Foreign Demand Shocks and Domestic Value Added: Firm-Level Evidence from Viet Nam *

Anmol Agarwal — University of Virginia
Alessandro Barattieri — World Bank & ESG UQAM
Aaditya Mattoo — World Bank

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Abstract

Recent shifts in global trade patterns have received a lot of attention, but the implications of these shifts for domestic value added in exports (DVAR) have so far been overlooked. The paper documents substantial increases in Viet Nam's aggregate DVAR since 2018, reversing a long declining trend. Analysis using matched firm-level and customs data reveals that idiosyncratic US demand shocks had large positive effects on firm-level DVAR and output. Firms respond to the shocks by exporting more to both US and non-US markets, and see increases in labor productivity, both of which may indicate the existence of economies of scale. Firms also increase their use of domestic materials and reduce reliance on imported materials, suggesting sensitivity to implicit rules of origin. Finally, the paper highlights the role of firm ownership, with non-Chinese owned firms driving the increase in domestic value added.

JEL Codes: F14, F13, F17, C68

Keywords: Trade Diversion, Domestic Value Added, Foreign Demand Shocks

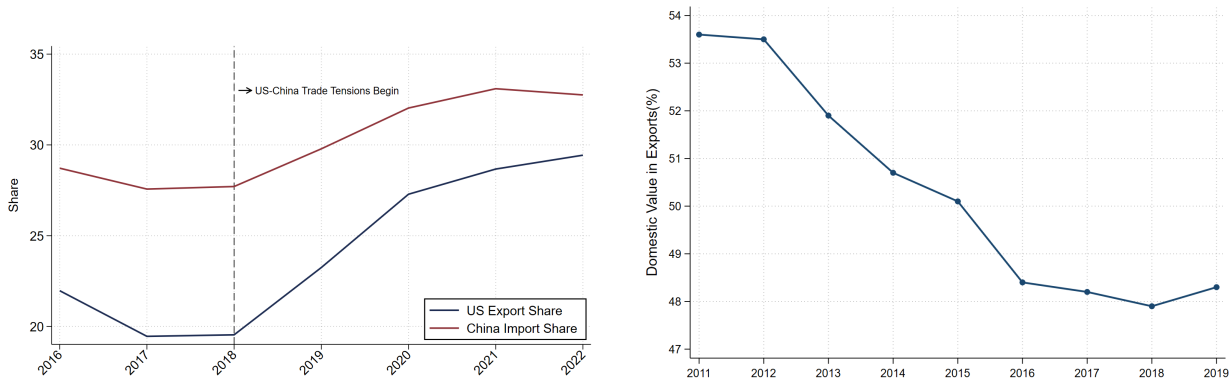
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1 Introduction

Yet alongside fear of Trump's tariffs and China's inexorable export growth, countries in south-east Asia are trying to capitalise on trade war opportunities, too. Playing the world's two largest economies off each other is an obvious strategy, as multinationals seek neutral ground. But extracting value from supply chain shifts is harder than it might seem.

- Chris Miller, Financial Times, Feb 2025

The US-China trade tensions created novel opportunities for third countries to increase their participation in global value chains (Fajgelbaum et al., 2024). Indeed, recent research finds that Viet Nam has emerged as a major beneficiary of the diminishing role of China in the US markets.[1,2] In figure 1a, using the official customs data, we plot the Vietnamese share of exports to the US and the share of imports form China. The magnitude of US's rise in Vietnamese exports is staggering. Over the period 2018-2020, share of US in Viet Nam's exports increases by roughly 8 percentage points - a 39.6% increase. Over the same period, the share of China in Viet Nam's imports rise by 15.6%, raising fears of potential rerouting of goods from China via Viet Nam. While this question has generated a lot of attention among researcher, pundits, and policy makers, an equally important question has been so far overlooked: How does increased access to US markets affect firm-level domestic value added in exports in Viet Nam?



(a) **(b)**

Figure 1: Panel (a) plots the share of US in Viet Nam's exports and share of China in Viet Nam's imports; Panel (b) plots the trend in Domestic value added in exports using the TiVA database

In this paper, we address this important question by utilizing Vietnamese customs

[1] Between 2017 and 2022, China's share in US imports fell from 22 to 16%

[2] see Alfaro and Chor (2023) , Freund et al. (2024)

data matched with the firm level survey data. Domestic content in exports is crucial in assessing the benefits from increased export opportunities that accrue to the domestic factors of production and thus domestic welfare. If most of the new exports are just re-labeling of goods from China, the gains from increased export numbers are limited. We use the methodology from Kee and Tang (2016) and estimate domestic value added in exports (DVAR) for Vietnamese firms.

We aggregate our firm-level DVAR measure using appropriate exports weights to get the national level DVAR. Our first finding is that that the national-level DVAR in Viet Nam's manufacturing sector reverses a declining trend and increases substantially since 2018. The finding is stark given the long declining trend in domestic content across many countries, worldwide. Johnson and Noguera (2017) show that during the period 1970-2009, most of the countries in their sample see a decline in domestic value added content. Viet Nam is not an exception as seen in figure 1b. The figure uses the measure of manufacturing sector DVAR from Trade-in-Value-Added (TiVA) database.[1] It is clear that DVAR in Viet Nam is consistently falling up until 2018. Our decomposition exercise further shows that the increase in domestic value since 2018 is driven by within-firm increases rather than a reallocation of exports towards high domestic content firms.

We assess the role increased opportunities to export to the US in driving the increase. We study a novel natural experiment that idiosyncratically affected a Vietnamese firm's ability to increase its export participation to the US. The US-China trade tensions led to unpredictable changes in the US import demand across products during 2018-19. As a result, otherwise similar Vietnamese exporters, face different demand shocks from the US based on *what* they were exporting before the trade tensions begin.

Our identification strategy is similar to the growing recent empirical trade literature on export demand shocks (Hummels et al. (2014); Aghion et al. (2024); Mayer et al. (2021); Berman et al. (2015)). Their are, however, two main differences. First, we focus on export demand shocks from the US rather than all firm destinations as the US-China trade tensions do not, necessarily, directly affect demand by other countries. Second, we limit our attention to the quasi-experimental variation from the period 2018-19[2]. Similar to Garin et al. (2019), the exogeneity of this demand shock stems from the quasi-randomness of the underlying import demand shocks in the US, and not the "shift-share" instrument form *per se*.

[1] Although, Kee and Tang (2016) highlight the downward bias in estimates built on the basis of I-O tables, it still provides a fair idea of broad movements in aggregate DVAR.

[2] One notable exception is Garin et al. (2019) who use quasi-experimental variation from the recession of 2008-09 in constructing their demand shocks

We find that the domestic value added in exports responds significantly to the firm-specific US demand shock. A US demand shock of the average value (8.9%), results in a firm increasing its DVAR by 2.1 percentage points, on average, in the period 2018-20. Consistent with quasi-random assignment, our dynamic estimates confirm the absence of any pre-existing trends in the movement of DVAR. The coefficients are economically large. The average US demand shock can alone explain 96% of the overall increase in DVAR since 2018 among the firms in our sample. The increase in DVAR is primarily due to a decline in the reliance on imported materials. In response to the demand shocks, the overall materials use of the firms increase that is entirely driven by an increase in the domestic materials. Consequently, the share of imported materials in total materials falls.

Consistent with scale effects, we show that US demand shocks allows firms to expand, rather than just relocate exports from other destinations to the US. We see a significant positive effect on output, total exports, exports to the US, and exports to non-US countries. The latter result is consistent with Fajgelbaum et al. (2024) who show that bystander countries export more to US and non-US, excluding China, in high tariff products.[3] Additionally, we also see significant positive effects on labor productivity.

Our results on the increase in domestic value in exports, both the aggregate trend and firm-level increases, indicate that the rise in exports are not merely an artifact of transshipment from China, that should have close to zero domestic content. We test the hypothesis directly by studying imports from China in response to the US demand shocks. We do not find evidence of increased imports from China. If anything, the imports from China decline in the short run.

The fact that rerouting does not seem important for incumbent firms in Viet Nam is not to be seen as evidence against the presence of any rerouting at all. To dig deeper, we separate the effects by ownership structure of the firms. Transshipment, if happening, might be easier to undertake via Chinese owned firms in Viet Nam. Indeed, we find that for the Chinese owned firms, both exports to the US and imports from China increase significantly. Chinese owned firms do not expand in terms of output and, importantly, do not increase reliance on domestic inputs. As a result, DVAR for these firms does not respond significantly to the new trade opportunities. For all other firms, both domestic and non-Chinese foreign owned, all previous results continue to hold. Importantly, imports from China decline for these firms. We document the importance of new firms in understanding potential rerouting. We show that for firms established in 2018 or later,

[3]It is however in contrast to Utar et al. (2023) who show that that Mexican firms more exposed to US tariffs on China increased exports to the US but not to the non-US destinations

DVAR trends downwards, consistent with their large share in increased imports from China during the period.

We highlight two potential reasons why a US demand shock may drive Vietnamese firms to shift from imported to domestic inputs. First, implicit Rules of Origin appear to have played a role. During 2018–2020, US authorities were alert to the risk of indirect Chinese exports via third countries.[4] Firms in Viet Nam seeking to expand US market access may have viewed reducing reliance on Chinese inputs as essential. Failure to do so risked sanctions—such as the over 400% US tariffs on Vietnamese steel in July 2019 due to concerns over rerouting.[5] Vietnamese authorities also took steps to prevent relabeling of Chinese goods.[6] Fear of future penalties or loss of export opportunities likely motivated firms to increase domestic value-added. We support this mechanism with evidence at both the firm and industry level. Consistent with this mechanism, we find that industries with higher domestic content requirements under NAFTA— plausibly reflecting US preferences for domestic sourcing—experience larger increases in DVAR in Viet Nam. At the firm level, gains in DVAR are concentrated among firms whose main exported product had above-median NAFTA domestic content requirements, while those below the median see no significant change.

A second related argument is an increase in domestic capacity in Viet Nam. We show that, apart from the increased trade participation, Viet Nam also emerged as a major beneficiary in manufacturing FDI from both US and China. As long as the increased manufacturing FDI signals an increase in domestic capacity, it facilitates firms' switch from foreign to domestic sources of materials, thereby increasing the domestic content in exports.

Our analysis relates to several strands of literature. First, it relates to the literature on measuring value-added in trade. Recent papers related to IO table-based estimates include Hummels et al. (2001); Antràs et al. (2012); Antràs and Chor (2013); De La Cruz et al. (2013); Johnson and Noguera (2012, 2017); Koopman et al. (2012, 2014). Our micro approach using firm-level measures comes from Kee and Tang (2016). Other recent papers using micro approach to GVC measurement include Bems and Kikkawa (2021); Tang et al. (2016); Kee et al. (2024).

Second, this paper is connected to the growing literature on the effects of US-China

[4]https://www.wsj.com/articles/for-chinese-steel-the-road-to-the-u-s-goes-through-Viet Nam-1523352601

[5]https://www.bloomberg.com/news/articles/2019-07-03/u-s-slaps-import-duties-on-Viet Nam-steel-in-ramp-up-of-war

[6]https://www.reuters.com/article/business/Viet Nam-to-crackdown-on-chinese-goods-relabelled-to-beat-u-s-tariffs-idUSKCN1TB0J0/

trade tensions on third countries. In the context of Viet Nam, Rotunno et al. (2023) show an increase in job creation and wages in sectors most affected by US tariffs. Mayr-Dorn et al. (2023) show that Vietnamese districts more exposed to the trade tension experience higher manufacturing sector employment and wages. Wu (2024) documents that the importance of foreign-owned firms, especially Chinese manufacturers, in evaluating the export gains in Viet Nam during the US-China trade tensions. Our work differs as we are primarily interested in measuring and evaluating the domestic value added in exports in response to the US demand shocks. Our results on the importance of new firms in driving the increases in labor during the trade tension period are, intuitively, in line with McCaig et al. (2022) who show that tariff induced employment growth in Viet Nam under the US-Viet Nam Bilateral Trade Agreement was largely due to new firm entry. Recently, Utar et al. (2023) shows that US tariff hikes increase GVC participation for Mexican firms. Our paper differs as we primarily focus on domestic value added for Viet Nam that does not enjoy geographical proximity to the US. Our results are thus broadly applicable to the analysis of other similar East-Asian economies.

Lastly, the paper relates to the recent work on global trade reallocation during the period of US-China trade tensions. Freund et al. (2024) and Alfaro and Chor (2023) highlight the fact that direct sourcing by US from China has decreased in favor of Viet Nam and Mexico, but these countries are deeply integrated with Chinese supply chains through increase imports. Fajgelbaum et al. (2024) show that the trade tensions created net trade opportunities for bystander countries rather than just shifting trade across destinations. Iyoha et al. (2024) directly evaluates rerouting from China via Viet Nam at the product and firm-level. They identify 16.1% of exports at the product-level and 1.8% of exports at firm-level as rerouting. Our results on rerouting add to the literature by distinguishing between the role played by new entrants vs incumbent firms in facilitating potential rerouting.

The rest of the paper is organized as follows. Section 2 details the measurement of firm-level domestic value added in exports. Section 3 describes the data and sampling. Section 4 discusses the trends in DVAR in Viet Nam. Section 5 presents the methodology used to create the idiosyncratic US demand shocks. Section 6 provides details on the estimation strategy and its validity. Section 7 presents the main results of the paper. Section 8 provides evidence on the key mechanisms in the paper and section 9 discusses the role of incumbent and old firms. Section 10 concludes the paper.

2 Measurement of Firm-Level Domestic Value Added

We follow Kee and Tang (2016) in defining the domestic value added in exports. We can write a firm's revenue as:

$$PY_i = \pi_i + wL_i + rK_i + P^D M_i^D + P^I M^I \tag{1}$$

where firm revenue (PY) consists of profits (π), total wages (WL), cost of capital (rK), cost of domestic materials ($P^D M^D$) and cost of imported materials ($P^I M^I$). Domestic and imported materials cost can be decomposed into purely domestic and foreign content as:

$$P^D M_i^D = \delta_i^F + q_i^D, \text{ and } P^I M_i^I = \delta_i^D + q_i^F \tag{2}$$

where δ_i^F is the foreign content in domestic materials, q_i^D is the domestic content in domestic materials, δ_i^D is domestic content in foreign materials, and q_i^F foreign content in foreign materials. Now, we can define the domestic value added (DVA) as the sum of profits, wages, cost of capital, and both types of domestic materials purchased as:

$$DVA_i = \pi_i + wL_i + rK_i + q_i^D + \delta_i^D \tag{3}$$

The total imports can be defines as the sum of material imports and capital imports as (δ_i^K):

$$IMP_i = P^I M^I + \delta_i^K \tag{4}$$

Using (1), (2), (3) and (4), we can rewrite DVA in (3) as:

$$DVA_i = PY_i - (IMP_i - \delta_i^D - \delta_i^K + \delta_i^F) \tag{5}$$

We can write the domestic value added per unit of total sales, $\frac{DVA_i}{PY_i}$ as:

$$\frac{DVA_i}{PY_i} = 1 - \frac{(IMP_i - \delta_i^D - \delta_i^K + \delta_i^F)}{PY_i} \tag{6}$$

We are interested in the domestic value added in exports. To achieve this, we need to know the share of inputs that are used in the production for exports and production for domestic sales, separately. This information is not available in the data. We use the simple proportionality assumption, where the share of inputs used in exports is equal to the share of exports in total sales of the firm. This assumption implies that total domestic value added per unit of total sales, domestic value added in exports per unit of exports,

and domestic value added in domestic sales per unit of domestic sales, are all equal. Therefore, we can write the domestic value added domestic value added in exports per unit of exports ($DVAR_i$) as:

$$DVAR_i = 1 - \frac{(IMP_i - \delta_i^D - \delta_i^K + \delta_i^F)}{PY_i} \tag{7}$$

To measure $DVAR_i$ in the data, we need to know δ_i^D, δ_i^K, and δ_i^F that are not directly available. We use alternate sources of data to get information on these components. First, δ_i^D is directly observed in the Trade in Value Added (TiVA) database. The measure is available for Viet Nam annually at the industry level. We create a correspondence between industries in the TiVA database and our firm-level Vietnamese data to map δ_i^D from TiVA to the data. For δ_i^K, we rely on the Broad Economic Categories (BEC) classification. The BEC classifies each 6-digit HS code into capital and other goods. Since, the customs data we use will be at the aggregate 2 digit HS level, we use the national level import data for Viet Nam from Comtrade to get a measure of the proportion of a HS 2 digit product that is capital imports. We assume that within a 2 digit product, firm-level use of 6 digit products is proportional to the national use. We can, thus, back out the capital imports by multiplying this proportion for each 2 digit product by the total imports of that product, for each firm.

The last remaining component is δ_i^F. Unfortunately, we are not aware of any available data that provides information on this measure for Viet Nam. In Kee and Tang (2016), this measure for China varies at the industry level and takes values between 0.4% to 5.7% (as proportion of exports). For our calculations, we use a value of 2.5%, that is somewhere in the middle of these values. We are aware that this is an imperfect measure but it does not hamper our ability to credibly assess the effects of foreign-demand shocks on DVAR. We always control for the industry-year fixed effects in our estimations. Any variation in firm-level DVAR that accrues to changes in δ_i^F is fully absorbed by the industry-year fixed effects.

We handle the problem of excessive importers similarly to that in Kee and Tang (2016). Excessive importers are firms that import more than their material needs and thus may result in the underestimate of their DVAR. We use imports for a firm from the customs data and compare it to the total material spending in the firm-level data. Since total material spending includes both spending on imported and domestic materials, if the imports exceed the total material spending, such firms are classified as excessive importers and dropped from the sample.

The national-level DVAR for Viet Nam can be measured by aggregating up the firm-level DVAR with appropriate weights. The weights used are the export share of a firm[7]. As discussed in Kee and Tang (2016), this grounds up approach overcomes the problem of a downward aggregation bias in the I-O table-based approach. Construction of IO tables usually over sample larger firms that tend to have a lower DVAR due to higher import-to-sales ratio that can lead to lower estimates of aggregate DVAR.

3 Data & Sampling

Vietnamese Firm Data: We use the data from Viet Nam Enterprise Survey (VES) to obtain firm level characteristics. The data includes annual information of balance sheet and income statement items such as revenues, employment, fixed capital, and material expenses. VES also provides information on other characteristics such as a firm's location, 2-digit industry code, foreign or domestic ownership as well as nationality of the primary foreign owners, and a unique tax id. Our sample covers the period from 2015 to 2020. During the sample period, the raw data consists of around 0.85 million firms.

Trade Data: We obtain the official customs data for Vietnamese firms from the Vietnamese authorities. The data covers the period from 2016 to 2020. The data includes firm-level information on the country specific exports and imports, at the 2 digit HS code level. We are able to match customs data with the VES data using the unique tax id available in both datasets. The customs data is crucial for our analysis as it provides information on the pre-2018 exposure of firms to trade in different products. This is important for our identification using a shift-share approach as discussed in section 6. The other commonly used source of firm-level trade data is Panjiva, but the data starts recording Vietnamese firms' transactions beginning 2018 and, thus, lacks the information on pre-2018 export and import baskets. The resulting matched dataset is, to our knowledge, the first of its kind, and enables us to additionally examine pre-trends in key firm-level outcomes.

Other Data: We employ several other data sources. We use the Comtrade database to obtain product-level data on the annual imports by US and exports from China. We use the TiVA database to get information on industry-level domestic content in imported materials. Finally, the classification of imports as capital imports or others comes from the

[7]Here the total exports are restricted to the sum of exports of all firms in the sample, rather than total exports of Viet Nam

Broad Economic Categories (BEC) classification.

We make several adjustments to the raw data to get the final sample of firms. First, since the main variable of interest is domestic value added in exports, that is defined only for exporters, all non-exporters are excluded by definition. Second, as discussed in section 2, we drop the excessive importers. Third, we work with a balanced panel of firms that are observed in each year from 2016 to 2020 and have a defined value for DVAR. Fourth, we remove a small number of exporting firms that do not import, as these firms have DVAR very close to 1 by definition, and can not change DVAR in response to the increased export opportunities to the US.[8] Finally, we work with firms only in the manufacturing sector. After these exclusions, we are left with a balanced panel of 3983 manufacturing exporters.

These remaining firms are, unsurprisingly, large. For instance, in the year 2017, out of the 18,834 total firms for whom DVAR is defined, our sample of 3,983 firms account for 73% of the total exports and 65% of the total imports by these firms. Since export weights are used to aggregate firm-level DVAR, our sample is large enough to make an inference about the overall DVAR trends in Viet Nam. We plot the export intensity of these firms in 2017 i.e exports as a share of total sales in Appendix figure A1. The average export intensity is 44% and median is 38%. Export earnings are, thus, a non-trivial portion of a firm's totals sales. We show the summary statistics for the important variables in Appendix Table A1. In terms of number of partner countries, an average firm imports from 7.5 countries and exports to 7.95 destinations in a year. In terms of exposure across different 2-digit products, an average firm imports 10.7 different products and exports 3.36 different products in a year. The average share of exports to the US is 12% and that of imports from China is 29%. The average value of domestic value added in exports stands at 75%. There is large heterogeneity with the lowest DVAR firm only using 22% and the highest DVAR firms using 98% domestic value.

4 Trends in Aggregate DVAR in Viet Nam

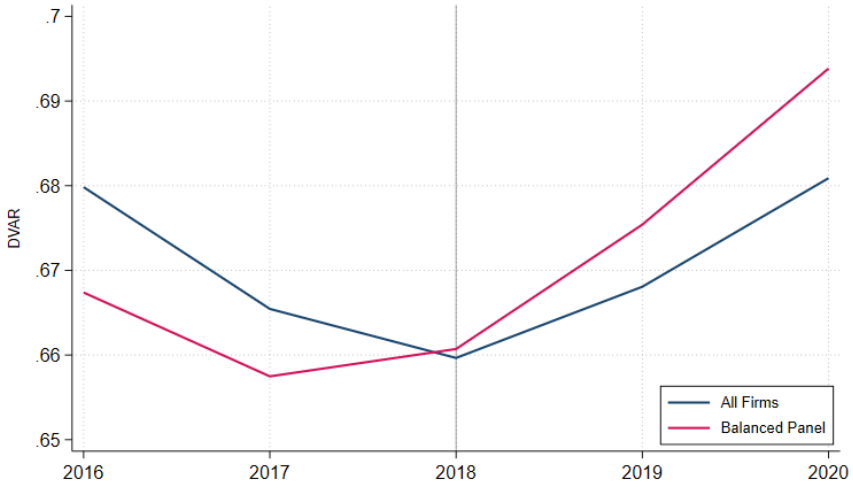
We use the above methodology to calculate the aggregate DVAR in Viet Nam from 2016 to 2020. The resulting trends are shown in figure 2. We show results for both an unbalanced as well as a balanced panel of firms that includes only those firms available in the data in all the 5 years with a define DVAR value. Two findings are clear from the figure. First,

[8]The results of the paper are robust to including the non-importing firms in the sample

the magnitude of DVAR values calculated through the grounds up approach is higher than the values calculated through the I-O table based approach in TiVA in figure 1b. For instance, in 2018 the aggregate DVAR value for all firms is over 16 percentage points higher than the same value in TiVA. These findings confirm the presence of a downward bias in measured aggregate DVAR in I-O table based approach and, further, highlight the role of firm-level data in understanding the movements in domestic value added.

Second, there is a clear trend of a falling DVAR up to 2018 and a sharp reversal since the beginning of the US-China trade tensions. As evident in figure 1b, the falling trend prior to 2018 is likely a much longer run trend of declining domestic value added. The long term declining trend in domestic value added is not restricted to Viet Nam. Johnson and Noguera (2017) show that in the time period 1970-2009, nearly all the countries in their sample of 42 countries experience a fall in domestic value added content. The uptick in DVAR post 2018 must, therefore, be seen as a reversal of a global long-term trend. Another interesting point is the magnitude of the reversal post 2018. For all exporters, DVAR increase by over 2.5 pp between 2018 to 2020. This is a large increase in a span of a three years. The timing of the reversal, coinciding, with the beginning of the the US-China trade tensions in 2018 provides suggestive evidence that an opportunity for Viet Nam to increase participation in US exports might have come hand in hand with a greater use of domestic inputs. This acts as our motivation for casually identifying the importance of new export opportunities to the US in driving this reversal.

Figure 2: Trends in Aggregate DVAR in Viet Nam



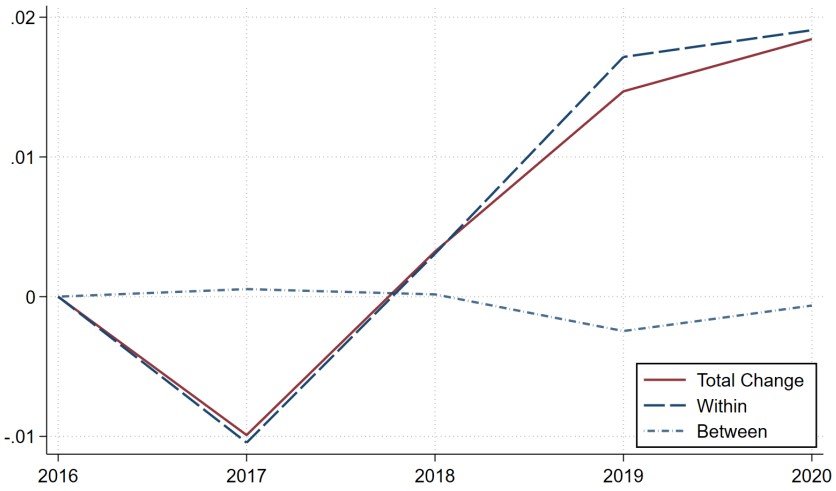
Note: The figure shows the trends in aggregate DVAR using the firm-level measure and aggregating up using firm's total exports as weight. The red line shows the trend for all firms and blue line shows the trend for balanced panel sample

DVAR can increase both due to increase in a firms' reliance on domestic inputs or due to reallocation of exports to firms with a higher domestic content in exports. Using our micro-data on the balanced panel of exporters, we can decompose the changes in aggregate DVAR into within and between firm changes as,

$$\Delta DVAR = \sum_i \overline{s_{it}}(\Delta DVAR_{it}) + \sum_i \overline{DVAR_{it}}(\Delta s_{it}) \tag{8}$$

where $\overline{s_{it}} = \frac{1}{2}(\frac{Exports_{i,t}}{Exports_t} + \frac{Exports_{i,t-1}}{Exports_{t-1}})$ is the average of the share of a firm's export in total exports, and $\overline{DVAR_{it}} = \frac{1}{2}(DVAR_{i,t}+DVAR_{i,t-1})$ is the simple average of firm $i's$ domestic value added in exports over the years t and $t-1$. The result from this decomposition is shown in figure 3. During the sample period, most of the the change in DVAR is driven by a within firm increase in DVAR rather than a reallocation of exports between-firms from low DVAR to high DVAR firms. Additionally, all of the increase in DVAR since 2018 is driven by a within firm increase.

Figure 3: Decomposing Changes in Aggregate DVAR



Note: The figure shows the decomposition of total change in DVAR across years into within and across (between) firms change. Red line shows the total change.

5 Firm Level US Export Demand Shocks

In order to identify the causal relationship from US exports to domestic value in exports, we need variation in a firm's exports to the US that are exogenous to other firm-level changes, that could affect both domestic value and exports to US. We exploit the two fea-

tures of the US-China trade tensions and its impact on US export demand. Firstly, the growth in the US imports (excluding Viet Nam) in a product (2-digit) post 2018 is not predicted by the growth in US imports for the product in the pre-2018 period. More concretely, a cross-sectional regression of product-level symmetric US import growth from 2016-17 to 2018-19 on the product-level symmetric US import growth from 2014-15 to 2016-17 gives a statistically insignificant coefficient and a low R-squared value of 0.005. On the other hand, symmetric US import growth from 2012-13 to 2014-15 strongly and significantly predicts US import growth from 2014-15 to 2016-17.[9] The product-level changes in the 2018-19 US imports were, thus, largely unexpected. Second, it is expected that the firms' product mix at the 2-digit level is sticky and firms can not easily switch its production for exports across products. Thus, there is substantial variation in firms' exposure to differently shocked products in US exports.

In order to measure the idiosyncratic demand shocks, we first define the pre-2018 exposure of a firm i in the export of product j as the share of firm's total 2017 exports that are exports of product j,

$$s_{ij} = \frac{Exports_{ij}^{2017}}{\sum_{j=1}^{97} Exports_{ij}^{2017}}$$

Then, we calculate the symmetric growth rate of imports by the US in product j from the all the countries, excluding Viet Nam, between the two pre trade tension years (2016 and 2017) and the two post trade tension years (2018 and 2019),

$$\Delta D_j = \frac{US\ Imports_j^{post} - US\ Imports_j^{pre}}{(US\ Imports_j^{post} + US\ Imports_j^{pre})/2}$$

The US export demand shock for a firm i is then constructed as the product level US import growth weighted by the firm's 2017 export exposure to that product, summed over all products,

$$\Delta US\ Shock_i = \sum_{j=1}^{97} s_{ij} \cdot \Delta D_j$$

This shock is similar in spirit to the shift-share export shocks used in recent literature[10]. There are however notable differences. First, While these papers exploit full network of country-product export shocks, we restrict the shocks to the US demand shocks. This is because the focus of this paper is, specifically, on the increased opportunities for Vietnamese firms to export in light of the US-China trade tensions that do not directly affect

[9] See Appendix Table A2 for results

[10] see Hummels et al. (2014); Aghion et al. (2024); Mayer et al. (2021); Berman et al. (2015)

the demand in other countries. Further, US is a large export market for Viet Nam and changes in US demand are expected to produce aggregate changes in Vietnamese firms' outcomes. It is important to note that not all firms are directly exposed to the US exports in the pre trade tension period. The weights, s_{ij}, are share of exports of j to any country and not just US. The assumption here is that two firms exporting products in the same proportion are equally affected by the US demand shocks irrespective of previously exporting the product to the US. This ensures that firms not previously selling to the US but facing a positive US demand shock in the products they are exposed to, are allowed to take advantage of the new export opportunities to the US.

Second, we focus on the quasi-experimental variation from the trade tensions rather than annual export shocks. This is similar to Garin et al. (2019) who focus on the quasi-experimental variation form the great recession. This is important for identification as the exogeneity in US export demand shocks stems from quasi-randomness in the underlying US demand shifts during the trade tensions, ΔD_j and not shift-share form per se (Garin et al. (2019); Borusyak et al. (2022)).

In our analysis, we will also control for the firm-level Chinese supply shock[11]. The basic idea remains similar as in the construction of the idiosyncratic US demand shock. We first define the 2017 (pre) exposure of a firm i in the import of product j as the share of firm's total 2017 imports that are imports of product j, $m_{ij} = \frac{Imports_{ij}^{2017}}{\sum_{j=1}^{97} Imports_{ij}^{2017}}$. We then calculate the symmetric growth rate of exports from China in product j to the all the countries, excluding Viet Nam, between the two pre trade tension years (2016 and 2017) and the two post trade tension years (2018 and 2019), $\Delta S_j = \frac{CN\ Exports_j^{post} - CN\ Exports_j^{pre}}{(CN\ Exports_j^{post} + CN\ Exports_j^{pre})/2}$. The China import supply shock for a firm i is then constructed as the product level Chinese export growth weighted by the firm's 2017 import exposure to that product, summed over all products, $\Delta CN\ Shock_i = \sum_{j=1}^{97} m_{ij} \cdot \Delta S_j$.

We show the distribution of the both the shocks across firms in Appendix figure A2. There is considerable variation across firms, with the inter-quartile range for the US export shock and China import shock being 11.8% and 8.6%, respectively. The median US demand shock value is 8.9% and the median China supply shock value is 14.6%. Table A3 provides information on products with the largest values of US demand shock.

[11] More discussion on this in section 6

6 Estimation Strategy

In this section, we spell out the estimation equation to evaluate the effects of trade dispute induced export opportunities to the US on the domestic value of exports and other firm-level outcomes in Viet Nam. We estimate the following event study style regression:

$$Y_{ikt} = \beta_0 + \sum_{k \neq 2017} \beta_k \Delta US\ Shock_i \times 1\{t = k\} + \sum_{k \neq 2017} \Gamma_k \Delta CN\ Shock_i \times 1\{t = k\} + X_{d,t_0}\delta_t + \delta_{kt} + \eta_i + \epsilon_{ikt} \quad (9)$$

where Y_{ikt} is the firm level outcome[12]. $\Delta US\ Shock_i$ is the idiosyncratic US export demand shock post trade tensions. $\Delta CN\ Shock_i \times 1\{t = k\}$ controls for the idiosyncratic China import supply shock. This is important as it is possible that firms' export and import mix are similar at the 2-digit level of product aggregation.[13] The US increase in demand for a product can be, further, correlated to the increase in the Chinese supply in that product as the Chinese firms reduce direct sales to the US due to higher tariffs.[14] Now, a Vietnamese firm that faces a larger US demand shock might also face a larger China supply shock. Increased imports from China, while being potentially correlated with increased exports to US, can lead to a fall in domestic value of exports. Thus, not controlling for the China supply shock, due to the nature of the trade tensions and the importance of China as a major sourcing strategy for imported inputs, can lead to a negative bias in the estimates of β_k.

$X_{d,t_0}\delta_t$ controls for a vector of 2017 (pre trade tensions) level firms' characteristics interacted with the year fixed effects. This includes the firm-size, exports as a proportion of sales, and US exports as a proportion of total exports. This allows larger firms, pre trade tensions, to follow different trends in light of the trade tensions as compared to smaller firms. This further ensures that the more export oriented firms and firms with a higher initial US presence are allowed to follow different trends as compared to firms that are not heavily export oriented and not exposed to US markets. η_i is the firm fixed effect and δ_{kt}

[12] When the dependent variable is exports to US or imports from China, we use Poisson pseudo-maximum likelihood (PPML) estimation to account for a substantial number of zeros in the value of the variables

[13] Appendix Figure A3 plots the binscatter correlation between the import and export share at the firm-product level. It is evident that there is a strong positive correlation between a firm's export and import mix

[14] Appendix Figure A4 documents the positive correlation between product-level US demand and China Supply shocks

is the industry-year fixed effect that controls for time varying characteristics at the 2-digit industry level. As discussed in section 2, we do not have a measure of the foreign content in domestic materials that is an important ingredient in the measurement of domestic value in exports. However, as long as this measure is varying at the industry level, the industry-year fixed effect fully absorbs the effects on DVAR from changes in the foreign content in domestic materials. Following Kee and Tang (2016), when the dependent variables are DVAR, imported materials to total materials and imported materials to output ratio, additionally, we control for the total wage to output ratio and the total materials to output ratio. These controls ensure that the effects of changing labor cost and materials intensity is captured in evaluating domestic value and imported materials intensity.

Our coefficients of interest are β_K. Each coefficient β_K is the year-specific effect of the US demand shock in year k relative to the pre-tension omitted year of 2017[15]. Our identifying assumption is that after appropriate controls in equation 9, any subsequent variation in the firm-level US export demand shock is uncorrelated with firm specific shocks to the outcomes studied. Graphical analysis of β_K further facilitates the check of pre-trends in the outcomes. If the US demand shocks are exogenous, we should not expect any differential evolution of outcomes prior to 2017.

We also estimate the pooled version of the difference-in-differences regressions:

$$Y_{ikt} = \beta_0 + \beta \Delta US\ Shock_i \times Post_t + \Gamma \Delta CN\ Shock_i \times Post_t\ + X_{d,t_0}\delta_t + \delta_{kt} + \eta_i + \epsilon_{ikt} \quad (10)$$

where $Post$ takes value 1 if the year is 2018, 2019 or 2020 and 0, if the year is 2017. The coefficient of interest β gives the effect of the US demand shock on the outcome of interest, on average in the post period relative to the pre period. In all specifications, standard error is two way clustered at the firm and year level.

7 Results

Figure 4 presents the main result of the paper showing the effects of US demand shocks on domestic value added in exports. Panel (a) shows the estimates from the unweighted estimates of equation 9. The effects are positive and statistically significant for the post trade tension period. Further, the effect size is increasing over time reflecting the pos-

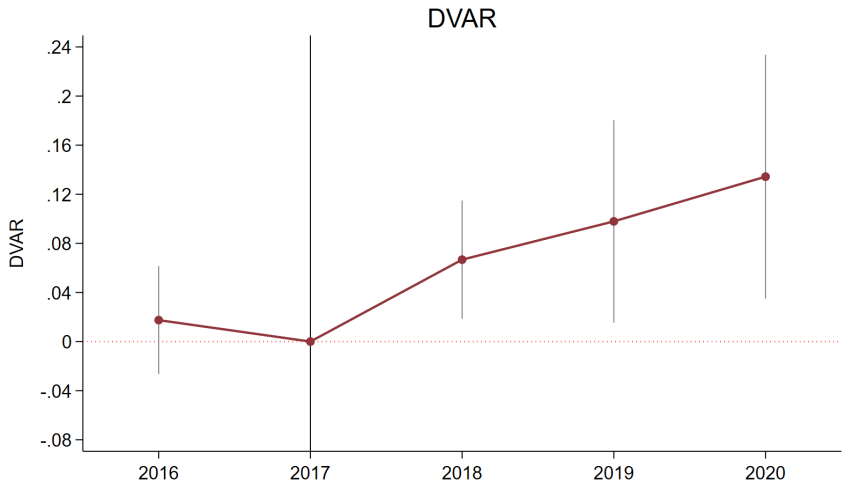
[15]If the dependent variable is output, labor, materials or labor productivity, we extend the analysis to 2015. All other dependent variables require data on either imports or exports and we are restricted by data availability from 2016 onwards

sibility that it is easier for firms to switch from foreign to domestic source of inputs as they have more time to do so. Consistent with quasi-random assignment, the US demand shock does not predict differential increase in DVAR before 2017. Thus, we see that trade tension induced export opportunities to the US does, indeed, lead to an uptick in the firm-level domestic value added in exports. Panel (b) reports estimates weighted by firms' 2017 export values. This is our preferred specification as weighting by initial exports reduces the influence of small exporters and provides an estimate that is more representative of aggregate changes in DVAR. The results remain positive and significant at the 5% level, and there is no significant prior trend. Since our results include the industry-year fixed effects, these results are not explained by industry level shifts to higher domestic value in exports. The results are driven by firm-level increases in domestic value in response to the US demand shocks. In response to a 10% US demand shock, form panel(b), DVAR increases by 2 pp in 2018, which further increases to 3.2 pp by 2020.

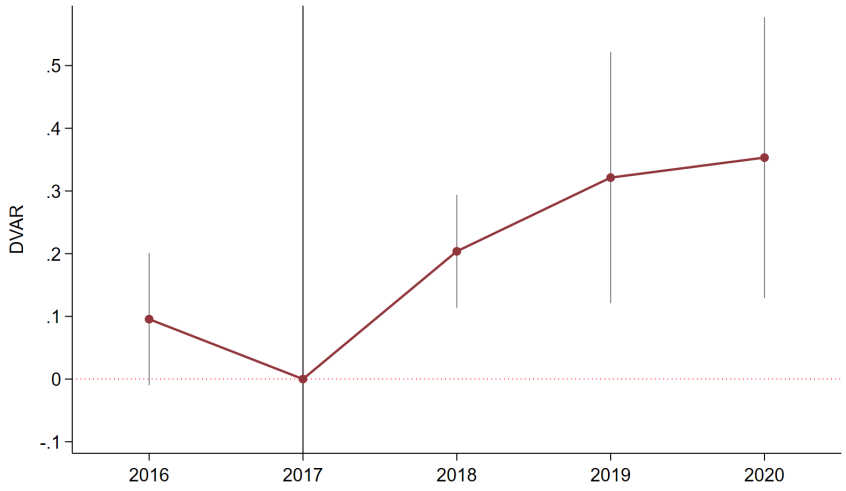
We now discuss the effects on other firm level outcomes in output, labor productivity, labor, and total materials. Panel (a) of figure 5 shows the effects of US demand shocks on firm output. Again, the effects are positive and significant and are sustained over time. The effects in the pre period are small and insignificant. For a 10% US demand shock, the gain in output is 4%, that increases to 5.8% by 2020. We find similar results for labor productivity and total materials as reported in panel (b) figures 5 and panel (a) of 6, respectively. The results for productivity are significant at the 5% level only up to 2019. Overall, increase in export opportunities to the US leads to Vietnamese firms becoming larger, use more materials and increasing the productivity of labor. Contrary to some new work on the effects on US-China trade tensions on labor in Viet Nam, we do not find any positive effects on firm-level employment due to US demand shocks (Panel (b) Figure 6). Thus, while firms expand, they are doing so on the back of increased labor productivity and as we document below domestic materials, not necessarily labor. We discuss in section 9, how our results on labor can be aligned with the new work showing positive effects on labor during trade tension period. The key will be the discussion of new firms that become operational since 2018, rather than gains for existing firms. It should be emphasized here that the focus of our paper is on firms operational before the trade tensions, due to the identification strategy that relies on the pre trade tensions export weights.

We now examine if the increase in DVAR is due to firms substituting from imported to domestic materials. We split materials into imported and domestic material use and assess which source of materials sourcing contributes more to the increase in total ma-

Figure 4: Event Study: Domestic Value Added in Exports



(a) Unweighted



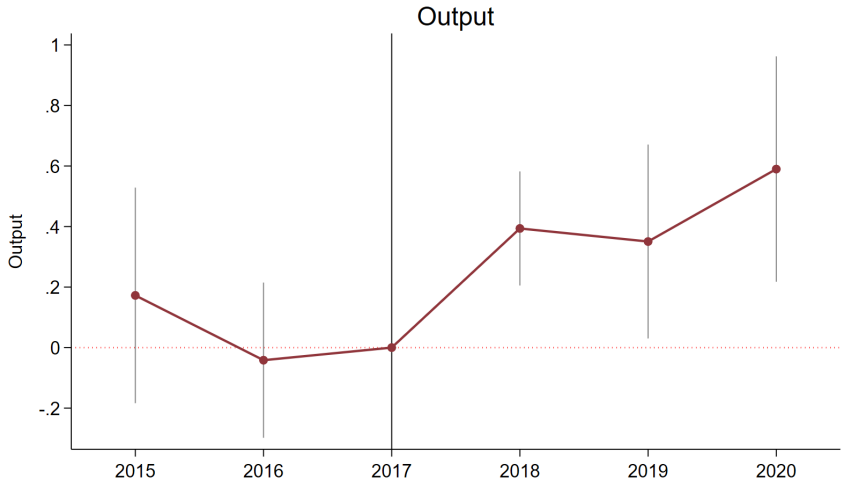
(b) Weighted by Exports 2017

Note: The figure plots the results from estimation of equation 9. The dependent variable is the domestic value added in exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additionally, we control for total wage to output ratio and total materials to output ratio. In Panel (b), we use total exports in 2017 as weights. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

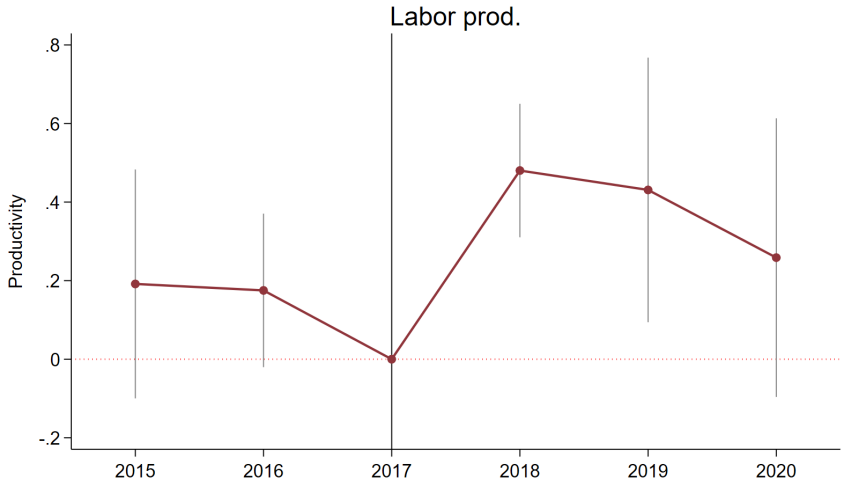
terial usage[16]. It is evident from panels (a) and (b) of figure 7 that the increase in total materials is entirely driven by the rise in domestic materials usage. Imported materials do not show any significant changes in response to the US demand shocks. For a 10%

[16]We can only do this split since 2016 due to data constraints, hence, 2015 is excluded from the estimation

Figure 5: Event Study: Total Output and Labor Productivity



(a) Output

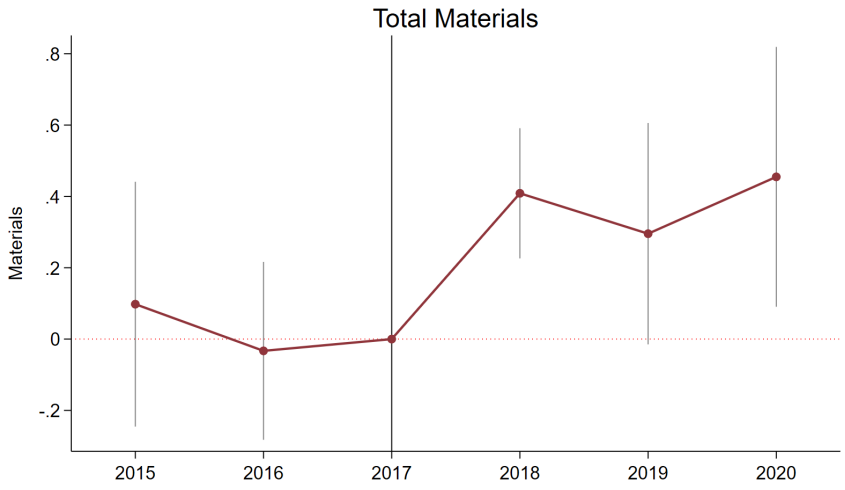


(b) Labor Productivity

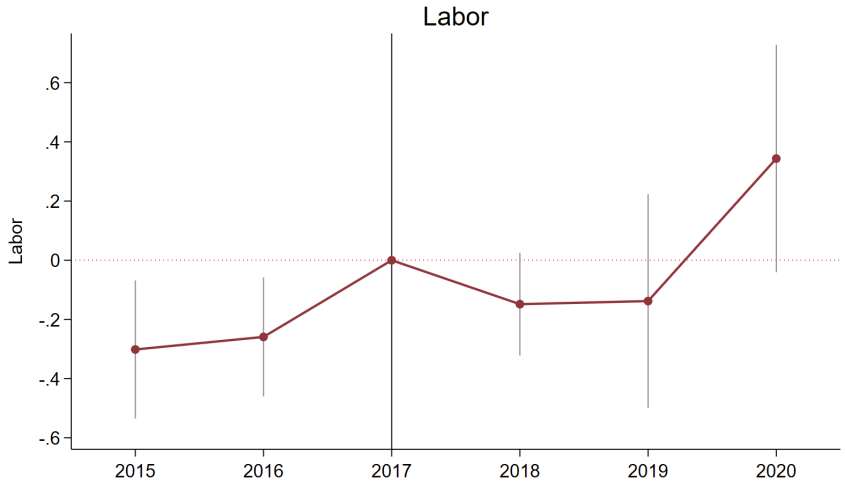
Note: The figure plots the results from estimation of equation 9. The dependent variable is the natural logarithm of total output in panel (a) and natural logarithm of labor productivity in panel (b). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

US demand shock, domestic materials usage increases by 6% in 2018 that goes up to 8% by 2020. We further study the effects on the share of imported materials in total materials used in Figure 8. As expected from the previous results, the ratio sees a statistically significant decline during the trade tension years, and the pre-trend is insignificant at the

Figure 6: Event Study: Total Labor and Total Materials



(a) Total Materials



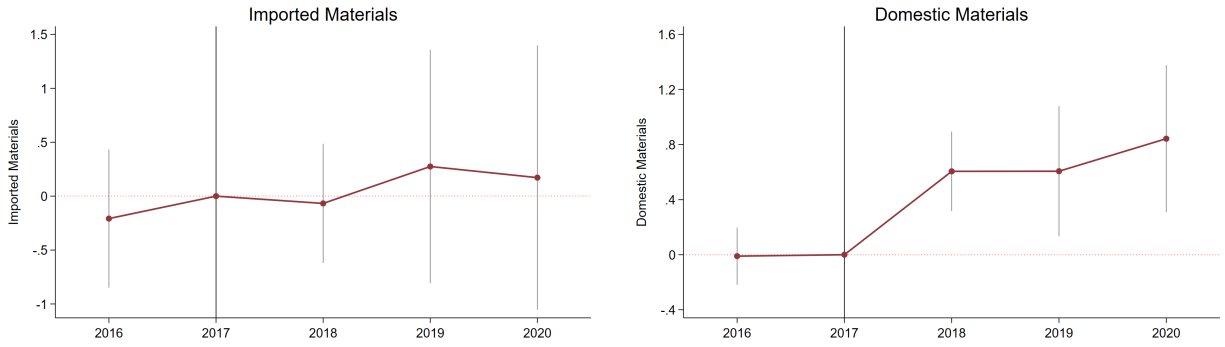
(b) Labor

Note: The figure plots the results from estimation of equation 9. The dependent variable is the natural logarithm of total materials in panel(a) and natural logarithm of labor in panel (b). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

5% level. Thus, in response to US demand shocks, firms are reducing their reliance on the imported materials.

Finally, we look at the outcomes in the export and import markets. Specifically, we look at changes in total exports, exports to US and non-US separately. Similarly, we study

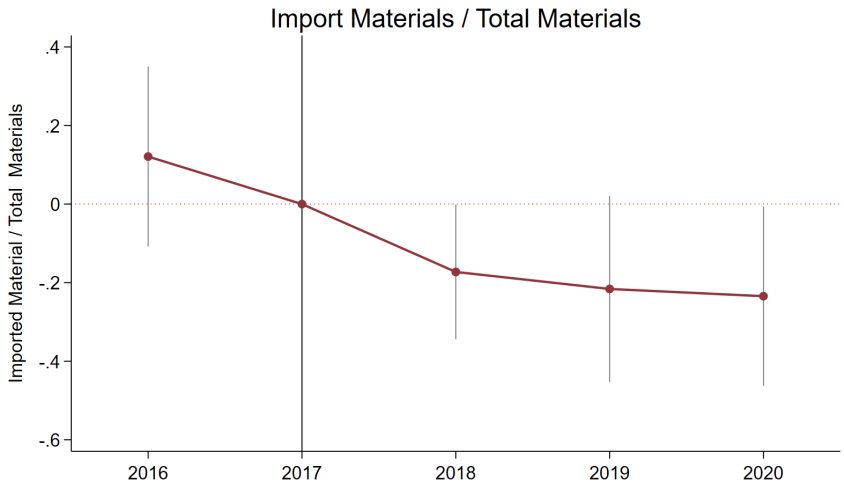
Figure 7: Event Study: Imported Materials and Domestic Materials



(a) **(b)**

Note: The figure plots the results from estimation of equation 9. The dependent variable is the natural logarithm of total domestic materials in panel (a) and natural logarithm of total imported materials in panel (b). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

Figure 8: Event Study: $\frac{Imported\ Materials}{Total\ Materials}$



Note: The figure plots the results from estimation of equation 9. The dependent variable is the ratio of imported materials to total materials. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

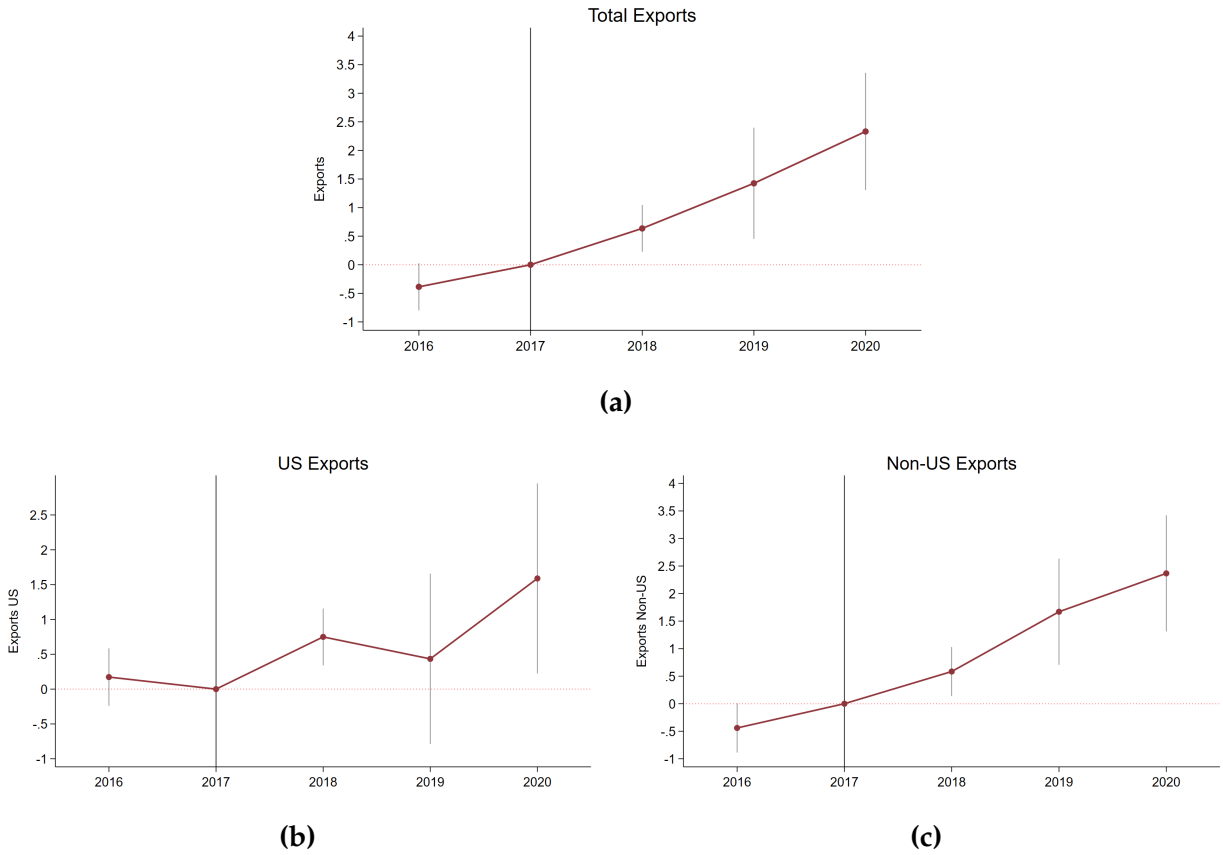
the changes in total imports, imports from China and non-China separately. The results on exports are shown in figure 9. In Panel (b) we use the Poisson pseudo-maximum likelihood estimation (PPML) to deal with zeros and find that US demand shocks do indeed lead to a significant increase in exports to the US. This is, however, not due to a relocation of exports from non-US destinations to the US. Panels (a) and (c) shows that the increase is not limited to the US market. The increased export opportunities to the US, leads to an increase in total exports as well as increased exports to the rest of the world. Again, for both exports to the US and total exports, there are no significant prior trends at the 5% level. The results are in line with Fajgelbaum et al. (2024) who show that, on average, the bystander countries increase exports to both US and non-US (excluding China) in products with higher US-China tariffs but different from Utar et al. (2023) who find US tariffs on China only led to an increase in exports to US but not the non-US markets for the Mexican firms. The results on imports are shown in figure 10. Our finding that domestic value added in exports rises indicates that increased export opportunities are not simultaneously met by increased imports of a similar magnitude. Panel(a) confirms the finding as there are no statistically significant impacts on total imports. This result implies that it is the increase in the domestic materials rather than a decline in imported materials that drives the decrease in imported materials to total material ratio.

We further divide total imports into imports from China and non-China provides to study the crucial issue of indirect exports from China to US. Some recent work has focused on an increase in indirect exports from China via third countries like Viet Nam[17]. We do not find any evidence of direct firm-level transshipment from China. Our results from PPML estimates in panel(b) show that US export shocks do not, in turn, lead to an increase in imports from China. In fact, in the short run there is a decline in the use of Chinese imports. In the next sections, we shed more light on the discussion of potential transhipment by studying two important sources of heterogeneity - Country of ownership, and New vs Incumbent firms. Finally, panel (c) of figure 10 shows that firms do not significantly change their imports from non-Chinese sources in response to the US demand shocks.

In order to understand the average effect size of our results, we next present the results from the pooled estimation in equation 10. Results on domestic value added are shown in table 1. Column (1) shows the results from the unweighted regression. The positive and statistically significant coefficient implies that the median US demand shock (0.089) leads to an increase in 0.89 pp increase in the DVAR. The coefficient from the weighted

[17] see Freund et al. (2024); Alfaro and Chor (2023); Iyoha et al. (2024)

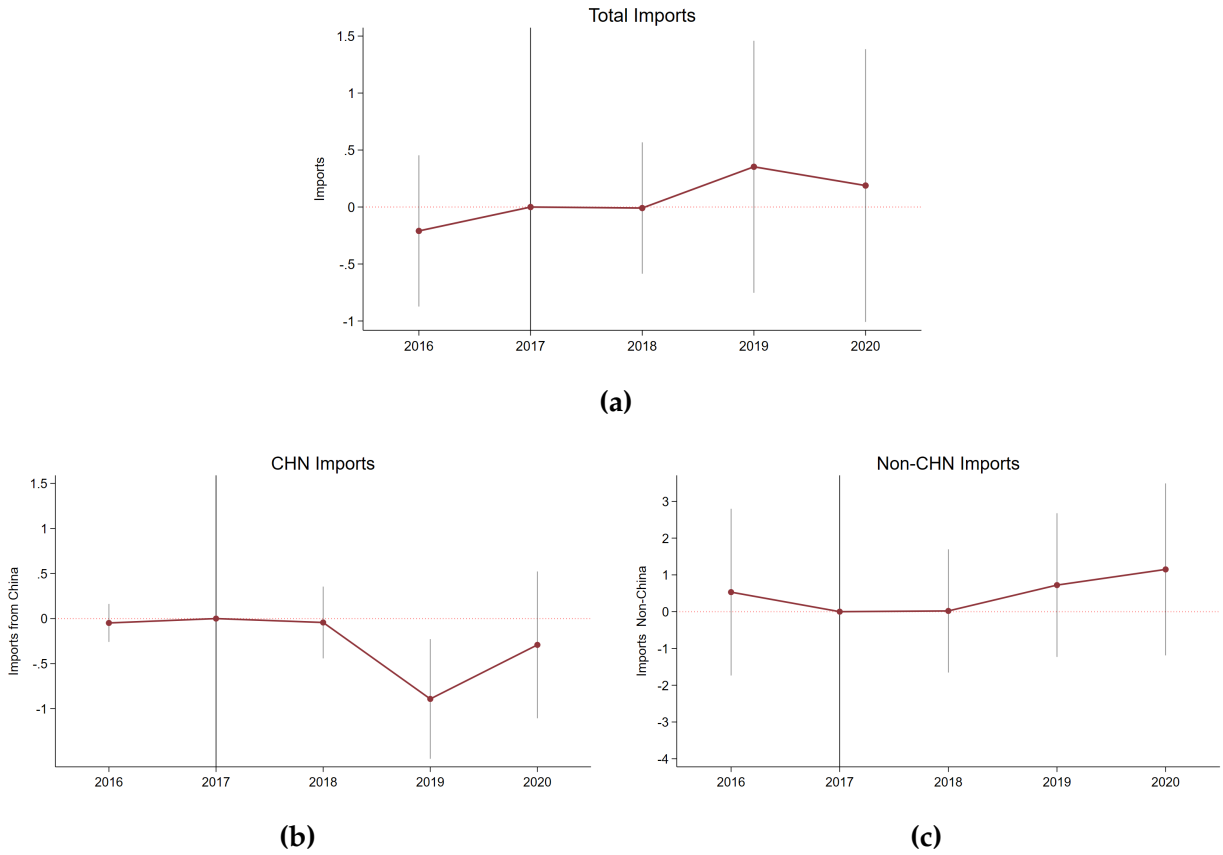
Figure 9: Event Study: Total, US, and Non-US Exports



Note: The figure plots the results from estimation of equation 9. The dependent variable is the natural logarithm of total exports in panel (a), total exports to US in panel (b), and natural logarithm of total exports to non-US in panel (c). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Panel (b) uses a PPML estimation procedure. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

regression in (2) implies that the US demand shock by the median value leads to a 2.6 pp increase in the domestic value on average in the post period. These effects are economically large as discussed in section 7.2. The results on export and import outcomes are presented in in table 2. In response to a median shock in the US export demand, we observe a 12.5% increase in total exports, and a 8.6% increase in exports to the US. The results on the import outcomes are not statistically significant. Results on other crucial firm level variables are presented in table Appendix A4. Importantly, a median increase in US demand shock leads to an increase of 3.6% in output, 3.3% in labor productivity and 5.7% in domestic materials usage. Further, we observe is a 1.8 pp decline in the imported materials to total materials ratio and a 1.68 pp decline in the imported materials to output

Figure 10: Event Study: Total, China and Non-China Imports



Note: The figure plots the results from estimation of equation 9. The dependent variable is the natural logarithm of total imports in panel (a), total imports from China in panel (b), and natural logarithm of total imports from non-China in panel (c). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Panel (b) uses a PPML estimation procedure. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to $US\ Shock$, along with 95% confidence intervals.

ratio.

7.1 Robustness

We conduct several additional robustness checks on the main results of the paper. While the major shift in US trade policy since 2018 creates exogenous variation in the product level US demand, the results of the paper should not be interpreted as the causal effect of US-China trade tensions on domestic value creation in Viet Nam. The direct implications of US tariffs on China for the domestic value in Viet Nam is an important policy question. Since our trade data is only available at the 2 digit HS code level, most of the direct tariff

Table 1: US Demand Shocks and Domestic Value Added in Exports

	(1) Unweighted	(2) Weighted
$\Delta US\ Shock \times Post$	0.099**	0.292**
	(0.027)	(0.065)
$\Delta CN\ Shock \times Post$	-0.080*	-0.213**
	(0.029)	(0.060)
Observations	15,932	15,932
R-squared	0.913	0.938
Firm FE	Y	Y
Ind-Year FE	Y	Y

Note: The dependent variable is the domestic value added in exports. All columns control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additionally, we control for total wage to output ratio and total materials to output ratio. $Post = 1$ if year $>=$ 2018 and 0 if the year is 2017. Column (2) weighs the observations using the total firm exports in 2017. Standard errors are twoway clustered at the firm and year level . *** is $p < 0.1$, ** is $p < 0.05$, and * is $p < 0.01$.

variation across the more detailed HS codes gets averaged out and the variation in firm-level exposure to US tariffs on China is much smaller.[18] To address the limited variation in tariff exposure of firms and speak to the direct relevance of US tariff on China, we use a different approach and categorize firms into 3 categories by tariff exposure. The bottom 25%, the middle 50% ($25^{th} - 75^{th}$ percentile) and the top 25% exposed firms. We want to test if relative to the bottom 25% tariff exposed firms, the DVAR increase in exports is higher for the most exposed firms. Figure 11 shows that the top 25 percentile of the tariff exposed firms experience a significant increase in DVAR relative to the least tariff exposed firms and their are no significant prior trends. The middle firms shows no significant changes. Overall, consistent with our previous results, we do find evidence of the most tariff exposed firms increasing their domestic value in exports. Further, figure 12a show that while both the middle and top exposed firm see a significant increase in exports to the US, the coefficients are larger for the top exposed firms. Importantly, consistent with our findings, figure 12b shows that top exposed firms that increase domestic value in exports and exports to US, do not significantly purchase more inputs form China. The middle firms on the other hand significantly increase Chinese imports that might explain

[18] Precisely, this means writing D_j in the construction of the US demand shocks in section 5 as the change in US tariffs on China in product j between 2017-19. The HS 10-digit tariffs are aggregated at the HS 2-digit level using the US import share of each 10-digit product in the broader 2-digit product in 2017

Table 2: US Demand Shocks and Exports, Imports

	Exports			*Imports*		
	(1) Total Exports	(2) US Exports	(3) Non-US Exports	(4) Total Imports	(5) China Imports	(6) Non-China Imports
$\Delta US\ Shock \times Post$	1.407*	0.978**	1.617*	0.046	-0.411	-0.675
	(0.519)	(0.486)	(0.600)	(0.323)	(0.363)	(0.595)
$\Delta CN\ Shock \times Post$	-0.261	0.482**	-0.128	0.721*	0.822**	0.871
	(0.182)	(0.244)	(0.229)	(0.297)	(0.365)	(0.490)
Observations	15,932	8,096	15,746	15,275	14,116	14,469
R-squared	0.936		0.921	0.920		0.861
Firm FE	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y

Note: The dependent variable is total exports in column(1), exports to US in column(2), exports to non-US in column(3), total imports in column(4), imports from China in column(5), and imports from non-China in column(6). All columns control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. $Post = 1$ if year >= 2018 and 0 if the year is 2017. Columns (2) and (4) use a PPML specification. Standard errors are twoway clustered at the firm and year level . *** is $p < 0.1$, ** is $p < 0.05$, and * is $p < 0.01$.

the non effects on domestic value for these firms. Thus, even with the direct exposure of Vietnamese firms to US tariffs on China, our primary results hold as the most exposed firms show significant increase in the domestic value added in their exports.

In Appendix figure A5, we show robustness to alternate specifications. Changes in DVAR might depend on the initial levels of DVAR for firms as firms with smaller initial values or higher initial reliance on imports might have a larger potential to switch to domestic inputs and increase domestic value in production. In specification 2, we allow for different time trends for firms based on the their 2017 DVAR level. In specification 3, instead of using DVAR in levels, we measure DVAR in log to represent proportional changes and reduce sensitivity to initial levels. In specification 4, we add to the baseline the province-year fixed effects to control for any province level policy changes as well as differential impact of the Covid pandemic across Vietnamese provinces especially relevant for the coefficient on the year 2020.

Another concern is that despite the US demand shocks across products being exogenous, they might be correlated with the global trends in demand for the products. To

that extent that the product-level US import changes are correlated with import change in regions like the Europe and Asia, the results might imply that Vietnamese firms are responding to global demand shocks rather than the US demand shocks. To tackle this we construct a measure for the firm-level Europe demand shock and Asia demand shock as in 5, replacing imports by US with imports by Europe and Asia, respectively. In specification 5, we additionally control for these demand shocks interacted with the time trends to account for global trends in import changes. The results on US demand shocks are stable across specifications and stay significant at the 5% level of significance. Further in Appendix figure A6, we plot the coefficients on Europe and Asia demand shocks from specification 5. The effects are not statistically significant at the conventional levels further strengthening the claim that the DVAR increase amongst Vietnamese firms is driven by the US demand shock.

In Appendix figure A7, we show that our results are robust to alternate levels of clustering. We allow for clustering at the firm level, and broader correlations within a region or industry by clustering at the province or the 2-digit industry level, respectively. The effects on DVAR stays significant at the 5% level of significance

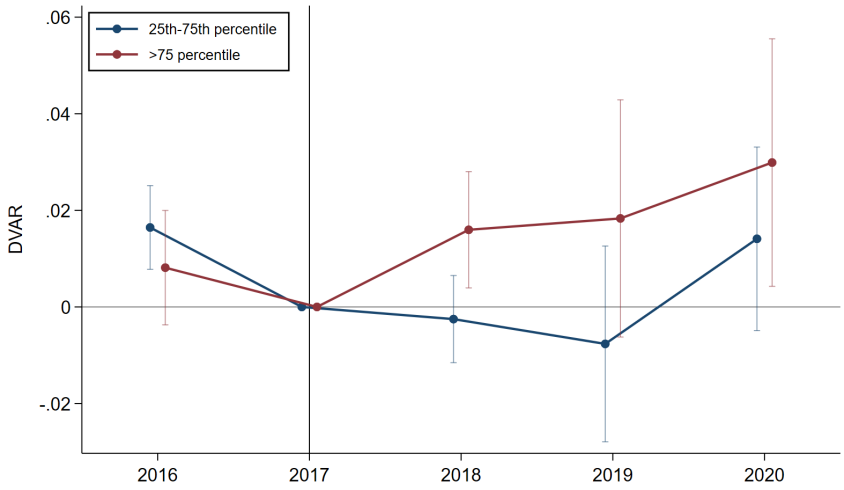
Finally, one remaining concern regarding the construction of US demand shocks in section 5 is a complete reallocation of US imports from Chinese to non-Chinese imports. Precisely, if in a given product, the increase in imports from non-China adequately compensates for the decline in imports form China, the US demand shock in that product is close to 0 by definition. This might underestimate the actual demand gains in that product for third countries like Viet Nam. To counter this, we change the measurement of the US demand shocks slightly and remove China from the total imports of product j in both the pre and post US-China trade tension period.[19]. This ensures that the demand shocks now represent just the non-Chinese changes in US imports and any strong reallocation from China to third countries is measured as a highly positive US demand shock. Table 3 shows that main results of the paper hold well with the shocks defined in this alternate way along with the full set of controls. Importantly, the coefficient on domestic value added in exports stays positive and statistically significant at the 5% level.

7.2 Economic Benchmarking of results

In this section, we assess the economic magnitude of our main findings on the increase in domestic value added in exports. The assumption is that US demand shocks do not lead

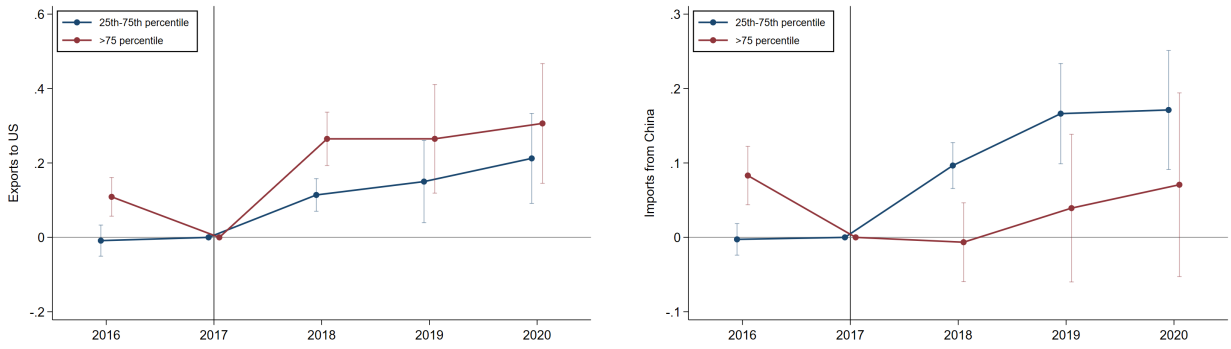
[19] Viet Nam is also excluded as earlier.

Figure 11: DVAR Effects by Tariffs Exposure



Note: The figure plots the results from using direct tariff exposure of firms as the main explanatory variable. The dependent variable is the domestic value added in exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. We additionally control for wage to output ratio and material to output ratio. Regression is weighted using the firm's total exports in 2017. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to top 25 percentile and 25th-75th percentile of tariff exposure, along with 95% confidence intervals.

Figure 12: Exports to US and Imports from China by Tariff Exposure



(a) **(b)**

Note: The figure plots the results from using direct tariff exposure of firms as the main explanatory variable. The dependent variable is exports to US in panel (a) and imports from China in panel (b). We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are clustered twoway at firm and year level. The y-axis displays the yearly DD coefficient estimates corresponding to top 25 percentile and 25th-75th percentile of tariff exposure, along with 95% confidence intervals.

Table 3: China Excluded US shock

	DVAR	Total Exports	US Exports	Non-US Exports	China Imports	Output	Productivity	Materials	Domestic Materials	Imported Materials
US Shock * Post	0.137**	1.159*	1.163***	1.100*	-0.041	0.421**	0.465**	0.434**	0.358*	0.767
	(0.042)	(0.428)	(0.390)	(0.411)	(0.275)	(0.120)	(0.089)	(0.122)	(0.138)	(0.332)
Observations	15,932	15,932	8,096	15,747	14,116	15,932	15,932	15,932	15,745	15,275
R-squared	0.938	0.936		0.926		0.977	0.896	0.976	0.954	0.927
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

*** p<0.01, ** p<0.05, * p<0.1

Note: The dependent variable is domestic value added in exports in column(1), total exports in column(2), exports to US in column(3), exports to non-US in column(4), imports from China in column(5), total output in column(6), labor productivity in column (7), total materials in column(8), total domestic materials in column (9) and total imported materials in column (10). All columns control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. In Column (1), additionally, we control for total wage to output ratio and total materials to output ratio, and weight the observations using the total firm exports in 2017. $Post = 1$ if year $>=$ 2018 and 0 if the year is 2017. In constructing the $US\ Shock$, we now exlude imports from China. Standard errors are twoway clustered at the firm and year level . *** is $p < 0.1$, ** is $p < 0.05$, and * is $p < 0.01$.

to just a relative increase in DVAR but also an absolute change. Given the importance of US in the exports for Viet Nam and the magnitude of the jump in exports share to the US during US-China trade tensions, it is unlikely that the effects are merely relative. In the sample used in the regression, the actual increase in aggregate DVAR, on average in the post period is of the magnitude of 2.19 percentage points. The coefficient on $US\ Shock$ in pooled regression with all the controls as in equation 10 along with province-year fixed effects and controlling for initial domestic value added trends is 0.238. The average value of the US demand shock (0.0885) thus leads to an increase in DVAR of 2.1 pp. Thus, the average value of US demand shock alone can explain approximately 96% of the total increase in the domestic value added in exports in the post trade tension period. We therefore conclude that US demand shocks are economically significant and play a fundamental role in reversing a decade long decline in DVAR in Viet Nam.

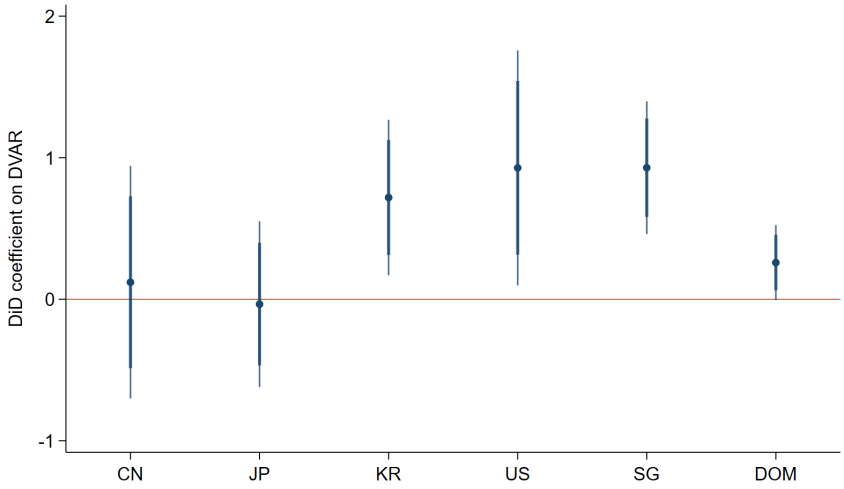
7.3 Heterogeneity

Heterogeneity by Ownership: We explore the importance of the nationality of owner for the Vietnamese firms in driving the results. Our focus is on distinguishing the effects between Chinese and non-Chinese owned firms. While we do not find any evidence of firm-level rerouting, on average, in Viet Nam, it is possible that the transshipment of Chinese exports occur more prominently through the Chinese subsidiaries in Viet Nam.

This directly affects domestic value addition for these firms as transshipment should not lead to meaningful increases in domestic content of exports. We use the nationality of the owners of firms and classify Chinese owned firms as those whose primary owner is either China or Hong Kong, SAR. For the remaining firms, we classify them as domestic owned with no foreign ownership, or non-Chinese foreign owned firms. Roughly 5% of the firms are classified as Chinese owned.

To broadly understand the patterns, we start by plotting the effects of US demand shocks on DVAR from the regression in the pooled DID estimation in equation 10 for the major foreign countries with stake in Vietnamese firms, as well as the domestic owned Vietnam firms (DOM). Their is a significant increase in the DVAR for firms owned by countries like US, Singapore, Rep. of Korea as well as the domestic owned firms. Chinese owned firms, on the other hand, do not significantly increase DVAR in response to a higher US import demand. Interestingly, Japanese owned firms also show a similar result wit no significant DVAR increase. Broadly, most of the major foreign players, apart form China and Taiwan, as well as purely domestic owned firms increase their domestic value added in exports.

Figure 13: DiD DVAR coefficients by Country of Ownership



Note: The figure plots the results from estimation of equation 10 separately by firm's ownership country - China, Japan, Rep.of Korea, USA, Singapore, and Domestic owned. The dependent variable is the domestic value added in exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additionally, we control for total wage to output ratio and total materials to output ratio. We weight the observations using firm's total exports in 2017. Standard errors are twoway clustered at the firm and year level. Bars depict 90% and 95% confidence intervals

In order to better understand the above result, we plot event study results from equa-

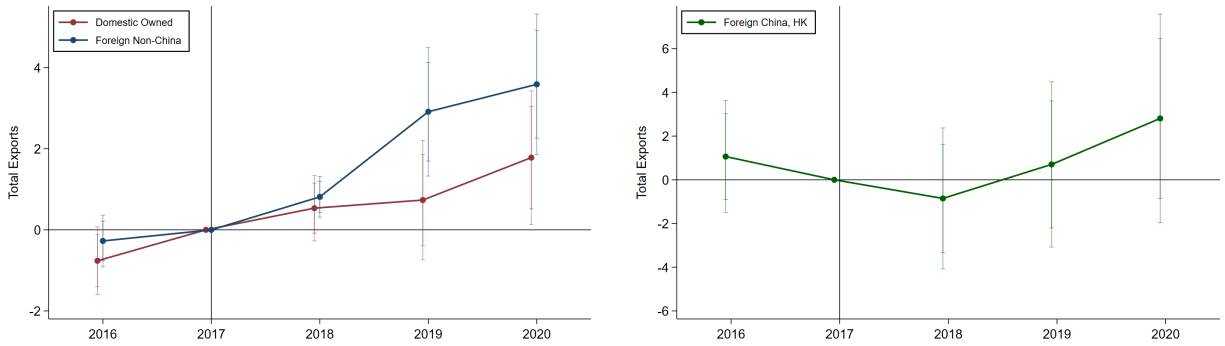
tion 9 for Chinese owned firm, Non-Chinese owned foreign firms and Domestic owned firms. We start by showing the effects on total exports in figure 14. Both domestic and non-Chinese owned firms expand its total exports in response to the US demand shocks, but total exports for Chinese firms do not increase significantly. Interestingly, if we split the total exports by exports to US and non-US in figures 15 and 16, we find different results. The Chinese owned firms, indeed, increase their exports to the US, substantially while there is a negative coefficient on the non-US exports. Thus, Chinese owned firms are taking advantage of the new export opportunities to the US but do not expand in terms of total exports.

We further test if the increase in exports to the US for Chinese firms are accompanied by increase in imports from China. Figure 17 shows that this is the case as for the Chinese firms, imports from China increase significantly. For both domestic owned and non-Chinese firms, on the other hand, imports from China decline. Figure 18 documents that Chinese owned firms are not expanding in terms of total output as well, complementing the results on total exports. This is strong evidence that nationality of Vietnamese firms' owners matters in how they respond to the US demand shocks. Chinese owned firms do not expand in scale but increase exports to the US backed by higher imports from China. There is, thus, potential transhipment of goods from China to US via Chinese subsidiaries in Viet Nam. The results are starkly different for domestic owned and non-Chinese foreign owned firms that, consistent with the overall results, expand in scale and show no evidence of rerouting. In fact, these firms reduce their imports from China. In section 9, we further examine the role of new vs incumbent firms in better understanding potential rerouting.

Appendix Figure A8 shows that Chinese firms do not increase their total domestic materials use. This is consistent with the fact that these firms also do no expand, and US exports increases are met, in part, by Chinese imports increase. Other firms increase the domestic materials usage significantly. Appendix Figure A9 highlights a similar pattern for labor productivity that increases for non-Chinese firms but not for Chinese owned firms. We finally study the impact on domestic value addition in exports for firms by ownership type. As expected from the results documented in this section, we find an increase in DVAR for the non-Chinese owned firms as seen in figure 19. As expected, the Chinese owned firms do not see any significant increase in domestic value in exports. The overall increase in DVAR in Viet Nam is, therefore, driven firm level DVAR increases for domestically owned as well as non-Chinese foreign owned firms.

Heterogeneity by Firm size: We also explore heterogeneity in our results through

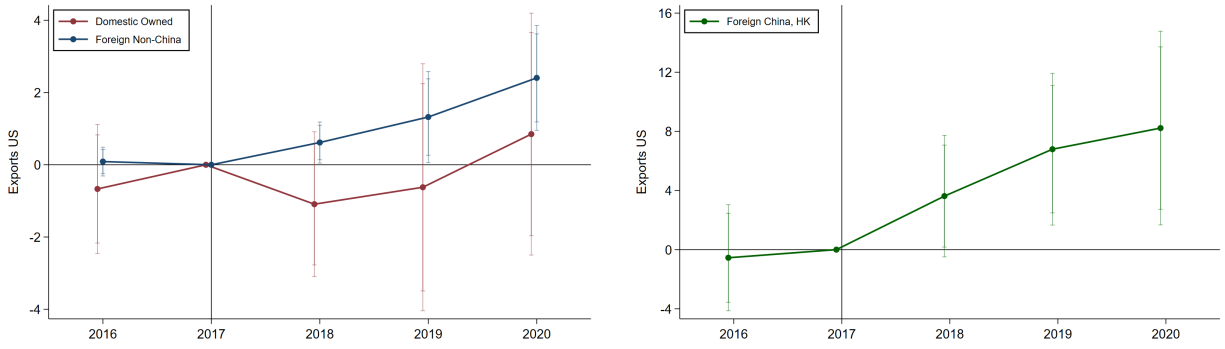
Figure 14: Event Study: Total Exports by Ownership



(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the natural log of total exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure 15: Event Study: Exports to US by Ownership

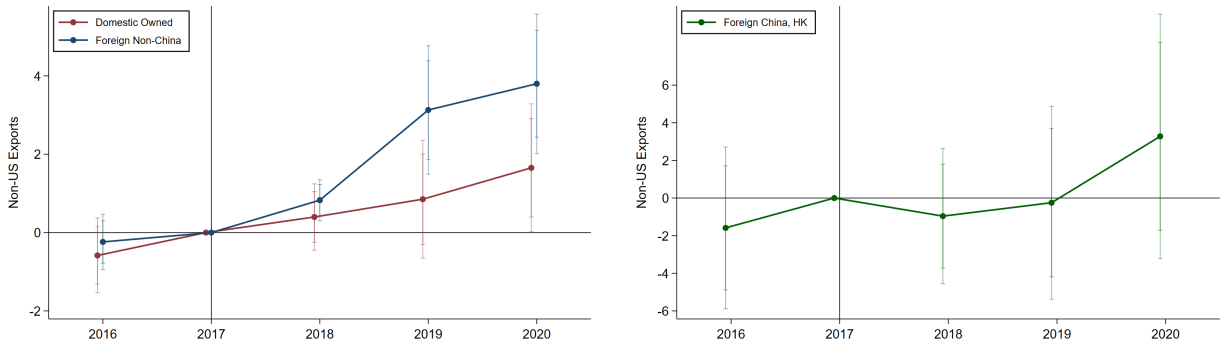


(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the exports to US. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. PPML estimation is used. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

firm size. It is possible that lager firms have a more diverse network of suppliers, both foreign and domestic. Further, larger firms could pay the additional costs of finding new suppliers of inputs if required. Both these factors implies that larger firms might find it easier to switch to domestic suppliers of inputs facilitating an increase in domestic value

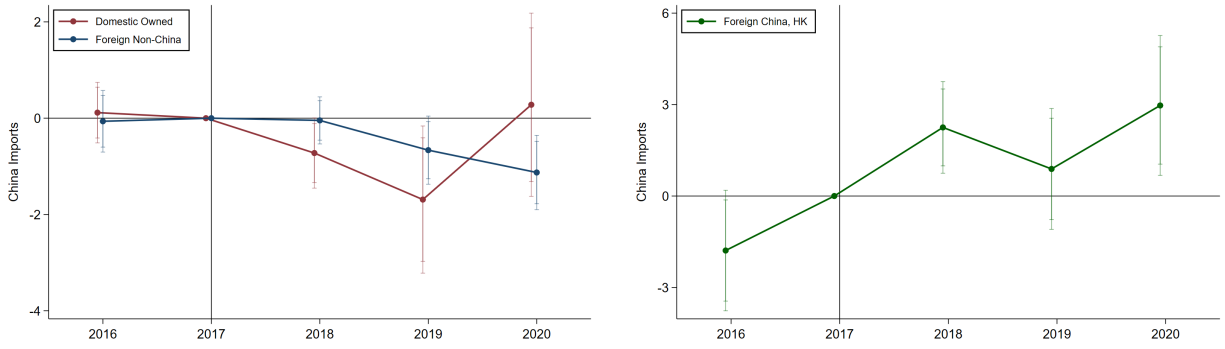
Figure 16: Event Study: Exports to Non-US by Ownership



(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the natural log of total non-US exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure 17: Event Study: Imports from China by Ownership

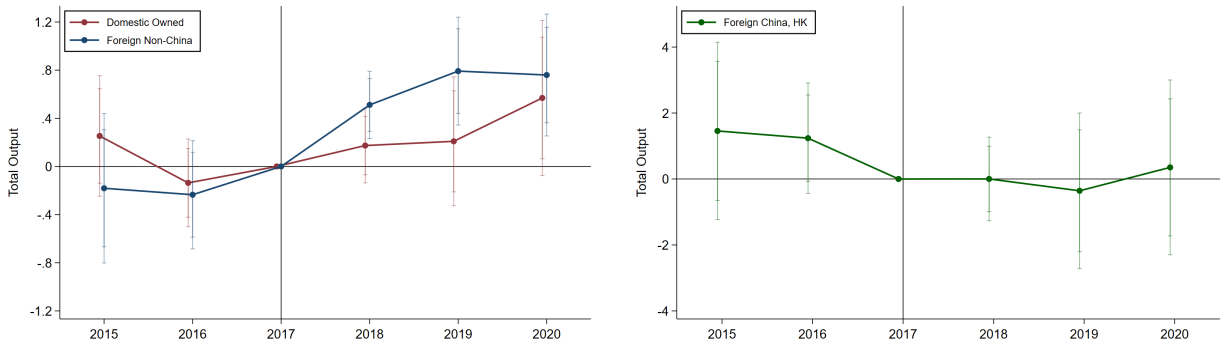


(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the Chinese imports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. PPML estimation is used. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

added. On the other hand, large firms might have longer term or more sticky contracts dampening their ability to switch to domestic factors quickly. It is therefore, theoretically, ambiguous if larger or smaller firms should see a larger changes in domestic value added in response to the US demand shocks. We test this empirically by classifying firms

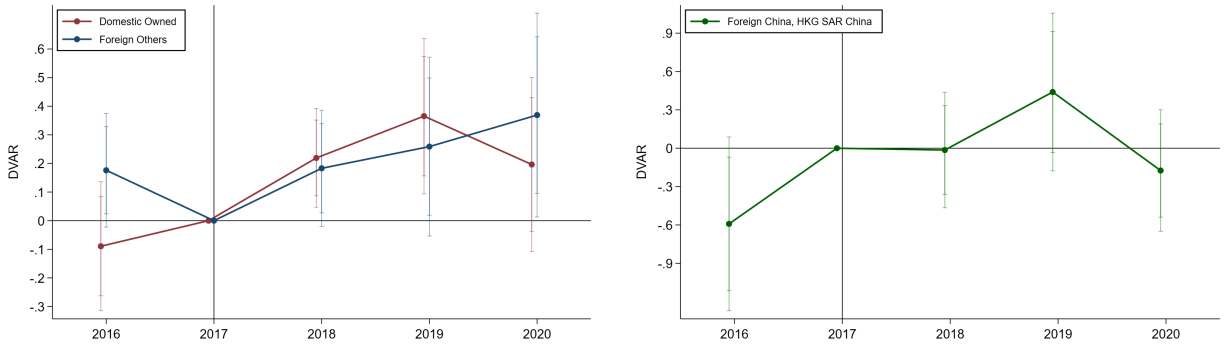
Figure 18: Event Study: Total Output by Ownership



(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the natural log of total output. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure 19: Event Study: DVAR by Ownership



(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the DVAR. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

as above or below median output or productivity in 2017 and examining the effects on DVAR for both separately. The results in Appendix figures A10a and A10b document that the gains are larger and significant for the initially larger or more productive firms. Smaller or less productive firms on the other hand show no significant changes to DVAR.

8 Mechanisms

The results provide comprehensive evidence that in response to the US demand shocks, firms in Viet Nam expand, reduce reliance on imports and increase the domestic value added in their exports. We now explore the potential mechanisms that can rationalize our findings.

As discussed earlier, both the US and Vietnamese authorities were aware of the potential transshipment of goods from China to US via third countries like Viet Nam and Mexico. It is possible that Vietnamese firms minimize the risk of potential future sanctions by the US by increasing the domestic content in their exports. In order to test this hypothesis, we estimate the DVAR changes for each 2-digit industry in Vietnam and study the relationship between domestic content requirement for the industry under NAFTA and the estimated industry coefficients. Domestic content requirement across industries in NAFTA is a useful metric. On the assumption that the variation across products in their degree of domestic content requirement in NAFTA is not random and the values reveal fundamental economic or political preferences, industries with a higher domestic inputs requirement under NAFTA might be the ones where US prefers more domestic value to avoid qualifying products from countries like China transshipped to US with minor processing in the NAFTA bloc. If the implicit rules of origin is at play, these could also then be the industries that face a higher risk of future tariffs by US on Viet Nam if the Vietnamese firms are found to have a high imported content share in its exports. We can, thus, expect a positive correlation between industry level DVAR estimates and domestic content requirement under NAFTA.

In order to measure the domestic content requirement for each industry under NAFTA, we first use the correspondence between the HS codes and ISIC Industries to match the 6-digit HS products to the 2 digit industries in Vietnam. Using the data from Conconi et al. (2018), we obtain 6-digit product I-O tables as well as the inputs that are required to be domestically sources within each product. For each 6-digit product, we then calculate the domestic content requirement as the proportion of inputs that are required to be domestically sourced for eligibility under NAFTA.[20] To measure the industry level domestic input requirement, we use three measures - the maximum possible domestic input requirement across all 6-digits products in an industry, mean, and median across all products in the industry. Figures 20a, 20b, and 20c show the results. Across all measures of

[20] Precisely, for a product, this means calculating the number of inputs required to be sources domestically as a ratio of the total number of inputs used in the production of that product

domestic content requirements under NAFTA, industries with a higher requirement have a significantly larger increase in domestic value added in Vietnam between 2018-20.

We perform another exercise using the firm level variation in the exported product mix and domestic input requirement under NAFTA. For each firm, we classify the primary product of the firm as the product with the highest exports value in 2017.[21] Since the customs data is classifies product at the 2-digit HS code level, we again measure domestic content requirement under NAFTA for the product as the average of the requirement across all 6-digit HS codes within the broad product. We then classify firms as below and above median in domestic content requirement under NAFTA based on their primary product. If implicit rules of origin are important, we expect firms initially exporting a product with a higher domestic requirement under NAFTA to increase their domestic valued added in exports by relatively more as these firms face a potentially higher risk of future sanctions by the US. In Appendix figure A11, we show this is the case as the above median firms experience a large positive and significant increase in DVAR. On the other hand, the below median do not experience any significant changes in DVAR with small and non-significant coefficients. As an additional exercise, we also check if the increase in DVAR is driven by firms that export to the US. The idea is intuitively simple. If the firms take into account potential future US sanctions wile making their production decisions, firms that do not export to US at all should not be affected by such sanctions. We classify firms as US exporter is they export at all to the US in the post period (2018-2020) and US non-exporters otherwise. Again, consistent with the analysis in this section, in Appendix figure A12 we see positive and significant effects on DVAR for US exporters but statistically insignificant results for the non-US exporters.

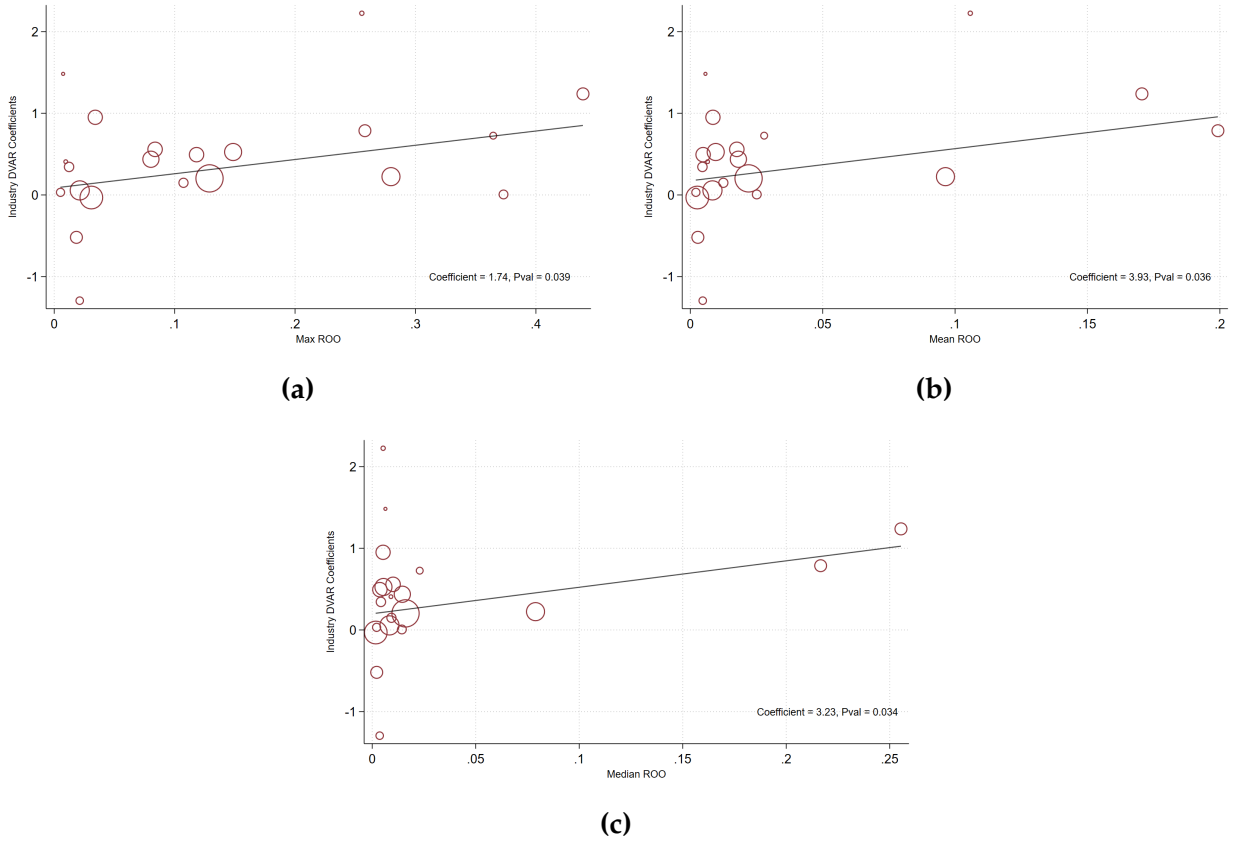
The discussion, so far, is centered around the Vietnamese firms' optimally choosing to increase their reliance on domestic inputs in production based on factors like the risk of future US trade sanctions. But even if firms want to look inwards, limited domestic capacity might pose an important constraint especially if several large exporting firms demand more domestic inputs. While we lack the data to empirically test if domestic capacity is important for our firm-level results, we provide suggestive evidence that domestic capacity in Vietnam increased since 2018. We show that Viet Nam has not only emerged as a major beneficiary in global trade but also as a recipient of manufacturing FDI from US and China. In figures 21a and 21b, we plot the changes in the share of countries' greenfield manufacturing FDI outflow from US and China between May 15-May 18 and June 18-June 21.[22] It is clear that in since 2018, Viet Nam is a major gainer of manufacturing FDI

[21] The top product accounts for, on average, 90% of the total exports value of a firm

[22] We use number of projects as the measure of FDI. Results are robust to using estimated Capex spending

from both US and China along with Mexico. Further, we classify the FDI into three broad sectors - manufacturing inputs, manufacturing final and non-manufacturing to study if the increase in FDI is clustered on the input side.[23] Indeed, the combined US and Chinese FDI to Vietnam increased by 35% in the manufacturing intermediates, 27% in manufacturing final and decreased by 12% in the non-manufacturing sector. As far as the increased foreign investments in manufacturing facilitate domestic capacity expansion, especially in the intermediates sector, this makes the switch to domestic inputs for Vietnamese firms easier and enables them to increase their domestic value added in exports.

Figure 20: Implicit Rules of Origin

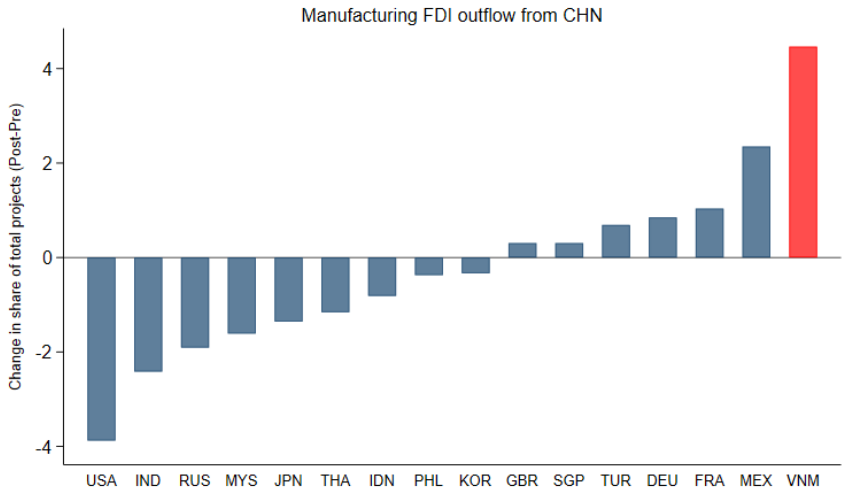


Note: The figure plots the correlation between coefficients on $US\ Shock$ from equation 10 at the industry level (with the dependent variable being DVAR) and the Domestic content requirement in that industry under NAFTA. Panel (a) defines industry-level ROO as the max of ROO of all products in the industry. Panel(b) and (c) defines industry-level ROO as the mean and median of ROO of all products in the industry, respectively. The size of the circle represents the weight equal to the share of industry in total exports in 2017.

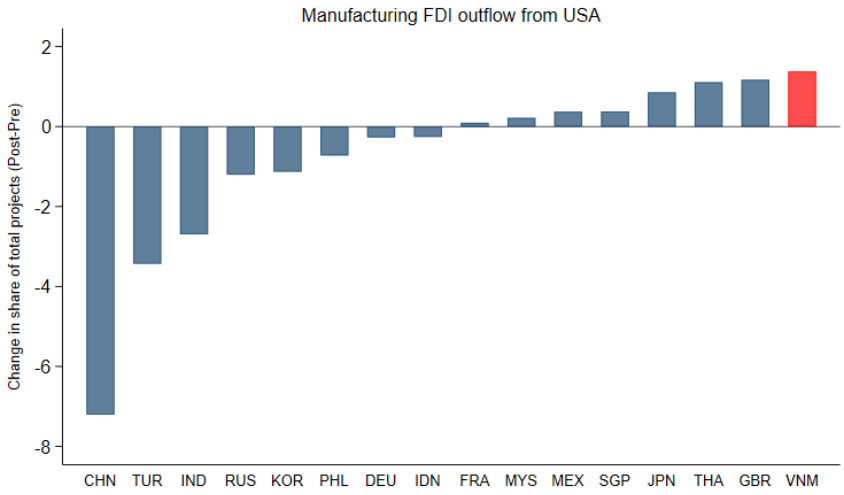
as a measure of FDI, instead

[23] See Table A5 for classification details

Figure 21: Manufacturing FDI outflow from China and US



(a) China



(b) US

Note: The figure plots the changes in share of Greenfield manufacturing FDI outflows from China (panel (a)) and USA (panel (b)) between May 2015-May 2018 and June 2018-June 2021 to a broad list of major FDI inflow countries. The red bar shows the increase in share of FDI outflows to Vietnam.

9 Importance of New Firms

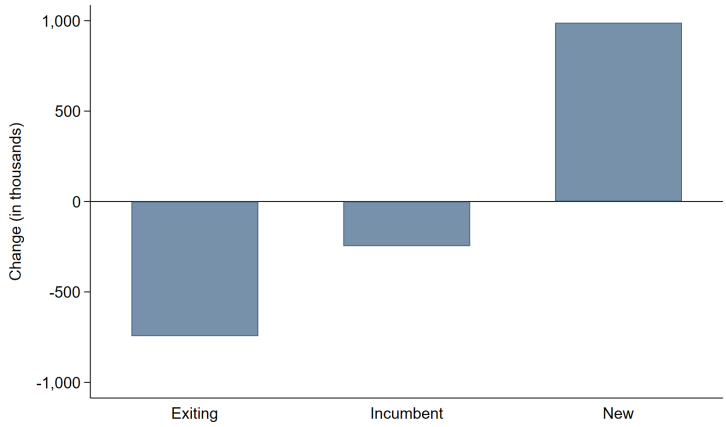
Our identification strategy relies on the pre 2018 exposure of firms to exports in different products. We are, therefore, unable to incorporate the role of new firms established in 2018 or later in our framework. Throughout this section, we provide graphical evidence that the new firms are indeed important in fully understanding the firm level responses

to the opportunities created by the US-China trade tensions. We, particularly, focus on our results on labor and rerouting from China. In the previous section, we do not find any evidence of the existing Vietnamese firms increasing employment or overall sourcing of inputs from China. These results are in contrast to some new research studying the effects on employment and rerouting in Viet Nam during the period of trade tensions.

We start with the results on labor. In figure 22, we decompose the total change in labor in Viet Nam across three types of firms - Existing firms that were present before 2018 and continued operations in 2021, New firms that were established in 2018 or later, and Exiting firms that were observed in 2017 but not in 2021. The decomposition shows that all of the increase in total labor in Viet Nam comes from new firms established during the trade tension period. The existing firms show a mild decline in the labor employed. Exiting firms, by definition, see a negative change in the labor employed. The positive effects on employment found in Mayr-Dorn et al. (2023) are based on analyzing labor at the district level, differing in exposure to industries potentially facing increased US demand. Similarly, the results in Rotunno et al. (2023) are based on at the industry level, differing in exposure to Trumps' tariffs. As long as these results on higher employment are driven by new firms, either at district or industry level, our results on are not inconsistent with these findings. Our result on the importance of new firms in driving labor growth is broadly in line with McCaig et al. (2022). They analyze the effects of US tariff reduction on exports from Viet Nam under the U.S.–Viet Nam Bilateral Trade Agreement, and show that tariff-induced employment growth is largely due to the entry of new firms and jobs, and not due to existing firms.

Next, we turn our attention to the results on rerouting. While we have shown that country of ownership is crucial in understanding the prevalence of potential rerouting, we are still restricted to the incumbent firms. To fully understand the possibility of increased transshipment form China to US via Viet Nam in the post trade tension period, we again highlight the role of new entrants. We first plot the aggregate DVAR for old and new firms separately in figure 23. If it is the new firms that are engaging in increased rerouting from China, one should expect the aggregate DVAR for these new firms to be decreasing rather than increasing in the trade tension period, as these firms increasingly rely on Chinese imports in their exports. This is exactly what we find. The new firms see a steady decline in DVAR as opposed to the older firms for whom DVAR increases in line with the aggregate trend. To further outline the importance of new firms in potential transshipment, we decompose the change in imports from China between 2017 and 2020 among three types of manufacturing firms. Old Chinese importers, firms which

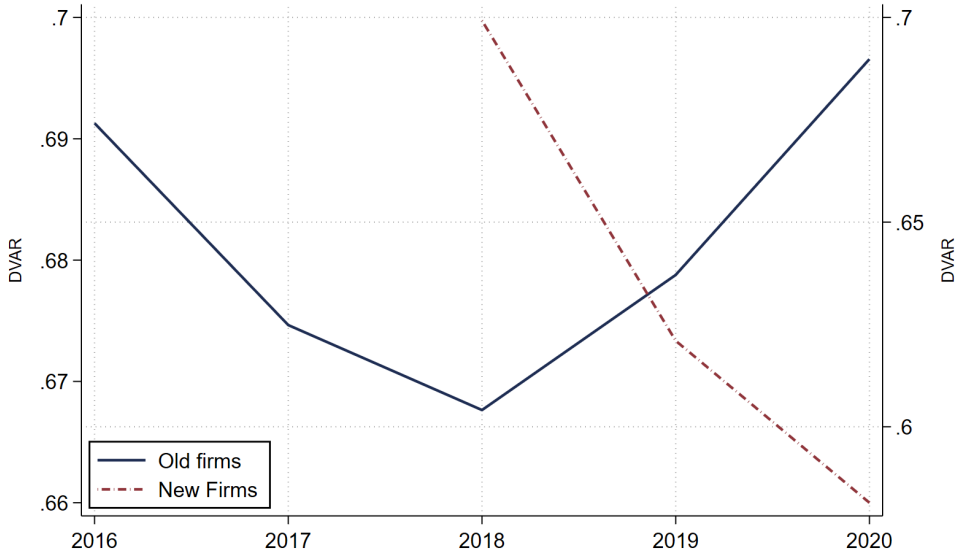
Figure 22: Decomposing Changes in Labor



Note: The figure decomposes shows the changes in total labor across exiting, incumbent and new firms. Exiting firms are those observed in 2017 but not in 2021. Incumbent firms are those observed in both years. New firms are those only observed in 2021 and established after 2017.

were already importing from China in 2017; Old Chinese non-importers, firms which were observed in 2017 but not importing from China; and New firms, established in 2018 or later. Appendix Figure A13a shows that imports by new firms form a major component of the overall increase in imports from China during the period. Chinese imports to new firms account for over 65% of the overall increase in Chinese imports by firms in Viet Nam. Similarly, we decompose the change in exports to US between 2017 and 2020 among three types of manufacturing firms in Appendix figure A13b. Old US exporters, firms already exporting to the US in 2017; Old US Non-exporter, firms existing in 2017 but not exporting to the US; and New firms. Again, exports by new firms account for over 40% of the overall increase in exports to the US. New firms are, therefore, critical in the increased participation of Viet Nam in both the US export and the Chinese import markets. If the results in Freund et al. (2024) that show increased indirect participation of China in the US via third countries, like Viet Nam, are driven by rerouting through new firms, our results of no firm level rerouting amongst incumbent firms should be thought of as a novel addition to the discussion on rerouting rather than being at odds with the current literature. The result is also consistent with Iyoha et al. (2024) who show that the level of aggregation significantly affects rerouting estimates. Specifically, firm-level rerouting is estimated to be an order of magnitude lower than product-level rerouting.

Figure 23: DVAR for Old and New Firms



Note: The figure shows the trends in DVAR across old (incumbent) firms and new firms. New firms are those established in 2018 or later. Y-axis on the left hand side shows DVAR value for old firms and y-axis on right hand side shows DVAR values for new firms.

10 Conclusion

In this paper, we use the matched customs and firm data for Viet Nam to calculate firm-level domestic value added in exports in Viet Nam. We show that since the the onset of the US-China trade tensions, aggregate DVAR in Viet Nam has increased, reversing years of a declining trend. The increase is driven by firm-level increases rather than a reallocation of exports towards high DVAR firms.

We examine the role of trade tensions induced idiosyncratic US export demand shocks in driving the firm-level DVAR increase. Our analysis reveals that in response to increased export opportunities to the US, firms in Viet Nam increase the domestic content of exports, and reduce their reliance on imported materials usage. The effects are economically large and significant. We, further, show that firms facing a large US demand shock expand in terms of output and total exports, both to US and non-US destinations. Firms use more domestic materials and enjoy a higher labor productivity, but do not employ more workers.

We do not find any evidence of firm-level transhipment from China for the sample of incumbent firms. Specifically, while the exports of firms increase, the imports from China do not increase. The results are starkly different for Chinese and non-Chinese owned

firms. The Chinese owned firms show evidence of transshipment with increased exports to US coupled with increased imports from China, without any increase in domestic content or scale. On the other hand, both domestic and non-Chinese owned foreign firms expand in scale and increase their DVAR.

We highlight the role of implicit Rules of Origin and FDI inflows in explaining DVAR increase in Viet Nam. We find that increases in DVAR are higher in industries with a higher domestic content requirement under NAFTA, plausibly revealing the preferences for industry specific domestic content by the US. Similarly, DVAR increase is concentrated amongst firms whose primary exported product is above median in NAFTA domestic content requirement. Further, Viet Nam also emerged as a major beneficiary of manufacturing FDI inflows from both China and US.

We further discuss the importance of distinguishing between incumbent and new firms in understanding the results on labor and potential transhipment via Viet Nam. This distinction points to a valuable direction for future research on the role of firm dynamics in shaping trade and labor market outcomes

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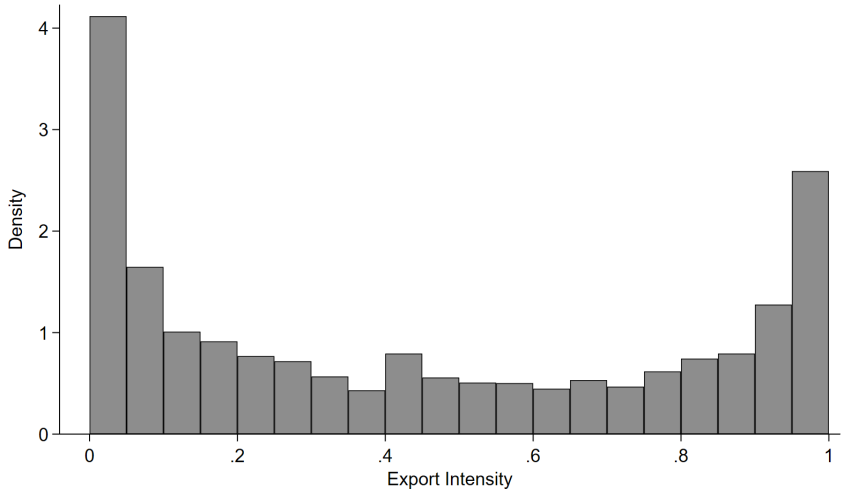
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A APPENDIX

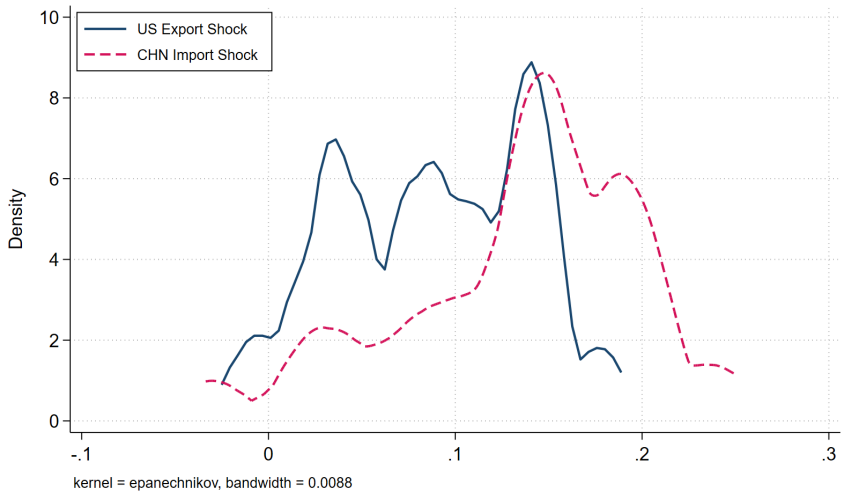
A.1 Additional Results

Figure A1: Export Intensity of Firms in Viet Nam



Note: The figures shows the distribution of export intensity defined by the ratio of total exports to total output for Vietnamese firms.

Figure A2: Kernel Density of US Demand and CHN Supply Shocks



Note: The figures shows the distribution of $US\ Demand\ Shock$ and $China\ Supply\ Shock$ across the firms in the sample.

Table A1: Summary Statistics of Key Firm Variables

	Mean	P25	P50	P75	Min	Max	SD
DVAR	0.75	0.61	0.80	0.93	0.22	0.98	0.21
(ln) Output	25.86	24.74	25.80	26.97	22.05	29.19	1.61
(ln) Labor	5.09	4.16	5.08	6.00	1.61	7.97	1.37
(ln) Exports	14.22	12.78	14.37	15.85	7.91	18.29	2.27
(ln) Imports	13.90	12.48	14.24	15.68	-0.69	18.16	2.62
(ln) Materials	25.68	24.55	25.61	26.82	21.82	29.05	1.64
(ln) Domestic Materials	25.26	24.18	25.21	26.35	19.04	29.05	1.57
(ln) Imported Materials	23.82	22.33	24.16	25.63	9.33	33.24	2.71
US Export Share	0.12	0.00	0.00	0.07	0.00	1.00	0.26
China Import Share	0.29	0.01	0.15	0.50	0.00	1.00	0.33
No. Import Sources	7.53	2.00	5.00	10.00	1.00	66.00	7.37
No. Export Destinations	7.95	2.00	4.00	10.00	1.00	130.00	10.22
No. Imported Products	10.73	4.00	9.00	16.00	1.00	55.00	8.41
No. Exported Products	3.36	1.00	2.00	4.00	1.00	34.00	3.31

Note: The table presents the summary statistics for the key firm level variables used in the paper.

Table A2: Prediction of Product-Level US Demand Shocks

	(1) $\Delta US\ Import_t$	(2) $\Delta US\ Import_t$
$\Delta US\ Import_{t-1}$	0.439***	0.057
	(0.120)	(0.081)
Observations	97	97
R-squared	0.124	0.005

Note: The dependent variable is product-level US import growth from 2014-15 to 2016-17 in column(1) and product-level US import growth from 2016-17 to 2018-19 in column (2). $\Delta US\ Import_{t-1}$ is the value of US import grwoth in the preceding period - 2012-13 to 2014-15 in column (1) and 2014-15 to 2016-17 in column (2). Imports from Vietnam are excluded from all import growth calculations. N = 97 2-digit HS products. *** is $p < 0.1$, ** is $p < 0.05$, and * is $p < 0.01$.

Table A3: Top 10 products by Value of US Demand Shock

Product (HS code)	**US Demand Shock**
Miscellaneous edible preparations (21)	0.56
Nickel and articles thereof (75)	0.29
Railway/tramway locomotives, rolling-stock & parts (86)	0.28
Other base metals; cermets; articles thereof (81)	0.25
Pharmaceutical products (30)	0.25
Salt; sulphur; earths & stone; plastering materials, lime & cement (25)	0.24
Ores, slag and ash (26)	0.24
Zinc and articles thereof (79)	0.21
Mineral fuels, oils & waxes (27)	0.21
Fertilizers (31)	0.18

Note: Note: The table shows the top 10 products by the value of US Demand Shock. Products are at the 2-digit level of HS Classification

Table A4: US Demand Shocks and Firm Variables

	(1) Output	(2) Labor	(3) Productivity	(4) Materials	(5) Domestic Materials	(6) Imported Materials	(7) $\frac{ImportedMaterial}{TotalMaterial}$	(8) $\frac{ImportedMaterial}{TotalOutput}$
$\Delta US\ Shock \times Post$	0.407**	0.004	0.371**	0.353*	0.640**	0.000	-0.202**	-0.189**
	(0.121)	(0.167)	(0.113)	(0.117)	(0.147)	(0.326)	(0.052)	(0.048)
$\Delta CN\ Shock \times Post$	0.214	0.263	-0.048	0.147	-0.101	0.853*	0.108*	0.085*
	(0.100)	(0.145)	(0.111)	(0.087)	(0.110)	(0.309)	(0.039)	(0.034)
Observations	15,932	15,932	15,932	15,932	15,745	15,275	15,932	15,932
R-squared	0.977	0.953	0.896	0.976	0.954	0.927	0.987	0.987
Firm FE	Y	Y	Y	Y	Y	Y	Y	Y
Ind-Year FE	Y	Y	Y	Y	Y	Y	Y	Y

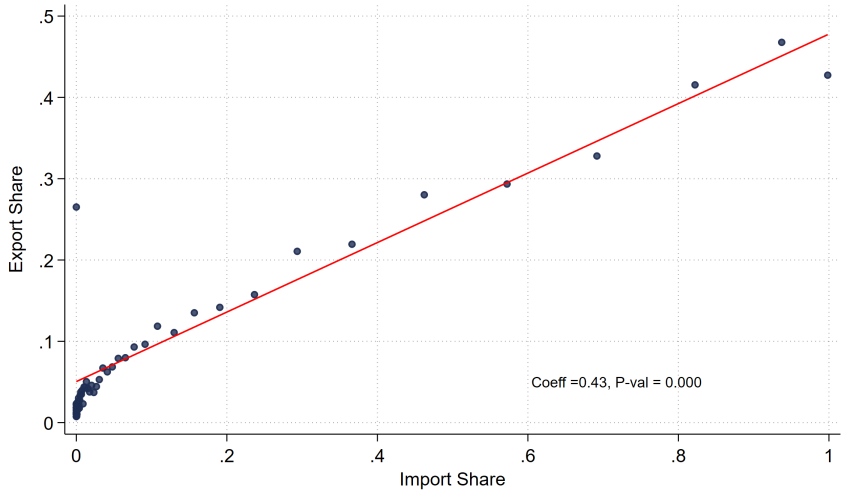
Note: The dependent variable is total output in column(1), total labor in column(2), labor productivity in column(3), total materials in column (4), total domestic materials in column(5), total imported materials in column(6), imported material to total materials ratio in column(7), and imported materials to total output ratio in column(8). All columns control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. $Post = 1$ if year $>=$ 2018 and 0 if the year is 2017. Columns (2) and (4) use a PPML specification. Standard errors are twoway clustered at the firm and year level . *** is $p < 0.1$, ** is $p < 0.05$, and * is $p < 0.01$.

Table A5: Classification of FDI

Sector	Subsectors
Intermediate (Inputs / Materials)	Other motor vehicle parts; Glass & glass products; Paints, coatings, additives & adhesives; Natural, liquefied and compressed gas; Communications equipment; All other electrical equipment & components; Communication & energy wires & cables; Electric lighting equipment; Wiring devices; Animal food; Grains & oilseed; Iron & steel mills & ferroalloy; Other fabricated metal products; Motorcycle, bicycle, & parts; Converted paper products; Artificial & synthetic fibres; Plastics packaging materials & unlaminated film & sheets; Urethane, foam products & other compounds; Rubber hoses & belting; Tyres; Textiles & Textile Mills.
Final Goods (Consumption / Capital)	Automobiles; Biological products (except diagnostic); Audio & video equipment (Consumer electronics); Household appliances; Cosmetics, perfume, personal care & household products; Dolls, toy, & games; Furniture, homeware & related products (Consumer); Furniture, homeware & related products (Wood); Apparel accessories & other apparel; Clothing & clothing accessories; Cut & sew apparel; Footwear; Snack food; Soft drinks & ice; Pharmaceutical preparations.
Non-Manufacturing (Services, Utilities, Construction)	Advertising, PR, & related; Architectural, engineering & related services; Business support services; Employment services; Legal services; Management consulting services; Professional, scientific & technical services; Speciality trade contractors; Water, sewage & other systems; Fossil fuel electric power; Data processing, hosting, & related services; Motion picture & sound recording industries; Accommodation; Commercial & institutional building construction; Industrial building construction; Real estate services; Rental & leasing services; Biomass power; Solar electric power; Wind electric power; Custom computer programming services; Internet publishing & broadcasting & web search; Software publishers (except video games); Air transportation; Freight/Distribution services; Warehousing & storage; Miscellaneous store retailers; Nonstore retailers.

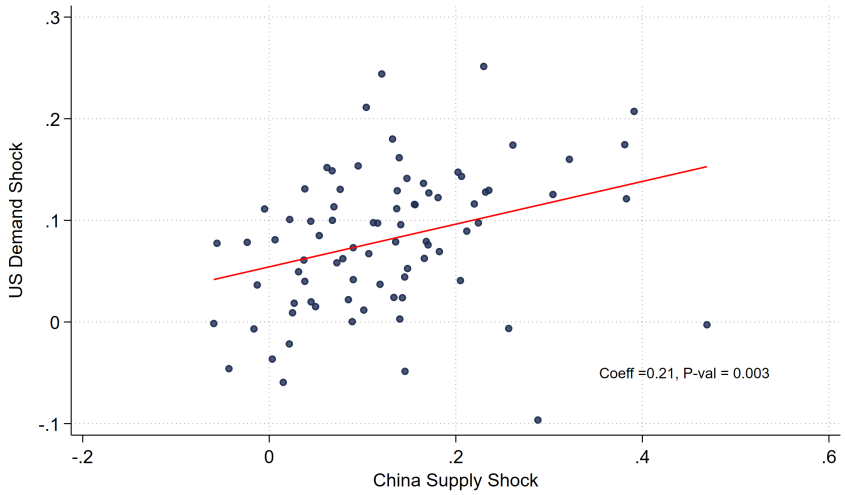
Note: Note: The table classifies the different sub-sectors in the FDI Markit data into three broad sectors - Manufacturing Inputs, Manufacturing Final and Non-Manufacturing

Figure A3: Correlation Between Export and Import Mix



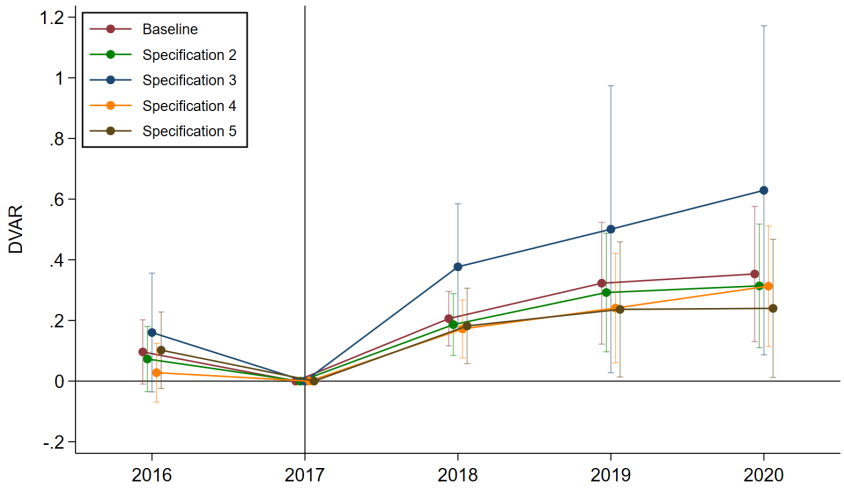
Note: The figures shows binscatter correlation plot of a firm's import and export mix. Each point is a firm-product observation.

Figure A4: Correlation Between Product-Level US Demand and China Supply Shocks



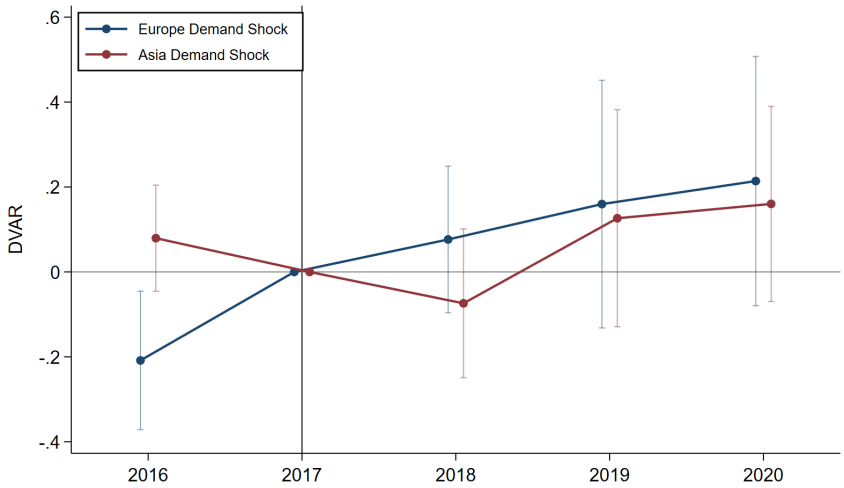
Note: The figures shows the correlation plot between product-level US Demand and China Supply shocks. Each point represents a product.

Figure A5: Robustness to Alternate Specifications



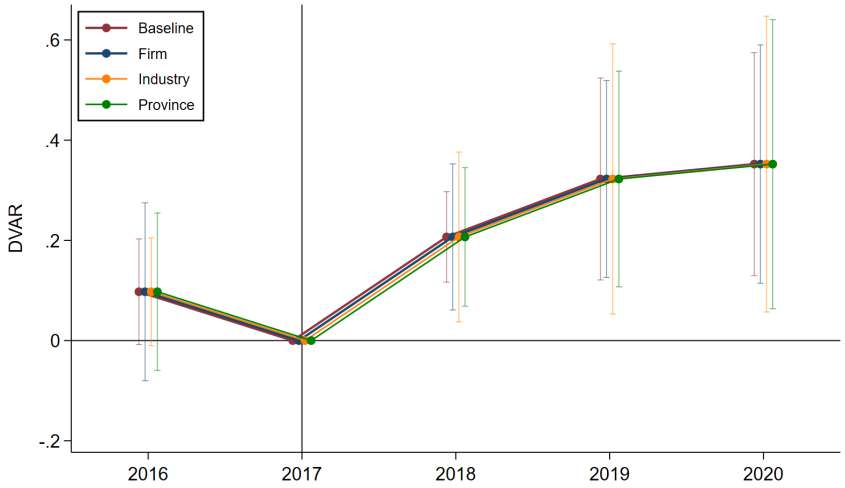
Note: The figure plots the results from estimation of equation 9 as the Baseline. The dependent variable is the DVAR. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. In specification 2, we additionally control for the baseline DVAR value interacted with the time trend. In specification 3, we use natural log of DVAR as the dependent variable. In specification 4, we add to specification 2 additional control for the province-year fixed effect. In Specification 5, we add to specification 2 the control for the Europe and Asia demand shocks. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A6: Effects of Asia and Europe Demand Shocks



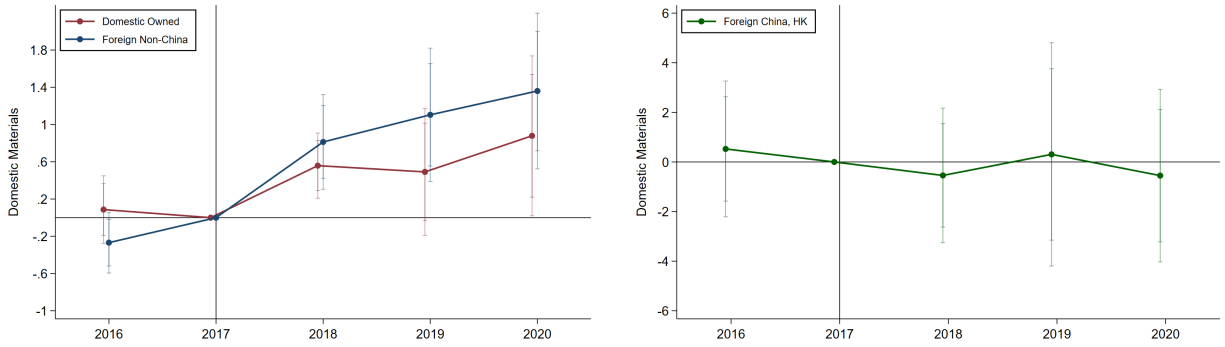
Note: The figure plots the results from estimation of equation 9 additionally including the Asia and Europe demand shocks. The dependent variable is the DVAR. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A7: Robustness to Alternate Clustering



Note: The figure plots the results from estimation of equation 9 as the Baseline with each specification clustering standard errors differently. The blue lines clusters at firm level, orange line at the industry level and green line at the province level. The dependent variable is the DVAR. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Bars depict 95% confidence intervals

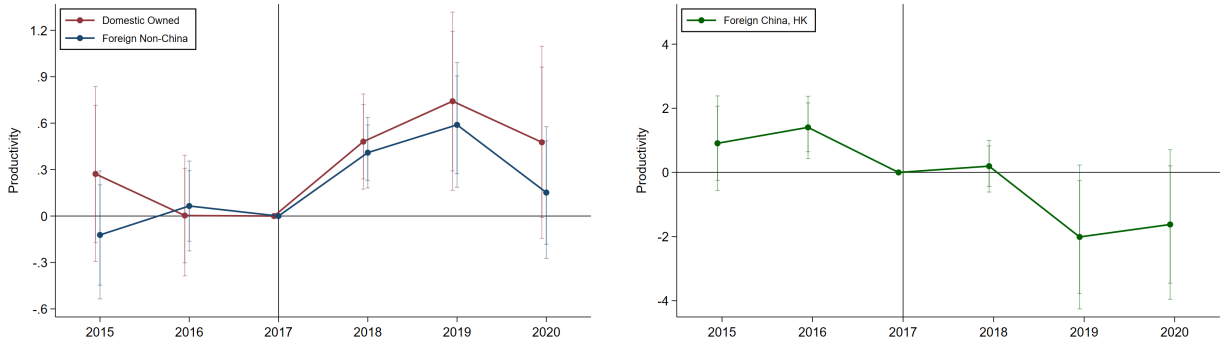
Figure A8: Event Study: Domestic Materials by Ownership



(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the natural log of total domestic materials. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

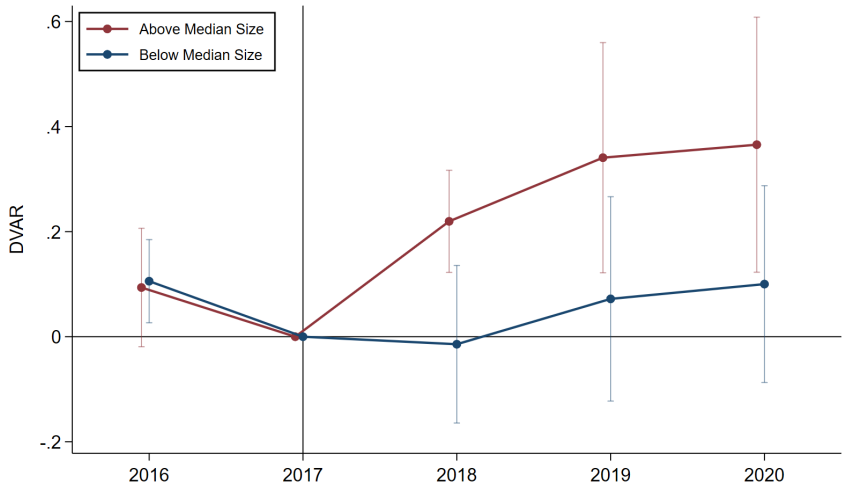
Figure A9: Event Study: Labor Productivity by Ownership



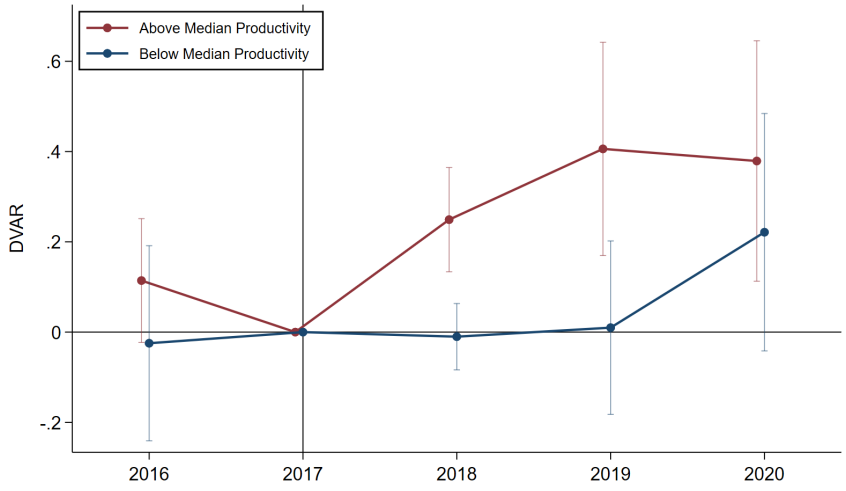
(a) **(b)**

Note: The figure plots the results from estimation of equation 9 separately by firm's ownership country. Panel (a) includes domestic owned and non-Chinese owned foreign firms. Panel (b) includes Chinese owned firms. The dependent variable is the natural log of labor productivity. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A10: DVAR by Firm Size



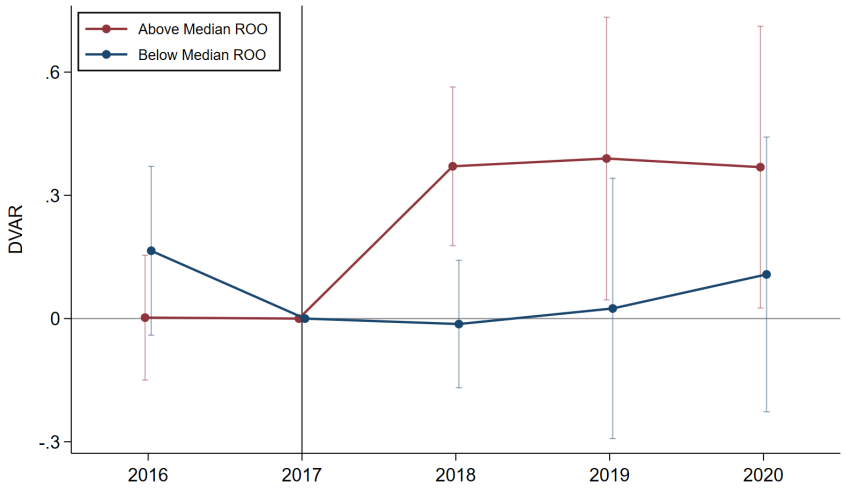
(a)



(b)

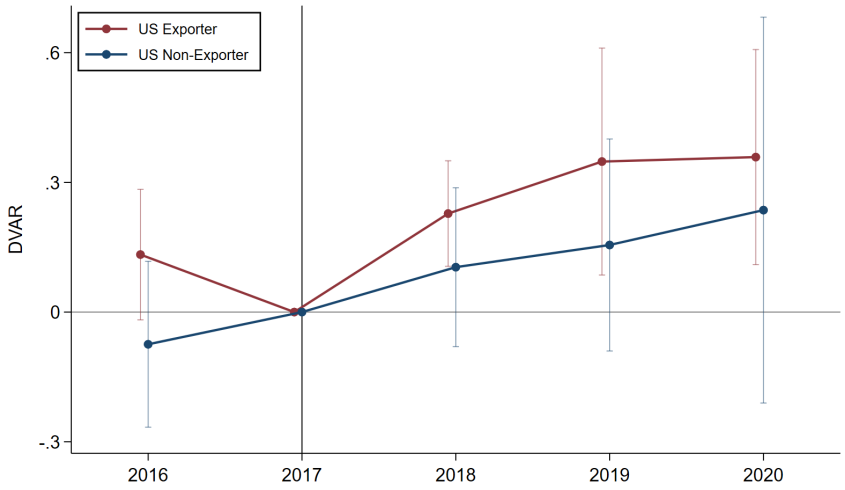
Note: The figure plots the results from estimation of equation 9 separately by firm size. Panel (a) plots the results for above and below median output firms. Panel (b) plots the results for above and below median productivity firms. The dependent variable is domestic value added in exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A11: Effects On DVAR by Domestic Input Requirements in NAFTA



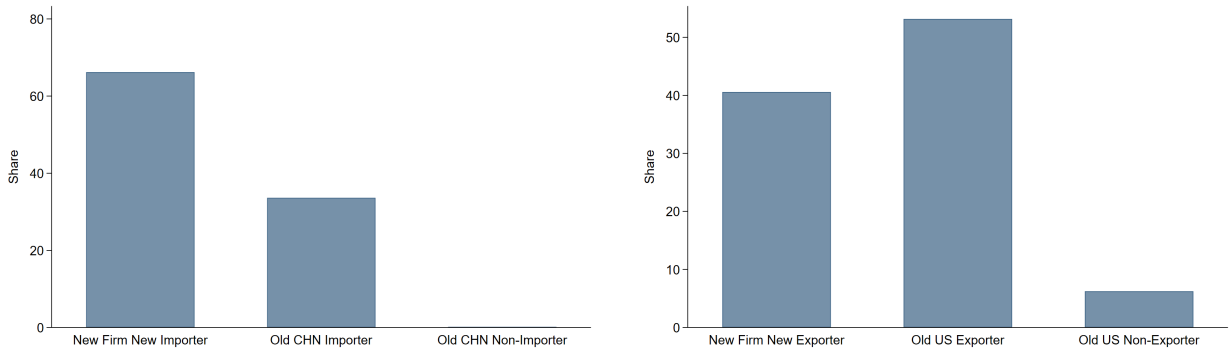
Note: The figure plots the results from estimation of equation 9 separately for above and below median firms in ROO requirement under NAFTA. The dependent variable is domestic value added in exports. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A12: Effects On DVAR by US Exporting Status



Note: The figure plots the results from estimation of equation 9 separately by firms export status. Red line includes firms who export at least once to the US in the post period. Blue line includes firms who do not export to the US at all inn the post period. The dependent variable is the DVAR. We control for firm and industry-year fixed effects, along with the following baseline firm characteristics interacted with a time trend: total output, exports as a share of output, and exports to US as a share of total exports. Additional controls include wage to output and materials to output ratio. We use firm's 2017 exports as weights. Standard errors are twoway clustered at the firm and year level. Bars depict 95% confidence intervals

Figure A13: Decomposing increase in Imports from China and US



(a) China **(b)** US

Note: Panel (a) decomposes the changes in imports from China between 2017-2020 across new firms, old chinese importers, and old firms not importing from China in 2017. Panel (b) decomposes the changes in exports to US between 2017-2020 across new firms, old US exporters, and old firms not exporting to US in 2017.