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Demystifying Trade Patterns In A Fragmenting World

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Demystifying Trade Patterns In A Fragmenting World

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ABSTRACT: So-called "connector" countries have been argued to benefit from the US-China trade tensions, given their rising share in US imports. This paper draws an important distinction between trade reallocation—countries increase domestic production to substitute for declining Chinese exports to the US—and trade rerouting—countries serve as one-stop place for transshipment of Chinese exports to the US. Leveraging granular data on trade and FDI flows and global input-output linkages, focusing on six Asian countries, we first document that the connector role of these countries may reflect their growing domestic markets and Chinese supply chain reconfiguration, beyond trade rerouting from China to the US. We then zoom in on value-added components and deploy a synthetic control approach to disentangle trade reallocation from trade rerouting. While the evidence remains elusive for five of the six countries, Vietnam appears to have benefited from trade reallocation, with increased domestic content in its exports to the US in strategic sectors, instead of facilitating significant transshipment of Chinese exports to the US. Such domestic production expansion also helped increase domestic content in Vietnam's exports to the rest of the world, and may be partly due to Chinese firms relocating to Vietnam through greenfield FDI. Despite potential short-term gains, trade reallocation increases connector countries' vulnerability to geoeconomic fragmentation with losses to all countries in the long run.

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Contents

1 Introduction

Since the advent of the US-China trade tensions, there has been a growing debate on the impact of rising barriers to trade on global and bilateral trade patterns.[1] Geoeconomic fragmentation poses losses to all countries in the medium to long term, but may lead to different trade dynamics among countries in the short-term. Especially those that rely on an export-oriented growth model, are open to global trade and investment, and are deeply integrated into global supply chains may be able to withstand trade tensions more effectively. So called "connector" countries have been argued to benefit from bridging the gap between trade blocs, for example, increasing exports to the US as they substitute for declining US sourcing from China, while at the same time increasing their imports from China (Fajgelbaum et al., 2021; Alfaro and Chor, 2023; Dahlman and Lovely, 2023; Freund et al., 2023; Utar et al., 2023; Gopinath et al., 2024). However, it is not clear (i) whether such connector countries are indeed serving as a bridge, as the increasing imports from China may reflect other factors such as growing domestic markets that Chinese firms tap into; and (ii) even if such "bridging the gap" effects exist, through which channels they operate. Two possible channels include:

- *Trade reallocation:* connector countries produce more goods domestically to export to the US—with rising domestic value added—as the US shifts away from China, likely using intermediate inputs imported from China.
- *Trade rerouting:* connector countries serve as a one-stop place for Chinese exports to the US with minimal to no domestic value added—in the extreme case through transshipment—to circumvent trade barriers, especially for products identified as having strategic importance, e.g., electronics and chemicals.

Separating these channels is important. While both trade reallocation and rerouting increase connector countries' vulnerability to shocks from further fragmentation, including from lower global growth, trade reallocation could benefit the domestic economy at least in the short-term as it increases domestic production for exports. Conversely, trade rerouting involves minimal to no domestic production activities and may result in harmful countervailing trade restrictions. Leveraging granular trade and FDI data as well as a multi-region input-output database, this paper provides a nuanced assessment of the changing trade patterns since 2018 by disentangling these two channels, with a focus on a sample of six Asian emerging markets, namely, India, Indonesia, Malaysia, Philippines,

[1] See for example Aiyar et al., 2023; Alfaro and Chor, 2023; Blanga-Gubbay and Rubínová, 2023; Freund et al., 2023; World Trade Organization, 2023; Gopinath et al., 2024.

Thailand, and Vietnam, which have been argued to have benefited from the US-China trade tensions.

First, we document that the positive correlation between these countries' imports from China and exports to the US may reflect other forces at play, such as their growing domestic markets and Chinese supply chain reconfiguration, and thus does not necessarily suggest their connector roles in bridging the gap between China and the US. Notably, several countries have seen an increase in their shares in Chinese imports, including India, Malaysia, and Vietnam. This suggests that Chinese firms may be relocating some of their production abroad to these countries, for example, due to their lower labor costs, and importing back the processed products for further processing and exports. In addition, the six Asian countries have seen an increase in their shares in Chinese abroad-absorbed value added,[2] which points towards the role of growing domestic markets and domestic demand in providing opportunities for market penetration by Chinese exporters. Hence, countries' growing domestic markets and Chinese supply chain reconfiguration may explain these countries' rising imports from China beyond mere trade rerouting. Consequently, there may not be a direct link between these countries' increasing exports to the US and their rising imports from China.

Second, we then dive into the value-added content of bilateral trade flows, by utilizing a multi-region input-output database and constructing two value-added measures in a country's exports to the US: (i) the share of domestic value added, and (ii) the share of Chinese value added. We use a synthetic control approach to estimate the effect of US-China trade tensions on these measures, especially for strategic sectors including *electrical and machinery sector* and *petroleum, chemical and non-metallic mineral products sector* that have been most affected by the US-China trade tensions and specifically US tariffs on Chinese exports.[3] Compared to the synthetic counterfactual, a higher share of domestic value added in a country's exports to the US would suggest evidence of trade reallocation, i.e., there is an increase in domestic production and more domestic content is embedded in the country's exports to the US, as the US shifts away from China. On the other hand, a lower share of Chinese value added in a country's exports to the US would suggest no evidence of trade rerouting *on a significant scale*. Otherwise it would have increased as Chinese exports are re-exported to the US with minimal to no domestic value added.

[2] A country's share in Chinese abroad-absorbed value added is the value added of Chinese production absorbed by this country's domestic final demand as a share of the total value added from Chinese production that is absorbed abroad by final demand.

[3] We follow the IMF *2023 April World Economic Outlook* to map strategic sectors with the 26 sectors in the multi-region input-output database. Given the aggregate sector definitions in the multi-region input-output database, precise mapping with the strategic sectors identified in International Monetary Fund (2023) which uses SEC 3 definitions and subsectors of ISIC code 20 is not possible.

The results suggest that among the six countries of interest, Vietnam appears to have benefited from the trade reallocation effect during 2018-2022—significantly increasing its domestic value added and reducing Chinese value added in its strategic sector exports to the US—–rather than trade rerouting from China to circumvent tariffs. Specifically, for strategic sectors, Vietnam has seen a statistically significant increase in the share of domestic value added in its exports to the US, 6 and 7 percentage points higher than its synthetic counterfactual in 2018, for *electrical and machinery sector* and *petroleum, chemical and non-metallic mineral products sector*, respectively, and 10 and 12 percentage points higher in 2022. This suggests that Vietnam has increased domestic production of its strategic sectors' exports and thus been able to embed more domestic content in its exports to the US. To eliminate potential confounding factors that affect not only strategic sectors but also non-strategic sectors (e.g. pandemic lockdowns disrupting supply chains, economy-wide structural reforms which increase productivity), we replicate the analysis for the non-strategic manufacturing sector and find that the increase in the share of domestic value added in Vietnam's non-manufacturing sectors' exports to the US is more muted and importantly, not statistically significant until 2021. Such difference between strategic and non-strategic sectors suggests that the significant increase in the share of domestic value added in strategic sectors' exports to the US can be attributed to the US-China trade tensions. On the other hand, Vietnam has seen a statistically significant decline in the share of Chinese value added in its strategic sectors' exports to the US, suggesting no evidence of trade rerouting from China to the US to circumvent tariffs on a significant scale.

Moreover, extending the analysis of domestic value added in Vietnam's export to *the world*, we show that Vietnam has been able to export more domestic content not only to the US but also globally, though the effects on the latter are slightly smaller and take longer to become statistically significant. This could suggest that, beyond increasing its domestic content in bilateral exports to the US, Vietnam managed to expand its domestic production capacity to capture a larger share in the global market.

Third, extending the analysis to FDI by examining the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam, we find that Vietnam attracted more greenfield FDI projects in strategic sectors from China after 2018, which is likely one of the reasons behind the scaling up of domestic production of its exports: Chinese firms relocate their production, or accelerate the relocation process that started before due to higher domestic labor costs, to Vietnam against the backdrop of increasing tariffs on China imposed by the US. Notably, this supply chain reconfiguration through FDI may not be exclusive to Chinese firms as FDI inflows to Vietnam from other countries, including the US, Japan, and Korea, also significantly increased at the same time.

Taken together, Vietnam appears to have benefited from the trade reallocation effect by increasing its domestic production—partly supported by Chinese FDI capital but also by its favorable structural characteristics—and therefore has been able to embed more domestic content in its exports to the US and the rest of the world, especially in strategic sectors. Meanwhile, the evidence suggests that Vietnam has not served as a one-stop place allowing China to reroute its exports to the US to circumvent tariffs on a significant scale.

As for the other five Asian countries, the impacts of the US-China trade tensions are elusive. Malaysia is estimated to have seen a positive but not statistically significant effect on the share of domestic value added in its strategic sector exports to the US, while other countries are estimated to have seen negative and not statistically significant effects (except for Thailand). In terms of the trade rerouting effect, Malaysia is estimated to have seen a negative (but not statistically significant) effect on the share of Chinese value added in its exports to the US for strategic sectors. Other countries have seen small positive and statistically significant effects on the share of Chinese value added in its exports for strategic sectors. However, this does not suggest evidence of trade rerouting as the increasing share of Chinese value added in these countries' strategic sector exports could well reflect their increasing supply chain integration with China through backward linkages, which would lead to a higher share of Chinese value added in its exports.[4]

In sum, this paper provides a nuanced assessment of changing global trade patterns against the backdrop of increasing geoeconomic fragmentation, by zooming in on so-called connector countries, delving into the value-added component of trade flows, and distinguishing between trade reallocation and trade rerouting effects. The connector role of these countries is not as clear-cut with limited evidence that they are indeed bridging the gap between trade blocs. Moreover, the connector role is likely to have been achieved through trade reallocation rather than trade rerouting, which could benefit the connector country, at least in the short term, as it boosts domestic production and potentially attracts more inward FDI flows.

Related Literature. This paper contributes to three strands of literature. First, it draws an important distinction between trade reallocation and trade rerouting. The literature on the impacts of the US-China trade tensions on global trade has primarily focused on reconfiguration of supply chains and reallocation of global trade (Fajgelbaum et al., 2021; Alfaro and Chor, 2023; Grossman et al., 2024; Freund et al., 2023). Despite the growing anecdotal discussion of rerouting, there have been few analyses disentangling trade rerouting from trade reallocation empirically in the context of the US-China trade tensions. Hayakawa and Sudsawasd (2024) study the impacts of Thailand's introduction

[4]For example, Foxconn began assembling top-end Apple iPhones in India in 2019 (Reuters, 2018).

of a watchlist to curb the rerouting of Chinese goods to the US and EU in 2019. They find that the watchlist did not significantly affect Thailand's imports of high-risk goods from China, while it led to an increase in those goods' exports to the US but a decrease in exports to the EU. Iyoha et al. (2024) examine at the product and firm level whether trade rerouting increased via Vietnam due to the US-China trade tensions. They find that the level of aggregation significantly affects the assessment: a significantly larger share of Vietnamese exports to the US is identified as subject to rerouting at the product level than at the firm level. These results also highlight the challenges in understanding trade rerouting and disentangling it from trade reallocation based on aggregate trade patterns. To our best knowledge, this paper is the first to disentangle the trade rerouting effect from the trade reallocation effect by examining value-added components of trade flows.

Second, we contribute to the recent literature on the emergence of connector countries in the context of geoeconomic fragmentation. Several studies propose the emergence of connector countries by looking at the association between the change in their inward linkages with China—measured by their shares in Chinese exports or outward FDI—and the change in their outward linkages with the US—measured by their shares in US imports (Alfaro and Chor, 2023, Dahlman and Lovely, 2023, Freund et al., 2023, Utar et al., 2023, Gopinath et al., 2024). We enrich the analysis by first looking at other potential forces at play, including China's production relocation and supply chain reconfiguration, and connector countries' growing domestic markets. These factors are not necessarily associated with connector countries bridging the gap between trade blocs. Second, we examine through which channels the connector role is achieved by differentiating between trade reallocation and trade rerouting. In addition, there are a growing number of studies zooming in on Vietnam, to study the impacts of the US-China trade tensions on its domestic economy, including labor markets (Mayr-Dorn et al., 2023; Rotunno et al., 2024), structural change (Nguyen and Lim, 2023), FDI flows (Xue, 2023), and environmental progress (Kahn et al., 2024). While the positive impact of the US-China trade tensions on Vietnam's domestic economy found in these papers is consistent with our main finding that Vietnam has benefited from trade reallocation rather than trade rerouting, this paper offers empirical evidence to support trade reallocation while rejecting the trade rerouting hypothesis. This paper also provides a cross-country comparison, by comparing Vietnam with other Asian emerging countries that are also argued to have benefited from the US-China trade tensions, and finds that the evidence of trade reallocation in other countries is elusive.

Third, our paper also relates to the literature on trade barrier circumvention through rerouting. The existing literature mainly uses trade data at different aggregation levels

without examining the value added components, with much of the evidence based on correlations. Fisman et al. (2008) find that China was more likely to import goods through Hong Kong if it had higher import tariffs on the rest of the world, and argue that this indirect trade was partly due to tariff evasion. Stoyanov (2012) provide evidence of tariff evasion by showing that goods with greater preferential treatment under the Canada-US Free Trade Agreement were more likely to be transshipped through the US to Canada. Rerouting from China to the US has been examined in the context of quotas and anti-dumping duties. Rotunno et al. (2013) find a high correlation between African countries' imports from China and exports to the US for apparel products for which African countries have duty- and quota-free access to the US market through the African Growth and Opportunity Act (AGOA). Rotunno and Vézina (2015) show that the US in-bond system of imports may be used by firms to illegally avoid trade barriers, which involves declaring Chinese exports bound for Mexico but diverting them to the US market while in transit. Liu and Shi (2019) find an increase in the correlation between Chinese imports and US exports in third countries for products that are subject to US anti-dumping duties on Chinese products. Iyoha et al. (2024) estimate the causal response of rerouting to the tariffs imposed during the US-China trade tensions using a difference-in-difference approach based on both product-level and firm-level data. However, looking at trade flows, without examining the value added components, may overstate the extent of rerouting if there are unobserved value-added activities, even within a product code. Our approach, using multi-region input-output linkages to construct value added-related measures and synthetic control counterfactuals, allows us to estimate the causal impact of the US-China trade tensions on the extent of trade rerouting versus trade reallocation.

The remainder of the paper is organized as follows: Section 2 documents stylized facts related to the geoeconomic fragmentation and connector countries, including an analysis of other potential factors behind countries' increasing imports from China. Section 3 presents the main empirical methodology and the data sources. Section 4 presents the main empirical results, alongside validation analysis. Finally, Section 5 concludes.

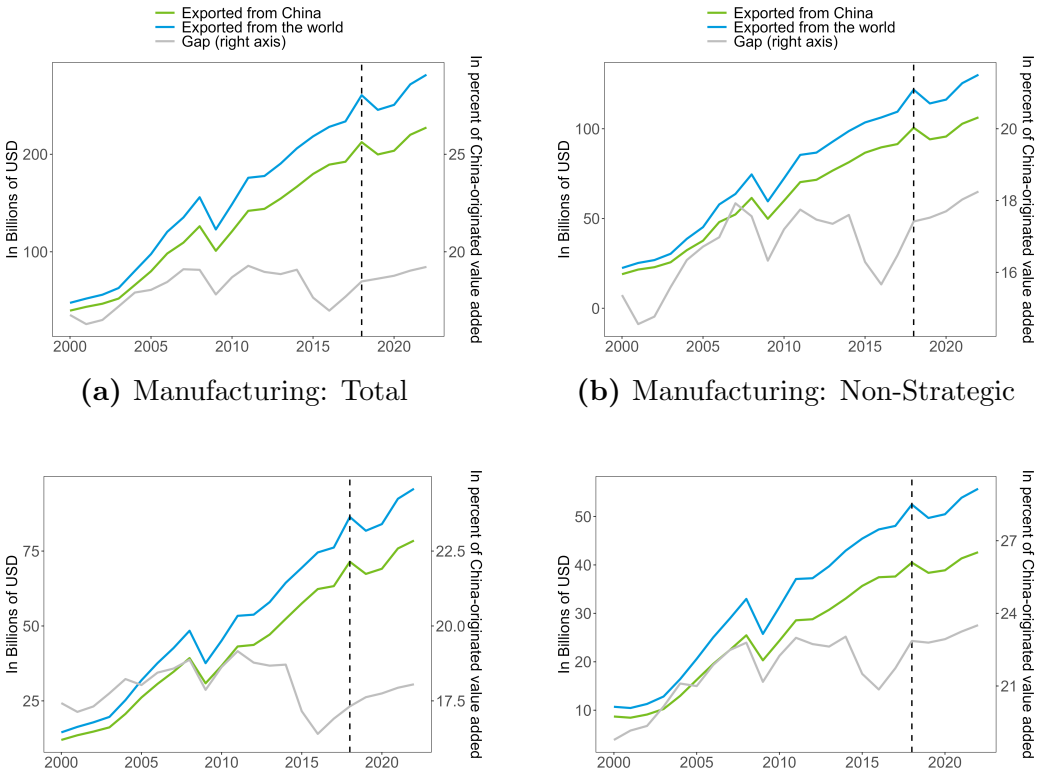
2 Stylized Facts

We first document the evolution of Chinese value added in US imports and to what extent it has been exported through other countries before analyzing the connector role of six Asian countries of interest: India, Indonesia, Malaysia, Philippines, Thailand, and Vietnam.

Chinese value added has been increasingly exported to the US through other countries,

not only in strategic sectors but also more broadly for the overall manufacturing sector. Figure 1 plots the Chinese value added in US imports that is exported from the world (including China itself) versus the value added that is exported directly from China, and the gap as a share of the total Chinese value added in US imports, for the overall manufacturing sector (panel (a)), non-strategic sectors (panel (b)), and strategic sectors including electrical and machinery (panel (c)) and petroleum, chemical, and non-metallic mineral products (panel (d)).

Figure 1: Value Added Originated in and Exported from China in US Imports



(a) Manufacturing: Total

(b) Manufacturing: Non-Strategic

(c) Manufacturing: Electrical and Machinery

(d) Manufacturing: Petroleum, Chemical and Non-Metallic Mineral Products

Notes: Panel (a)-(d) plot Chinese value added that is exported either from China or other countries (the blue lines) versus Chinese value added that is exported only from China (the orange lines) on the left axis and the gap between the two as a share of the total Chinese value added on the right axis, for the overall manufacturing sector, the non-strategic sectors, and strategic sectors include electrical and machinery and petroleum, chemical, and non-metallic mineral products, respectively. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Since China's accession to the WTO in 2001, an increasing share of its value added has been exported through other countries, which is likely due to its integration into the

global value chain through forward linkages, i.e., supplying intermediate goods to other countries for production and exports. However, the increasing trend plateaued after the Global Financial Crisis, before starting to decline in 2015 and reaching its trough in 2016. Since 2017, it has started to increase again, not only in strategic sectors, but also in non-strategic sectors and for the overall manufacturing sector.

The recent upward trend may be argued as evidence of Chinese exports having been channeled through other countries to the US to circumvent tariffs for strategic sectors. However, the broad-based increase—not only in strategic sectors but also non-strategic sectors—suggests that the trend may also reflect Chinese firms' production relocation and supply chain reconfiguration. For example, Chinese firms may be increasingly supplying intermediate products and relocating low-value added production, such as assembly and packaging, abroad to countries with lower labor costs, as labor costs in China increase and China strives to move up the value chain.[5]

While the literature has coined the emergence of connector countries based on the positive correlation between their shares in Chinese exports and US imports, the link between these countries' increasing exports to the US and imports from China is not clear. Following Gopinath et al. (2024), Figure 2 first plots the change in a country's share in US imports against the change in its share in Chinese exports, between 2013-17 and 2018-22 for non-aligned countries (panel (a)).[6] We then augment the analysis by also looking at the change in a country's share in Chinese imports (panel (b)) and the change in its share in Chinese abroad-absorbed value added (panel (c)), between 2013-17 and 2018-22, against the change in its share in Chinese exports. A country's share in Chinese abroad-absorbed value added is the value added of Chinese production absorbed by this country's domestic final demand (consumption and investment), as a share of the total value added from Chinese production that is absorbed abroad by the global final demand. It therefore serves as an indicator of the amount of Chinese exported value added that is absorbed within a country's domestic economy as opposed to going into the production of exported goods, and thus a measure of the size of the country's domestic market in absorbing Chinese exports.

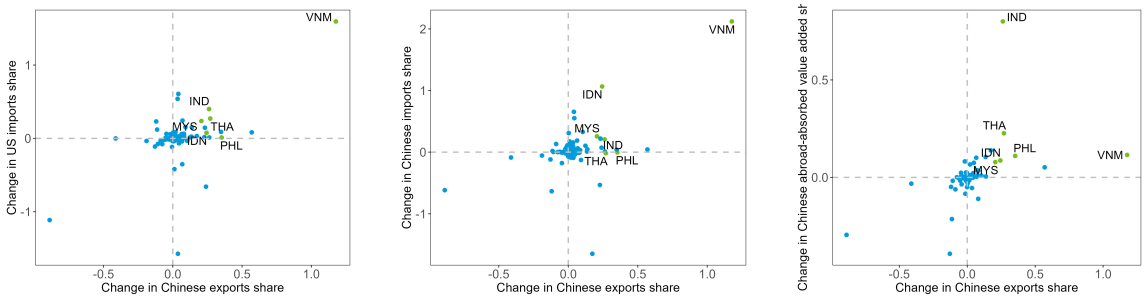
As documented in many studies, India, Malaysia, Thailand, and Vietnam have seen both an increase in their shares in Chinese exports and an increase in their shares in US imports (panel (a)), which has been argued as evidence of their roles as connector countries between China and the US, i.e., facilitating the rerouting of Chinese exports to

[5]For example, the 'Made in China 2025' initiative, launched in 2015, aims to raise the domestic content of core materials.

[6]We follow the definition in Gopinath et al. (2024) on blocs. All six Asian countries of interest in this paper are therefore considered as non-aligned countries.

the US.

Figure 2: Change in the Share of Non-Aligned Countries in US Imports, Chinese Imports, and Chinese Abroad-Absorbed Value Added versus Change in the Share of Chinese Exports



(a) US Imports versus Chinese Exports

(b) Chinese Imports versus Chinese Exports

(c) Chinese Value Added Absorbed Abroad versus Chinese Exports

Notes: Panel (a)-(c) plot changes in three measures of market shares of non-aligned countries, including the share in US imports (panel (a)), the share in Chinese imports (panel (b)), and the share in Chinese abroad-absorbed value added (panel (c)), between 2013-17 and 2018-22, against change in the share in Chinese exports. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: BACI Database (Gaulier and Zignago, 2010), The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

However, there could be other forces at play which may break the direct link between the two. First, as shown in Panel (b), India, Indonesia, Malaysia, and Vietnam have also seen an increase in their shares in Chinese imports at the same time as they see an increase in their shares in Chinese exports. This would suggest evidence of Chinese firms relocating some of their production to these countries, for example, due to their lower labor costs,[7] and importing back the processed products. As such, increasing imports from China that reflect Chinese firms relocating production abroad is not necessarily associated with trade rerouting due to the US-China trade tensions. Second, as shown in Panel (c), all six Asian countries have seen an increase in the size of their domestic markets—measured by their shares in Chinese abroad-absorbed value added—at the same time as they have seen an increase in their shares in Chinese exports. This would suggest that the increase in their shares in Chinese exports may well reflect these countries' growing domestic markets and thus increasing demand and absorption of exports from China. As such, increasing imports from China that reflect these countries' growing domestic markets are again not

[7]For example, Le and Tran-Nam (2018) find that the high level of FDI inflows into Vietnam could be explained mainly by its relatively skilled workforce, combined with low wages as compared to neighboring countries in the region. Luo et al. (2022) study the determinants of Japanese divestment in China and find that higher minimum wages raise the probability of divestment.

necessarily associated with trade rerouting due to the US-China trade tensions. Zooming in onto strategic sectors yields similar results (see Appendix B).

In sum, despite the increasing share of Chinese value added that has been exported to the US through other countries, there is no evidence based on trade flows that Chinese exports are rerouted through other countries to the US. Moreover, the connector role of some economies in the interest of this paper—argued based on the association between their increasing shares in Chinese exports and the US imports since 2018—could reflect other forces at play, beyond trade rerouting from China to the US through these economies as a result of the US-China trade tensions. These forces include structural factors such as Chinese firms relocating production abroad to these countries and these economies' growing domestic demand for Chinese exports.

3 Data and Methodology

In this section, we first describe the empirical methodology and then discuss the data and sample.

Methodology. We deploy the synthetic control approach proposed in Abadie et al. (2010). Simply put, for the observation of interest, we construct a synthetic counterfactual which is a weighted average of the other observations in the sample, based on the matching of pretreatment characteristics, so that this synthetic counterfactual provides a more appropriate comparison than any other single observation. The synthetic control approach works well with aggregate macro data when no single unit alone may provide a good comparison for the unit affected by the intervention, for example, if no single unit satisfies the "parallel pretreatment trend" assumptions. In our case, we employ it to examine the effect of the US-China trade tensions since 2018, and set the treatment period as years from 2018 onwards. We focus on India, Indonesia, Malaysia, Thailand, Philippines, and Vietnam, a group of Asian countries that are argued to have benefited from the US-China trade tensions and geoeconomic fragmentation more generally.

To disentangle the trade reallocation effect from the trade rerouting effect, we examine two value-added measures that are constructed from a multi-region input-output database (see below): (i) the share of domestic value added in a country-sector's exports to the US and (ii) the share of Chinese value added in a country-sector's exports to the US. Two hypotheses are tested:

Hypothesis I: *There has been trade reallocation resulting from the US-China trade*

tensions, leading the country to produce more goods domestically to export to the US as the US shifts away from China, i.e.,

$$\frac{Domestic\ Value\ Added_{t,outcome}}{Total\ exports\ to\ US_{t,outcome}} > \frac{Domestic\ Value\ Added_{t,counterfactual}}{Total\ exports\ to\ US_{t,counterfactual}} \tag{1}$$

To test this hypothesis, we examine the dynamics of the share of domestic value added in a country's exports to the US. A higher share of domestic value added in a country's strategic sector exports to the US relative to the synthetic control counterfactual, with statistical significance, would suggest that the country has seen trade reallocation resulting from the US-China trade tensions and has actually benefited from it, as it has led to more domestic production and more domestic content embedded in its exports.

Hypothesis II: *There has been* ***significant*** *trade rerouting resulting from the US-China trade tensions, i,e., importing Chinese goods and re-exporting them to the US with minimal to no domestic value added.*

To test this hypothesis, let

$$Y_t^{counterfactual} \equiv \frac{Chinese\ Value\ Added_{t,counterfactual}}{Total\ exports\ to\ US_{t,counterfactual}} \tag{2}$$

be the share of Chinese value added in a country's exports to the US in the counterfactual control group *absent any trade rerouting* in the treatment year t. Compare this counterfactual ratio to the outcome ratio, that is the *actual* observed share of Chinese value added in the country's exports to the US, defined as

$$Y_t^{outcome} \equiv \frac{Chinese\ Value\ Added_{t,counterfactual} + \Delta_t}{Total\ exports\ to\ US_{t,counterfactual} + \Delta_t + \epsilon_t} \tag{3}$$

where Δ_t represents the *additional* value added of Chinese products *resulting from the US-China trade tensions* that is exported to the country and embedded in the country's exports to the US, and ϵ_t represents the *additional* domestic value that is added to Chinese imports that go into exports to the US (e.g. think of Δ_t and ϵ_t as jointly entering a firm's production function).

If ϵ_t is zero or sufficiently small compared to Δ_t, then for any Δ_t

$$Y_t^{outcome} > Y_t^{counterfactual}. \tag{4}$$

In the case of trade rerouting with minimal to no domestic value added, we have $\epsilon_t \to 0$, i.e. the additional domestic value added is zero or sufficiently small compared to the Chinese value added Δ_t. As a result, the observed share of Chinese value added is larger than the counterfactual. Equivalently, a rejection of the inequality (4) would suggest that ϵ_t is not sufficiently small compared to Δ_t, indicating the trade rerouting has not happened *on a significant scale*.

Operationally, in the synthetic control approach, compared to the synthetic counterfactual, a lower share of Chinese value added, with statistical significance, would provide evidence to *reject* the inequality (4) and thus the hypothesis, suggesting that trade rerouting has not happened *on a significant scale*.

Importantly however, a higher share of Chinese value added, even if statistically significant, does not necessarily suggest evidence of trade rerouting, as it could reflect a country's increasing supply chain integration with China, in particular through backward linkages, which would lead to a higher share of Chinese value added in the country's exports to the US.[8]

We follow the IMF *2023 April World Economic Outlook* to map strategic sectors with the 26 sectors in the multi-region input-output database, which include (i) electrical and machinery, and (ii) petroleum, chemical and non-metallic mineral products.[9] Matching characteristics in the synthetic control approach include the value-added measures from 2010 to 2017 to capture the pretreatment trend, nominal GDP in US dollar based on purchasing power parity in 2010 and 2015 to capture the size of the economy, and exports of goods as a share of GDP in 2010 and 2015 to capture the level of trade openness.[10]

To evaluate the statistical significance of our estimates, we use placebo tests, following Abadie and Gardeazabal (2003), Bertrand et al. (2004), and Abadie et al. (2010). For each country of interest, we run placebo studies by applying the synthetic control method to all other countries (excluding China and the US, and other countries in the interest of this paper). If the placebo studies create gaps of magnitude similar to the one estimated for the country of interest, this suggests that there is no significant evidence to support trade reallocation effect or reject trade rerouting effect of the US-China trade tensions. If, on the other hand, the placebo studies show that the gaps estimated for the country is unusually large (when it is positive) or small (when it is negative) relative to the gaps for

[8] A special case of trade rerouting involves illegally changing the origin or the value-added composition of a product. Input-output tables would not capture such artificial practices. We therefore caveat that we assume accurate measurement of the value added of exports through input-output tables.

[9] Given the aggregate sector definitions in the multi-region input-output database, precise mapping with the strategic sectors identified in the International Monetary Fund (2023) which uses SEC 3 definitions and subsectors of ISIC code 20 is not possible.

[10] Both the nominal GDP in US dollar based on purchasing power parity and exports of goods as a share of GDP are from the *IMF World Economic Outlook Database*.

all other countries, e.g., in the top or bottom decile of the distribution, this suggest that there is significant evidence to support trade reallocation effect or reject trade rerouting effect of the US-China trade tensions. As such, a $10^{th}-90^{th}$ percentile range is constructed based on the distribution of the estimated effects of all countries excluding those with a mean squared prediction error (MSPE) during the pretreatment period of more than five times the MSPE of the country at hand, i.e., the placebo test distribution. An estimated effect is therefore statistically significant at the 90 percent confidence level if it is outside the constructed $10^{th} - 90^{th}$ percentile range.

Data. We use the Eora26 Global Supply Chain database which consists of a multi-region input-output table (MRIO) model, covering 189 countries and 26 sectors and spanning the period from 1990 to 2022 (see Appendix A for details on the sample).[11] Leveraging this input-output table database, we construct value-added measures that enables us to examine the value-added component of country-sector pairs' exports as mentioned above.

We also use the Orbis Cross-Border Investment database provided by Bureau van Dijk to examine the dynamics of greenfield FDI projects, such as a company setting up (or expanding) a physical presence in a foreign market. This database provides detailed project-level information, such as sourcing country, destination country, project industry, date of announcement, current status, committed capital expenditure, etc. Due to the lack of information on the disbursement of committed capital, we examine the dynamics of and the effect on the cumulative number of projects which were announced between 2003 and 2022 in strategic sectors and non-strategic manufacturing sectors. We focus only on projects of which the latest status is either completed or announced.

4 Empirical Results

In this section, we first present the empirical results that test the hypotheses of trade reallocation and trade rerouting effects, and then zoom in on specific country cases by augmenting the trade analysis with FDI data.

[11] Other input-output databases, e.g. ADB MRIO, OECD TiVA, are also commonly used. We deploy the Eora database as it covers a particularly large set of countries which allows for a larger pool to draw from in constructing the synthetic counterfactual.

4.1 Has there been trade reallocation?

Recall that, to test the hypothesis whether there has been trade reallocation resulting from the US-China trade tensions, we examine the share of domestic value added in a country's exports to the US. Compared to the synthetic counterfactual, a higher share of domestic value added in a country's exports to the US, with statistical significance, would suggest that the country has seen trade reallocation and has actually benefited from it, as it has boosted domestic production of exports.

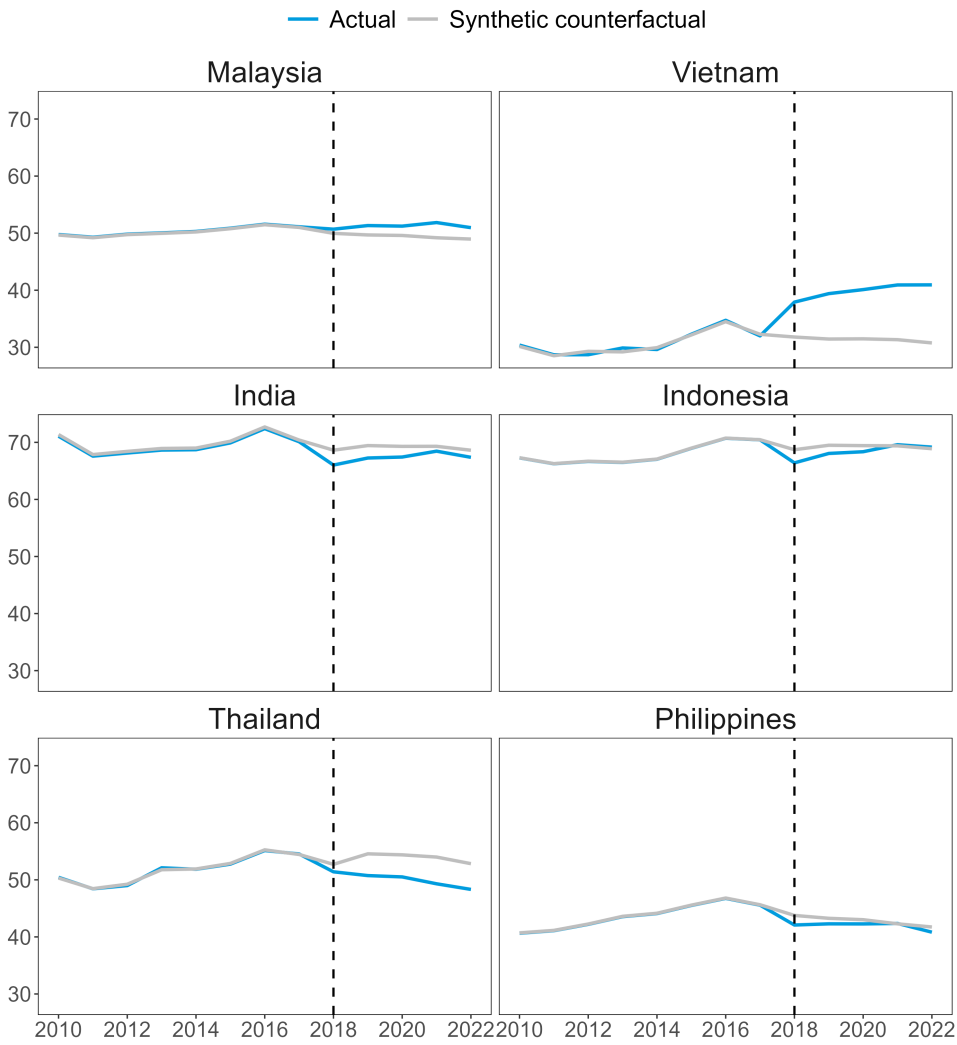
For the electrical and machinery sector as shown in Figure 3, Malaysia and Vietnam have seen a higher share of domestic value added in their exports to the US after the onset of the US-China trade tensions, as compared to their synthetic counterfactuals. Specifically, Malaysia would have seen its share of domestic value added declining since 2018 if there were no US-China trade tensions, but instead the share has been relatively stable since then. Vietnam has seen an increasing share of domestic value added since 2018, rising above 40 percent, while the counterfactual shows a gradual decline. On the other hand, all other countries of interest, namely, India, Indonesia, Philippines, and Thailand, have exhibited a lower share of domestic value added than their synthetic counterfactuals.

Figure 4 shows the estimated effect on the share of domestic value added in the countries' electrical and machinery exports to the US, calculated as the gap between the actual values and the synthetic counterfactuals, and the $10^{th}-90^{th}$ percentile range of the placebo test distribution. Results show that, while both Malaysia and Vietnam see positive effects, only Vietnam displays statistically significant effects since 2018. Specifically, Vietnam has seen its share of domestic value added increase by 6 percentage points in 2018, accumulating to more than 10 percentage points in 2022. For all other countries that have negative effects, none of those are statistically significant at the 90 percent confidence level, except for Thailand.

For petroleum, chemical and non-metallic mineral products, similar results hold: Malaysia and Vietnam have seen positive effects on the domestic content of their exports to the US, with a higher share of domestic value added in their exports to the US compared to their synthetic counterfactuals, but the positive effects are only statistically significant in Vietnam. Vietnam has seen its share of domestic value added increase by 7 percentage points in 2018, which has accumulated to almost 12 percentage points in 2022. On the other hand, all other countries in the sample display negative but not statistically significant effects on the domestic content of their exports to the US (see more details in Appendix C).

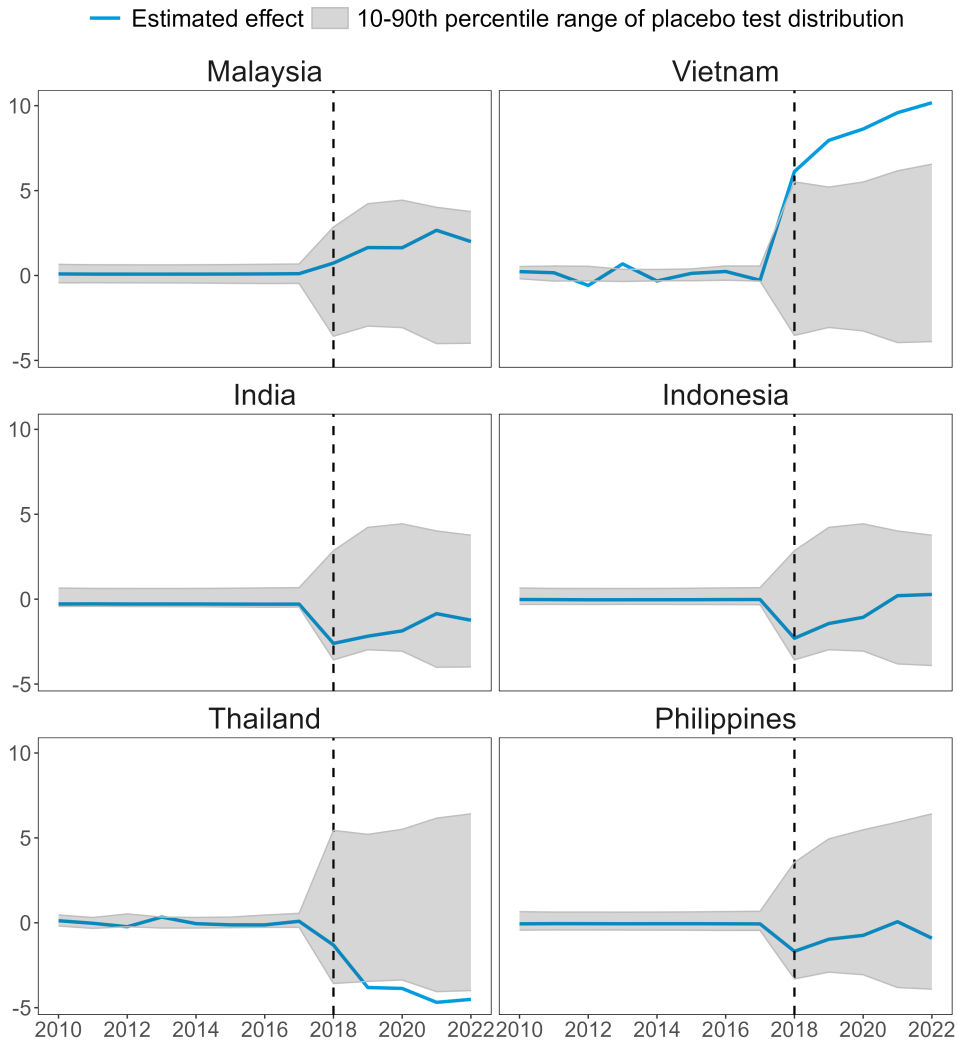
These results show that, for strategic sectors that include electrical and machinery, and

Figure 3: Share of Domestic Value Added in the Country's Exports to the US, Electrical and Machinery
(In Percent)



Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of domestic value added in the country's exports to the US, for electrical and machinery sector. The synthetic counterfactuals are constructed based on a weighted average of the share of domestic value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 4: Estimated Effect on the Share of Domestic Value Added in the Country's Exports to the US,
Electrical and Machinery
(In Percentage Points)



Notes: For each country, the figure plots the estimated effect on the share of domestic value added in the country's exports to the US, for electrical and machinery sector (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

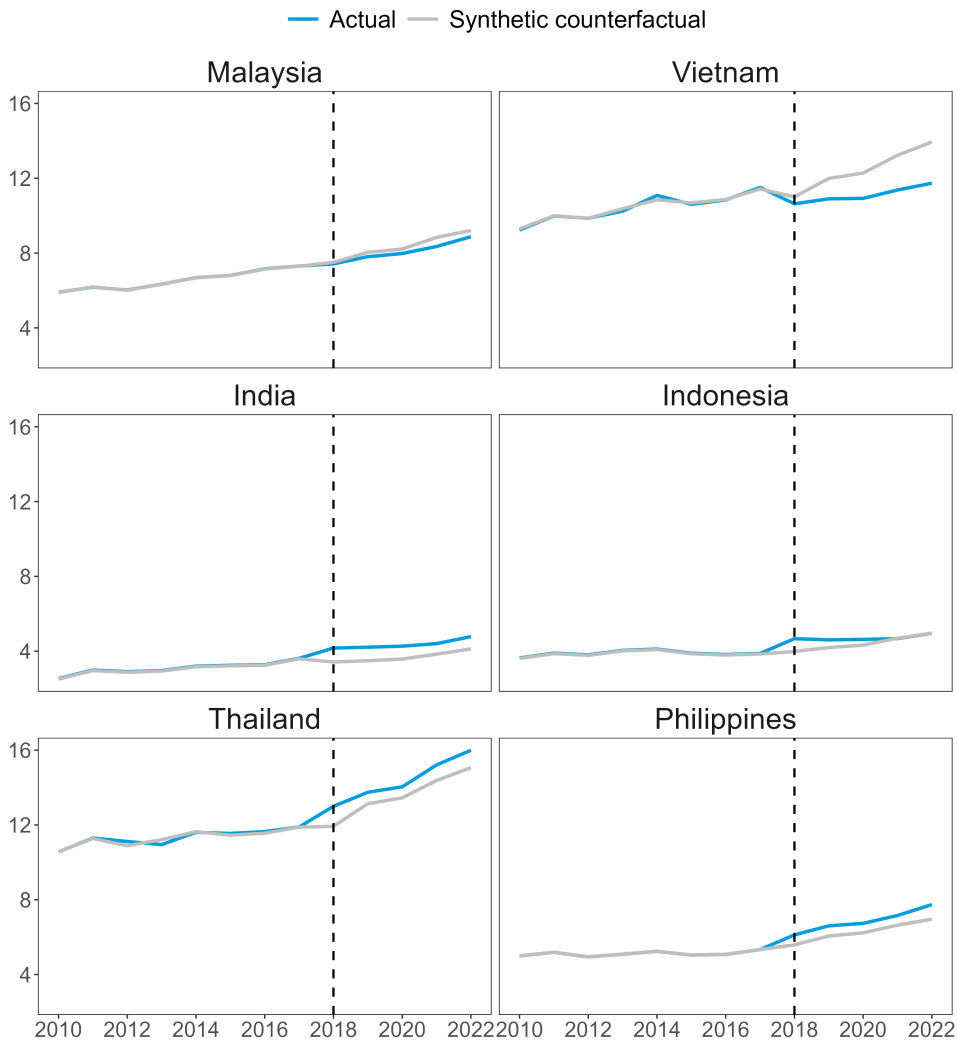
petroleum, chemical and non-metallic mineral products, among the countries in the sample, Vietnam has seen a positive and statistically significant effect on the domestic content of its exports to the US, while the other countries do not exhibit any statistically significant effects. Combining these results, it suggests that Vietnam has benefited from the trade reallocation effect, as the US shifts away its sourcing from China, which has boosted its domestic production of exports for strategic sectors, reflected in increasing domestic content of its exports. On the other hand, other countries in the sample haven not seen any statistically significant effects on the domestic content of their exports to the US.

4.2 Has there been trade rerouting?

Recall that, to test the hypothesis whether there has been significant trade rerouting resulting from the US-China trade tensions, we examine the share of Chinese value added in a country's exports to the US for strategic sectors. Compared to the synthetic counterfactual, a lower share of Chinese value added, with statistical significance, would provide evidence to *reject* the hypothesis, suggesting that trade rerouting has not happened on a significant scale. On the other hand, even a higher share of Chinese value added with statistical significance does not necessarily suggest evidence of trade rerouting as it could reflect a country's increasing supply chain integration with China, particularly through backward linkages, which would lead to a higher share of Chinese value added in the country's exports to the US.

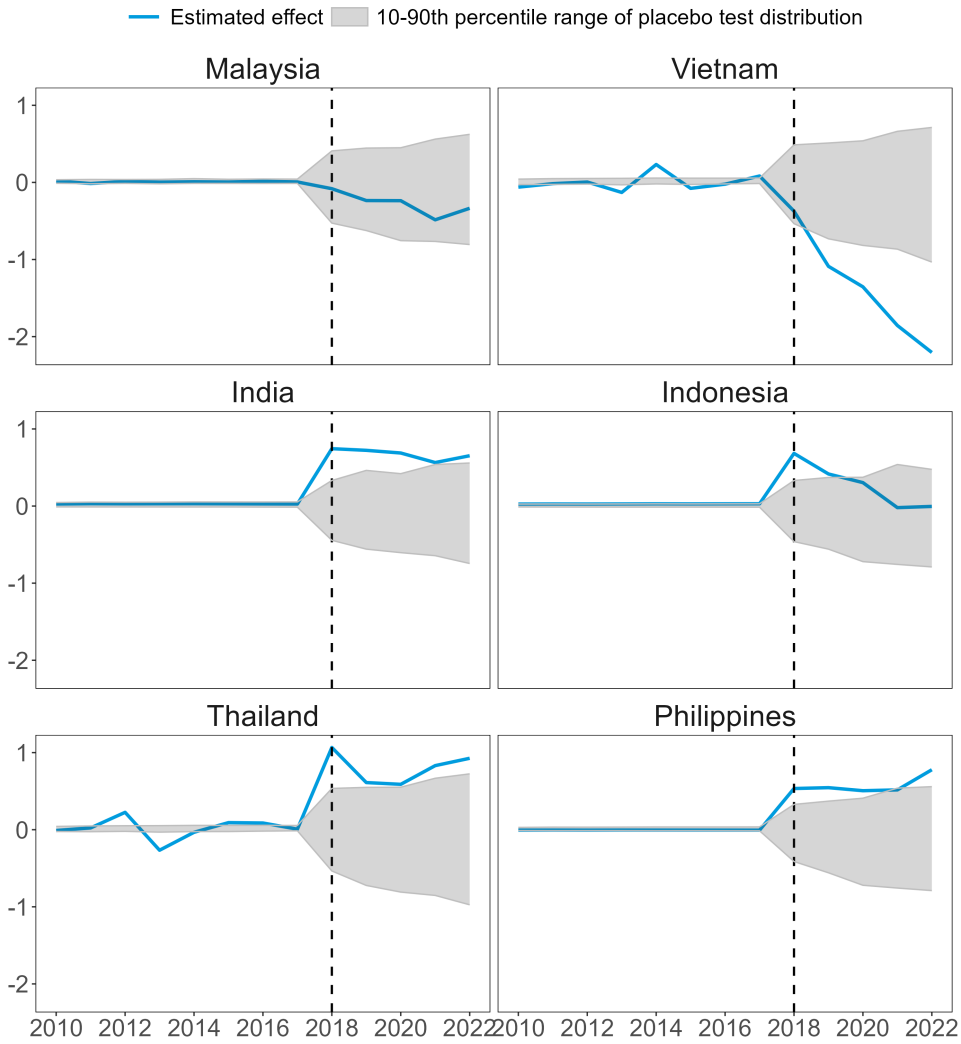
For electrical and machinery sector as shown in Figure 5, Malaysia and Vietnam have seen lower share of Chinese value added in their exports to the US since 2018, as compared to their synthetic counterfactuals. On the other hand, India, Indonesia, Thailand, and Philippines have seen higher share of Chinese value added in their exports to the US. Looking at the estimated effects and their statistical significance as shown in Figure 6, Malaysia and Vietnam have seen negative effects on the share of Chinese value added in their exports to the US, with those of Vietnam statistically significant at 90 percent confidence level from 2019 onwards. In other countries who have seen positive effects, the effects are statistically significant in India, Thailand, and Philippines during 2018-22, and in Indonesia during 2018-19 only. Similar results are found for petroleum, chemical and non-metallic mineral products that Vietnam has seen a negative and statistically significance effect on the share of Chinese value added in its exports to the US, while other countries except India have seen negative but not statistically significant effects (see more details in Appendix D).

Figure 5: Share of Chinese Value Added in the Country's Exports to the US, Electrical and Machinery
(In Percent)



Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of Chinese value added in the country's exports to the US, for electrical and machinery sector. The synthetic counterfactuals are constructed based on a weighted average of the share of Chinese value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 6: Estimated Effect on the Share of Chinese Value Added in the Country's Exports to the US,
Electrical and Machinery
(In Percentage Points)



Notes: For each country, the figure plots the estimated effect on the share of Chinese value added in the country's exports to the US, for electrical and machinery sector (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

These results provide evidence to *reject* the null hypothesis that there has been significant trade rerouting through Vietnam, as it has seen statistically significant negative effects on the Chinese value added in its strategic sector exports to the US. In other words, trade rerouting has not happened as a result of the US-China trade tensions through Vietnam on a significant scale. It is also important to note that, the inability to reject the hypothesis for other countries does not suggest evidence of trade rerouting, as noted above that the positive effects on the share of Chinese value added in these countries' exports to the US could reflect their increasing supply chain integration with China. For example, these effects could reflect that major manufacturers relocated part of their production from China to these countries, in particular assembly and packaging that would source inputs from China but enable them to export to the US, such as that Foxconn began assembling top-end Apple iPhones in India in 2019 (Reuters, 2018).

Taken together, results from the two value added-based measures suggest that, among countries of interest in the paper, Vietnam has seen trade reallocation effect as US shifts away from China and reconfigures its supply chains towards Vietnam, instead of trade rerouting from China to circumvent tariffs. As such, Vietnam has benefited from the trade reallocation effect which has boosted its domestic production and increased the domestic content embedded in its exports to the US. On the other hand, the effects—either trade reallocation or trade rerouting—in other countries is elusive.

4.3 The Case of Vietnam

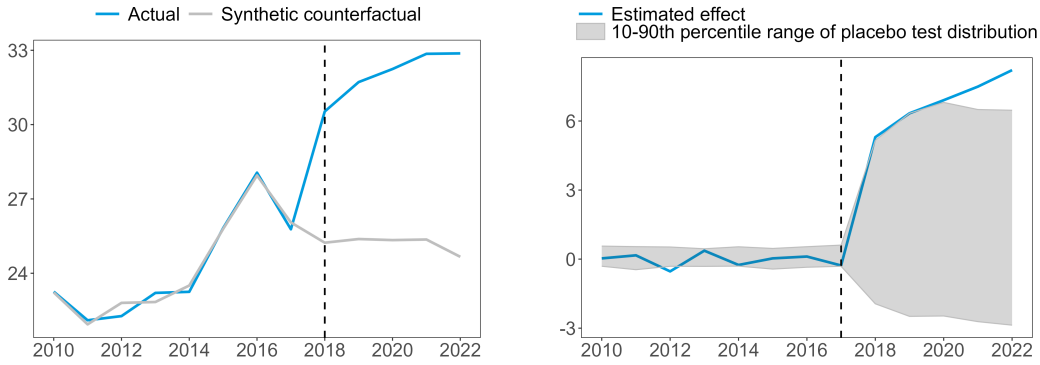
The results above suggest that Vietnam appears to have benefited from trade reallocation as a result of the US-China trade tensions, which has boosted its domestic production and thus increased the domestic content of its exports to the US in strategic sectors. Zooming in on Vietnam, we further examine (i) to what extent Vietnam's exports to the rest of the world (beyond the US) have been affected and (ii) whether part of the reason behind the scaling up of domestic production is related to Chinese firms' reallocation to Vietnam, by examining the FDI dynamics.

4.3.1 Effect on Domestic Content Exported to the World

A natural question building on the positive effect on domestic value added found in Vietnam's exports to the US is whether Vietnam has boosted domestic production for exporting not only to the US, but also to the rest of the world. If so, this suggests that Vietnam has been able to reap more benefits from the US-China trade tensions

than simply gaining from trade reallocation between China and US. We answer this by applying the analysis on the share of domestic value added to that in Vietnam's *total* exports to the world.

Figure 7: Share of Domestic Value Added in Vietnam's Exports to the World, Electrical and Machinery
(In Percent)



(a) Trend **(b)** Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) share of domestic value added in Vietnam's exports to the world, and Panel (b) plots the estimated effect (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study, for electrical and machinery sector. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 7 shows the actual and synthetic counterfactual trends (panel (a)) and the estimated effect (panel (b)) for the electrical and machinery sector. Vietnam has seen the share of domestic value added in its electrical and machinery exports to the world increase since the US-China trade tensions, by 5 percentage points in 2018 and 8 percentage points by the end of 2022. While these effects are slightly smaller than those on Vietnam's electrical and machinery exports to the US (6 and 10 percentage points in 2018 and 2022, respectively), they are still statistically significant at 90 percent level, although the estimates are very close to the 90^{th}-percentile threshold during 2018–20. These positive and statistically significant effects suggest that Vietnam has been able to export more domestic content not only to the US, as a result of the US-China trade tensions, but also to the rest of the world—otherwise the gross effects would be much smaller given that its exports to the rest of the world are about 70 percent of Vietnam's total exports.

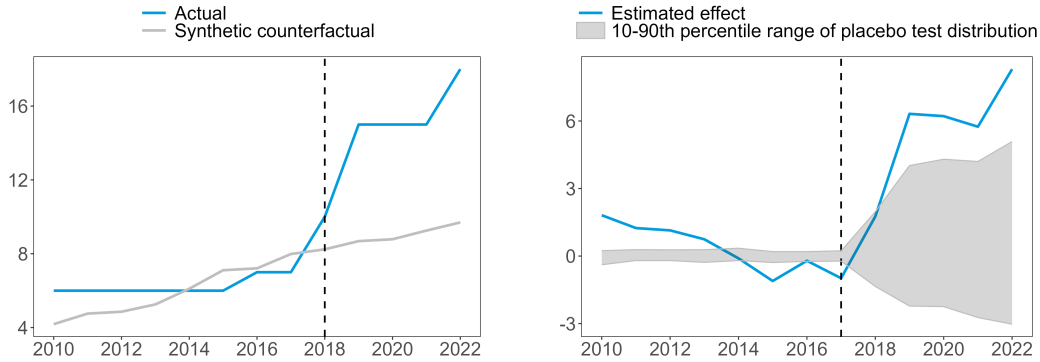
4.3.2 The FDI Channel

To examine whether part of the reason behind the scaling up of domestic production in Vietnam is related to Chinese firms' reallocation to Vietnam, we replicate the synthetic control analysis for the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam since 2003, the year when data in the Orbis Cross-Border Investment Database becomes available. While the database also has information on the value of committed capital, there is no information on the disbursement status or schedule. As a result, we choose to use the number of projects.

Figure 8 shows the actual and synthetic counterfactual trends (panel (a)) and the estimated effect (panel (b)) for the electrical and machinery sector. Results show that Vietnam has seen a positive and statistically significant effect on FDI inflows from China in the electrical and machinery sector since 2019: it has six more greenfield FDI projects that commit Chinese capital to Vietnam than its synthetic counterfactual cumulatively by 2019, and eight more by 2022. We note that the pre-2018 trend is not perfectly matched, likely due to the volatile nature of the number of greenfield FDI projects—for example, during 2010 and 2017, there are only projects in 2016 in Vietnam—but the average match during 2010 and 2017 is relatively good with mean squared prediction error around 1, which underpins the validity of the estimated effect to some extent.

Combining the results on the share of domestic value added and the number of greenfield FDI projects for Vietnam, it suggests that part of the reasons behind Vietnam's increasing domestic production and thus increasing domestic content in its exports to the US and the rest of the world could be that Chinese firms relocate their production to Vietnam through greenfield FDI for exports. These FDI projects do not only serve the mere purpose of producing products in Vietnam for exporting to the US, but also boost Vietnam's domestic production capacity more broadly and therefore enable it to export more domestic content to the entire world. In addition, tariffs on Chinese exports may also induce non-Chinese firms in China to relocate their production to countries with competitive production costs like Vietnam. Due to the lack of information on the ultimate ownership of these FDI projects, we caution that the effects on FDI could include those from Chinese firms and non-Chinese firms in China. Moreover, the supply chain reconfiguration through FDI may not be exclusive to China as FDI inflows to Vietnam from other countries, including the US, Japan, and Korea, also significantly increased at the same time. While the analysis covers only greenfield FDI investment, FDI inflows into existing businesses for expanding production capacity and mergers and acquisitions could further underpin the attractiveness of Vietnam, along with its high level of education and quality of labor, to foreign investors.

Figure 8: Cumulative Number of Greenfield FDI Projects that Commit Chinese Capital to Vietnam
Electrical and Machinery



(a) Trend (Actual versus Synthetic Counterfactual)

(b) Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) of the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for electrical and machinery sector since 2003. The synthetic counterfactuals are constructed based on a weighted average of the cumulative number of greenfield FDI projects that commit Chinese capital to other countries for the same sector since 2023, excluding Vietnam. Dashed vertical indicates the year 2018 when the US-China trade tensions started. Panel (b) plots the estimated effect on the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for electrical and machinery sector since 2003 (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of Vietnam.
Sources: The Orbis Cross-border Investment Database and authors' calculations.

Taken together, these channels are different from trade rerouting in which Vietnam only serves as one-stop place to allow Chinese exports to be re-exported to the US with minimal to no domestic value added.[12] Instead, trade reallocation through FDI helps boost Vietnam's domestic production, enabling it to export more domestic content to the world, and could prove to be more beneficial if there are positive spillovers from FDI firms to domestic firms, as evidence in other countries suggests (Ahn et al., 2024).

The question remains what factors explain the distinct impact of the US-China trade tensions on Vietnam relative to other Asian emerging markets. Several possible reasons to reallocate a significant volume of trade and FDI, and to reconfigure supply chains towards one connector country relative to another could explain the evidence presented in this paper, including these countries' growing domestic markets and their favorable labor costs. While identifying the precise country characteristics is beyond the scope of this paper, it is worth noting that greater openness to global trade and investment,

[12]Few cases of Chinese FDI abroad resulted in US rulings on anti-dumping and countervailing duties, alleging transshipment via third countries with minimal to no domestic value added to circumvent tariffs (e.g. in the solar industry). The evidence of such practices however applied only to isolated cases rather than being evidence of broad-based trade rerouting, and resulting remedial actions were firm-specific rather than affecting all exporters of the affected product.

along with more efficient financial markets, can foster the role as a connector. Vietnam in particular stands out as a candidate connector country partly due to its successful structural transformation boosted by early FDI reforms in the 1980s, its accession to the World Trade Organization (WTO) in 2007, further structural reforms (e.g. on labor markets and state-owned enterprises), FDI incentives in the 2010s, several free trade agreements, supported by a young population, relatively high educational outcomes and female labor force participation, political stability, and geographic proximity to China, which also substantially reduces transportation costs. These factors turned Vietnam into a favorable destination for FDI in Southeast Asia that long preceded the US-China trade tensions and continued afterwards.

4.4 Discussions

One threat to the identification could arguably stem from the impact of potential confounding factors that affect not only strategic sectors but also non-strategic sectors, for example, lockdowns during the Covid-19 pandemic which disrupt supply chains and countries' production capacity, and economy-wide structural reforms which increase productivity. To address this, we replicate the analysis for non-strategic manufacturing sector, that is, calculating the average share of domestic value added in a country's exports to the US across all non-strategic manufacturing sectors and examining whether there have been any effects on the share of domestic value added in a country's non-strategic manufacturing exports to the US. Results in Appendix C show that the positive effects on Vietnam's non-manufacturing sectors are more muted and importantly, not statistically significant until 2022, suggesting that Vietnam has not seen statistically significant effects on the domestic content of its non-strategic manufacturing exports to the US, in contrast with the positive and statistically significant effects on strategic sectors throughout the period of 2018-22. Such difference between strategic and non-strategic sectors helps address potential confounding factors that affect all manufacturing sectors, and thus suggests that the positive and statistically significant effects on strategic sectors can be attributed to the US-China trade tensions. Moreover, two features of our research design mitigate these concerns. First, the Covid-19 pandemic spans only the later half of our post-treatment period, with the bulk of the significant evidence already captured in the unaffected years 2018-2019. Second, to the extent that the pandemic represented a global shock and lockdowns occurred simultaneously in many countries, pandemic-related supply chain reconfiguration would affect all countries in the synthetic control group in a similar manner without confounding effects on the relative distribution of value added in exports. Similar to the trade reallocation effect, the positive and statistically significant effects on FDI are only observed in strategic sectors but not in the non-strategic man-

ufacturing sectors (see Appendix G for results on petroleum, chemical and non-metallic mineral products sector and non-strategic manufacturing sectors).

A similar argument could be drawn with respect to concerns about the effects from the US-China trade tensions on other countries, challenging the validity of including some countries in the synthetic control group. Arguably, the US-China trade tensions, while rippling through markets globally, did not significantly upend all countries' trade relationships and lead to a reconfiguration of supply chains in every country, as found in many studies (e.g. Gopinath et al., 2024 among others). Notwithstanding, Appendix E presents the top countries—with the largest weights that add up to 70 percent—used in constructing the synthetic counterfactual for each country in the sample. The country lists suggest that other frequently mentioned connector countries, such as Mexico and Poland, do not receive large weights when constructing the synthetic counterfactuals. Moreover, all countries (except the six Asian countries in the sample, and China and the US) are included in constructing the $10^{th} - 90^{th}$ percentile range of the placebo test distribution. This strengthens our key finding that the effect on Vietnam still remains statistically significant, even when including some other countries in the synthetic control group which may have been affected by US tariffs and may also have seen positive effects on the share of domestic value added in their exports to the US.

One may also argue that there may be other structural factors in these countries (e.g. a relative increase in labor costs) driving the change in domestic value added or Chinese value added in gross exports that occurred around the time of the US-China trade tensions. An increase in the domestic input costs in China may increase incentives for rerouting of goods by Chinese firms while such an increase in the connector countries may be reflected as an increasing share of domestic valued added in their exports. This could challenge the interpretation of domestic and Chinese value added as sufficient to test our hypotheses of trade reallocation and rerouting. However, as shown in the results, the share of value added (either domestic or Chinese) is slow-moving. With the pre-treatment matching characteristics including the dynamics of the variable of interest in almost one decade as well as the economy and exports sizes, structural factors such as significant increases in domestic input costs or productivity growth should already be accounted for when constructing the synthetic counterfactuals. In addition, as mentioned before, failure to reject the trade rerouting hypothesis could still reflect Chinese firms' incentive to relocate their production to the connector country to benefit from favorable structural characteristics rather than mere transshipment. Finally, some structural drivers among the countries in our sample and in the counterfactual long preceded the US-China trade tensions as part of a slower-moving structural transformation of countries towards manufacturing and services.

5 Conclusion

This paper provides a nuanced distinction of *trade reallocation* and *trade rerouting* in explaining changing trade patterns since the onset of US-China trade tensions, by zooming in on six Asian connector countries' trade and FDI flows as well as input-output linkages. First, the connector role—that has been argued based on inward linkages with China through imports and outward linkages with the US through exports—does not necessarily establish the bridging role of these countries between the trade blocs, and could well reflect Chinese firms' relocation of production abroad and reconfiguration of supply chains, as well as these economies' growing domestic markets. Second, examining the value-added content of bilateral trade, Vietnam appears to have benefited from trade reallocation as a result of the US-China trade tensions during 2018-2022. Vietnam's domestic production of strategic sector exports to the US has scaled up, which is reflected in an increasing share of domestic value added embedded in its exports to the US for strategic sectors. Conversely, there is no evidence of Vietnam facilitating trade rerouting—or transshipment—of Chinese exports on a significant scale, as it has seen a lower share of Chinese value added in its strategic sector exports to the US. Moreover, the positive effects on domestic value added are also found in Vietnam's strategic sectors' exports to the rest of the world. At the same time, Vietnam has seen an increase in the committed inward FDI from China in its strategic sectors. Taken together, it suggests that the connector role of Vietnam has manifested through trade reallocation as the US shifts away from China and reconfigures its supply chains towards Vietnam while China shifts production to Vietnam by setting up more factories in Vietnam through FDI—likely not only because of tariffs imposed by the US but also to take advantage of lower labor costs—which has led to a scale-up of domestic production of strategic sector products and more domestic content embedded in Vietnam's exports, not only to the US but also to the rest of the world. The evidence of either the trade reallocation or trade rerouting effect in the other five Asian countries is elusive.

The benefits of rising trade and FDI flows to the *domestic* sector, however, remain unclear. Benefits of geoeconomic fragmentation-related inflows may come from boosting trade activity in the FDI sector and from translating into value added to the domestic sector, including through higher employment and wages, technological spillovers, and deepening of domestic firms' global value chain integration. For example, studies on the US-China trade tensions in 2018-2019 find positive labor market effects in districts more exposed to US-China tariffs (Mayr-Dorn et al., 2023; Rotunno et al., 2024). At the same time, Vietnam's "dual economy", or disconnect between activities in the domestic and FDI sectors, weighs on the technological diffusion and productivity spillovers that could boost domestic firm potential.

Fragmentation also risks clouding connector countries' prospects. In relative terms and in the short term, non-aligned countries that maintain open trade relationships to all countries may stand to suffer the least from geoeconomic fragmentation (Aiyar et al., 2023; Bolhuis et al., 2023; Cerdeiro et al., 2021; Góes and Bekkers, 2022). However, such countries, usually those with an export-oriented growth strategy that are well-integrated into the global supply chain, would be more vulnerable to adverse shocks resulting from an intensification of geoeconomic fragmentation, such as disruptive movements in commodity prices, unexpected shifts in protective trade policies, and an overall decline in external demand from a shrinking global economy. In the long run, all countries stand to lose from geoeconomic fragmentation.

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Appendices

Appendix A Country and Sector Sample

The appendix presents the sample of country in Table 1 and the 26 sectors in the Eora Global Supply Chain database in Table 2.

Table 1: Sample of Country by Income Group

Advanced Economies	Emerging Market and Middle-Income Economies	Low Income Developing Countries
Andorra	Aruba	Afghanistan
Australia	Angola	Burundi
Austria	Albania	Benin
Belgium	United Arab Emirates	Burkina Faso
Canada	Argentina	Bangladesh
Switzerland	Armenia	Bhutan
Cyprus	Antigua and Barbuda	Central African Republic
Czech Republic	Azerbaijan	CÃfÂ´te d'Ivoire
Germany	Bulgaria	Cameroon
Denmark	Bahrain	Democratic Republic of the Congo
Spain	Bahamas, The	Congo, Republic of
Estonia	Bosnia and Herzegovina	Djibouti
Finland	Belarus	Eritrea
France	Belize	Ethiopia
United Kingdom	Bolivia	Ghana
Greece	Brazil	Guinea
Hong Kong SAR	Barbados	Gambia, The
Ireland	Brunei Darussalam	Honduras
Iceland	Botswana	Haiti
Israel	Chile	Kenya
Italy	China	Kyrgyz Republic
Japan	Colombia	Cambodia
Korea	Cabo Verde	Lao P.D.R.
Lithuania	Costa Rica	Liberia
Luxembourg	Dominican Republic	Lesotho
Latvia	Algeria	Moldova
Macao SAR	Ecuador	Madagascar
Malta	Egypt	Mali
Netherlands	Fiji	Myanmar
Norway	Gabon	Mozambique
New Zealand	Georgia	Mauritania
Portugal	Guatemala	Malawi
Singapore	Guyana	Niger
San Marino	Croatia	Nigeria
Slovak Republic	Hungary	Nicaragua
Slovenia	Indonesia	Nepal
Sweden	India	Papua New Guinea
Taiwan Province of China	Iran	Rwanda
	Iraq	Senegal
	Jamaica	Sierra Leone
	Jordan	Somalia
	Kazakhstan	São Tomé and Príncipe
	Kuwait	Chad

	Lebanon	Togo
	Libya	Tajikistan
	Sri Lanka	Tanzania
	Morocco	Uganda
	Maldives	Uzbekistan
	Mexico	Vietnam
	North Macedonia	Yemen
	Montenegro, Rep. of	Zambia
	Mongolia	Zimbabwe
	Mauritius	
	Malaysia	
	Namibia	
	Oman	
	Pakistan	
	Panama	
	Peru	
	Philippines	
	Poland	
	Paraguay	
	Qatar	
	Romania	
	Russia	
	Saudi Arabia	
	El Salvador	
	Serbia	
	Suriname	
	Eswatini	
	Seychelles	
	Syria	
	Thailand	
	Turkmenistan	
	Trinidad and Tobago	
	Tunisia	
	Turkey	
	Ukraine	
	Uruguay	
	Venezuela	
	Vanuatu	
	Samoa	
	South Africa	

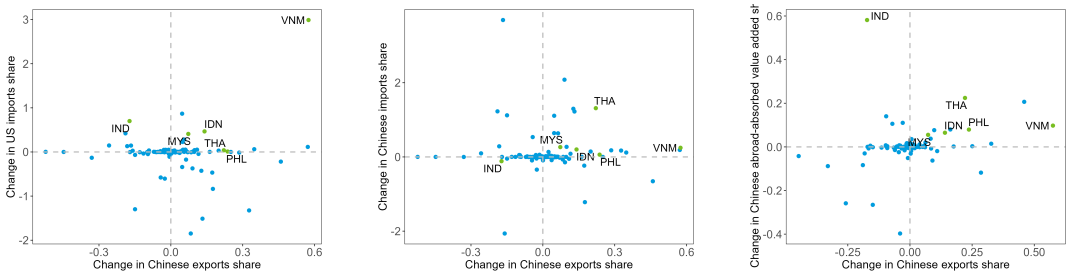
Table 2: Sectors in the Eora Global Supply Chain Database

Sector
Agriculture
Fishing
Mining and Quarrying
Food and Beverages
Textiles and Wearing Apparel
Wood and Paper
Petroleum, Chemical and Non-Metallic Mineral Products
Metal Products
Electrical and Machinery
Transport Equipment
Other Manufacturing
Recycling
Electricity, Gas and Water
Construction
Maintenance and Repair
Wholesale Trade
Retail Trade
Hotels and Restaurants
Transport
Post and Telecommunications
Financial Intermediation and Business Activities
Public Administration
Education, Health and Other Services
Private Households
Others
Re-export and Re-import

Appendix B Additional Stylized Facts

This appendix presents additional stylized facts on the association between change in a country's share in the US imports, in Chinese imports, in Chinese abroad-absorbed value added, and change in a country's share in Chinese exports, for strategic sectors including (i) electrical and machinery (Figure 9) and (ii) petroleum, chemical and non-metallic mineral products (Figure 10).

Figure 9: Change in the Share in US Imports, Chinese Imports, and Chinese Abroad-Absorbed Value Added versus Change in the Share of Chinese Exports Electrical and Machinery



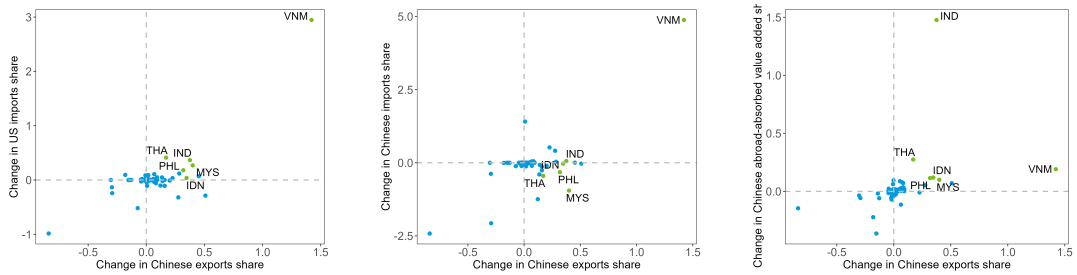
(a) US Imports versus Chinese Exports

(b) Chinese Imports versus Chinese Exports

(c) Chinese Value Added Absorbed Abroad versus Chinese Exports

Notes: Panel (a)-(c) plot changes in three measures of market shares, including the share in US imports (panel (a)), the share in Chinese imports (panel (b)), and the share in Chinese abroad-absorbed value added (panel (c)), between 2013-17 and 2018-22, against change in the share in Chinese exports, for nonaligned countries. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: BACI Database (Gaulier and Zignago, 2010), The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 10: Change in the Share in US Imports, Chinese Imports, and Chinese Abroad-Absorbed Value Added versus Change in the Share of Chinese Exports Petroleum, Chemical and Non-Metallic Mineral Products



(a) US Imports versus Chinese Exports

(b) Chinese Imports versus Chinese Exports

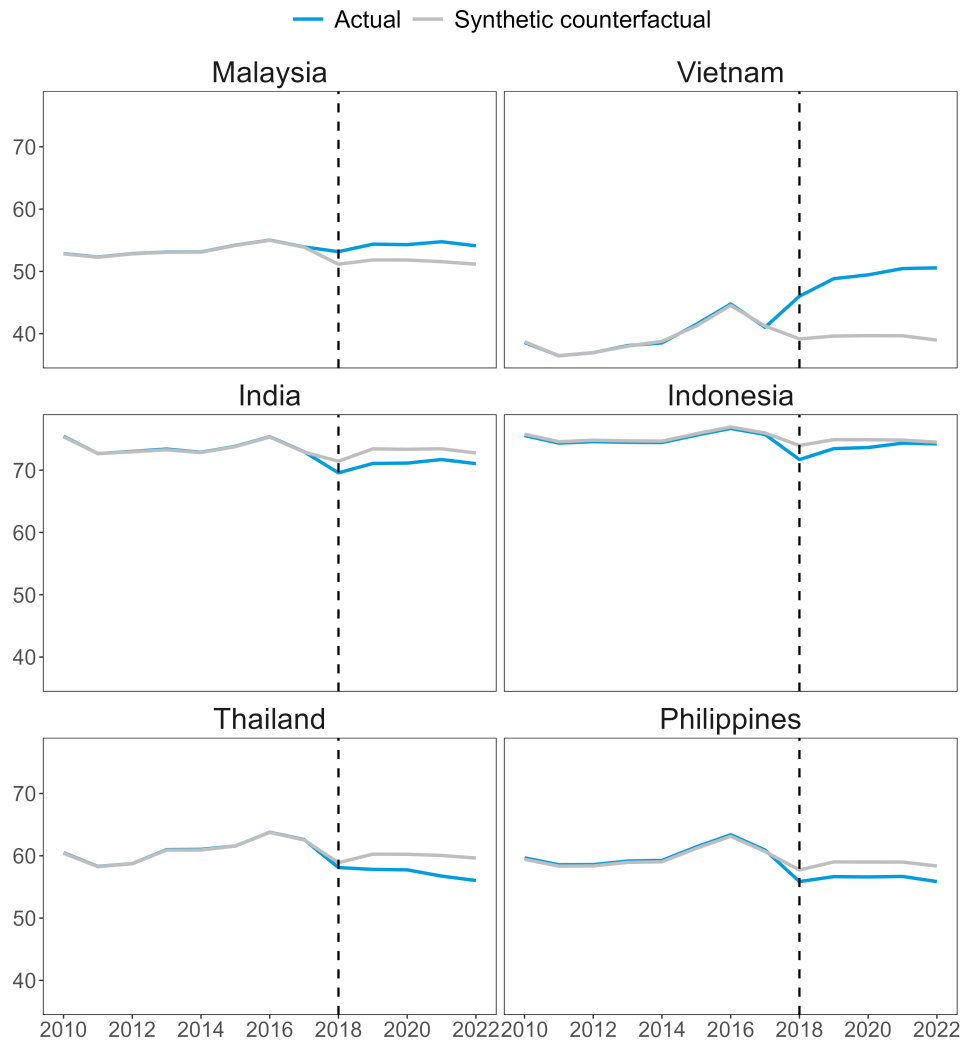
(c) Chinese Abroad-Absorbed Value Added versus Chinese Exports

Notes: Panel (a)-(c) plot changes in three measures of market shares, including the share in US imports (panel (a)), the share in Chinese imports (panel (b)), and the share in Chinese abroad-absorbed value added (panel (c)), between 2013-17 and 2018-22, against change in the share in Chinese exports, for nonaligned countries. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: BACI Database (Gaulier and Zignago, 2010), The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Appendix C Additional Empirical Results on the Share of Domestic Value Added in Exports

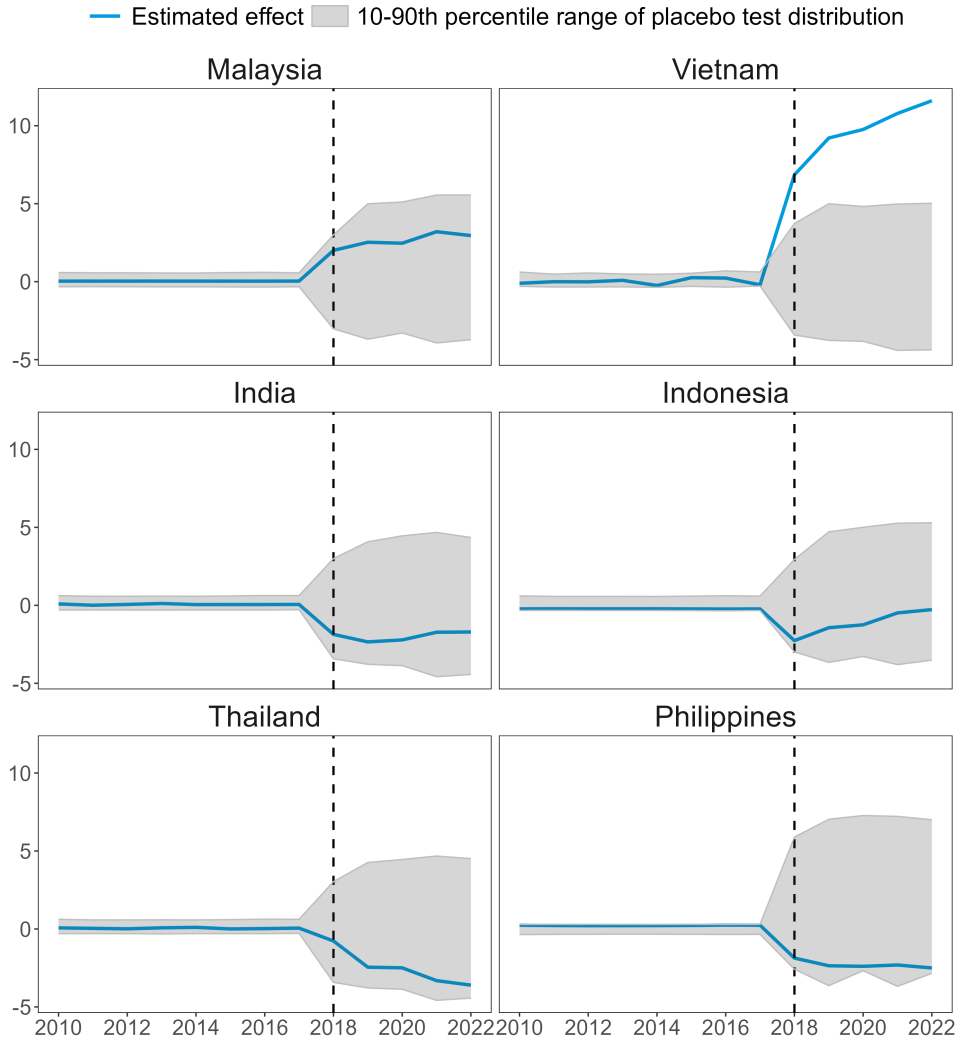
The appendix presents empirical results for petroleum, chemical and non-metallic mineral products, and non-strategic manufacturing products, including (i) the dynamics - both the actual values and the synthetic counterfactuals - of the share of domestic value added in a country's exports to the US, and (ii) the estimated effects.

Figure 11: Share of Domestic Value Added in the Country's Exports to the US, Petroleum, Chemical and Non-Metallic Mineral Products
(In Percent)



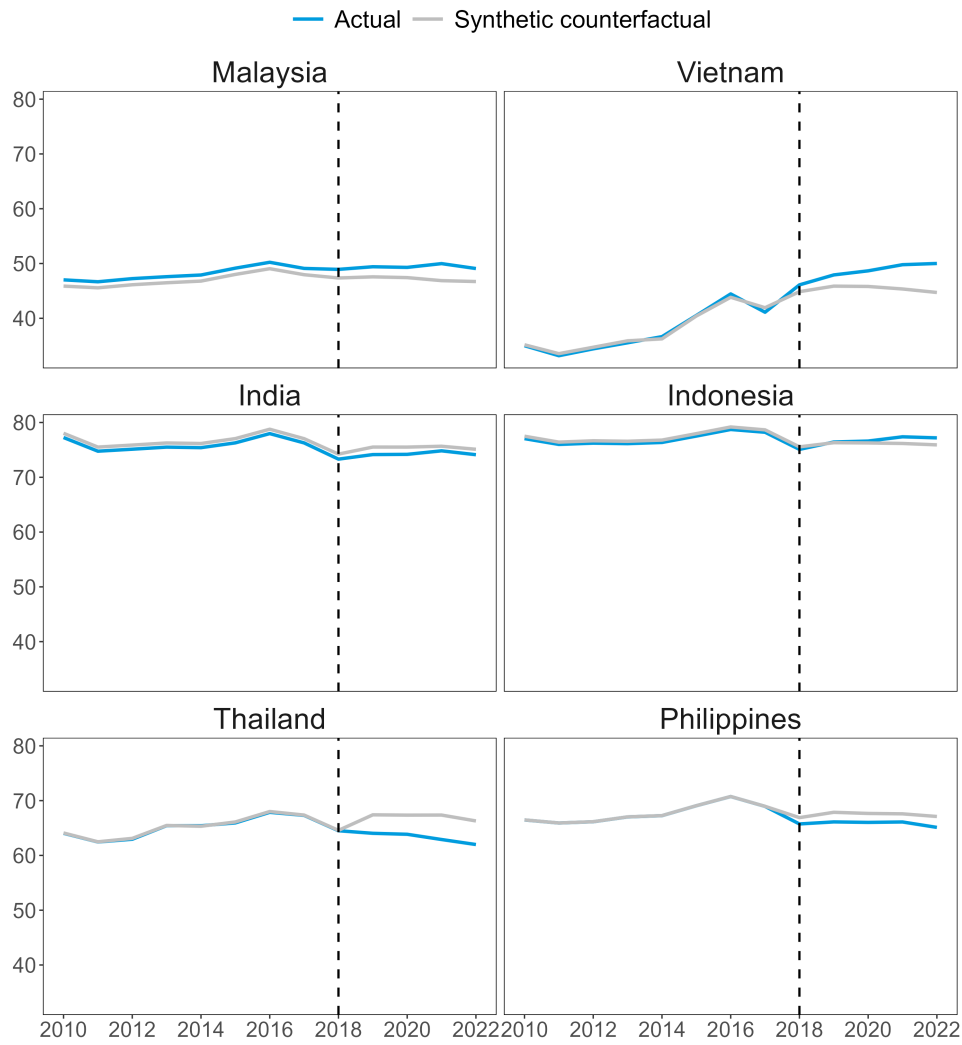
Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of domestic value added in the country's exports to the US, for petroleum, chemical and non-metallic mineral products sector. The synthetic counterfactuals are constructed based on a weighted average of the share of domestic value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 12: Estimated Effect on the Share of Domestic Value Added in the Country's Exports to the US,
Petroleum, Chemical and Non-Metallic Mineral Products
(In Percentage Points)



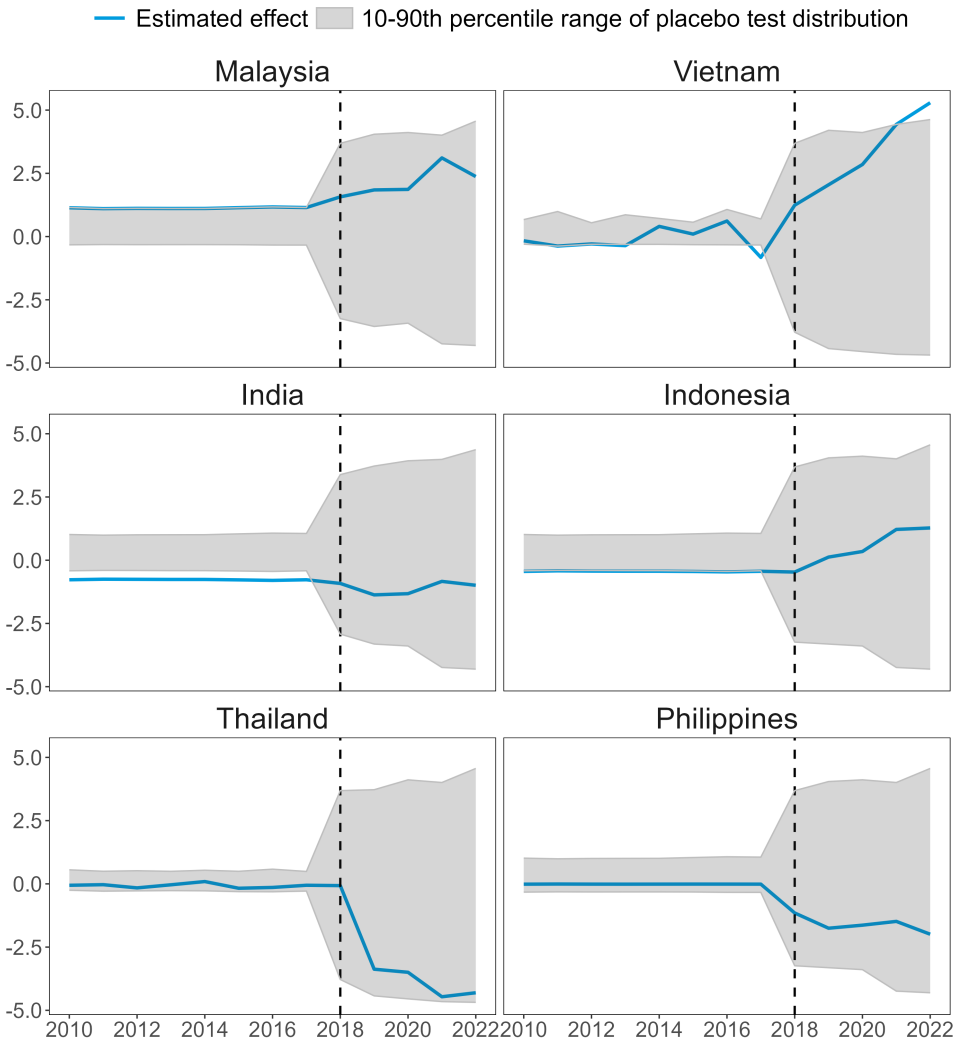
Notes: For each country, the figure plots the estimated effect on the share of domestic value added in the country's exports to the US, for petroleum, chemical and non-metallic mineral products sector (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. ashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 13: Share of Domestic Value Added in the Country's Exports to the US, Non-Strategic Manufacturing Products
(In Percent)



Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of domestic value added in the country's exports to the US, for non-strategic manufacturing sectors. The synthetic counterfactuals are constructed based on a weighted average of the share of domestic value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 14: Estimated Effect on the Share of Domestic Value Added in the Country's Exports to the US,
Non-Strategic Manufacturing Products
(In Percentage Points)

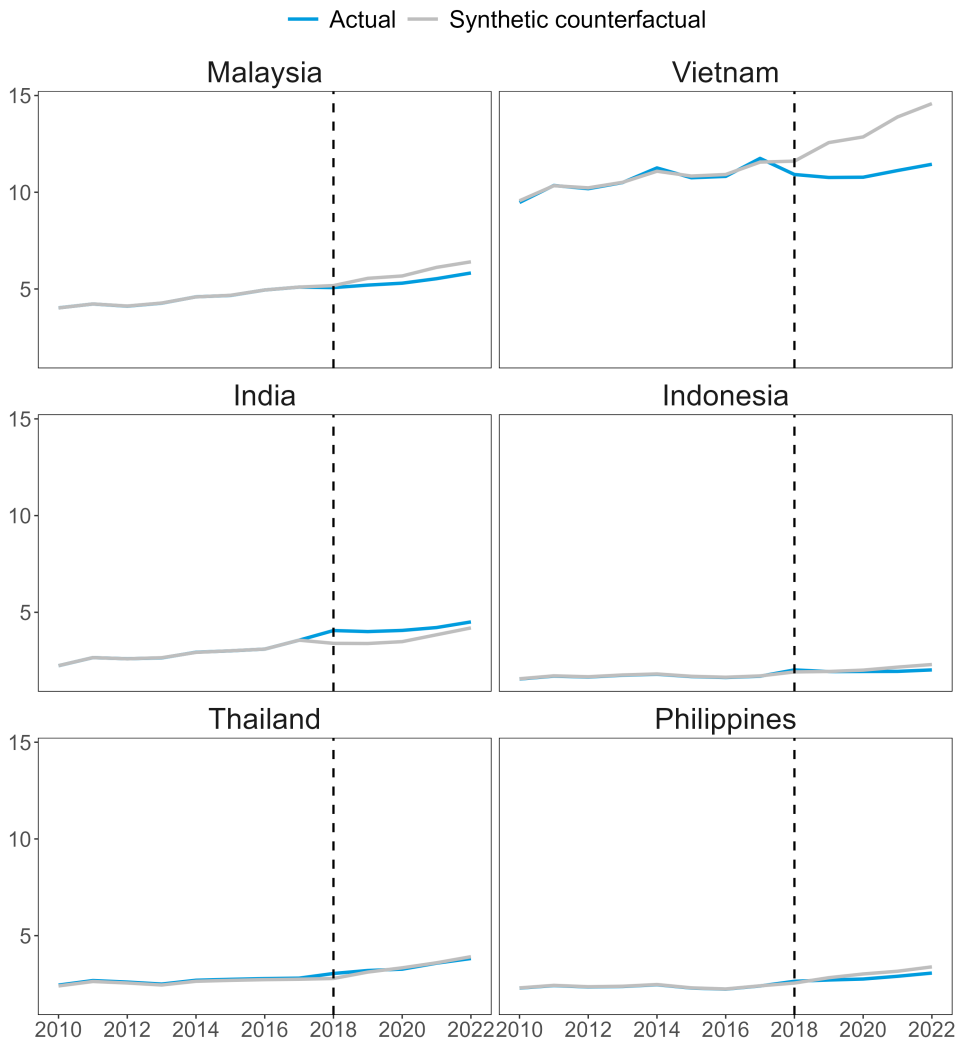


Notes: For each country, the figure plots the estimated effect on the share of domestic value added in the country's exports to the US, for non-strategic manufacturing sectors (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. ashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Appendix D Additional Empirical Results on the Share of Chinese Value Added in Exports

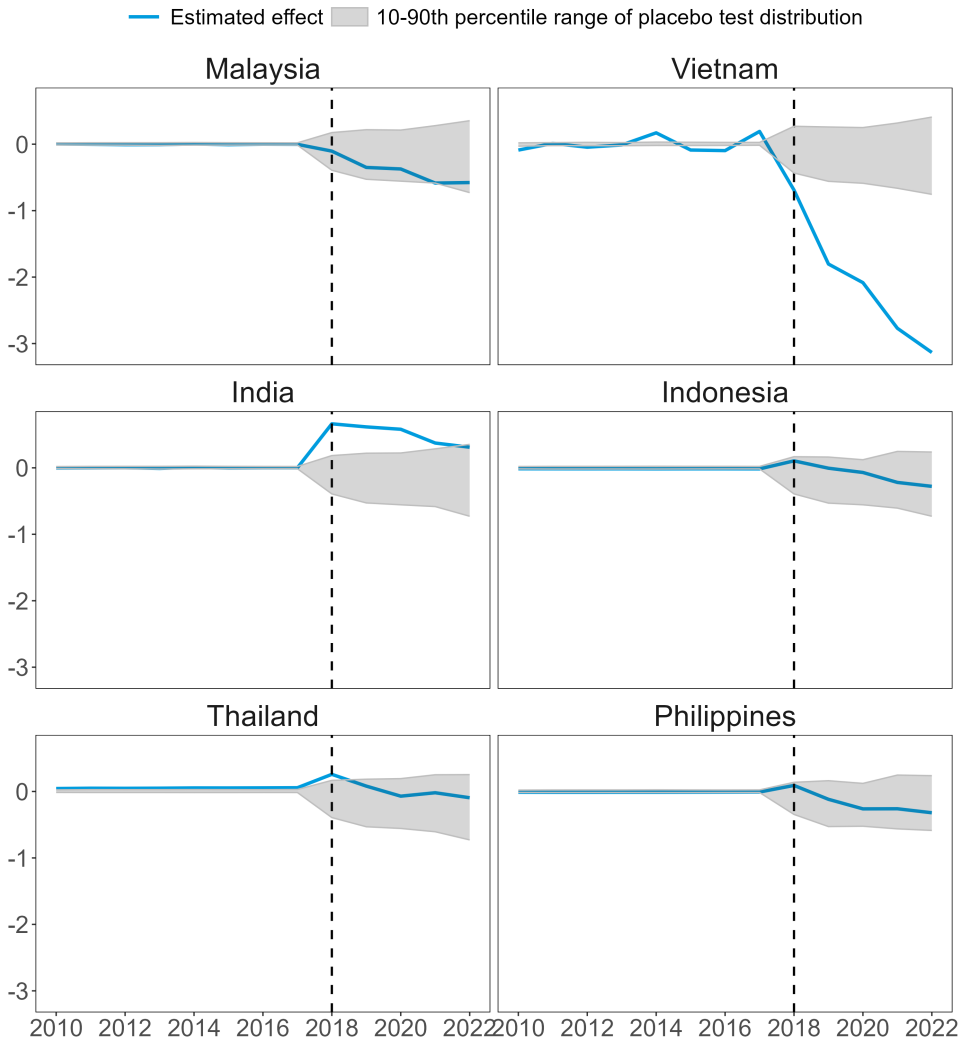
The appendix presents empirical results for petroleum, chemical and non-metallic mineral products, and non-strategic manufacturing products, including (i) the dynamics - both the actual values and the synthetic counterfactuals - of the share of Chinese value added in a country's exports to the US, and (ii) the estimated effects.

Figure 15: Share of Chinese Value Added in the Country's Exports to the US, Petroleum, Chemical and Non-Metallic Mineral Products
(In Percent)



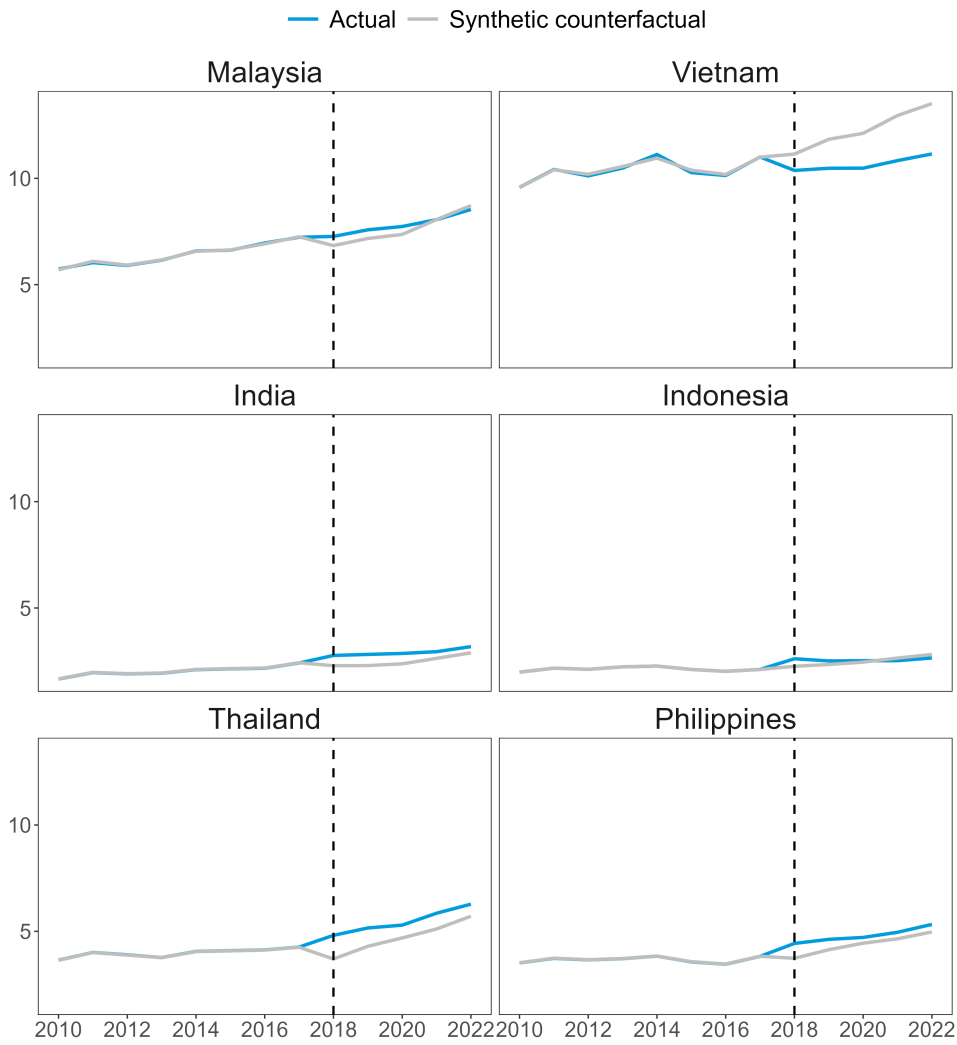
Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of Chinese value added in the country's exports to the US, for petroleum, chemical and non-metallic mineral products sector. The synthetic counterfactuals are constructed based on a weighted average of the share of Chinese value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 16: Estimated Effect on the Share of Chinese Value Added in the Country's Exports to the US,
Petroleum, Chemical and Non-Metallic Mineral Products
(In Percentage Points)



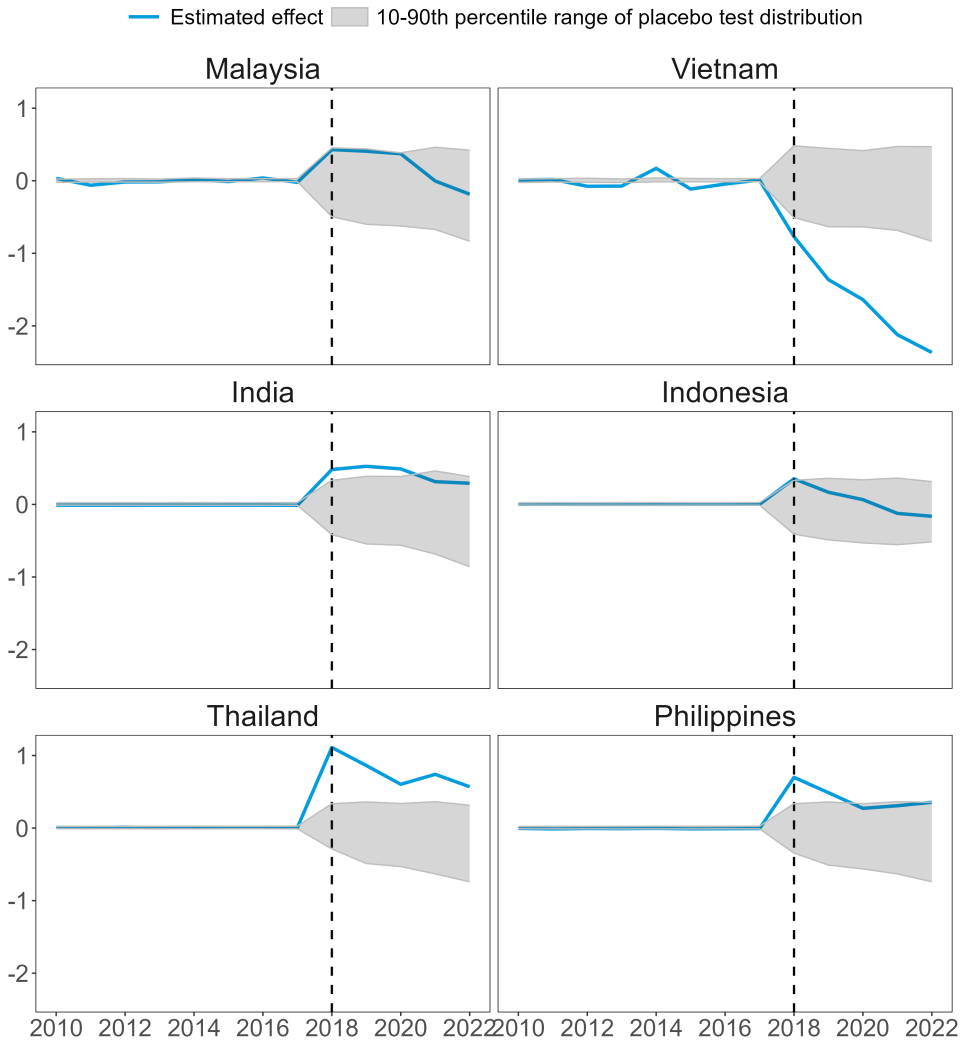
Notes: For each country, the figure plots the estimated effect on the share of domestic value added in the country's exports to the US, for petroleum, chemical and non-metallic mineral products sectors (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. ashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 17: Share of Chinese Value Added in the Country's Exports to the US, Non-Strategic Manufacturing Products
(In Percent)



Notes: For each country, the figure plots the actual (the blue lines) and the synthetic counterfactual (the grey lines) share of Chinese value added in the country's exports to the US, for non-strategic manufacturing sector. The synthetic counterfactuals are constructed based on a weighted average of the share of Chinese value added in other countries' exports to the US for the same sector, excluding the six countries of interest in this paper. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 18: Estimated Effect on the Share of Chinese Value Added in the Country's Exports to the US,
Non-Strategic Manufacturing Products
(In Percentage Points)



Notes: For each country, the figure plots the estimated effect on the share of domestic value added in the country's exports to the US, for non-strategic manufacturing sectors (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study. ashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Appendix E List of Countries Used in Constructing Synthetic Counterfactuals

The appendix presents the list of countries used in constructing the synthetic counterfactuals for the share of domestic value added (Table 3 - 5) and for the share of Chinese value added (Table 6 - 8), with the largest weights that add up to 70 percent.

Table 3: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Domestic Value Added, Electrical and Machinery

Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	United Arab Emirates	Suriname	Guyana	Seychelles	Singapore	Luxembourg
2	Burundi	Yemen	Myanmar	Guyana	Maldives	Hungary
3	Côte d'Ivoire	Uzbekistan	Singapore	Hong Kong SAR	Seychelles	
4	Brunei Darussalam	Myanmar		Singapore		
5	Bahrain	Serbia				
6	Benin					
7	New Zealand					
8	Bulgaria					
9	Peru					
10	Bolivia					
11	Brazil					
12	Oman					
13	Trinidad and Tobago					
14	Pakistan					
15	Central African Republic					
16	Chad					
17	Russia					
18	Norway					
19	Cameroon					
20	Angola					
21	South Africa					
22	Mozambique					
23	Qatar					
24	Iran					
25	Egypt					
26	Algeria					
27	Kuwait					
28	Nepal					
29	United Kingdom					
30	Ecuador					
31	Australia					
32	Mauritius					
33	Congo, Republic of					
34	Belarus					
35	Malawi					
36	Tanzania					
37	Colombia					
38	Switzerland					
39	Panama					
40	Myanmar					

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Table 4: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Domestic Value Added, Petroleum, Chemical and Non-Metallic Mineral Products

Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	Panama	Serbia	Hungary	Austria	Seychelles	Seychelles
2	South Africa	Myanmar	Angola	Togo	Korea	Lithuania
3	New Zealand		Hong Kong SAR	United Arab Emirates		Luxembourg
4	Singapore		Netherlands	Mauritania		
5	Hungary		Ireland	Armenia		
6	Oman		Norway	Haiti		
7	Taiwan Province of China		Mozambique	Montenegro, Rep. of		
8	Spain		Sweden	Zambia		
9	Mozambique		Switzerland	Senegal		
10	Norway		Luxembourg	Romania		
11	Congo, Republic of		Myanmar	Djibouti		
12	Tunisia		Malawi	Argentina		
13	Kuwait		Congo, Republic of	Cambodia		
14	Tanzania		Belarus	Madagascar		
15	Belarus		Lithuania	Germany		
16	Malawi		Guyana	Tunisia		
17	Luxembourg		Singapore	Ecuador		
18	Switzerland		Taiwan Province of China	Denmark		
19	Myanmar			Nepal		
20	Pakistan			Bulgaria		
21				Ghana		
22				Mexico		
23				Poland		
24				Kenya		
25				Tanzania		
26				Iceland		
27				Nigeria		
28				Cyprus		
29				Mauritius		
30				Switzerland		
31				Croatia		
32				Egypt		
33				Gambia, The		
34				Cabo Verde		
35				Portugal		
36				Panama		
37				Democratic Rep. of Congo		
38				Seychelles		
39				Bahamas, The		
40				Belarus		
41				Luxembourg		
42				Guyana		
43				United Kingdom		
44				Uzbekistan		

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Table 5: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Domestic Value Added, Non-Strategic Manufacturing Products

Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	Nigeria	Pakistan	Korea	Haiti	Maldives	Luxembourg
2	Myanmar	Morocco	Singapore	Switzerland	Seychelles	Montenegro, Rep. of
3		Myanmar		Macao SAR		
4				Belarus		
5				United Kingdom		
6				Guyana		
7				Pakistan		
8				Seychelles		
9				Egypt		

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Table 6: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Chinese Value Added, Electrical and Machinery

Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	Nigeria	Lesotho	Germany	Moldova	Moldova	Hong Kong SAR
2	Belarus	Kyrgyz Republic	Singapore	Egypt	Yemen	Djibouti
3	Congo, Republic of			Hong Kong SAR	Hong Kong SAR	
4	Cambodia			Belarus		
5	Iran					
6	Panama					

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Table 7: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Chinese Value Added, Petroleum, Chemical and Non-Metallic Mineral Products

Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	Central African Republic	Ghana	Belarus	Cyprus	Seychelles	Hong Kong SAR
2	Mozambique	Lesotho	United Arab Emirates	Macao SAR	Germany	Djibouti
3	Belarus	Djibouti	Germany	Uzbekistan		
4	Myanmar			Nepal		
5	Russia			Nigeria		
6	Chad			Belarus		
7	Macao SAR					
8	Tajikistan					
9	Cambodia					
10	Panama					
11	Botswana					
12	Nepal					
13	Nigeria					
14	Malawi					

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Table 8: List of Top Countries Used in Constructing the Synthetic Counterfactual for the Share of Chinese Value Added, Non-Strategic Manufacturing Products

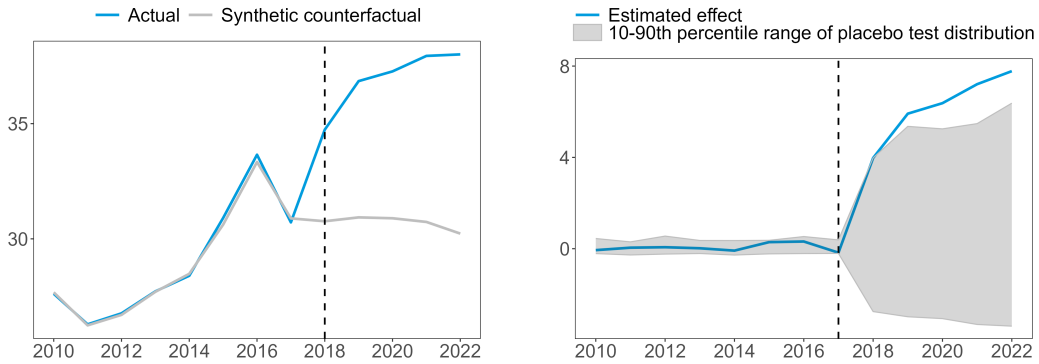
Rank	Indonesia	India	Malaysia	Philippines	Thailand	Vietnam
1	Angola	Pakistan	Mauritius	Belarus	United Arab Emirates	Hong Kong SAR
2	Switzerland	Czech Republic		Egypt	Seychelles	Mongolia
3	Georgia	Suriname			Djibouti	
4	Guatemala	Jamaica				
5	Brazil	Mauritius				
6	Qatar	Ghana				
7	Mozambique	Lesotho				
8	Myanmar	Germany				
9	Oman	Yemen				
10	Croatia	Madagascar				
11	Panama	Guyana				
12	Congo, Republic of	Uzbekistan				
13	Botswana	Djibouti				
14	Macao SAR	Morocco				
15	Chad	Serbia				
16	Iran	Montenegro, Rep. of				
17	Namibia					
18	Tanzania					
19	Belarus					
20	Nigeria					

Notes: Each column lists the countries used in constructing the synthetic counterfactual for each country in the sample, with the largest weights that add up to 70 percent.
Sources: authors' calculations.

Appendix F Additional Empirical Results on the Share of Domestic Value Added in Vietnam's Exports to the World

The appendix presents empirical results for petroleum, chemical and non-metallic mineral products, and non-strategic manufacturing products, including (i) the dynamics - both the actual values and the synthetic counterfactuals - of the share of domestic value added in Vietnam's exports to the world, and (ii) the estimated effects.

Figure 19: Share of Domestic Value Added in Vietnam's Exports to the World, Petroleum, Chemical and Non-Metallic Mineral Products
(In Percent)

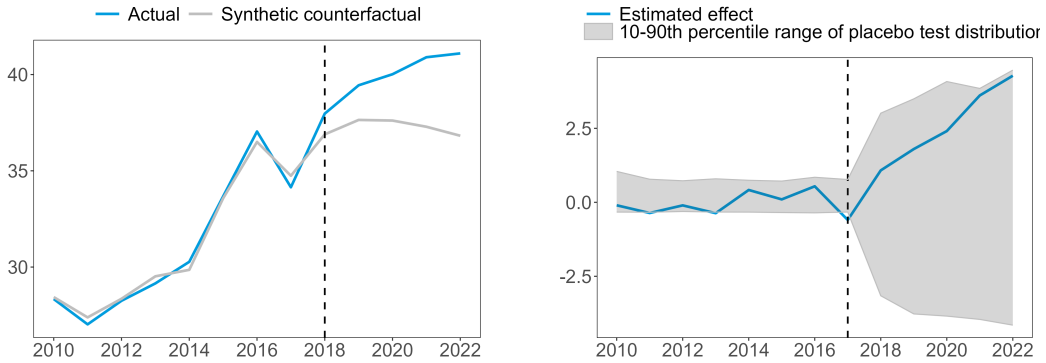


(a) Trend (Actual versus Synthetic Counterfactual)

(b) Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) share of domestic value added in Vietnam's exports to the world, and Panel (b) plots the estimated effect on the share of domestic value added in Vietnam's exports to the world (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study, for petroleum, chemical and non-metallic mineral products. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Figure 20: Share of Domestic Value Added in Vietnam's Exports to the World, Non-Strategic Manufacturing Products
(In Percent)



(a) Trend (Actual versus Synthetic Counterfactual)

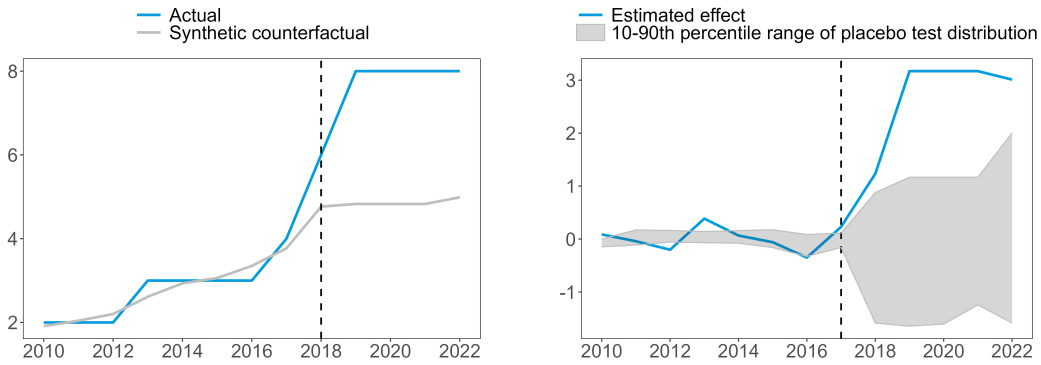
(b) Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) share of domestic value added in Vietnam's exports to the world, and Panel (b) plots the estimated effect on the share of domestic value added in Vietnam's exports to the world (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of the country in study, for non-strategic manufacturing products. Dashed vertical indicates the year 2018 when the US-China trade tensions started. To account for a visible seam between 2015 and 2016 data in the Eora Global Supply Chain Database due to a structural break in the database methodology (see Eora Global Supply Chain Database (2024)), value added measures from 2016 onwards are adjusted so that the adjusted 2016 value is equal to the linearly-extrapolated value based on data during 2010 and 2015 while the post-2016 trend is kept unchanged.
Sources: The Eora Global Supply Chain Database (Lenzen et al., 2012, Lenzen et al., 2013), Aslam et al. (2017), and authors' calculations.

Appendix G Additional Empirical Results on the Number of Greenfield FDI Projects

The appendix presents empirical results for petroleum, chemical and non-metallic mineral products, and non-strategic manufacturing products, including (i) the dynamics - both the actual values and the synthetic counterfactuals - of the cumulative number of greenfield FDI projects that commit Chinese capital in Vietnam, and (ii) the estimated effects.

Figure 21: Cumulative Number of Greenfield FDI Projects that Commit Chinese Capital to Vietnam
Petroleum, Chemical and Non-Metallic Mineral Products

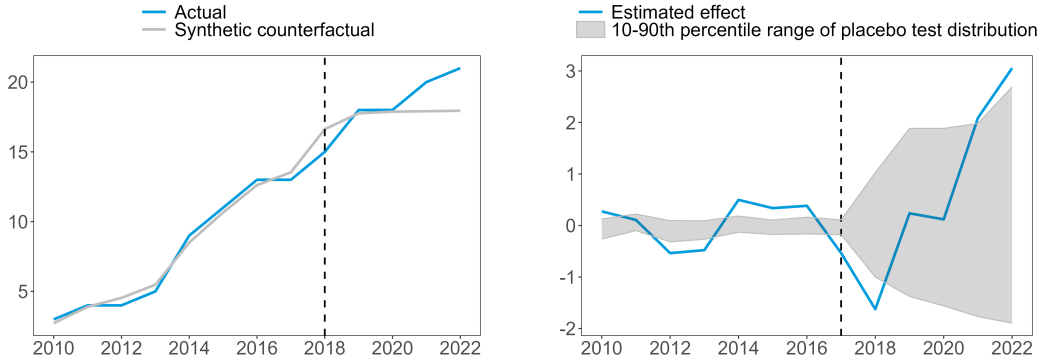


(a) Trend (Actual versus Synthetic Counterfactual)

(b) Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) of the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for petroleum, chemical and non-metallic mineral product sector since 2003. The synthetic counterfactuals are constructed based on a weighted average of the cumulative number of greenfield FDI projects that commit Chinese capital to other countries for the same sector since 2023, excluding Vietnam. Dashed vertical indicates the year 2018 when the US-China trade tensions started. Panel (b) plots the estimated effect on the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for electrical and machinery sector since 2003 (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of Vietnam.
Sources: The Orbis Cross-border Investment Database and authors' calculations.

Figure 22: Cumulative Number of Greenfield FDI Projects that Commit Chinese Capital to Vietnam
Non-Strategic Manufacturing Sector



(a) Trend (Actual versus Synthetic Counterfactual)

(b) Estimated Effect

Notes: Panel (a) plot the actual (the blue line) and the synthetic counterfactual (the grey line) of the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for non-strategic manufacturing sector since 2003. The synthetic counterfactuals are constructed based on a weighted average of the cumulative number of greenfield FDI projects that commit Chinese capital to other countries for the same sector since 2023, excluding Vietnam. Dashed vertical indicates the year 2018 when the US-China trade tensions started. Panel (b) plots the estimated effect on the cumulative number of greenfield FDI projects that commit Chinese capital to Vietnam for electrical and machinery sector since 2003 (the blue lines) and the $10^{th} - 90^{th}$ percentile range of the placebo test distribution excluding countries that have pretreatment (before 2018) mean squared prediction error (MSPE) of more than five times the MSPE of Vietnam.
Sources: The Orbis Cross-border Investment Database and authors' calculations.

PUBLICATIONS

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