes can help net them out.

The estimation sample is the benchmark panel: potential rerouting matched within a province at the HS 8-digit product and quarter and summed to the HS 6-digit product, covering all ownership and entry groups from 2018Q1 to 2022Q4. The unit of observation is an HS 6-digit product by import origin by quarter. We exclude Vietnam as an origin, products outside the China-tariff comparison universe, and products covered by the Section 201 and 232 actions. We retain products with positive exports to the US at some point in the window. The balanced panel contains 3,259 products by 40 origins by 20 quarters, or 2,607,200 observations; the rerouting and imported-content shares are zero where a product-origin-quarter has no matched trade or no content.

[16] Information on import and export regimes, such as goods for reexport, is not available in the Panjiva data.

Let $g_{(6)}$ index HS 6-digit products, o source countries, and t calendar quarters. For treated products, event time $e_{g_{(6)}t}$ is the number of quarters from the product's first US tariff announcement on Chinese goods to quarter t, so $e_{g_{(6)}t} = 0$ in the announcement quarter. For never-treated products, all event-time treatment interactions are set to zero. We estimate the dynamic specification:

$$y_{g_{(6)}ot} = \sum_{\substack{e=-4 \\ e\neq -1}}^{16} \beta_e \Delta\tau_{g_{(6)}o} \times \mathbf{1}\{e_{g_{(6)}t} = e\} + \alpha_{g_{(6)},t} + \alpha_{g_{(6)}o} + \alpha^{seas}_{o,q(t)} + \theta_t \, \pi_{g_{(6)}o} + \varepsilon_{g_{(6)}ot}. \tag{10}$$

The outcome $y_{g_{(6)}ot}$ is either the rerouted share of Vietnam-to-US exports associated with source country o, $r^o_{g_{(6)}t}$, or the imported-content share from source country o embodied in Vietnam-to-US exports, $c^o_{g_{(6)}t}$; both are defined below. Treatment, $\Delta\tau_{g_{(6)}o}$, equals the first announced US tariff increase on imports of product $g_{(6)}$ from China for treated products when $o = CHN$; it is zero for never-treated products and for all $o \neq CHN$.

We include fixed effects to absorb several sources of confounding variation. Product by calendar-quarter fixed effects, $\alpha_{g_{(6)},t}$, control for product-specific shocks to Vietnam's trade with all source countries in a given quarter. Product by source fixed effects, $\alpha_{g_{(6)}o}$, absorb permanent differences in Vietnam's sourcing patterns across products and countries. Source country by quarter-of-year fixed effects, $\alpha^{seas}_{o,q(t)}$, control for seasonal patterns, where $q(t) \in \{1, 2, 3, 4\}$ is the quarter of the year. The term $\theta_t \, \pi_{g_{(6)}o}$ is a calendar-quarter-specific slope in $\pi_{g_{(6)}o}$, the source country's pre-tariff mean share of the product's imports, allowing products with different pre-period sourcing patterns to follow different time paths. Standard errors are clustered at the HS 6-digit product level.

The identifying assumption is that, absent the US tariff increases on Chinese goods, China-linked outcomes would have evolved similarly to comparable outcomes for other source countries within the same product and quarter, conditional on the fixed effects and controls. Identifying variation comes from differences across source countries within a product-quarter, rather than from differences between treated and untreated products since few products are

untreated at the 6-digit level.

We also estimate a static specification that summarizes the average post-tariff response:

$$y_{g_{(6)}ot} = \beta \Delta\tau_{g_{(6)}o} \times \mathbf{1}\{e_{g_{(6)}t} \geq 0\} + \alpha_{g_{(6)},t} + \alpha_{g_{(6)}o} + \alpha^{seas}_{o,q(t)} + \theta_t \, \pi_{g_{(6)}o} + \varepsilon_{g_{(6)}ot}. \tag{11}$$

The coefficient β is the response to a 100-percentage-point tariff increase. To interpret magnitudes, we multiply β by the average tariff increase faced by Chinese products during the trade war.

Outcome: rerouting. The tariff variation is measured at the HS 6-digit level, while the rerouting measure is constructed using HS 8-digit product matches. We therefore aggregate the HS 8-digit rerouting measure to the HS 6-digit, source-country, and quarter level:

$$r^{o}_{g_{(6)}t} = \frac{\sum_{g \in \Omega_{g_{(6)}}} \sum_v R^{o}_{vgt}}{\sum_{g \in \Omega_{g_{(6)}}} \sum_v X^{USA}_{vgt}}. \tag{12}$$

Here, g indexes HS 8-digit products nested within HS 6-digit product $g_{(6)}$, $\Omega_{g_{(6)}}$ is the set of HS 8-digit products in HS 6-digit product $g_{(6)}$, v indexes provinces, and R^{o}_{vgt} is the potential rerouting amount of Equation (1). The numerator is the value of Vietnam-to-US exports of product $g_{(6)}$ in quarter t that can be matched to contemporaneous imports of the same HS 8-digit product from source country o into the same province. The denominator is the total Vietnam-to-US exports of the HS 6-digit product in that quarter. When o is China, this outcome is the rerouted share from China.

Outcome: imported content. For imported content, the outcome is $c^{o}_{g_{(6)}t}$, the source-country imported-content share of Equation (7): the imports from source country o embodied in firm exports of HS 6-digit product $g_{(6)}$ to the US in quarter t, net of goods classified as rerouted, summed over exporters and divided by the product's total exports to the US in that quarter, the same denominator as in Equation (12). When o is China, $c^{o}_{g_{(6)}t}$ measures Chinese imported content embodied in Vietnam-to-US exports. Estimating Equation (10)

and Equation (11) with this outcome tests whether US tariffs on Chinese goods increased reliance on Chinese inputs in Vietnamese production, relative to imported content from other source countries.

6.2 Results

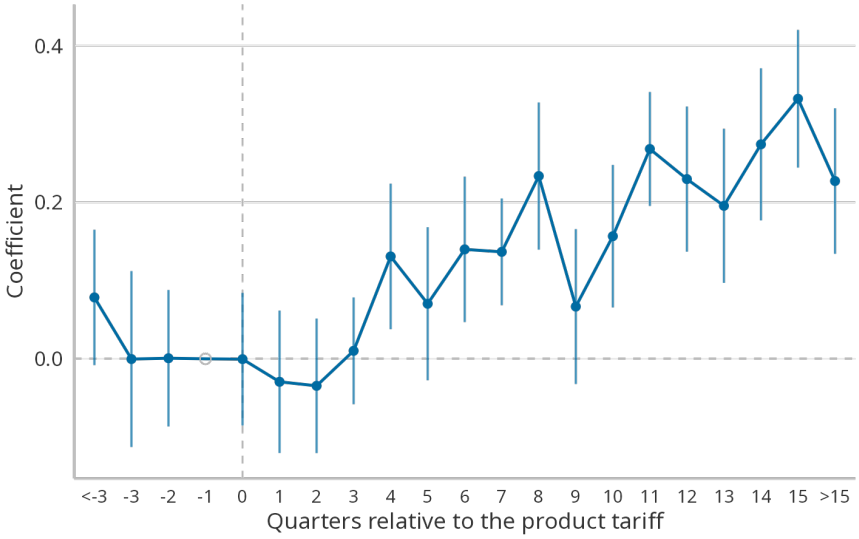
Rerouting. We first report how tariffs changed rerouting behavior. Figure 9 displays estimates of β_e from Equation (10) for province-level rerouting. The rerouting coefficients become positive about four quarters after the tariff announcement and continue to rise for most of the remaining sample period. This suggests that rerouting was not a temporary reaction to tariff increases but a strategic response that required some initial time to ramp up.

Column (1) of Table 3 shows the average post-tariff effect on rerouting following Equation (11). The coefficient on the tariff interaction is 0.1035 and is statistically significant at the 1% level. Given the average tariff increase of 12.24 percentage points, this estimate implies an increase of 1.27 percentage points in the rerouted share. Relative to the China-origin baseline mean of 0.121 in 2018Q1–Q2, this corresponds to an increase of 10.5%. Figure A.9 shows that the within-firm and across-firm components of the rerouting measure contributed fairly evenly to this increase.

Chinese imported content. Next, we examine whether trade-war tariffs increased Chinese input content in Vietnamese exports to the US. Figure 10 reports estimates of β_e from Equation (10). The estimated effect on the Chinese imported-content share does not become statistically significant until the fifth quarter after the tariff announcement.

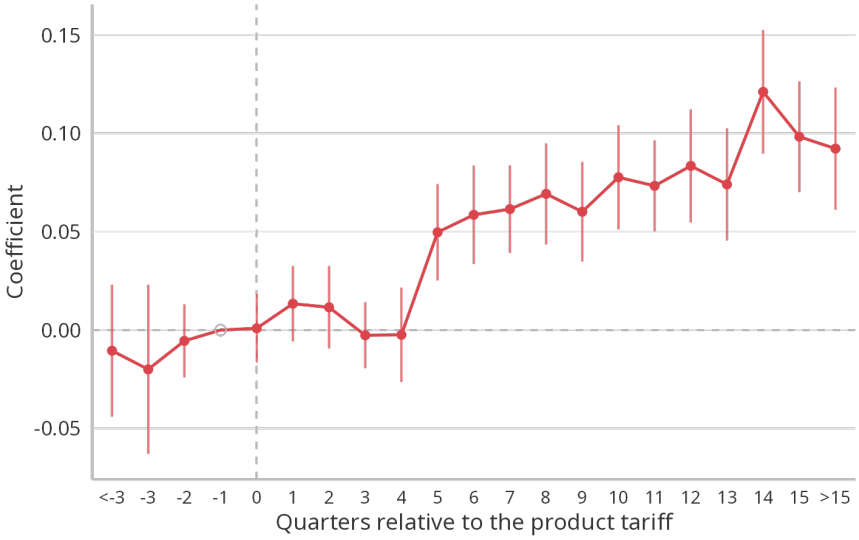
Column (2) of Table 3 reports the corresponding average post-tariff effect and shows that the coefficient on the tariff interaction is 0.0547 and is statistically significant at the 1% level. Evaluated at the average tariff increase of 12.24 percentage points, this estimate implies an increase of 0.67 percentage points in the Chinese imported-content share of Vietnam-to-US

Figure 9: Rerouting Response to US Tariffs on China



Notes: This figure shows event-study coefficients from Equation (10) for the rerouting share of Vietnam's exports to the US, with 95 percent confidence intervals; event time is quarters since the product's first US tariff announcement on China. Each observation is an HS 6-digit product by origin by quarter; standard errors are clustered by HS 6-digit product.

Figure 10: Imported-Content Response to US Tariffs on China



Notes: This figure shows event-study coefficients from Equation (10) for the imported-content share of Vietnam's exports to the US, with 95 percent confidence intervals. Each observation is an HS 6-digit product by origin by quarter; standard errors are clustered by HS 6-digit product.

exports. Relative to the China-origin baseline mean of 2.6% in 2018Q1–Q2, this corresponds to an increase of 25.8%.

Although the rerouting response was larger in absolute percentage-point terms, the imported-content response was larger relative to its baseline mean. Separately, the descriptive accounting in Section 5.1 shows that imported content accounted for a larger share of Vietnam's export growth than potential rerouting.

Table 3: Responses of Rerouting and Imported Content to US Tariffs on China

	Rerouted Share (1)	Imported Content Share (2)
Tariff × Post = 1	0.1035***	0.0547***
	(0.0191)	(0.0081)
China-origin mean, 2018Q1–Q2	0.121	0.026
Observations	2,607,200	2,607,200
R^2	0.54131	0.58702
Within R^2	8.06×10^{-5}	7.12×10^{-4}
Product-Origin fixed effects	✓	✓
Product-Quarter-Year fixed effects	✓	✓
Origin × quarter-of-year fixed effects	✓	✓
Pre-Tariff Import Share × Quarter-Year	✓	✓

Notes: This table reports estimates of Equation (11) for the rerouting share (column 1) and imported-content share (column 2) of Vietnam's exports to the US. The observation is an HS 6-digit product by origin by quarter, 2018Q1 to 2022Q4. The baseline mean is the China-origin mean of the outcome in 2018Q1–Q2. Standard errors in parentheses are clustered by HS 6-digit product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

6.3 Robustness

We assess the robustness of our baseline estimates to sample restrictions, alternative timing assumptions, and controls for contemporaneous trade-war policies. Table 4 shows the results. The rows are the rerouted share, its cross-firm and within-firm parts, which add to the total in every column, and the Chinese imported-content share.

Columns (1), (2) and (6) address sample composition. Column (1) excludes automobiles, a sector in which simultaneous imports and exports may arise naturally from complex cross-border production networks. Column (2) excludes HS 854231, the integrated-circuit product discussed in Section 5. Column (6) keeps only products with good coverage in 2018, those

Table 4: Robustness of Baseline Estimates

	Drop HS 87 (1)	Drop HS 854231 (2)	Uniform 2018Q3 date (3)	Sample ending 2020Q2 (4)	Retaliation control (5)	Well-covered products, 2018 (6)
Rerouted Share	0.1054***	0.1048***	0.1813***	0.0540***	0.1038***	0.1226***
	(0.0194)	(0.0191)	(0.0222)	(0.0207)	(0.0192)	(0.0225)
Cross-Firm Rerouted Share	0.0586***	0.0586***	0.1159***	0.0229	0.0581***	0.0672***
	(0.0179)	(0.0177)	(0.0211)	(0.0198)	(0.0177)	(0.0208)
Within-Firm Rerouted Share	0.0469***	0.0462***	0.0655***	0.0311***	0.0457***	0.0554***
	(0.0102)	(0.0100)	(0.0121)	(0.0110)	(0.0100)	(0.0121)
Imported Content Share	0.0528***	0.0547***	0.0585***	0.0228***	0.0547***	0.0445***
	(0.0081)	(0.0081)	(0.0070)	(0.0061)	(0.0081)	(0.0095)
Observations	2,571,200	2,606,400	2,607,200	1,303,600	2,607,200	2,032,000
Product-Origin fixed effects	✓	✓	✓	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓	✓	✓	✓
Origin × quarter-of-year fixed effects	✓	✓	✓	✓	✓	✓
Pre-Tariff Import Share × Quarter-Year	✓	✓	✓	✓	✓	✓

Notes: This table reports the average post-tariff effect from Equation (11) on the rerouting and imported-content shares of Vietnam's US-bound exports. Observations are HS 6-digit product by origin by quarter, 2018Q1 to 2022Q4 except in column (4), with product by origin, product by calendar quarter and origin by quarter-of-year fixed effects and calendar-quarter slopes in the pre-tariff import share. Standard errors are clustered by product; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

whose exports in Panjiva reach 75% of the value Vietnam reports to Comtrade for the product, reducing the influence of products for which pre-period measurement is less reliable; it retains 2,540 of the 3,259 products.

Columns (3) to (5) address treatment timing and contemporaneous policy changes. In Column (3), we replace the product-specific tariff quarter with a common treatment date of 2018Q3 for all treated products. This specification addresses the concern that firms may have anticipated later tariff waves after the first round of Section 301 tariffs. Both coefficients remain positive, although the rerouting coefficient rises from 0.1035 in the baseline to 0.1813 under the common date. Column (4) restricts the sample to quarters through 2020Q2, excluding the later COVID period. The rerouting estimate remains positive but is smaller than in the full sample, consistent with the event-study evidence that rerouting increased gradually over the post-tariff period. The Chinese imported-content estimate is also positive in the sample ending in 2020Q2, which includes the onset of the pandemic. Column (5) controls for Chinese retaliatory tariffs on US goods at the HS 6-digit product-by-quarter level. The estimates are similar to the baseline results, indicating that the responses are

not explained by contemporaneous Chinese tariff changes. The estimates remain positive in every column. In sum, these exercises support the interpretation that the baseline results reflect a broad response to the tariff increases rather than a specific timing assumption or product-composition artifact.

Alternative rerouting definitions. Table A.10 compares the province benchmark with matching across similar products; matching at the country, economic-region, and metropolitan-area levels; and matching within firms across provinces. These alternatives vary product comparability, spatial scope, and whether the same firm must conduct both transactions. The firm-across-provinces definition differs from the firm-within-province comparison in Table 1. All reported rerouting coefficients are positive and statistically significant. Appendix B.3 describes the definitions.

Quantity-based rerouting. Table A.11 compares the quantity-based measure with the value-based measure constructed from the same usable customs transactions and with the full-sample baseline. Columns (1) and (2) use the same export denominator. The tariff-response coefficient is 0.0965 using quantities, 0.0756 using values on the same transactions, and 0.1035 in the baseline; all three are significant at the 1% level. The positive response therefore holds under quantity measurement. The measured levels differ: in 2022, the province–HS 8-digit–quarter shares are 13.50% using quantities and 7.06% using values on the same transactions. Table A.3 reports the comparison at other aggregation levels.

7 Heterogeneity by Ownership and Incumbency

The arrangements in Figure 3 can depend on firms' access to suppliers and their ability to organize production. Existing Chinese supplier and parent-company relationships can reduce the costs of finding inputs, arranging transactions, and coordinating shipments. These connections can support both rerouting and production in Vietnam using Chinese inputs.

We therefore examine both outcomes for Chinese and Hong Kong-owned firms and for other ownership groups.

The comparison between entrants and incumbents asks how much adjustment occurs through new operations rather than the expansion or reorganization of existing firms. New foreign affiliates may draw on supplier networks already established in China, including when they undertake substantial production in Vietnam. New operations can also specialize in rerouting as a continuing activity. Both activities can persist.

We decompose the baseline rerouting and imported-content responses by ownership and entry status. Each group's contribution is divided by total exports to the US in the relevant product-quarter.

For rerouting, we first allocate province-level rerouted trade to firms within each province, HS 8-digit product, source country, and quarter. We then aggregate to the HS 6-digit product, source country, and quarter level. For a firm characteristic h, define

$$r^{o,h}_{g_{(6)}t} = \frac{\sum_{g\in\Omega_{g_{(6)}}} \sum_v \sum_f \mathbf{1}\{h_f = h\} \left(R^{o,\text{own}}_{fvgt} + R^{o,\text{exc}}_{fvgt}\right)}{\sum_{g\in\Omega_{g_{(6)}}} \sum_v \sum_f X^{USA}_{fvgt}}, \tag{13}$$

where $\mathbf{1}\{h_f = h\}$ is an indicator equal to one if firm f belongs to group h, X^{USA}_{fvgt} denotes firm f's exports of HS 8-digit product g to the US from province v in quarter t, and $R^{o,\text{own}}_{fvgt}$ and $R^{o,\text{exc}}_{fvgt}$ denote the potential rerouting from source country o allocated to firm f: the minimum of the firm's own two legs and its share of the province remainder, respectively. The denominator is total exports to the US in the product-quarter.

For imported content, we construct the analogous object using the imported-content value defined in Section 4.2. Let $C^{o}_{fg_{(6)}t}$ denote the value of imports from source country o embodied in firm f's exports of HS 6-digit product $g_{(6)}$ to the US in quarter t, net of rerouted trade. We define

$$c^{o,h}_{g_{(6)}t} = \frac{\sum_f \mathbf{1}\{h_f = h\}\, C^{o}_{fg_{(6)}t}}{\sum_f X^{USA}_{fg_{(6)}t}}, \tag{14}$$

where $X^{USA}_{fg_{(6)}t}$ denotes firm f's exports of product $g_{(6)}$ to the US. As with the rerouting decomposition, the denominator is total exports to the US in the product-quarter.

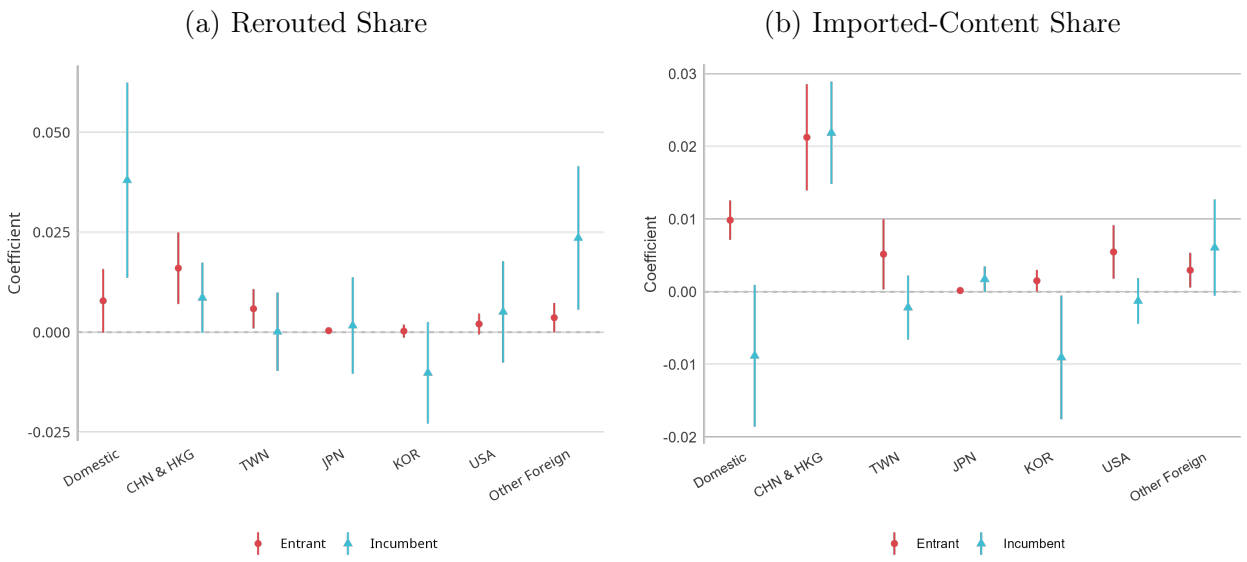
This normalization gives the measures an accounting property that is useful for interpretation. For any partition H of firms into mutually exclusive groups,

$$r^{o}_{g_{(6)}t} = \sum_{h \in H} r^{o,h}_{g_{(6)}t}, \qquad c^{o}_{g_{(6)}t} = \sum_{h \in H} c^{o,h}_{g_{(6)}t}. \tag{15}$$

Thus, the coefficients in the heterogeneity regressions can be interpreted as each group's contribution to the aggregate rerouting or imported-content response. When o is China, $c^{o,h}_{g_{(6)}t}$ is the contribution of group h to Chinese imported content.

We define ownership nationality as the foreign country contributing the largest share of a firm's foreign capital. For domestic firms, ownership is classified as Vietnamese. Incumbents appear in the VES before 2018; entrants first appear in 2018 or later.

Figure 11: Firm Ownership, Incumbency, and the Response to US Tariffs on China



Notes: This figure shows the average post-tariff effect from Equation (11) by exporter ownership and incumbency, 2018Q1 to 2022Q4, with each group's potential rerouting (Panel (a)) and imported content (Panel (b)) divided by total US-bound exports in the HS 6-digit product-quarter. Bars are 95 percent confidence intervals from standard errors clustered by HS 6-digit product.

Figure 11 and Table A.12 report the results. The rerouting response is dispersed across ownership groups. Domestic firms account for the largest positive contribution, followed by other foreign firms and Chinese and Hong Kong-owned firms. The domestic contribution is concentrated among incumbents, while the Chinese and Hong Kong contribution is split between incumbents and entrants. The decomposition in Figure A.10 shows that the domestic incumbent response arises mainly from the cross-firm component of our rerouting measure, while Chinese and Hong Kong-owned firms dominate the within-firm response through both incumbents and entrants.

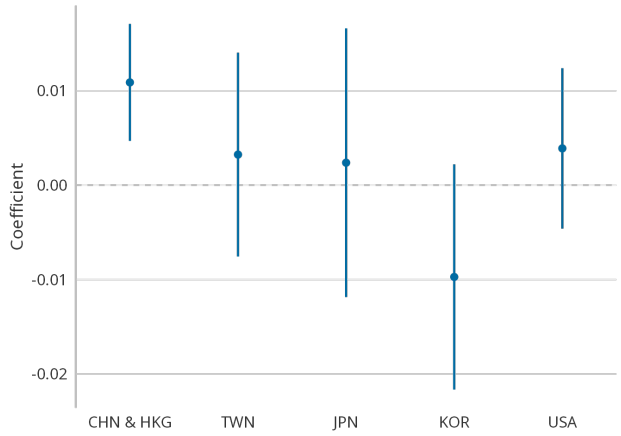
The tariff-induced increase in Chinese imported content is concentrated among Chinese and Hong Kong-owned firms, which account for about 79% of the overall response. Their contribution is split roughly evenly between incumbents and entrants. Other foreign firms also contribute positively. The negative coefficient for Korean incumbents reflects a sharper increase in imports from China in the second quarter of 2018.

These patterns show that rerouting is not confined to newly established Chinese-owned firms; it also appears among incumbent domestic firms and other foreign firms. Enforcement therefore cannot focus exclusively on new Chinese investment. The imported-content response is consistent with Chinese-linked firms expanding exports from Vietnam while maintaining upstream input relationships with China.

A remaining question is whether these ownership patterns reflect a general tendency for multinational subsidiaries to reroute goods from their home countries during the trade war. To examine this possibility, we construct ownership-specific rerouting measures in which the source country is the firm's country of ownership. For example, for Chinese and Hong Kong-owned firms, the outcome captures rerouting from China and Hong Kong; for Korean-owned firms, it captures rerouting from Korea. Figure 12 reports the corresponding estimates for the major foreign ownership groups.

In the home-country exercise, the rerouting coefficient is positive and statistically significant for Chinese and Hong Kong-owned firms. The estimates for Taiwanese, Japanese,

Figure 12: Home-Country Rerouting



Notes: Estimates of Equation (11) by foreign ownership group, 2018Q1–2022Q4, with the group's home country as the treated origin. The outcome is the group's rerouting from that origin divided by total US-bound exports in the product-quarter. Bars show 95% confidence intervals, with standard errors clustered by HS 6-digit product.

US-owned, and Korean-owned firms are not statistically distinguishable from zero. Thus, our estimated positive rerouting response of Chinese and Hong Kong-owned establishments to the trade war is not simply an artifact of home-country sourcing.

8 Conclusion

Tariffs are an increasingly prominent tool of economic statecraft, and their effectiveness depends in part on whether targeted firms can redirect trade through third countries. This paper studies the 2018 US–China trade war, focusing on rerouting and Chinese imported content in Vietnam's exports to the US. Between 2018 and 2022, increased rerouting and Chinese inputs embodied in Vietnam's exports replaced the equivalent of 13% of lost China-to-US trade.

We develop a transaction-level proxy for potential rerouting by matching the same HS 8-digit product entering and exiting a Vietnamese province within one quarter. We also consider country- and firm-level measures, which are less and more conservative than the province-level measure, respectively. We show that aggregation substantially affects the

measured extent of rerouting. Our preferred provincial measure indicates that increased rerouting accounts for approximately 10.5% of the growth in Vietnamese exports to the US from 2018 to 2022. In contrast, the country-level measure yields a substantially higher value of 26.8%.

We also provide causal evidence that the 2018 trade war intensified both rerouting and Chinese imported content embodied in Vietnamese exports. The average tariff increase raised the rerouted and imported-content shares by 1.27 and 0.67 percentage points, respectively, relative to other source countries. The heterogeneity analysis shows that the rerouting response was dispersed across ownership groups, with the largest contribution from domestic incumbents. By contrast, the imported-content response was concentrated among Chinese and Hong Kong-owned firms, including both incumbents and entrants.

While rerouting through Vietnam rose in response to the trade war, it accounted for a minority of the China-linked content in Vietnam's export expansion. Chinese imported content was quantitatively larger, showing that much of Vietnam's export expansion remained linked to Chinese upstream suppliers. The two channels imply different policy margins. Rerouting points to customs enforcement and rules-of-origin compliance, while Chinese imported content points to the limits of tariffs as a tool for reducing dependence on Chinese supply chains.

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 trade flows consistent with potential tariff evasion. The framework allows us to quantify the extent of likely rerouting and pinpoint the firms, sectors, and places most involved. Our results also raise new questions about the organizational origins of rerouting and the relationship between value-added production and tariff circumvention.

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A Data Construction

A.1 Panjiva

We use Vietnamese customs records for imports and exports by sea, air and land in 2018–2022, and US maritime import bills of lading for 2016–2022. The US data identify the 2016–2017 pre-trade war Chinese supplier–US buyer network and subsequent direct trade between those firms. We match foreign counterparties across the two datasets using firm names, addresses and a Panjiva–Capital IQ crosswalk provided by S&P Global .

Firm IDs: We aggregate Vietnamese establishments using the first ten digits of their tax IDs. We exclude placeholder IDs and firms never observed in the Vietnam Enterprise Survey (VES). Among firms with customs transactions passing the validity, product and partner criteria below, we retain 136,122 firms, or 94.63 percent of firms and 99.56 percent of trade value.

Countries and provinces: Partner country identifies the foreign exporter on imports and the foreign importer on exports.

We assign each shipment to the province in the Vietnamese firm's customs address. Missing provinces are filled from the firm's VES province in the same year, then its modal VES province.

Products: Benchmark matching uses reported HS 8-digit codes. Regressions and links to other datasets use HS 6-digit codes harmonized to the 2017 revision. We drop codes with fewer than six digits and HS chapter 99.

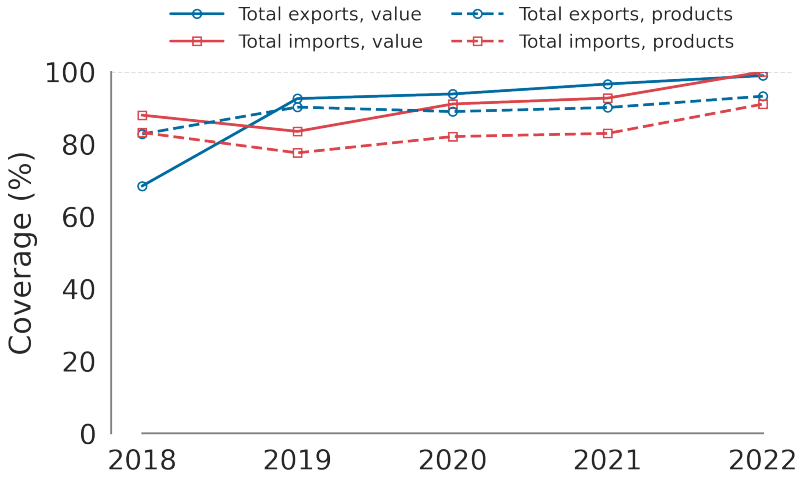
Values: We drop observations with missing dates or missing or nonpositive dollar values. We exlcude transactions below the $800 de minimis threshold from our rerouting and imported content calculations. This retains 98.43 percent of US-bound export value between 2018 and 2022.

Quantities and unit values: We use reported quantity where available and otherwise divide value by the reported unit value. Quantity units vary across and within product

codes. To standardize physical units within an HS 8 product code, we select the unit with the greatest trade value for that product and retain only transactions that have this unit and a unit value between 1/100 and 100 times the product median. These transactions cover 84–91 percent of annual US-bound export value from 2018–2022. Appendix B.3 describes the quantity-based measure.

Data Coverage. Figure A.1 compares Panjiva with UN Comtrade. Panjiva captures 68.4% of Comtrade export value and 88.0% of import value in 2018, rising to 98.9% and 103.2% in 2022.

Figure A.1: Panjiva vs. UN Comtrade Coverage



Notes: Value coverage is Panjiva value divided by Comtrade value, capped at 100% for display. Product coverage is the share of Comtrade HS6 products for which Panjiva records at least 75% of Comtrade value, excluding HS chapter 27.

The connector comparison in Figure 1c uses destination-reported Comtrade imports in 2017 and 2022, with the same reported valuation basis for each country's ratio across years. US imports are valued CIF.

A.2 Vietnam Enterprise Survey (VES)

We aggregate survey records to ten-digit tax-ID firms and harmonize industry, province and ownership codes across waves. Records with missing or incomplete IDs are excluded.

Revenue, cost of goods sold, the wage bill and long-term assets are converted from million dong to nominal US dollars at annual exchange rates. Industries follow the Vietnam Standard Industrial Classification, based on ISIC Revision 4.

A.3 Panjiva–VES Merge

Same-year VES records cover 92.8 percent of Panjiva firm-years and 98.7 percent of customs value in 2018–2022 (Table A.1).

Table A.1: Panjiva and VES Match Quality

	Matched (1)	Panjiva Only (2)	Total (3)	% Matched (4)	% of Value Matched (5)
2018	68,950	5,683	74,633	92.4%	98.3%
2019	74,056	6,579	80,635	91.8%	97.3%
2020	78,253	5,945	84,198	92.9%	99.0%
2021	76,764	5,281	82,045	93.6%	99.1%
2022	80,469	5,872	86,341	93.2%	99.2%
Total	378,492	29,360	407,852	92.8%	98.7%

Notes: Matches use ten-digit tax IDs and the same year, 2018–2022. The Total row pools firm-years. Column (5) reports matched firm-years' share of customs value.

B Measurement

B.1 Allocating Potential Rerouting to Firms

We allocate province-level potential rerouting R^{o}_{vgt} to firms in two steps. The within-firm amount is the minimum of the firm's imports and exports. The province remainder is allocated in proportion to exports left after the within-firm step:

$$R^{o,own}_{fvgt} = \min\left\{X^{USA}_{fvgt},\, M^{o}_{fvgt}\right\}, \tag{16}$$

$$R^{o,exc}_{fvgt} = \frac{X^{USA}_{fvgt} - R^{o,own}_{fvgt}}{X^{USA}_{vgt} - R^{o,own}_{vgt}} \left(R^{o}_{vgt} - R^{o,own}_{vgt}\right), \qquad R^{o,own}_{vgt} = \sum_{f \in v} R^{o,own}_{fvgt}, \tag{17}$$

where X^{USA}_{fvgt} and M^{o}_{fvgt} are the firm's US exports and imports from origin o used to construct rerouting. The allocations sum to R^{o}_{vgt}. Cross-firm allocations are zero when the denominator is zero. Import-side allocations replace residual exports in Equation (17) with residual imports, $M^{o}_{fvgt} - R^{o,own}_{fvgt}$ and $M^{o}_{vgt} - R^{o,own}_{vgt}$.

B.2 Revenue and Quarterly Imported-Content Construction

Following Kee and Tang (2016), annual revenue Y_{fa} is set to the largest of reported revenue, gross annual exports and gross annual imports.

Let G_{ft} be the firm's gross imports across all products and origins in quarter t and $G_{fa} = \sum_{t \in a} G_{ft}$. We allocate annual revenue in proportion to quarterly gross imports:

$$Y_{ft} = Y_{fa} \frac{G_{ft}}{G_{fa}}. \tag{18}$$

Let $\widetilde{M}^{o}_{ft}$ denote intermediate imports from origin o after subtracting allocated potential rerouting and truncating at zero. For quarters with positive gross imports,

$$m^{o}_{ft} = \frac{\widetilde{M}^{o}_{ft}}{Y_{ft}} = \frac{G_{fa}}{Y_{fa}} \frac{\widetilde{M}^{o}_{ft}}{G_{ft}}. \tag{19}$$

Quarters with zero gross imports contribute zero imported content. Net US exports are also truncated at zero after subtracting allocated potential rerouting.

B.3 Alternative Matching Definitions

Similar products. Following Artuc et al. (2026), we link pairs of HS 6-digit codes whose descriptions have Sentence-BERT (SBERT) cosine similarity of at least 0.9. We match each connected group as one product, including codes connected indirectly through other codes.

Spatial units. The six economic regions are the Red River Delta, Northern Midland and Mountainous Region, North Central and Central Coast, Central Highlands, Southeast, and

Mekong Delta. Metropolitan areas combine Ho Chi Minh City, Binh Duong, Dong Nai, and Long An; Hanoi, Bac Ninh, Hung Yen, Hai Duong, Vinh Phuc, and Ha Nam; Hai Phong and Quang Ninh; Da Nang and Quang Nam; and Can Tho and Hau Giang. Country matching combines all provinces. Firm-across-provinces matching combines establishments with the same ten-digit tax identifier.

Across-province rerouting. We subtract the sum of province minima from the country minimum:

$$\min\left\{\sum_v X^{USA}_{vgt}, \sum_v M^o_{vgt}\right\} - \sum_v R^o_{vgt}. \tag{20}$$

We report it separately from the province benchmark.

B.3.1 Sensitivity to Aggregation and Quantity Measurement

Table A.2 varies the product, period and spatial unit used to match imports and exports. Our benchmark matches imports and exports of the same HS 8-digit product in the same province and quarter.

The quantity comparison in Table A.3 uses lines with positive quantities that pass the physical-unit and unit-value rules in Appendix A. Both trade legs and the export unit value use lines of at least $800, as in the benchmark. We match quantities in the same physical unit before aggregation. For each combination of product, period and spatial unit, the quantity measure is $\min\{q^M, q^X\}p^X$, where q^M and q^X are import and export quantities and p^X is the export unit value. The value comparison takes the smaller import and export value on these same lines. Both annual measures divide by gross US-bound export value on lines with usable quantities. The eligible sample covers 85.2 percent of US-export value in the benchmark regressions.

Table A.2: Aggregate Potential Rerouting at Alternative Product, Temporal, and Spatial Levels

	2018			2022		
	Year	Quarter	Month	Year	Quarter	Month
Panel A: Country						
HS 4-digit	22.09	21.64	20.88	40.67	39.97	38.87
Similar HS 6-digit	17.84	17.43	16.69	28.84	27.63	26.78
HS 6-digit	16.69	16.20	15.32	27.86	26.53	25.59
HS 8-digit	14.93	14.31	13.38	23.17	22.01	21.13
Panel B: Province						
HS 4-digit	12.35	11.27	9.96	26.70	23.75	22.54
Similar HS 6-digit	9.96	9.35	8.68	13.85	12.86	11.89
HS 6-digit	7.25	6.64	5.87	12.25	11.22	10.33
HS 8-digit	6.16	5.47	4.82	9.51	8.56	7.83
Panel C: Firm across provinces						
HS 4-digit	3.38	2.83	2.29	6.83	6.11	5.79
Similar HS 6-digit	3.58	3.26	2.82	3.33	3.03	2.69
HS 6-digit	1.85	1.67	1.50	2.54	2.34	2.17
HS 8-digit	1.65	1.38	1.22	1.88	1.71	1.59
Panel D: Firm						
HS 4-digit	3.36	2.81	2.28	6.77	6.06	5.74
Similar HS 6-digit	3.57	3.25	2.81	3.28	2.99	2.65
HS 6-digit	1.84	1.66	1.50	2.50	2.30	2.14
HS 8-digit	1.65	1.38	1.21	1.84	1.68	1.56

Notes: Potential rerouting from China as a percent of Vietnam's US-bound exports. Rows vary the spatial unit and product definition; columns vary the matching period. The benchmark is province–HS 8-digit–quarter matching.

Table A.3: Aggregate Potential Rerouting: Quantity and Value Measures

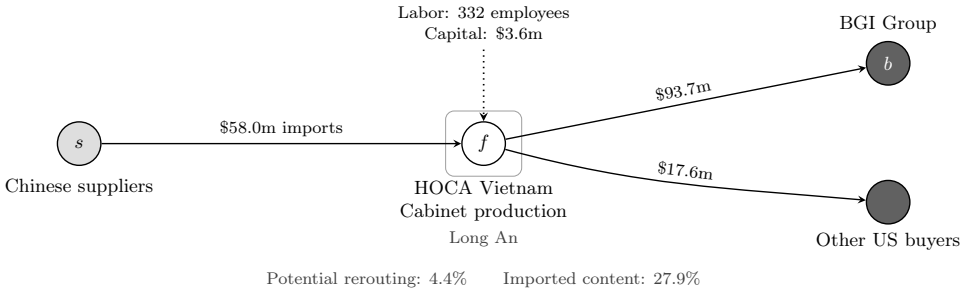
	2018			2022		
	Year	Quarter	Month	Year	Quarter	Month
Panel A: Country						
HS 6-digit, quantity-based	15.49	15.03	14.31	35.20	34.16	33.08
HS 6-digit, value-based	12.88	12.49	11.79	25.01	23.76	22.80
HS 8-digit, quantity-based	13.86	13.33	12.53	28.65	27.33	26.34
HS 8-digit, value-based	11.55	11.01	10.22	20.26	19.38	18.54
Panel B: Province						
HS 6-digit, quantity-based	6.61	6.07	5.49	20.29	19.07	18.19
HS 6-digit, value-based	5.18	4.78	4.29	10.13	9.26	8.52
HS 8-digit, quantity-based	5.48	4.94	4.42	14.71	13.50	12.46
HS 8-digit, value-based	4.40	3.90	3.45	7.82	7.06	6.43
Panel C: Firm across provinces						
HS 6-digit, quantity-based	1.84	1.66	1.50	5.41	4.76	4.40
HS 6-digit, value-based	1.52	1.33	1.20	2.11	1.93	1.81
HS 8-digit, quantity-based	1.65	1.51	1.36	2.91	2.60	2.33
HS 8-digit, value-based	1.37	1.11	0.97	1.75	1.60	1.50
Panel D: Firm						
HS 6-digit, quantity-based	1.83	1.66	1.49	5.36	4.71	4.36
HS 6-digit, value-based	1.51	1.32	1.20	2.07	1.90	1.78
HS 8-digit, quantity-based	1.65	1.51	1.36	2.84	2.53	2.28
HS 8-digit, value-based	1.36	1.10	0.96	1.72	1.57	1.47

Notes: Quantity- and value-based potential rerouting from China as a percent of annual US-bound export value on the same eligible lines. Physical units are matched before aggregation. Both numerator legs and the export unit value use lines of at least $800; denominators retain gross exports with usable quantities.

B.4 Case Illustrations from Our Data

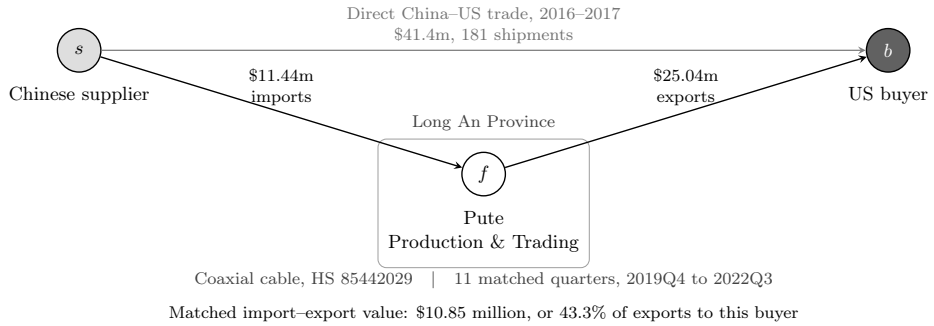
The figures show patterns of rerouting and imported content obtained from our customs and enterprise-survey data for two firms that were the subjects of rerouting-related customs investigations.

Figure A.2: Imported Inputs and Cabinet Production: HOCA



Notes: Customs trade in 2018–2022. Labor is year-end employment and capital is long-term assets; the labels average available annual enterprise-survey observations in 2019–2022. Potential rerouting and imported content are 4.4 and 27.9 percent of HOCA's total US exports. Both shares refer to China. CBP reversed its initial evasion finding in June 2022 (U.S. Customs and Border Protection, 2022a).

Figure A.3: Own Imports and Exports: Coaxial Cable



Notes: Pute's trade in HS 85442029 with one Chinese supplier and one US buyer in 11 matched quarters between 2019Q4 and 2022Q3. The sum of the smaller quarterly leg values is $10.85 million, or 43.3 percent of exports to this buyer in those quarters. The gray link shows direct trade between the supplier and buyer in HS6 854420 in 2016–2017. Vietnamese customs reported Chinese-origin cable bearing Vietnamese-origin labels (Lê Ngân, 2023; Thái Bình, 2023).

B.5 Validating the Spatial Unit

B.5.1 Pre-trade War Trading Partners

We use US import records of China-origin shipments arriving in 2016–2017 to identify pre-trade war trading partners. Supplier and buyer identities are resolved using names and the Panjiva–Capital IQ crosswalk, as described in Appendix A. Let $A^{\text{pre}}_{sbg_{(6)}} = 1$ if Chinese supplier s and US buyer b traded HS 6-digit product $g_{(6)}$ directly in those years.

A candidate route combines a Chinese supplier on a Vietnamese import with a US buyer on a Vietnamese export of the same HS 8-digit product in the same quarter. We use customs lines of at least $800 and legs with known provinces. The supplier and buyer must each have traded the HS6 product in the pre-trade war US data. The eight-quarter window begins in 2018Q2 for Lists 1 and 2, 2018Q3 for List 3, and 2019Q3 for List 4A. Products never subject to a China-specific tariff receive a window beginning in 2018Q3.

We count each supplier–buyer–HS6 combination once, assigning it to the narrowest spatial level connecting it during the window: the same firm within a province, different firms in the same province, or different provinces. The last category includes a firm's trade across provinces. Let $D^{h}_{sbg_{(6)}}$ indicate assignment to spatial level h. The share of candidate combinations that recover a pre-trade war relationship is

$$m_h(A^{\text{pre}}) = \frac{\sum_{s,b,g_{(6)}} D^{h}_{sbg_{(6)}} A^{\text{pre}}_{sbg_{(6)}}}{\sum_{s,b,g_{(6)}} D^{h}_{sbg_{(6)}}}. \tag{21}$$

The denominators are 402 firm-level, 12,062 province-level, and 46,726 country-level combinations.

We compare these shares with a benchmark that preserves each firm's number of trading partners. For the benchmark, we retain Chinese suppliers and US buyers observed anywhere in the cleaned Vietnamese data in 2018–2022 and matched to the US data. These pools are formed across all products before constructing candidate routes. Within each HS6 product, the network contains every pre-trade war link between these suppliers and buyers, including

pairs without a candidate route.

Following Maslov and Sneppen (2002), we select two links, (s_1, b_1) and (s_2, b_2), and propose replacing them with (s_1, b_2) and (s_2, b_1). We reject switches that duplicate a link or share a supplier or buyer. Each reshuffle starts from the observed network and attempts ten swaps per original link; successful swaps preserve every firm's number of partners. We generate 1,000 reshuffles and calculate Equation (21) with the same candidate combinations and denominators in every reshuffle. Networks that cannot be rewired remain unchanged. Table 2 reports the observed share, mean simulated share, and their ratio. The simulation p-value is the share of reshuffles at least as large as the observed statistic. Figure A.4 illustrates the comparison; Table A.4 checks whether additional swap attempts change the simulated match shares.

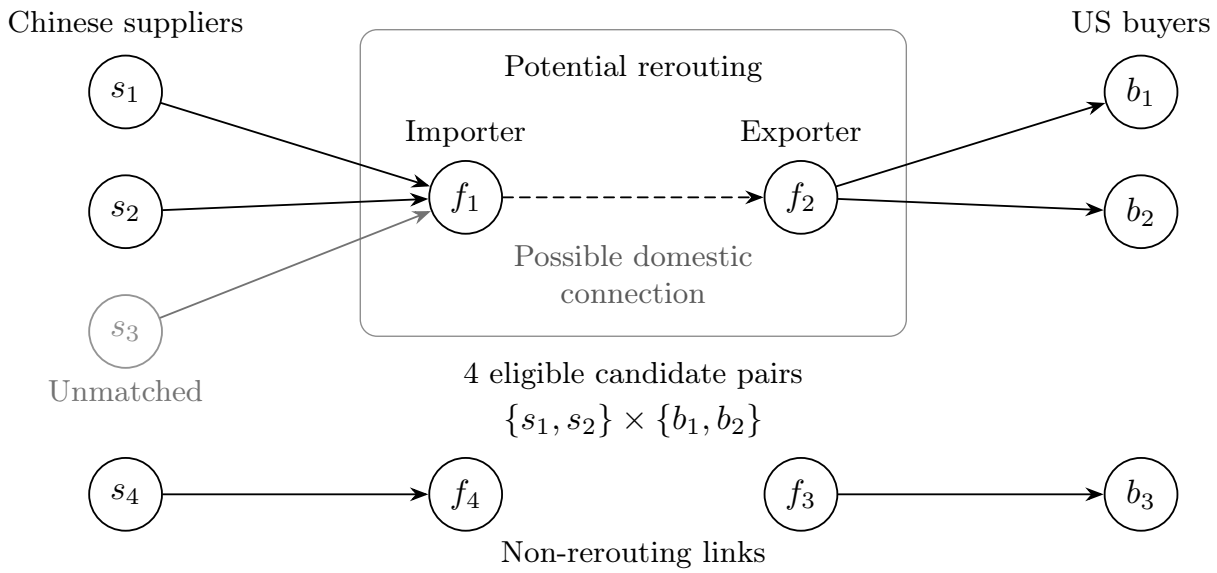
Table A.4: Sensitivity to the Number of Swap Attempts

	Mean simulated match share (%)		
Attempted swaps per link	Firm	Province	Country
2	5.74	1.05	0.61
5	5.58	1.07	0.61
10 (baseline)	5.22	1.03	0.62
20	5.67	1.04	0.60
40	5.41	1.04	0.60
Observed match share (%)	27.61	1.44	0.75

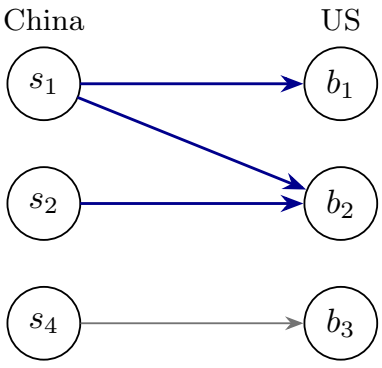
Notes: Simulated shares average 16 independent reshuffles at each setting. The first column gives the number of attempted swaps per original link; invalid swaps are rejected. The main results use ten attempts per link and 1,000 reshuffles.

Figure A.4: Recovering Pre-trade War Trading Partners

(a) Observed Vietnam trade

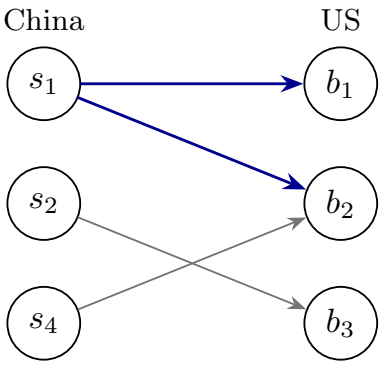


(b) Actual pre-trade war links



Candidate pairs covered: 3/4

(c) One reshuffle



Candidate pairs covered: 2/4

Notes: Panel (a) forms four candidate pairs from the same HS8 product and quarter through importer f_1 and exporter f_2 in one province. Solid arrows show observed trade; the dashed arrow is a possible domestic connection. Supplier s_3 is unmatched to the US data. Blue links in panels (b) and (c) recover candidate pairs. The illustrated reshuffle preserves each firm's number of partners and changes coverage from three of four pairs to two of four.

B.5.2 Price Comparison

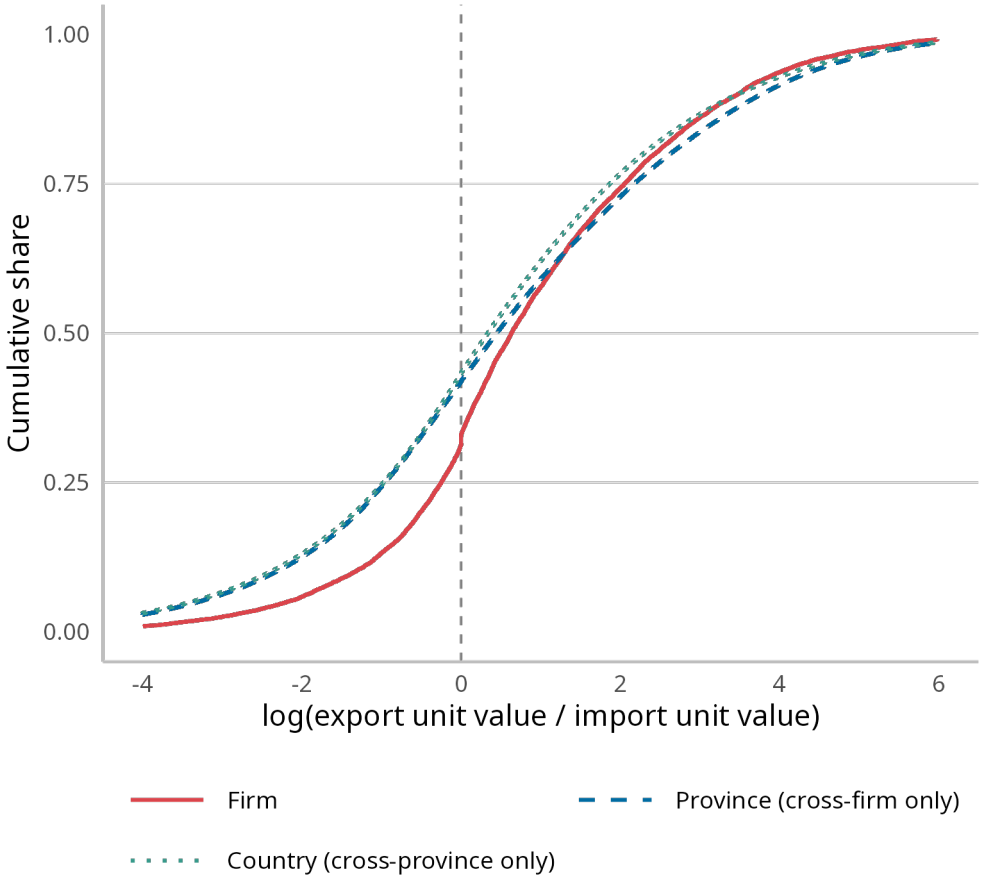
The price sample contains candidate routes on the same products and eight-quarter windows, including suppliers and buyers without pre-trade war matches. A route consists of a Chinese supplier, a US buyer, a Vietnamese importer, a Vietnamese exporter, and an HS 8-digit product. Each route-quarter enters once, classified by its importer and exporter: the same firm within a province, different firms in the same province, or different provinces.

We compare unit values when both Vietnamese legs have positive quantities in the product's modal physical unit for that trade direction and the two units agree. Each unit value divides the value of eligible lines by their quantity, using the rules in Appendix A. Let $\mathcal{P}_h$ be the set of priced route-quarters at spatial level h, with import and export unit values p_n^M and p_n^X for observation n. We report the share

$$\phi_h = \frac{1}{|\mathcal{P}_h|} \sum_{n \in \mathcal{P}_h} \mathbf{1}\{p_n^M \leq p_n^X\}. \tag{22}$$

Standard errors use 1,000 bootstrap draws that resample routes, retaining all quarters of each sampled route. We conduct a two-sided test of $\phi_h = 1/2$. Figure A.5 plots the distribution of $\log(p_n^X / p_n^M)$.

Figure A.5: Distribution of the Log Export–Import Price Ratio by Spatial Level



Notes: Empirical distributions of $\log(p_n^X/p_n^M)$ for priced candidate route-quarters. The vertical line marks equal unit values.

B.5.3 Sample Coverage

Table A.5 measures how much potential rerouting occurs in exporting-firm–HS6–quarter observations containing an eligible candidate route. It also reports coverage by routes that recover pre-trade war trading partners, at the combination's assigned spatial level or at any spatial level. Each observation is counted once across the three spatial levels.

Table A.5: Coverage of the Rerouting Measure by Candidate Routes

	Potential rerouting ($ millions)	Share (%)
Eligible candidate route	807.0	25.8
Pre-trade war match, assigned spatial level	150.7	4.8
Pre-trade war match, any spatial level	196.8	6.3
Potential rerouting in the comparison sample	3,127.3	100.0

Notes: Potential rerouting from China allocated to exporting firms, for the trading-partner comparison's products and eight-quarter windows. Rows sum the measure over exporting-firm–HS6–quarter observations containing each type of route, counting each observation once. Shares divide by total potential rerouting on these products and windows.

B.5.4 Direct China–US Trade of Pre-trade War Trading Partners

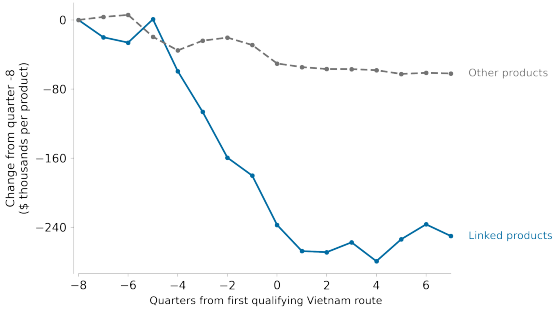
We next compare a pair's direct China–US trade in linked and other tariffed products. A linked product is a Section 301 product traded by the pair in 2016–2017 that appears on a candidate route through one Vietnamese province during its eight-quarter window. The event is its first such route within that window. There are 280 linked supplier–buyer–product combinations across 258 pairs.

The regression sample keeps pairs with another product in their pre-trade war tariffed basket that has no same-province candidate route in 2018–2022. It contains 125 pairs, 141 linked pair-products and 401 other pair-products. We stack windows from eight quarters before to seven quarters after each event cohort; a pair can enter more than one cohort. Each pair receives equal total weight on each side of the comparison, split equally across its cohorts, products within each group, and quarters. Table A.6 reports the linked-product-

by-post coefficient, absorbing pair–product and pair–calendar-quarter fixed effects within each cohort. Both outcomes use the same 9,616 observations. When a US import bill lists multiple raw HS6 codes, we split its value equally across those codes before harmonizing products. Standard errors are clustered by supplier and buyer.

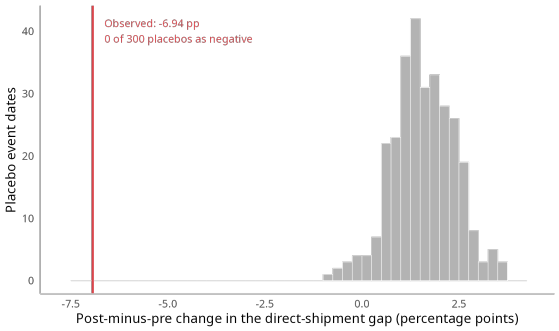
Panel (a) of Figure A.6 shows the weighted mean direct trade value per product for these two groups. Panel (b) uses a separate shipment-presence comparison for 140 linked combinations across 124 pairs whose other tariffed products were shipped in the eight quarters before the event. It compares the change in the gap between shipping the linked product and any other tariffed product during quarters 0–16 with the change during quarters −8–−1. The observed change is −6.94 percentage points. The placebo exercise draws 300 sets of event dates from 1,335 never-linked combinations. For each linked combination, controls are matched exactly on product and tariff cohort, and the five nearest controls are selected based on pre-trade-war trade value, active quarters, and bills.

Figure A.6: Direct China–US Trade of Pre-trade War Trading Partners Around the First Route Through Vietnam



(a) Direct trade value of linked and other products

Notes: Equal-pair weighted means per product, in thousands of dollars, net of common quarter-of-year effects. Each series subtracts its value at quarter −8.



(b) Placebo event dates

Notes: Changes in the shipment-presence gap for 300 placebo draws. The vertical line marks the observed change of −6.94 percentage points.

Table A.6: Direct China–US Trade of Pre-trade War Trading Partners

	Direct value ($ thousands)	Shipment presence (pp)
	(1)	(2)
Linked product × Post	-144.564**	-9.462***
	(67.924)	(3.298)
Observations	9,616	9,616
Supplier-buyer pairs	125	125
Supplier clusters	82	82
Buyer clusters	102	102
Cohort × pair × product FE	Yes	Yes
Cohort × pair × quarter FE	Yes	Yes

Notes: Linked-product-by-post coefficients for direct China–US trade. Pre is quarters −8–−1 and post is 0–7. Both columns include cohort-specific pair–product and pair–calendar-quarter fixed effects and equal pair weights. Standard errors are two-way clustered by supplier and buyer. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.6 Sales per Worker and Input Use

For Equation (8) and Figure 5, we classify firms once using customs trade pooled over products and 2018–2022, before linking them to the enterprise-survey estimation sample. The rerouting and imported-content groups are defined using trade from China. Among 14,208 US exporters, the median potential-rerouting share of gross US exports is 5.06 percent; firms above this median are classified as rerouters. This includes own rerouting and the firm's allocation of the same-province remainder. Imported-content firms are the remaining firms with positive imported content. All others form the comparison group.

We aggregate establishments to ten-digit tax identifiers. The 2018–2022 sample requires positive year-end employment, revenue, US exports and total exports; observed wage bill, materials, capital, industry and main HS6 product; and nonnegative factor-to-revenue ratios. The main product is the HS6 product with the largest pooled US-export value. Capital is long-term assets, and materials are $Z_{fa} = \max\{\text{COGS}_{fa} - W_{fa}, 0\}$, where W_{fa} is the wage bill. Money variables are in nominal US dollars. We winsorize each outcome at the pooled 1st and 99th percentiles, using common cutoffs across groups. The sample contains 33,843 firm-years and 13,476 firms.

Table A.7: Sales per Worker and Input Use

	Log exports per worker (1)	Log revenue per worker (2)	Capital / revenue (3)	Materials / revenue (4)	Wage bill / revenue (5)
Rerouting	0.931***	0.232***	-0.077***	0.034***	-0.043***
	(0.078)	(0.038)	(0.027)	(0.006)	(0.007)
Imported content	0.979***	-0.076*	0.030	0.010	-0.010
	(0.091)	(0.045)	(0.028)	(0.008)	(0.008)
Observations	33,843	33,843	33,843	33,843	33,843
R^2	0.41957	0.44476	0.24570	0.35089	0.32766
Within R^2	0.03414	0.00884	0.00172	0.00284	0.00417
Product-Year fixed effects	✓	✓	✓	✓	✓

Notes: Estimates of Equation (8), relative to other US exporters, with main HS6 product–year fixed effects. Outcomes are winsorized at the pooled 1st and 99th percentiles. Standard errors are clustered by main product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B.7 Capital Intensity and Tariffs

Capital intensity comes from China's 2005 Annual Survey of Industrial Production. We calculate each sector's median ratio of total assets to sales and average across sectors mapped to each HS6 product. We exclude ratios outside $[0, 1]$. The tariff measure is the announced US tariff increase on Chinese goods for the product's first tariff wave, expressed as a fraction; it is zero for never-treated products.

The regressions in Table A.8 use province–HS6–year observations in 2018–2022 with positive US exports. We exclude observations whose Chinese imported content exceeds US exports from both outcome samples. Regressions include year fixed effects and cluster standard errors by HS6 product. The plots in Figure 6a and Figure 6b remove year effects from the outcome and regressor before forming 20 capital-intensity bins and 17 tariff bins.

Table A.8: Rerouting and Imported Content from China by Capital Intensity and Tariffs: Slopes

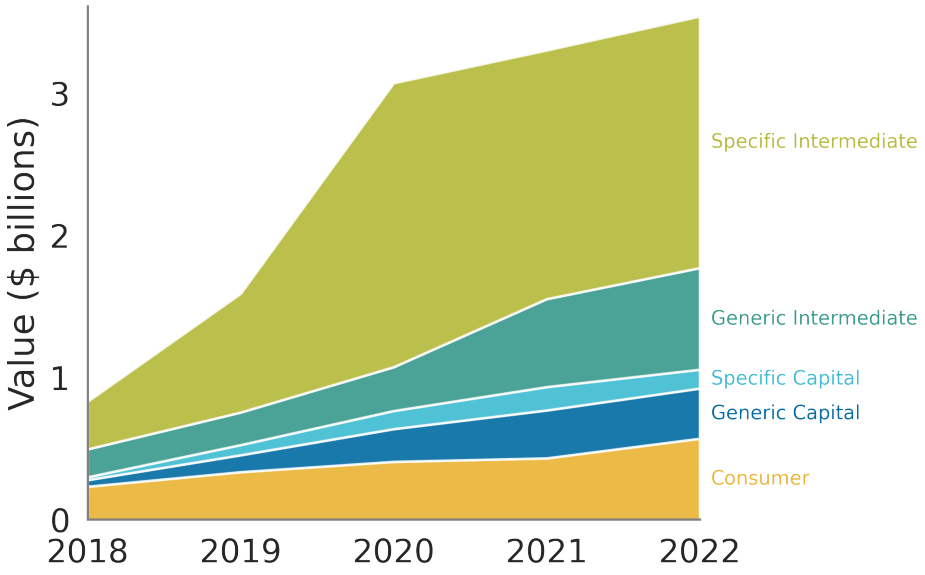
	Capital intensity in China		US tariff increase on China	
	Rerouting	Imported content	Rerouting	Imported content
	(1)	(2)	(3)	(4)
Slope	0.375***	-0.351***	0.317***	0.274***
	(0.061)	(0.030)	(0.106)	(0.051)
Observations	32,431	32,431	58,132	58,132
R^2	0.01907	0.06131	0.00302	0.01095
Within R^2	0.01836	0.05802	0.00209	0.00869
Year fixed effects	✓	✓	✓	✓

Notes: Slopes for the rerouting and imported-content shares of US exports, with year fixed effects. Both outcomes refer to China. Observations are province–HS6–year combinations. Standard errors are clustered by HS6 product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

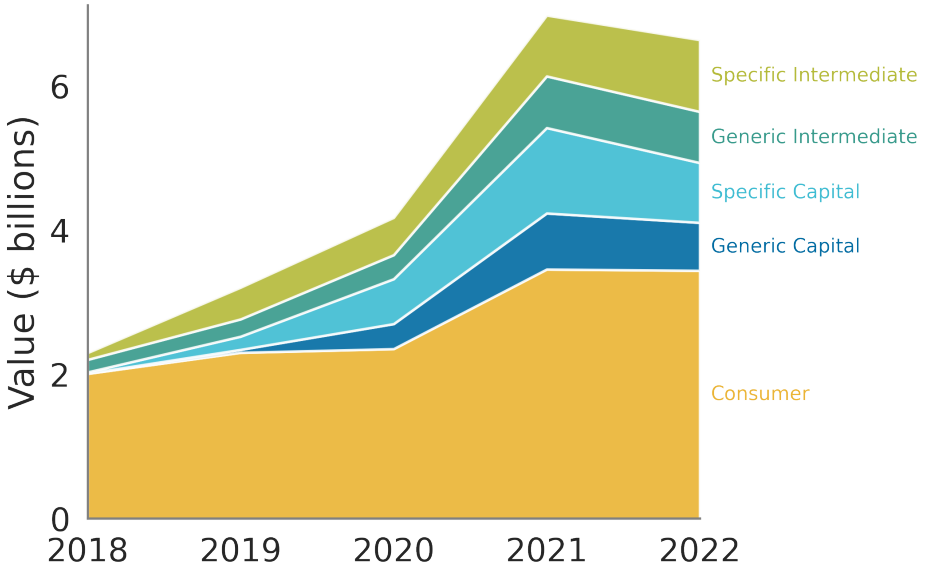
C Descriptive Patterns

Figure A.7: Rerouting and Imported Content from China by Product Category

(a) Rerouted Exports



(b) Imported Content



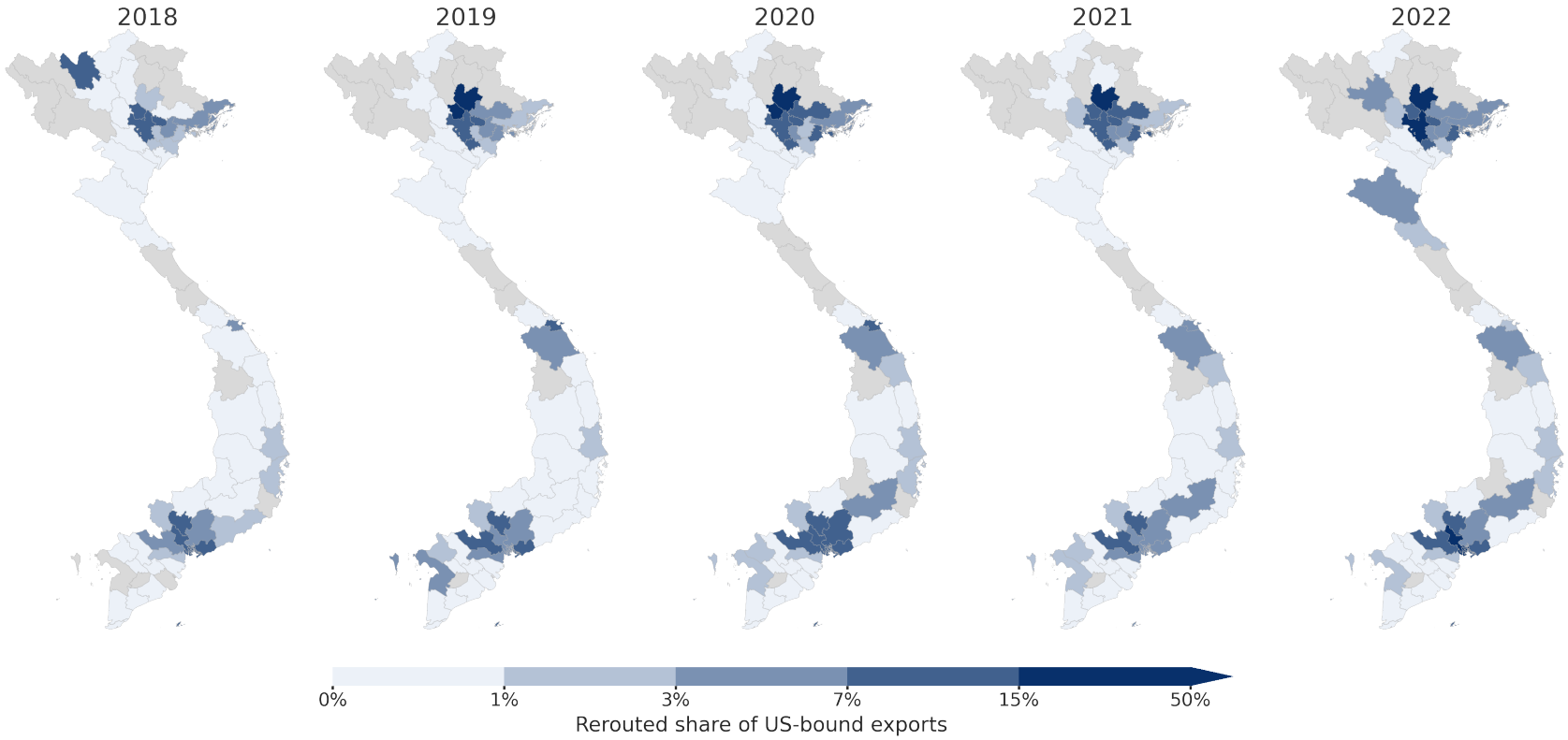
Notes: Annual potential rerouting and imported content in Vietnam's US-bound exports, both from China, by Broad Economic Classification, 2018–2022. Values are in billions of dollars. Rerouting uses the province, HS 8-digit, quarterly definition; imported content is net of rerouting.

Table A.9: Products with the Largest Contribution to the Growth of US Imports from Vietnam

		Growth 2018–2022		Share of growth (%)		Tariff change
Product	Description	$ millions	% of total	Chinese Rerouting	Chinese Imported Content	(%)
851762	Communication apparatus (excluding telephone sets or base stations)	9,597.1	12.26	2.2	27.2	10
851712	Telephones for cellular networks or for other wireless networks	7,947.9	10.15	-2.6	15.3	0
847330	Parts and accessories for automatic data processing machines and units	3,508.4	4.48	0.9	10.8	6
851830	Headphones, earphones, combinations	2,783.0	3.55	2.2	9.4	8
940161	Seats with wooden frames, upholstered nes	1,858.6	2.37	0.0	18.7	9
940360	Furniture, wooden, nes	1,551.0	1.98	-0.9	4.9	10
640411	Sports footwear, including tennis shoes, basketball shoes and gym shoes	1,399.7	1.79	1.2	7.1	6
847130	Portable Computers under 10kg with Keyboard & Display	1,255.0	1.60	12.7	16.1	0
850440	Static converters, nes	1,242.9	1.59	53.0	14.9	5
391810	Floor coverings and wall or ceiling coverings of vinyl chloride polymers	1,048.1	1.34	1.2	28.3	10
950300	Other toys (wheeled, model scale, puzzles)	1,048.0	1.34	16.9	-10.9	0
640399	Footwear, with outer soles of rubber, plastics or composition leather	1,041.4	1.33	0.0	0.1	12
852580	Television cameras, digital cameras and video camera recorders	947.6	1.21	4.5	24.8	10
940340	Kitchen furniture, wooden, nes	944.1	1.21	-0.1	9.0	10
854231	Electronic integrated circuits: processors and controllers	877.8	1.12	28.2	1.1	25
These 15 products		37,050.5	47.31	4.9	16.3	
All benchmark products		71,482.9	91.29	10.6	16.3	
All products (export-growth accounting)		78,307.3	100.00	10.5	16.6	

Notes: The 15 HS 6-digit benchmark products with the largest growth of US imports from Vietnam, 2018–2022, in millions of dollars and as a share of total growth. Components follow the accounting in Appendix F.1. The tariff is the product's first Section 301 increase. Import values are from the USITC.

Figure A.8: Map of Provincial Rerouting



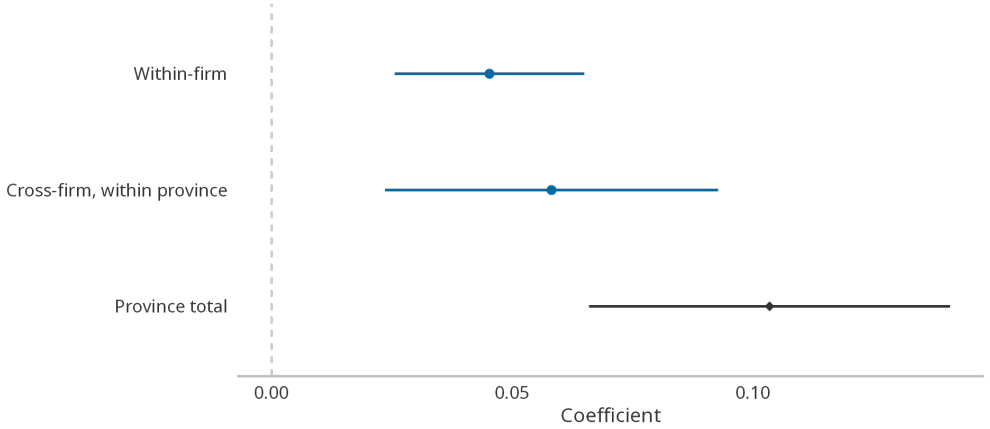
Notes: Potential rerouting as a share of each province's exports to the US, 2018–2022, using the province, HS 8-digit, quarterly definition. Provinces with annual US exports below $10 million are gray. Province boundaries are from GADM.

D Tariff Responses

The comparison origins are the 40 countries with the largest pooled import values in the cleaned Vietnamese customs data over 2018–2022, with China and the US included. Unknown origins and Vietnam are excluded from this ranking. The regressions use the balanced product–origin–quarter sample described in Section 6.1.

The retaliation-control specification adds China's first product-specific tariff increase on US goods to the US-origin observations after the corresponding Chinese tariff announcement.

Figure A.9: The Rerouting Response Within and Across Firms



Notes: Estimates of Equation (11) for the province-level rerouted share and its within-firm and cross-firm components, 2018Q1–2022Q4. The components sum to the total. Bars show 95% confidence intervals, with standard errors clustered by HS 6-digit product.

Table A.10: Potential Rerouting Response to Trade War Tariffs: Alternative Definitions

	Baseline province, HS8 (1)	Similar products (2)	Country (3)	Regions (4)	Metro areas (5)	Firm across provinces (6)
Rerouted Share	0.1035***	0.1372***	0.1883***	0.1318***	0.1224***	0.0468***
	(0.0191)	(0.0247)	(0.0250)	(0.0224)	(0.0217)	(0.0105)
Observations	2,607,200	1,991,200	2,607,200	2,607,200	2,607,200	2,607,200
Products (clusters)	3,259	2,489	3,259	3,259	3,259	3,259
Product-Origin fixed effects	✓	✓	✓	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓	✓	✓	✓
Origin × quarter-of-year fixed effects	✓	✓	✓	✓	✓	✓
Pre-Tariff Import Share × Quarter-Year	✓	✓	✓	✓	✓	✓

Notes: Estimates of Equation (11) for the rerouted share under the matching definitions in Appendix B.3, 2018Q1–2022Q4. Standard errors in parentheses are clustered by HS 6-digit product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.11: Rerouting Response to Trade War Tariffs: Quantity and Value Measures

	Quantity-based (1)	Value-based (2)	Value-based (3)
Tariff × Post = 1	0.0965***	0.0756***	0.1035***
	(0.0172)	(0.0158)	(0.0191)
Observations	2,607,200	2,607,200	2,607,200
R^2	0.53320	0.51942	0.54131
Within R^2	1.14×10^{-4}	7.37×10^{-5}	8.06×10^{-5}
Product-Origin fixed effects	✓	✓	✓
Product-Quarter-Year fixed effects	✓	✓	✓
Origin × quarter-of-year fixed effects	✓	✓	✓
Pre-Tariff Import Share × Quarter-Year	✓	✓	✓

Notes: Estimates of Equation (11), 2018Q1–2022Q4. Columns (1) and (2) compare quantity- and value-based rerouting on the same transactions with usable quantity information and with the same export denominator, as described in Appendix B.3. Column (3) reports the full-sample baseline. Standard errors in parentheses are clustered by HS 6-digit product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

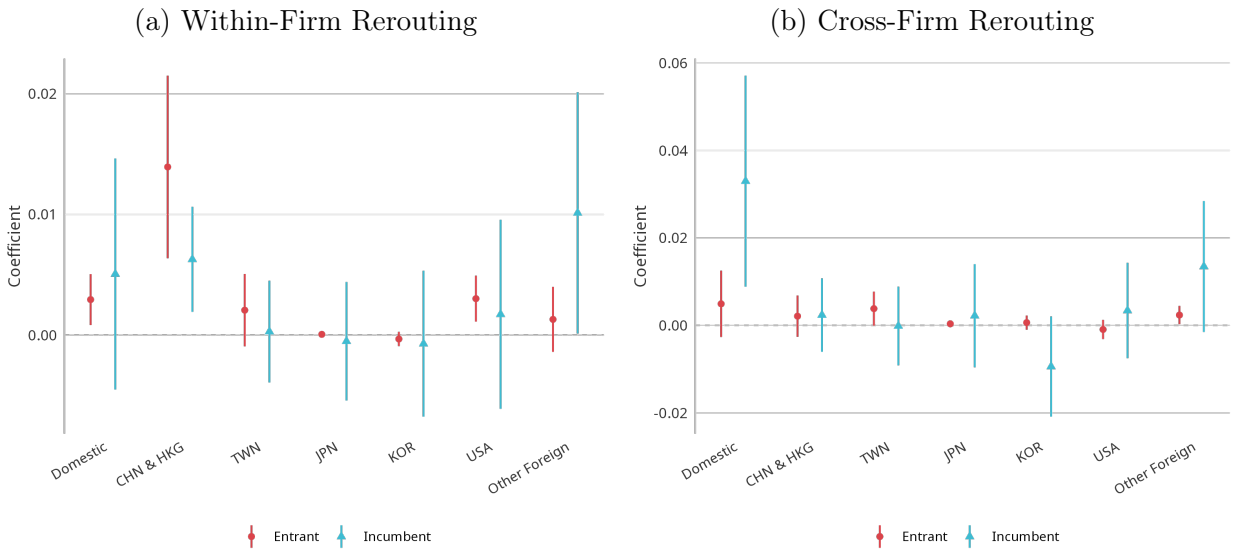
E Ownership and Entry

Table A.12: Firm Ownership, Incumbency, and the Response to Trade War Tariffs

	Rerouted Share			Imported Content Share		
	Entrant (1)	Incumbent (2)	All (3)	Entrant (4)	Incumbent (5)	All (6)
Domestic	0.0079*	0.0381***	0.0459***	0.0099***	-0.0088*	0.0010
	(0.0041)	(0.0124)	(0.0130)	(0.0014)	(0.0050)	(0.0049)
China and Hong Kong	0.0161***	0.0086*	0.0247***	0.0212***	0.0219***	0.0431***
	(0.0046)	(0.0045)	(0.0066)	(0.0037)	(0.0036)	(0.0052)
Taiwan	0.0059**	0.0002	0.0061	0.0052**	-0.0022	0.0030
	(0.0025)	(0.0050)	(0.0056)	(0.0025)	(0.0022)	(0.0034)
Japan	0.0004	0.0017	0.0021	0.0002	0.0017*	0.0019**
	(0.0004)	(0.0062)	(0.0062)	(0.0002)	(0.0009)	(0.0009)
Korea	0.0003	-0.0101	-0.0098	0.0015**	-0.0091**	-0.0075*
	(0.0008)	(0.0065)	(0.0066)	(0.0008)	(0.0043)	(0.0044)
US	0.0021	0.0051	0.0072	0.0055***	-0.0013	0.0042*
	(0.0013)	(0.0065)	(0.0066)	(0.0019)	(0.0016)	(0.0025)
Other foreign	0.0037*	0.0236**	0.0273***	0.0030**	0.0061*	0.0090**
	(0.0019)	(0.0092)	(0.0094)	(0.0012)	(0.0034)	(0.0035)
All ownership groups	0.0363***	0.0672***	0.1035***	0.0464***	0.0083	0.0547***
	(0.0075)	(0.0181)	(0.0191)	(0.0053)	(0.0064)	(0.0081)
Observations	2,607,200	2,607,200	2,607,200	2,607,200	2,607,200	2,607,200
Products (clusters)	3,259	3,259	3,259	3,259	3,259	3,259

Notes: Estimates of Equation (11) by ownership and entry status, 2018Q1–2022Q4. Each group's outcome is divided by total US-bound exports in the product-quarter, so group contributions sum to the aggregate response. Columns (3) and (6) pool entrants and incumbents; the last row pools ownership groups. Standard errors in parentheses are clustered by HS 6-digit product. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Figure A.10: Ownership, Incumbency, and the Components of the Rerouting Response



Notes: Estimates of Equation (11) for within-firm and cross-firm rerouting, both classified by exporter ownership and incumbency, 2018Q1–2022Q4. Each component is divided by total US-bound exports in the product-quarter; their coefficients sum to the total rerouting response for each group. Bars show 95% confidence intervals, with standard errors clustered by HS 6-digit product.

F Supporting Calculations

F.1 Export Growth and Its Components

We multiply the annual customs shares by total US imports from Vietnam reported by the USITC. The accounting identity is

$$\begin{aligned}\bar{X}^{USA}_{2022} - \bar{X}^{USA}_{2018} = {} & \left(r^{CHN}_{2022}\,\bar{X}^{USA}_{2022} - r^{CHN}_{2018}\,\bar{X}^{USA}_{2018}\right) \\ & + \left(c^{CHN}_{2022}\,\bar{X}^{USA}_{2022} - c^{CHN}_{2018}\,\bar{X}^{USA}_{2018}\right) \\ & + \left(c^{ROW}_{2022}\,\bar{X}^{USA}_{2022} - c^{ROW}_{2018}\,\bar{X}^{USA}_{2018}\right) + \text{value added}, \end{aligned} \tag{23}$$

where r^{CHN}_a is the annual rerouted share from China, c^{CHN}_a and c^{ROW}_a are the Chinese and rest-of-world imported-content shares, and $\bar{X}^{USA}_a$ is the USITC import total in year a. Annual shares divide each component's annual customs value by annual US-bound exports. Value added is the residual after subtracting the three measured contributions from total export growth.

Table A.13: Export Growth and Its Components, 2018–2022

		$ millions		Share of
Component	2018	2022	Change	growth (%)
Rerouting from China	2,688.5	10,914.5	8,226.0	10.5
Imported content from China	7,436.2	20,455.9	13,019.7	16.6
Other imported content	9,025.6	21,824.3	12,798.8	16.3
Value added	29,989.3	74,252.1	44,262.8	56.5
Total	49,139.5	127,446.8	78,307.3	100.0

Notes: Customs component shares multiplied by USITC import totals. Other imported content includes transactions coded to Vietnam and unknown origins. Calculations use unrounded values.

For the product-level contributions in Table A.9, we multiply each product's rerouted value, Chinese-content value and US-bound exports by the year's aggregate ratio of USITC imports to customs exports, then take the change from 2018 to 2022.

Table A.14: Rerouting's Contribution to Export Growth by Spatial Unit

Matching unit	Change ($ millions)	Share of growth (%)
Country	21,014.5	26.8
Province	8,226.0	10.5
Firm	1,460.6	1.9

Notes: The accounting in Equation (23), using the country, province and firm shares in Table 1. The denominator is the $78,307.3 million increase in US imports from Vietnam between 2018 and 2022.

F.2 Vietnam's Replacement of China's US Import Share

Let s_a be Vietnam's share of total US imports in year a, measured from destination-reported UN Comtrade values. We apply the same annual customs shares to calculate the China-linked fraction of Vietnam's market-share gain:

$$\frac{s_{2022}(r_{2022}^{CHN} + c_{2022}^{CHN}) - s_{2018}(r_{2018}^{CHN} + c_{2018}^{CHN})}{s_{2022} - s_{2018}} \simeq 28.43\%. \tag{24}$$

This calculation divides each year's exports by total US imports in that year. Total US imports grew by 29.2% between 2018 and 2022, so the China-linked share of Vietnam's gain in US import share differs from its share of dollar export growth.

Table A.15: Changes in US Import Shares, 2018–2022

	US import share (%)		Change
	2018	2022	(percentage points)
Vietnam	1.964	4.028	2.065
China-linked exports through Vietnam	0.405	0.992	0.587
China	21.567	17.068	−4.499

Notes: Market shares use destination-reported UN Comtrade imports. The China-linked component multiplies Vietnam's US import share by the sum of its rerouting and imported-content shares from China. Calculations use unrounded values.

Rerouting contributes 0.238 percentage points and Chinese imported content 0.349 points. Their combined contribution is 28.43% of Vietnam's 2.065-point gain and 13.05% of China's 4.499-point decline.

F.3 Tariff Responses in Relative Changes

The mean treatment intensity in the estimation sample is 12.24 percentage points: treated products are assigned their first announced Section 301 tariff increase, and never-tariffed products are assigned zero. Multiplying the coefficients in Table 3 by 0.1224 gives the implied changes in the outcome shares.

Table A.16: Tariff Responses at the Mean Tariff Increase

Outcome	Coefficient	Baseline mean	Change (percentage points)	Change relative to baseline (%)
Rerouted share	0.1035	0.121	1.27	10.5
Imported-content share	0.0547	0.026	0.67	25.8

Notes: Coefficients and means are from Table 3. Baseline means are for China-origin observations in 2018Q1–Q2. Percentage-point changes equal $100 \times \hat{\beta} \times 0.1224$; relative changes divide the implied share change by the baseline mean.