Fishing in Troubled Water:

The Impact of the US-China Trade War on Vietnam's Export, Firms, and Labor Market

A Dissertation

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Abstract

In 2018, the world observed a trade war between two massive economies: China and the United States, which was a new phenomenon in the era of modern economics. The United States implemented several waves of tariff increases on specific products, particularly on Chinese products. This study investigates the trade diversion, which we define as the trade war's impacts on Vietnams' firms, which gained relatively favorable access to the US market. Using the US import data, we first show that the trade war statistically increased the import of targeted products from Vietnam to the United States.

Using firm-level microdata from Vietnam, we also provide empirical evidence that tariff increases against Chinese products increased the probability of being an exporter among Vietnamese firms in the targeted industries. Specifically, firms are more likely to be exporters by 0.3% point and foreign direct investment exporters by 0.2% point. These are sizable effects considering the share of exporters before the trade war: only 2.24% in 2017. We also employed tariff increases as an exogenous shock to become an exporter and estimated the effect of exportation on firm productivity. The instrument variable estimation shows that being an exporter increases firms' productivity by approximately 180% points in Vietnam.

In addition, this study investigates short-term effects of the US–China trade war as a positive demand shock on Vietnam's labor market. Using heterogeneity in tariff increases against Chinese products, we construct an industry-level measurement of the difference between US import tariffs on Vietnamese and Chinese products before and during the trade war. We examine the reallocation of workers from informal to formal sectors, and from uninsured to insured employment in Vietnam. Our estimation results show that individual workers in industries with substantial exposure to US tariff increases are less likely to be hired as informal or uninsured workers. The reallocation from informal to formal and uninsured to insured employees was more significant for middle-aged workers and those with relatively low levels of education.

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Dedication

To my parents, Pham Trung Chinh and Nguyen Thi Lan, who allowed me to pursue my studies in Japan

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Chapter 1

Introduction

1.1 Background, Motivation, and Theme of the Thesis

In 2018, after supporting free trade for more than half a century, the United States imposed several waves of import tariff increases on specific products from China to boost its manufacturing sector. According to 2018 and 2019 import data from the US International Trade Commission, those increases in tariffs, ranging from 5% to 25%, affected 16,197 products and accounted for almost $328,219 billion of US annual imports from China. In response, China imposed retaliatory tariffs increases ranging between 5% and 25% on US exports affecting 11,297 products with a total value of $110 billion in annual US exports to China. The series of tariff increases imposed by both US and China against each other are generally termed "the US-China trade war."

The trade war between the two largest world economies has brought massive attention to its immediate and long-term effects on the US, China, and other economies. Extensive research has shown that the trade war negatively affected the US economy. Fajgelbaum et al. (2020) found that in 2018, the trade war led to a 2.5% decline in US imports of targeted products, a 9.9% decrease in US exports of retaliatory products, and a loss of $51 billion (0.27% GDP) in real income to US customers and firms. Huang et al. (2019) showed that stock returns of firms heavily engaged in trade with China became lower than those of firms without such engagement shortly after the announcement of new waves of tariffs targeting China. Moreover, firms impacted by the US import tariffs, on average reduced exports (Handley et al., 2019) and increased retail prices (Flaaen et al., 2019), and reduced investment (Caldara et al., 2019). Similarly, on the China side, it is estimated that the US-China trade war led to a decrease in the output of textiles and computers by 6.29% and 14.26%, respectively (Guo et al., 2019). Moreover, the trade war reduced real wages in China by around 0.37% (Guo et al., 2018) and reduced Chinese economic welfare (Bollen and Rojas-Romagosa, 2018).

Although the US-China trade war damaged both economies, it is suggested that it benefited some emerging economies that can produce products similar to those made in China and export them to the US. Many analysts have pointed out that one of the biggest beneficiaries of the trade war is Vietnam since most of the Chinese goods targeted in the trade war are also consumed and produced in Vietnam (Tuan et al., 2018; Lam and Nguyen, 2019). According to the import data from the US International Trade Commission, Vietnam's aggregate exports to the US increased significantly after the trade war. Overall, Vietnam's exports to the US increased 35.2% in 2019. Compared to 2018 figures, exports of mobile phones and mobile phone components grew by 115%, while exports of computers and computer components nearly tripled in 2019. Japanese investment bank Nomura (2019) reported that around 7.9% of Vietnam's GDP growth resulted from increased exports to both China and the US during 2018–2019.

It is conjectured by many that the US-China trade war would boost exports and FDI (Foreign Direct Investment) in Vietnam. The multinational firms in targeted industries would either relocate out of China or look for alternative locations as a diversification strategy to deal with the increased risk. Vietnam is an attractive alternative to foreign investors for many reasons: its low labor cost, efforts in administrative reform, various tax benefits provided to foreign firms, and proximity to China. According to the Vietnam Ministry of Planning and Investment, the total registered FDI increased by 7.2%

to 38 billion USD in 2019, compared to 2018, with the increase in newly-registered projects by 27% to 3,883 projects.

However, there also exists views that Vietnam cannot easily replace China's position in the global supply chain due to the sheer size of China. Many also suspect that China will detour their products through Vietnam to avoid increased tariffs. The detoured products from China and Vietnam's trade surplus are also likely to put Vietnam on the "watch list" of US trade policymakers and can be subjected to the higher tariff imposed by the US in the future.

Despite the trade war's anticipated impacts on Vietnam's economy, to the best of our knowledge, no study has investigated the effects of the US-China trade war on Vietnam's firms and labor market. The thesis aims to provide the first empirical evidence related to the effect of the US-China trade war on a third country's market using various microdata in three aspects: Vietnam's export to the US, Vietnam's enterprises, and its labor market. The thesis first elaborates if increased export from Vietnam to the United States is due to an increase in export volume of those products targeted by the tariff increases by the United States. The thesis analyzes how the increased access to the US market affected Vietnam's firms using extensive firm-level microdata from 2017 to 2019. Its third main chapter is devoted to examining the impacts of the positive trade shock on informal and uninsured employment in Vietnam.

1.2 Main Findings and Contribution to the Literature

The thesis contributes to the literature in several aspects. Firstly, it appears to be the first study utilizing various micro-data (Vietnam Enterprise Survey and Labor Force Survey) to estimate the effect of the US-China trade war on the third country, Vietnam.

Using microdata allowed the thesis to have several advantages. Most importantly, it enabled us to construct a unique industry-level measurement of the tariff differences applied to Chinese and Vietnamese products imported into the US. The identification strategy employing within-industry variation in terms of trade war allows us to estimate the causal impacts of the trade war on Vietnam, controlling many confounding factors. The microdata also allows us to understand the behavior of investors and Vietnamese firms in the middle of the trade war, as well as the influence of relative tariff advantages given firm productivity. Lastly, using microdata makes it possible for the thesis to examine the heterogeneous effects of the US-China trade war across various firms and employers in the market.

The thesis also takes advantage of detailed firm-level microdata and provides empirical evidence related to firms' joint decisions on FDI and export, which are more relevant in the context of developing countries. Several studies examined the effect of export and FDI decisions of firms on productivity separately (Clerides et al., 1998, Doms and Jensen, 1998, Bernard and Jensen, 1999, 2004, Bernard and Wagner, 2001, Hallward-Driemeier et al., 2002). These studies showed that exporters and FDI have higher productivity than non-exporters and domestic firms. Nevertheless, few look at the effect of joint decisions (e.g., FDI exporter and FDI non-exporter) or the impact of such decisions on the firm's productivity, making the findings in the thesis uncommon but meaningful.

The overall theme of the thesis is in line with a growing literature on trade diversion and its effects on firms' behavior. Bernard et al. (2003), Verhoogen (2008), Lileeva and Trefler (2010), and Bustos (2011) found that the reduction in tariff increases the probability of being an exporter in targeted countries. The thesis provides empirical evidence in a different but unique context created by the US-China trade war, where Vietnamese firms faced with relative gains as tariff hikes are applied to potential competitors in the neighboring country, China.

To the best of our knowledge, only a few studies have examined the linkage between trade and Vietnam's informal employment: McCaig and Pavcnik (2018) showed that the 2001 US-Vietnam Bilateral Trade Agreement led to the reallocation of labor from informal to formal sectors, while Trinh et al. (2019) provided evidence that global value chains have a positive effect on the share of formal employment in Vietnam. The last main chapter of the thesis contributes to the developing literature by examining the trade shock in an unexplored context driven by two giant economies in the world on informal, often precarious, or uninsured employment in an emerging economy, Vietnam.

The first main chapter of the thesis provides empirical evidence that the US-China trade war affected export from Vietnam to the United States. Using the dynamics difference-in-difference method, we found that the US-China trade war sharply increased the export volume of those affected goods from Vietnam to the US. On average, Vietnam's export to the United States is more than doubled within six months of tariff increases. The increase in import volume also remains statistically significant even after eight months of tariff increases. We also show that there is no association between the US-China trade war on the export of those affected goods from China to Vietnam, implying that Vietnam's increased export is not driven by those detours originally from China.

In the second main chapter of the thesis, we pay close attention to Vietnamese firms' exportation and investment, explaining the dynamics behind the increased export volume. Referring to firms' export behavior, our study, through a linear probability model, shows that the firms in the targeted industry are more likely to be an exporter by 0.3% points and FDI exporters by 0.2% points. These are sizable effects concerning that the share of exporters was only 2.24% right before the onset of the trade war. Moreover, our result implies that the trade war leads to a 0.7% increase in foreign investment and a 3% increase in the firm's export volume. It should be noted that these increases are driven by tiny numbers of FDI firms (2.71% of the sample) and exporters (2.24% of the sample).

Subsequently, we investigated the impact of export activity and FDI on firms' productivity using the US-China trade war as an instrument variable. This study used various measures of productivity, including labor productivity (total sales per worker), ACF (Ackerberg-Caves-Frazer, 2015), as well as Woodridge (2009)'s. Our analysis highlights that being an exporter has significantly positive effects on the firms' productivity across various productivity measures. On average, being an exporter increases firms' TFP by 180% points, while being a FDI exporter increase 319% points of TFP. The results are slightly smaller for labor productivity, with around 148% and 280% points.

In the final chapter of the thesis, we examined the impacts of the US-China trade war on Vietnam's labor market. Our preliminary results show that relatively improved access to the US market had several desirable impacts on employees working in industries with a relatively large gap in US tariffs against Chinese and Vietnamese goods. In Vietnam, formal workers can enjoy a better working environment (e.g., higher income, longer working hours) than informal workers, as well as extensive social protection. Therefore, the reallocation of workers from the informal sector to the formal sector due to the trade war would have significant welfare consequences for employees.

The reduced form analyses highlight that the probability of being hired as an informal worker declined by 0.519 percentage points. In comparison, the likelihood of being employed as an uninsured worker decreased by 0.57 percentage points compared to workers in other industries. The empirical evidence provided in this chapter would serve as a good reference for policymakers in Vietnam to develop relevant policies that the benefits of the trade war can be shared with workers.

1.3 Organization of the Dissertation

The rest of the paper is organized as follows. Chapter 2 examines the impacts of the US-China trade war on Vietnam's export to the United States. Chapter 3 focuses on analyzing the effects of the US-China trade war on Vietnamese firms' export, FDI, and productivity. Chapter 4 analyses the impact of the trade war on Vietnam's labor market. Chapter 5 summarizes the main findings, presents conclusions, and suggests directions for further study.

Chapter 2

The Impact of the US-China Trade War on Vietnam's Export

2.1 The US-China Trade War

Donald Trump was among the presidents of the United States who started their terms with protectionist measures. He initiated many trade conflicts during his term, including the US-China trade war. He attempted to renegotiate existing free trade agreements such as the North American Free Trade Agreement and the US-Korea Free Trade Agreement and withdrew from the Trans-Pacific Partnership negotiations. However, the gravity of the US-China trade war was unprecedented owing to the size of the two economies and the potential impacts of the trade war on the global supply chain.

In 2017, the first year of Donald Trump's presidency, the two economies were each other's largest trading partners. In January 2018, the United States announced tariffs on solar panels and washing machines; the US imported approximately 8% of its solar panels from China in 2017. In March 2018, the US additionally increased tariffs on aluminum, iron, and steel from all countries. The product-specific tariffs increases were the only prelude to subsequent tariff increases, mostly on Chinese products imported into the United States.

[Table 2.1 to be Inserted Here]

Table 2.1 shows the timeline of the China-US trade war from 2018 to 2019. The first two waves targeted products and affected all the goods imported to the United States, regardless of their origins. The subsequent four waves of the war targeted Chinese products imported into the United States, creating a sharp wedge in tariffs between goods from China and those from other countries. The table also shows the number of Chinese products and the number of Vietnamese products with the same Harmonized System 10-digit (HS10)[1] code. The number of Vietnamese goods affected was lower than that of the Chinese products targeted because not all targeted Chinese imports had equivalent Vietnamese products in the same HS10 category during our sample period.

The tariff differences presented in Table 2.1 are defined as each wave's unweighted differences in tariffs applied to Chinese and Vietnamese imports to the US. The positive number implies that higher tariffs were imposed on Chinese goods on average. Table 2.1 shows that, on average, tariffs applied to Chinese products were lower compared to those applied to Vietnamese goods in 2017. However, four waves of China tariffs sharply increased the tariff applied to Chinese products, which became much higher compared to those applied to Vietnamese products. The first two waves were product-specific tariff increases, eliminating previous tariff differences between Chinese and Vietnamese products.

After the first two waves of the trade war in early 2018, China retaliated by imposing tariffs on imports from the US, including cars and soybeans. In May, China agreed to reduce the United States' trade deficit by importing more agricultural products from the United States. In June, Trump declared that the US would impose 25% tariffs on $50 billion worth of Chinese goods, starting July 6, 2018. We denote the event as China 1, and this new measure caused, on average, a 23.96 pp (% point) difference

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[1] United States uses a 10-digit HS code to classify products, with the first six digits being the HS codes that are common, as administrated by the World Customs Organization (WCO).

between the Chinese and Vietnamese goods imported to the United States. Vietnam was also affected, as its 161 products exported to the United States became relatively cheaper than the Chinese products. Table 2.1 shows that Vietnam's export of the targeted goods increased from 1.2 billion in 2017 to 1.7 billion in 2019. In August, the US, again, imposed a 25% tariff on 401 Chinese goods causing, on average, a 22.97%-point gap between goods from China and those from Vietnam. Both China 1 and China 2 waves were followed by China's retaliatory tariff increases on American products of similar trade volume.

The scale of the trade war expanded in September 2018 when the US declared a 10% tariff on approximately $200 billion worth of Chinese goods. The wave targeted 8,539 Chinese products and affected 2,176 products that Vietnam exports to the United States, causing, on average, a 7.23% point difference between the tariffs applied to Chinese and Vietnamese goods. In March 2019, the U.S. Department of Commerce stated that in 2018, the U.S. trade deficit with China was the highest ever recorded. In May 2019, the previous 10% tariffs on $200 billion worth of Chinese goods increased to 25%. Thereafter, at a G20 Osaka Summit, the leaders of two economies announced a truce in the trade war; however, this truce did not last a month. In September 2019, the two countries imposed new and higher tariffs on each other's products, targeting 5,628 Chinese products and affecting 2,011 Vietnamese products that were exported to the US during our sample period. Table 2.1 shows that the series of the trade war between the two economies increased the wedge in tariffs. The imports of Vietnamese goods to the United States from 2017 to 2019 increased; however, the causal relationship between the tariff gaps and Vietnamese export to the US cannot yet be claimed from the descriptive statistics.

[Figure 2.1 to be Inserted Here]

[Figure 2.2 to be Inserted Here]

Figures 2.1 and 2.2 also visually present the differences between American tariffs on Chinese and those on Vietnamese products during the trade war and before the onset of the COVID-19 pandemic. Figure 2.1 visually shows the unweighted difference in average statutory tariffs applied to Vietnamese and Chinese goods. The positive figure implies that tariffs on Chinese products are higher than tariffs on Vietnamese products, as shown in Table 2.1. As Figure 2.1 depicts statutory tariffs, some later exemptions on specific products were incorporated when calculating the tariff differences. Conversely, Figure 1B, shows the difference in tariffs caused by the trade war, without considering later exemptions and relaxations. Ignoring latter exemptions might be more informative if relevant economic agents recognize the trade war as a permanently increased uncertainty related to targeted Chinese products imported into the United States.

Figures 2.1 and 2.2 show almost no difference between Chinese and Vietnamese products in terms of import tariffs before the onset of the trade war, except for the products targeted in China 4, which exhibited lower tariffs for Chinese products, compared to Vietnamese products, until September 2019. However, each trade war wave targeted Chinese products, creating a sharp increase in the difference in tariffs. The tariff differences decreased in the second half of 2019 as some products were later exempted. For the products targeted by the China 4 wave, the elimination of favorable tariffs applied to Chinese products has created a positive difference in tariffs since September 1, 2019.

2.2 The Effect of the US-China trade war on Vietnam's Export

2.2.1 Data and empirical strategy

2.2.1.1 Data construction

Before the trade war, US tariffs on imported goods from both China and Vietnam could enjoy Most-Favored-Nation tariffs (MFN). Therefore, the pre-trade-war differences in average tariffs mostly stem from the differences in the imported volumes from China and Vietnam. We acquired data on statutory tariffs for the period 2017–2019 and the effective date of change in each tariff on Chinese products from the United States International Trade Commission. The data includes the eight-digit and ten-digit Harmonized Tariff Schedule (HTS) level of targeted products, the time when tariff changes went into effect, and the increased tariffs as well as later exemptions and relaxations. We constructed tariff data at HS-10 for goods imported monthly from China and Vietnam, whereby the changed tariffs were incorporated from the calendar month of the effective date[2].

We acquired monthly import data from the HS-10 US Census Bureau. Further, we employed the Cost, Insurance, and Freight (CIF) value of monthly imports in USD value as well as quantity, unit value, and duty inclusive unit value[3]. Tariff and imports data are

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[2] Our primary analyses remain robust when we incorporate changed tariffs from the subsequent month after the effective date.

[3] US Census Bureau notes that the duty calculated using the data might not accurately reflect the amount of duty paid, and the data should be interpreted cautiously. The portion of products assembled or processed in the US could be eligible for duty exemptions causing an overstatement of the figures. Conversely, no duty is calculated when there are

merged at the month-HS10 level for our analyses in this chapter. To prevent any confounded impacts from the Covid-19 pandemic, we restricted our sample to the end of 2019.

2.2.1.2 Empirical strategy

To estimate the impact of the China-US trade war on Vietnam's export to the United States, we employed the difference in differences (DID) event study (or a dynamic DID model) specification as follows:

$$Y_{it} = \alpha + \sum_{l=1}^{6} \beta_l Pretrends_{it}^{l} + \sum_{k=0}^{8+} \gamma_k Tariff_{it}^{k} + HS8_j + Month_t + \varepsilon_{it} \quad (1)$$

where Y_{it} is import statistics of Vietnamese products imported into the United States, with HS10 code "i" in month "t" measured as log of value, quantity, unit value, and duty-inclusive unit value, all measured in USD. The main variables of interest are $Tariff_{it}^{k}$. This is a set of variables indicating that a Chinese product with the same HS10 code "i" was hit by tariff increase "k" months earlier. Therefore, γ_k captures the evolution of the impact of tariff increases on equivalent Vietnamese products over time. k ranges from zero to eight where more than eight months from the effective date is top-coded. $Pretrends_{it}^{l}$ is a set of indicators that Chinese products with the same HS10 code "i" would experience tariff increase "l" months later. The value of "l" ranges from one to six. By construction, all the estimated coefficients of $Pretrends_{it}^{l}$ and $Tariff_{it}^{k}$ capture the movement of outcome variables around the effective date of tariff increases relative to

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several duty rates at various levels, thereby underestimating the statistics.

the baseline period, which is set to be at least seven months before the month of the effective date. We also include Harmonized System 8-digit (HS8) and monthly fixed effects to control for differences in products across HS8 categories as well as common time trends. Finally, error terms ε_{it} are clustered within each HS8 category.

2.2.2 Main empirical results

[Figure 2.3 to be Inserted Here]

Four graphs in Figure 2.3 visually present the estimated coefficients of pre-trends (β_l) as well as those of dynamic difference-in-differences (γ_k). The horizontal axis in each graph represents months relative to tariff enactment, where "zero" denotes the month of the effective date. In all four graphs, the green dotted line represents estimated coefficients while the red and blue dotted lines represent upper and lower bounds of the 95% confidence interval, respectively. We multiplied both coefficients and standard error by 100 when making graphs; therefore, these graphs show us, in terms of percentages, how the effects of tariff enactment evolve around the time of enactment of tariff increases.

The upper left graph in Figure 2.3 demonstrates the movement of log of Vietnamese import into United States measured in USD. It shows that Vietnamese imports started to increase three months after the tariff increases targeting equivalent Chinese products. The increase in import volume remains statistically significant even after eight months of tariff increases. The magnitude of the impact implies that, on average, Vietnam's export to the United States more than doubled within six months of tariff increases. The estimated impacts are huge but consistent with simple descriptive statistics[4] on some major exporting goods.

The other three graphs in Figure 2.3 examine the log of quantity, log of unit value, and log of duty-inclusive unit value to identify the sources of increased import volume further. The upper right graph shows that most increase in the import volume from Vietnam is caused by increased quantity. Import volume measured in general quantity sharply increased from the fourth month of enactment of new tariff, which is consistent with the movement of import volume measured in USD. The increased quantity remains even after eight months, although estimates become less accurate in later months. The lower left graph also shows a slight increase in unit value, while the upper right graph shows an almost identical pattern in duty-inclusive unit value, which confirms that this increase in unit value is not driven by duty.

The analyses in this section examined the short-run impacts of trade war on Vietnam in 2018 and 2019 to avoid the confounding effects of the pandemic. Though we only examined the short-run impact of the trade war on Vietnam, estimates provided in this section imply that the market quickly reacted to the trade war by looking for alternatives imports to China.

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[4] ITC Trade Map (https://www.trademap.org/Index.aspx) shows that Vietnam more than doubled its cellphone exports to the US in 2019, compared to 2017 and 2019. Most of Vietnam's cell phone production is done by Samsung, accounting for around 25% of total Vietnamese exports to the United States at the onset of the trade war. Vietnam also exported 30% more shoes to the US in 2019 than in 2017.

2.2.3 Robustness test

2.2.3.1 China's export to Vietnam

In this subsection, we test the robustness of the main results by examining the trade volume from China to Vietnam. One developing country may not replace the enormous pre-trade-war volume from China to the United States in the short run. The increase in Vietnam's export to the United States since the trade war began raised suspicion that some portion of its export is a detour export from China seeking to dodge the tariffs.

[Table 2.2 to be Inserted Here]

This possibility can be easily seen in Table 2.2, which shows China's export to Vietnam (A) and Vietnam's export to the US (B). Among products in category (A), the share of products targeted by the trade war was only 0.11% in 2018; however, this share increased to 26.79% as the trade war expanded. The volume of imports from China to Vietnam also steadily increased from 2017 to 2019. Approximately 90% of products in category (B) are also included in category (A), showing that China and Vietnam are competitors in the export market and implying that Vietnam could be used as a new platform for Chinese products heading for the US.

To check that increased Vietnamese export to the US in the previous section is not driven by Chinese products detour through Vietnam, we investigate whether a greater volume of products under China tariffs was imported to Vietnam from 2017 to 2019. The best publicly available data of such trade flow can be acquired from UN COMTRADE annually. Therefore, the most disaggregated level of trade volume we could acquire was at the Harmonized System 6-digit (HS6) while most tariff increases against Chinese products were implemented at the HS8 level. As such, we constructed the three measures of the trade war: the share of products under China tariffs in terms of HS6 codes, the share of products under China tariffs in terms of trade volume, and tariffs against Chinese products weighted by Vietnam's export to the US. Then, we estimated the impacts of the trade war on export from China to Vietnam using the specification as follows:

$$Y_{it} = \alpha + \beta China\ Tariff_{it} + \gamma Vietnam\ Tariff_{it} + HS6_i + Year_t + \varepsilon_{it} \quad (2)$$

where Y_{it} is China's export to Vietnam at HS6 code *i* in year *t*. The coefficient of $China\ Tariff_{it}$ is one of three measures we constructed and would capture the impacts of the trade-war while Vietnam's tariffs against Chinese products ($Vietnam\ Tariff_{it}$) are controlled. We also included fixed effects at HS6 and year. Error terms are clustered within each HS6 code to address autocorrelation.

[Table 2.3 to be Inserted Here]

In regressions (1), (2), and (3), we restricted the product samples to those in both categories (A) and (B), defined in Table 2.2. In regressions (4), (5), and (6), we examined all the products that are exported from China to Vietnam, even though some of them were not Vietnam's export to the US. In all regressions, estimates show no significant association between the measure of the US-China trade war and export volume from China to Vietnam. However, we still cannot entirely exclude the possibility of some detoured trade from China to the US through Vietnam, because the amount of such trade volume did not lead to significant changes in the trade volume of targeted goods between China and Vietnam[5].

2.2.3.2 Vietnam's export to other countries

Though we acquired empirical evidence that the trade war increased Vietnam's export to the US market, we are yet to conclude that total Vietnam export increased. It is difficult to exclude the possibility that by increasing its export to the United States, Vietnam decreased its export to some other major trading partners. Vietnam's three major trading partners for its export are United States, China, and Japan.

We sampled monthly import data on Vietnamese products from Japan Customs from 2017 to 2019 to investigate if Vietnam's export to Japan was affected during the trade war. Though Japan customs provides up to eight digits of disaggregated trade statistics, only the first six digits are consistent with international classifications and can be matched with the data of tariff lines related to the US-China trade war. Therefore, we constructed the same three measures of the trade war (the share of products under China tariffs in terms of HS6 codes, the share of products under China tariffs in terms of trade volume, and tariffs against Chinese products weighted by Vietnam's export to the US) as

[5] All the regressions reported in Table 3 remain robust when we control for the Most Favoured Nation (MFN) tariffs, rather than the preferential tariff for Chinese products. In case some products lacked preferential tariffs for Chinese imports, we employed MFN tariffs instead.

in subsection 2.2.3.1 at the HS6-month level. Then, we estimate the impact of the trade war on Vietnam's export to Japan as follows:

$$Y_{im} = \alpha + \beta China\ Tariff_{im} + \gamma Japan\ Tariff_{im} + HS6_i + Month_m + \varepsilon_{im} \quad (3)$$

where Y_{im} is Vietnam's export of product i to Japan in month m. Further, Japan's tariffs against Vietnamese goods, as well as HS6 and monthly fixed effects, are controlled. Error terms are clustered within each HS6 code.

[Table 2.4 to be Inserted Here]

Table 2.4 presents estimates from Equation (3) using three different measures of the trade war on two different samples. Regressions (1), (2), and (3) are estimated on products whose HS6 code belongs to both (1) Vietnam's export to Japan and (2) Vietnam's export to the United States. Regressions (4), (5), and (6) are estimated using all the products exported from Vietnam to Japan. In all regressions, estimates show no significant changes in Vietnam's export to Japan when products are targeted by the US-China trade war. The empirical exercise in Table 2.4 suggests that no empirical evidence indicates that Vietnam's increased export to the US during the trade war involved the reduction in its export to other major trading partners.

Chapter 3

The Impact of the US-China Trade War on Vietnamese Firms

3.1 Introduction

In the history of development economics, export and foreign direct investment (FDI) have been considered critical factors in improving economic growth. Therefore, over recent decades, developing countries have attempted to improve access to the global market and attract new FDI by changing import tariffs, mainly through trade liberalization or free trade agreements. Along with this, interest in the linkage between these tariff changes and the export or FDI decisions in emerging countries has been increasing. Many previous studies have found evidence that a decrease in import tariffs increases the probability of being an exporter for firms in participant countries (Bernard et al., 2003; Lileeva and Trefler, 2010; and Verhoogen, 2008). Meanwhile, tariff changes affect FDI differently, depending on investment orientation (Asiedu, 2002). For investors seeking markets, a decrease in tariffs will reduce FDI, while for export-oriented companies that want to manufacture products for export to third countries, trade liberalization will promote FDI inflows (Blanchard, 2007).

Although extensive literature has investigated the relationship between tariff policies and exports or FDI decisions, most of them focused on the impact of tariff reductions on the participant countries. To date, few studies have examined the effect of tariff increases on firms' export and FDI behavior. Moreover, whether these tariff increases affect non-participant countries remains an unsolved question.

This chapter attempts to fill the gap in the literature by examining the effect of the 2018 US-China trade war on Vietnamese firms. The tariffs imposed by the US on Chinese products during the trade war provides a unique opportunity to investigate the improved access to foreign markets, through the tariff hikes' trade policies, and the effect on firms' export and FDI behavior in third countries, in this case, Vietnam.

In this chapter, we examine how the increased access to the US market affected Vietnamese firms using three rounds of Vietnam Enterprise Survey (VES) from 2017 to 2019. The data cover firms in all industries and provinces and provides detailed firm demographics, information on FDI, and firms' export activities. Utilizing the extensive firm-level microdata allows us to examine the heterogeneous effects of the US-China trade war across firms in Vietnam. We combine firm data with a unique industry-level measurement of the differences in US import tariffs applied to Chinese and Vietnamese products. The identification strategy employing within-industry variations caused by the trade war is used to estimate the causal effect of the trade war on Vietnam, while controlling for several confounding factors. To the best of our knowledge, our chapter is the first to estimate the effect of the US-China trade war on firms in third countries (e.g. Vietnam) using firm-level data.

Through a linear probability model, we show that Vietnamese companies in the targeted industry are more likely to be exporters by 0.3% points and FDI exporters by 0.2% points. These are sizable effects, given that the share of exporters was only 2.24% in 2017 - right before the start of the trade war. Furthermore, our empirical findings indicate that the US-China trade war increased foreign investment by 0.7% and the firms' export volume by 3%. Importantly, these increases are driven by a small numbers of FDI companies (2.71% of the sample) and exporters (2.24% of the sample).

After examining the effect of the US-China trade war on Vietnamese firms' export and FDI behavior, we investigated the impact of export activity and FDI on firms' productivity, using the US-China trade war as an instrument variable. Several measures of productivity are used for the analysis, including labor productivity (total sales per worker) as well as the ACF (Ackerberg-Caves-Frazer, 2015) and Woodridge methods (Woodridge, 2009). Our findings suggest that being an exporter has significantly positive effects on firm productivity across various productivity measures. On average, being an exporter boosts firms' Total Factor Productivity (TFP) by 180% points, whereas being an FDI exporter raises TFP by 319% points. The results are slightly lower for labor productivity, with being an exporter and an FDI exporter raising approximately 148% and 280% log points, respectively.

Our study on firm productivity contributes to the developing literature on firms' joint decisions regarding FDI and export and the effect on firm productivity. Extensive theoretical research has shown that firms that engage in export or FDI are generally more productive than non-exporters and domestic-owned firms. Some reasons can explain these higher productivities. First, firms are likely to learn and adopt more-advantageous technologies to compete in foreign markets, and thus increase their productivity (Grossman and Helpman, 1991; Yeaple, 2005; and Bustos, 2011). Second, entering the export market incurs sunk costs, while exporters and FDI can overcome these costs and access export markets easier than non-exporters and domestic companies can (Roberts and Tybout, 1997; Melitz, 2003; Helpman et al., 2004). However, this research area has mixed empirical results that often contradict each other, depending on the sample periods and examined countries. Several studies found that exporters and FDI companies have higher productivity compared to non-exporters and domestic firms (Doms and Jensen, 1998; Hallward-Driemeier et al., 2002; Biesebroeck, 2005; De Loecker, 2007). Conversely, Clerides et al. (1998), Bernard and Jensen (1999, 2004), Globerman et al. (1994), and Barbosa et al. (2009) reported that being an exporter or FDI company does not affect firm productivity. This chapter will provide additional empirical results on the effect of being exporters and FDI companies on firm productivity, using the US-China trade war as an instrument. Our chapter differs from the existing literature in that we examine the effect of joint decisions (e.g., FDI exporters and non-exporters), instead of single decisions, on the firm productivity.

The rest of the chapter is organized as follows. Section 3.2 summarizes the literature on the effect of trade war on export and FDI, and the relationship between exporters, FDI and firm productivity. Section 3.3 describes the data and summarized statistics. Section 3.4 discusses the construction of weighted tariff difference. Section 3.5 presents our main empirical results about the impact of the US-China trade war on export and FDI. Section 3.6 focuses on the effect of export status on firm productivity. Section 3.7 presents conclusions and suggests directions for further study.

3.2 Literature Review

3.2.1 Trade war and export

The concept of trade diversion was first introduced by Jacob Viner (1950) in the context of discriminatory trade policies such as free trade agreements (FTAs). He argued that if a country applies the same tariff to all other countries, it would import products from the most efficient producer. However, if a lower tariff is imposed on one country, imports from that country would increase, but those from the rest of the world would decrease. Conversely, Viner said, if a higher tariff is imposed on one country, importing will switch to other countries that are less efficient sources with higher-cost supplies. To date, the vast majority of studies on the trade diversion effect have been quantitative; however, most of those studies examined the effect of FTAs under which a lower tariff is imposed on participating trading partners. Moreover, the findings of those studies are inconsistent and at times contradictory, in terms of both a country's aggregate export decisions and its export decisions at the firm level.

In their study of aggregate export, Shujiro and Misa (2010) examined the impacts of regional trade agreements covering the trade of 20 products among 67 countries during the period 1980–2006. They provided evidence that the remaining tariffs on imports from non-members would lead to trade diversion, while various factors, other than the reduction in tariff rates, would cause trade creation. Dai and Zylkin (2014) analyzed manufacturing trade data and FTAs for 64 countries from 1990 to 2002 and concluded that FTAs increase trade flows between member countries but reduce exports from non-participating countries. In contrast, Matto and Ruta (2017) exploited a database on the content of FTAs from 96 countries for the period 2002–2014 and found evidence of an increase in exporting from non-member countries. Conversely, Clausing (2001) suggested that Canada-US FTAs have a significant effect on the trade volume between the US and Canada but have little effect on trade with other countries. Similarly, Magee (2008) examined data on bilateral trade flows between 133 members of the WTO from 1980 to 1998 and found only limited evidence of trade diversion. The inconsistent findings of these studies provide evidence that the effect of tariff cuts on non-participating countries is not apparent empirically, particularly in the short term.

Regarding the export behavior of firms, most of the literature examined the impact of improved access to foreign markets through tariff cuts (or trade liberalization) on the export decisions of firms. Bernard et al. (2003), Lileeva and Trefler (2010), and Verhoogen (2008) found evidence that in the US, Canada, and Mexico, easing of tariffs increased the probability of being an exporter. Bustos (2011) demonstrated that a tariff reduction induced increased entry into the export market for upper-middle size Argentinian firms. A major advantage of firm-level analyses is that the effect of firm heterogeneity (in size and other characteristics) on firm behavior can be understood. However, to date, no study has examined the effect of tariff changes on firms' export behavior in non-participant countries.

Until now, few empirical studies have examined the impact of tariff hikes on non-participant countries' aggregate export and export behavior of firms in these countries. The tariffs imposed by the US on Chinese products during the US-China trade war provide a natural experiment for the evaluation of the trade diversion effect of tariff hike policy in third countries. Many studies, using a significant number of model-based methodologies, have found that the positive effects of trade diversion are not directly affected by trade disputes between the US and China for a number of third countries. Balistreri et al. (2018) applied a multi-regional and multi-sectoral general equilibrium simulation model and found that the US-China trade war harmed both the US and the Chinese economies but provided economic benefits for other countries and regions, particularly Europe. Bellora and Fontagne (2019), who used general equilibrium models, concluded that in the long run, the US-China tariff hikes benefitted several countries, such as Canada and Mexico, while hardly affecting Korea and Japan. Moreover, through an input-output gravity approach, Felbermayr and Steininger (2019), and Bolt et al. (2019), used the Euro Area and Global Economy model and found evidence suggesting that the US-China trade war was slightly favorable to Europe. Although numerous studies have conducted model-based analyses of the impact of the US-China trade war on third countries, few published empirical studies have examined the potential short-run trade diversion effects of the trade war on exports from and FDI to third countries.

3.2.2 Trade war and FDI

Research on FDI has a long history. Caves were first used to explain the emergence of FDI in 1971, arguing that there are two primary motivations for FDI: vertical and horizontal motivations. In vertical motivation, foreign firms exploit the host country's resources, such as technologies and affordable labor resources. Meanwhile, in horizontal motivation, FDI in the host country aims to distribute and sell products and extend the lifespan of the business cycle. Dunning (1977, 1981) introduced the "OLI framework," [6] which holds that FDI aims to leverage ownership, location, and internalization. Engagement in FDI is successful if all three advantages are leveraged. The ownership advantage asserts that firms are more likely to engage in FDI when their market power increases due to ownership of products or production processes to which other firms do not have access (such as patents, blueprints, and trade secrets). Leveraging location advantage, including low factor prices, cheaper transport costs, and low trade barriers in the host country, will increase the probability of FDI receipt. Finally, the internalization advantage enables multinational firms to grow in order to maintain their core competencies, such as knowledge assets. Although the OLI framework explains why FDI exists, it fails to explain the motivation behind the choice of location.

In recent years, an increasing number of studies have explained the existence of FDI further, for example, "export-platform FDI," introduced by Motta and Norman (1996)[7]. Export-platform FDI is characterized by establishing FDI and then exporting to

[6] "OLI framework" is also known as the eclectic paradigm.

[7] After Motta and Norman (1996), the term "export-platform FDI" was further developed by Greenaway and Kneller (2007), Ekholm, Forslid, and Markusen (2007), and Ito (2013).

third markets, rather than selling the final output in the home country or host country markets. Lower trade cost, due to factors such as the existence of a free trade agreement or a free trade zone in a host country, is the main reason for export-platform FDI (Oyamada, 2017), as by establishing FDI in host countries, firms can suppress trade costs and easily access destination markets (third countries). In that sense, export-platform FDI affords a good explanation for recent increases in inward FDI in many developing countries.

Although the literature on the theoretical model of export-platform FDI is well developed, little empirical evidence has been presented. The US-China trade war provides a unique opportunity to investigate whether an increase in trade cost in China (resulting from a tariff increase imposed by the US) led to an increase in inward FDI in other countries that can serve as an export platform to access the US market.

However, until now, few studies have investigated in detail the effect of the US-China trade war on FDI in the US, China, and third countries. The only study related to this topic is Blanchard et al. (2021), which analyzed project-level data on announced new green-field investments and found that the quantity of trade-exposed FDI projects in China was not affected after the trade war, while the figures in Mexico and India indicated a significant increase. Conversely, some South-East Asian countries experienced a negative, but not statistically significant, reduction in the number of FDI projects. However, that study had several limitations. First, it could only examine the impact of the trade war on the number of new FDI projects, not the actual value of FDI investment. Second, it only analyzed the impact on FDI projects at the aggregate level (two-digit ISIC industry code). Finally, the measure of the US-China trade war used in that study was only a dummy variable representing the post-2018 second half, which did not reflect the heterogeneity across industries in the US tariff increases on Chinese products. This study's scope surpasses firm behavior regarding FDI; it also examines foreign investment decisions, which contributes substantially to our understanding of the effect of the US-China trade war on third countries.

3.2.3 Export, FDI, and productivity

A growing body of literature is recognizing the relationship between export, FDI, and firm productivity. In theory, a two-way causal relationship between exporters and productivity indicates that exporters are more productive than non-exporters for two reasons. First, the learning-by-exporting hypothesis argues that firms are likely to learn and adopt more-advantageous technologies to compete in foreign markets. Grossman and Helpman's (1991) small economy model-based study and the heterogeneous firm model studies by Yeaple (2005) and Bustos (2011) explain that mechanism theoretically.

Second, the self-selection hypothesis explains reverse causation, where productivity growth drives exports, indicating that only more productive firms can pay the fixed cost of entry into the highly competitive export market, as discussed by Roberts and Tybout (1997), Melitz (2003), and Helpman et al. (2004).

Extensive empirical literature has investigated whether exports increase productivity. However, the findings are mixed, depending on the sample periods and the examined countries. Clerides et al. (1998) and Bernard and Jensen (1999, 2004) examined firms in Colombia, Mexico, Morocco, and the US and found that exporters have higher productivity than non-exporters do; the evidence found proved that productivity was higher before the firms entered the export market. These studies provide evidence that being an exporter does not affect firm productivity. Studies conducted in other countries, such as Bernard and Wagner (2001) in Germany and Baldwin and Gu (2003) in Canada, report similar findings. Conversely, Biesebroeck (2005) and De Loecker (2007) report that productivity in firms in Ivory Coast and Slovenia increased after the firms became exporters.

In addition to the relationship between exports and productivity, the relationship between FDI and productivity has recently been identified as important. In the theoretical literature, Helpman et al. (2004) incorporated FDI into a trade and firm heterogeneity model and predicted that FDI firms would perform better than domestic firms would, as entering the export market incurs sunk costs. Further, FDI firms are likely to overcome these sunk costs and access export markets easier compared to domestic-owned companies. However, empirical results on this topic are varied and often contradictory. Studies by Doms and Jensen (1998) in the US, Hallward-Driemeier et al. (2002) in Indonesia, Korea, Malaysia, the Philippines, and Thailand, and Kimura and Kiyota (2006) in Japan confirm that, compared to domestic firms, FDI firms have higher productivity. Aitken and Harrison (1999) studied panel data on Venezuelan companies and found evidence of a positive relationship between FDI and firm productivity, but only for small firms. By contrast, Globerman et al. (1994) and Barbosa et al. (2009) found no significant difference between the performance of domestic and foreign-owned firms.

3.3 Data and summary statistics

3.3.1 Vietnam enterprise survey

To analyze the impact of the trade war on firms, we employed three rounds of VES annually conducted by General Statistical Office, which covers firms across all industries. VES covers a population of state-owned companies, FDI companies, and registered companies with more than 100 employees. VES also includes a representative sample of smaller firms with less than 100 employees selected based on three levels of stratification[8]. Overall, the survey collected detailed information on more than 500,000 firms each year.

Three rounds of VES collected in 2017, 2018, and 2019 were employed as they provided detailed firm demographics and information on FDI and firms' export activities. For the pre-trade-war period, we used the 2017 wave, as the 2016 waves do not have firms' exportation. We also did not utilize data from 2020 onward to avoid the confounding effects of the pandemic. VES reports each firm's industry using a five-digit Vietnam Standard Industrial Classification[9] (VSIC). To merge VES with US tariff lines defined in each industry, we paired the three-digit VSIC with the equivalent three-digit ISIC[10].

Tax code was used to identify firms across different waves. We excluded observations with missing tax codes (991 observations, 0.035% of the sample), missing industry codes (1,100 observations, 0.039% of the sample), and negative values for total

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[8] Firms with less than 100 employees were selected through random sampling within three levels of stratification: four-digit industry, number of employees, and region. Please refer to the Appendix for a more detailed description of the VES data.

[9] The 2017 wave classified industries using the Vietnam Standard Industrial Classification 2007 (VSIC 2007), while the 2018 and 2019 waves employed Vietnam Standard Industrial Classification 2018 (VSIC 2018).

[10] As VSIC is based on ISIC, most industries could be easily matched without any modification. Appendix Table A.3.1 provides information on further concordance made in other cases.

sales or fixed assets (6,116 observations, 0.219% of the sample). We also eliminated outliers with main variable values[11] greater than eight standard deviations from the mean.

This study's main variables of interest included the amount of FDI and firms' export activities. We utilized information on total invested foreign direct capital reported in each fiscal year and the accumulated amount of foreign direct capital invested by the end of each fiscal year. We also identified exporters as firms who reported having made transactions with foreign partners and received positive amounts of revenue from these transactions.

[Table 3.1 to be Inserted Here]

Table 3.1 demonstrates some basic features related to FDI-receiving firms and export activities. The table highlights the role of FDI in exportation and employment among Vietnamese firms. Very few firms receive FDI; only 15,221 firms received FDI in 2017, accounting for 2.71% of all firms. The figure increased to 17,017 firms in 2019, while its share of all firms declined to 2.48%. However, this small number of FDI firms account for more than 50% of all exporters. Out of all exporters, the share of FDI firms slightly increased from 53.01% in 2017 to 54.96% in 2019. Further, more than 50% of export volume was attributed to FDI firms. Lastly, FDI firms employ a considerable share of workers in Vietnam's economy, with approximately 20% of total employed workers during our sample period.

[11] The main variables are sales, employment, spending on investment, total foreign direct investment, and total export value.

3.3.2 Continuing, new, and previous exporters in VES

Following Bustos (2011), we divided firms into four groups: continuing exporters, new exporters, previous exporters, and non-exporters. We first restricted the sample of firms to be those that appear in all waves and constructed panel data. Then, firms were categorized by their export activity in the previous and current fiscal years[12]. If firms were exporters in both years, they were identified as continuing exporters. If firms were exporters only in the previous (or current year), they were identified as previous exporters (or new exporters). Non-exporters are firms that did not export in both years.

[Table 3.2 to be Inserted Here]

Table 3.2 shows that the vast majority of firms (around 96% of all firms) in Vietnam are non-exporters. Notably, the number of previous exporters and new exporters is significant, implying a low survival rate of exporting firms despite the active flow of new exporters every year. Table 3.2 highlights an increase in the number of continuing exporters between 2018 and 2019 and a corresponding decline in the number of previous exporters in 2019 compared to 2018. For instance, the number of continuing exporters increased from 8,227 in 2018 to 9,198 in 2019, while previous exporters declined from 3,553 to 3,262.

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[12] During the 2017 wave, we employed the VES wave conducted in 2014 to identify firms' status as an exporter in the previous fiscal year, as the 2016 and 2015 waves do not contain information on firms' exportation.

[Table 3.3 to be Inserted Here]

In Table 3.3, we restricted the sample to large companies with more than 100 employees; this table features several differences. Approximately 60% of firms are non-exporters, as more than half of the exporters are these large firms with more than 100 employees. A much smaller share of new and previous exporters suggests that large firms are more likely to survive as exporters and stay longer in the global market.

3.2.3 Comparison of exporters and non-exporters by type of investment

[Table 3.4 to be Inserted Here]

This subsection compares FDI exporters, domestic exporters, and FDI non-exporters to domestic non-exporters. We defined domestic firms as firms that do not have any FDI as a source of finance. In Table 3.4, four performance indicators (sales, employment, fixed capital, and wage bill in a logarithm) are regressed on indicators of firm type as well as province and three-digit industry fixed effects. A domestic non-exporter whose indicator is not included as a regressor serves as a baseline group to compare estimated coefficients.

Table 3.4 clearly shows that exporters tend to have more outstanding sales and larger amount of fixed capital. FDI exporters and domestic exporters also hired more workers, and paid more, while post-estimation in regression (4) shows that compared to domestic exporters, FDI exporters pay even greater wage bills to workers. Specifically, domestic and FDI exporters have greater sales by 4.215 and 4.156 log points, respectively, compared to domestic non-exporters. Further, FDI non-exporters exhibit greater sales, employment opportunities, fixed capital, and wage bills. However, post-estimation shows that performance of these FDI non-exporters is significantly less than that of FDI exporters. The simple comparison presented in Table 3.4 suggests the importance of export activities on firms' performance and employment.

[Table 3.5 to be Inserted Here]

In Table 3.5, we further examined whether maintaining exporter status is an essential predictor of firm performance. Following Table 3.4, we regressed firms' performance indicators on indicators for a continuing exporter, new exporter, and previous exporter. We omitted the indicator for non-exporter, which serves as a baseline. Table 3.5 shows that continuing exporters have larger sales and fixed assets. They also hire more workers, thus paying more than non-exporters. Post-estimation in each regression highlights that continuing exporters are better than new and previous exporters. Notably, new exporters have significantly better figures than previous exporters in all indicators, suggesting that new and better exporters are replacing existing exporters.

3.4 Construction of weighted tariff difference for firm analysis

To understand the impacts of the US-China trade war on Vietnam's firms, we constructed an industry-level tariff measure that reflects both tariff increases against Chinese imports to the United States and its importance in the United States market. We first attached the three-digit ISIC industry code to each six-digit HTS defined by the

United States[13]. Then, a measure of weighted tariff in industry j in year t is defined as follows

$$\tau_{jt} = \sum_{k \in j} \Delta tariff_{kt} \times \omega_{jk} \qquad (1)$$

where $\Delta tariff_{kt}$ is annual differences in tariffs on products k imported from China and Vietnam to the United States. $\Delta tariff_{kt}$ is set as zero for the pre-trade-war period and for goods not targeted during the US-China trade war. Then, each tariff line is weighted by ω_{jk} , which is defined as the import share of product k from China to the United States before the trade war.

$$\omega_{jk} = \frac{V_{jk}^{C}}{V_j} \qquad (2)$$

where V_{jk}^{C} is the CIF value of the US imports[14] of ten-digit HTS product line k, within the three-digit ISIC industry code (j), from China in 2015[15]; and V_j is the total CIF

[13] We dropped the last four digits of the ten-digit HTS codes to get the six-digit HTS codes. Thereafter, we used the concordance table provided by the United Nations Statistics Division (UNSD) to convert the six-digit HTS codes to three-digit ISIC industry codes.

[14] The Cost, Insurance, and Freight (CIF) value indicates the value of goods imported, including cost, insurance, and freight but excluding duties.

[15] Our results are robust when using the CIF value of US imports in 2016, instead of that

value of the US imports in industry *j* from all countries[16]. The weight is constructed to capture the impact of the trade war in each industry (*j*) caused by a specific product that used to be imported from China (*k*). Then, this weighted tariff is summed over all the products in each three-digit industry codes.

The large unexpected wedges in tariffs on imported goods from the two countries are created by the economic conflict between the United States and China on the issue of trade deficit and intellectual property theft. Thus, the targeted products and the magnitude of tariff differences are not likely to be correlated with the demand for imported goods from Vietnam or supply-side changes in Vietnamese exporters. We also employed a pre-trade-war import share of each Chinese product out of all US imports as a weight to make sure exogeneity of our tariff difference measure.

The approach follows practices in empirical literature such as those by Bernard and Jensen (2004), DiNardo et al. (1996), and McCaig (2011). Summary statistics for the difference between US import tariffs on Vietnam and those on China during the trade war are shown in Appendix Table A.3.2. The average tariff difference was highest in manufacturing sectors. There is a large variation in the weighted tariff difference, both across and within major industry sectors. The variation within sectors was highest within manufacturing sectors, where the standard deviation of the tariff difference was 2.66% points in 2019. The largest tariff differences in 2018 were industry 302 (manufacture of railway locomotives and rolling stock), industry 271 (manufacture of electric motor), and

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of imports in 2015.

[16] The data for total US imports from all countries and from China in 2015 were downloaded from the US Census Bureau website.

industry 273 (manufacture of wiring and wiring devices), while in 2019, industry 142 (manufacture of articles of fur), industry 302, and industry 310 (manufacture of furniture) had the largest tariff difference.

3.5 The impact of the US-China trade war on export and FDI

3.5.1 The Emergence of continuing, new, and FDI exporters

In this subsection, we empirically examine the impact of the US-China trade war on the emergence of different types of exporters in Vietnam using the following linear probability model and a sample of firms in all industries, including the service sector[17].

$$Y_{ijt} = \alpha + \beta\tau_{jt} + \gamma_p + \theta_t + \varepsilon_{ijt} \qquad (3)$$

[17] VES 2017-2019 also includes companies in the public sector (11 companies) that belong to industry 841, 842, and 843 (public administration and defense; compulsory social security). There are 9,231 state-owned companies (0.49% of total firms) included in VES 2017-2019.

In this specification, Y_{ijt} is one of the five exporter indicators for firm i in industry j in year t: exporter, domestic exporter, FDI exporter, continuing exporter, and new exporter. Continuing and new exporters are the relative statuses of firms compared to the previous round of information, as defined in Tables 3.2 and 3.3. τ_{jt} is the weighted tariff differences defined as Equation (1) for each industry and year. The specification also includes the province γ_p , year θ_t, and industry μ_j fixed effects. The specification does not include the firm fixed effects that capture a new firm's entry into the industry as an exporter or existing firms' entry into the export market.

The province fixed effect is included to control any time-invariant province characteristics that may affect firms' activities within a province. The industry fixed effects capture all time-invariant features within each three-digit industry. Standard errors are clustered within a three-digit industry to account for heteroscedasticity and serial correlation in the error terms.

The key parameter of interest is the coefficient of the differences in weighted tariffs on imported goods from China and Vietnam. According to the literature, we hypothesize that, owing to better access to the international market, firms become initiating exporters. Therefore, we expect the coefficient of the weight tariff differences to be positive, implying that the US-China trade war allowed Vietnamese firms to replace Chinese firms in the US market.

[Table 3.6 to be Inserted Here]

Table 3.6 demonstrates the estimation of Equation (3) using the five outcome variables we described above. The regression (1) shows that the weighted differences in tariff increase firms' likelihood of being an exporter by 0.185. The estimated coefficient becomes 0.003 when multiplied by the mean weighted difference in the tariffs in the affected industry. It captures the magnitude of the effect that firms in the targeted industry would experience. The firms in the targeted industry are more likely to be an exporter by 0.3% points, and it is a sizable effect when to the mean of the dependent variable, 0.026. The expected effect slightly declines when multiplied by 0.019, one standard deviation of weighted tariffs across all industries.

Regressions (2) and (3) show that both domestic and FDI exporters increased in number because of the tariff differences. However, these newly emerged exporters are twice more likely to be FDI exporters (0.133) than domestic exporters (0.052). Regression (4) and (5) also highlight that the trade war hugely contributed to firms' increased likelihood of continuing exporters. Meanwhile, the likelihood of being a new exporter declined significantly.

[Table 3.7 to be Inserted Here]

The results presented in Table 3.6 largely remain robust when the sample is restricted to firms with more than 100 employees. The magnitude of estimated coefficients demonstrates that the increased probability of being an exporter (0.830 in regression (1)) is mainly driven by an increase in the emergence of FDI exporters (0.743 in regression (3)). For firms in the targeted industries, the probability of being an exporter, FDI exporter, and continuing exporter increased by 1.4, 1.3, and 2.5 percentage points.

The simple analyses presented in this subsection suggest that the US-China trade war led to Vietnamese firms' entry into the export market. The trade war allowed firms to stay longer in the market and induced the emergence of FDI-receiving exporters, especially among the large firms with more than 100 employees.

3.5.2 The impact of the US-China trade war on FDI and export

To corroborate the findings in subsection 3.5.1 further, we restricted the sample to firms appearing in all survey rounds (2017, 2018, and 2019) and employed firm fixed effects to capture firm heterogeneity, as in Equation (4). This approach makes it possible to examine the impacts of the trade war on existing firms not confounded with firms' entry and exit.

$$Y_{ijt} = \alpha + \beta\tau_{jt} + \gamma_p + \theta_t + \mu_j + \vartheta_i + \varepsilon_{ijt} \qquad (4)$$

Equation (4) is estimated for four outcome variables: exporter indicator, FDI-exporter indicator, log of FDI value, and log of export value. FDI is accumulated FDI capital invested by the end of each fiscal year, while export volume is the annual value of export reported by the firm. Both values are deflated by Producer Price Index (PPI)[18] at the two-digit industry level.

[Table 3.8 to be Inserted Here]

The estimates presented in regressions (1) and (2) in Table 3.8 are similar in

[18] In case PPI is not reported at the two-digit industry level, we employed PPI reported at the letter code of industry.

magnitude to those in regressions (1) and (3) in Table 3.6 without firm fixed effects. The similarity confirms that our tariff measure is not endogenous and not correlated with firms' unobserved characteristics. In addition, it implies that the trade war induced existing firms to be exporters, rather than inviting new exporters into the market. These existing firms also became exporters by receiving FDI. Specifically, firms are more likely to be exporters by 0.3% point and FDI exporters by 0.2% point. These are sizable effects considering the share of exporters before the trade war: only 2.24% in 2017.

In regressions (3) and (4), we further examined the impact of tariff differences on the amount of FDI and export volume. The estimated coefficients are all significant, and the magnitude is 0.007 for a log of FDI and 0.030 for a log of export volume when multiplied with mean weighted differences in tariffs in the targeted industry. The impact may appear small, as it implies, on average, a 0.7% increase in FDI and a 3% increase in export volume. However, these increases are driven by approximately 2.71% of FDI firms and 2.24% of exporters[19]. For FDI-receiving firms and exporters, the magnitude will be approximately 25.83% (=0.7%/0.0271) increase in FDI and 133.93% (=3%/0.0224) increase in export volume.

[Table 3.9 to be Inserted Here]

We further tested the estimation of Equation (4) on different samples: firms with more than 100 employees in Table 3.9, firms in the manufacturing sector with more than

[19] In Table 3.1, we reported the share of FDI firms and the share of exporter as 2.71% and 2.24%, respectively, in 2017.

100 employees in Table 3.10, and firms in the trading sector with more than 100 employees in Table 3.11. Table 3.9 exhibits larger coefficients, as the share of the exporter and FDI firms are higher in the sample. The main findings in Table 3.8 also largely remain robust in Table 3.10 and Table 3.11, despite a much smaller sample with less variation in the weighted tariff differences.

[Table 3.10 to be Inserted Here]

[Table 3.11 to be Inserted Here]

3.5.3 The impact of the US-China trade war by quartile of the firm size distribution

The results from the preceding section indicate the overall impact of the US-China trade war on Vietnamese firms' exportation. However, Vietnamese firms may respond differently to the increase in US import tariffs on China products. To explore this potential heterogeneity, we divided firms into four quartiles in each industry, using the firm's total number of employees at the end of 2017 relative to that of each three-digit ISIC as a proxy for initial firm size. We used the within-industry quartiles to accommodate differences across industries and ensure that each quartile contains firms across all industries. Then, we analyzed the effects of the US-China trade war on each quartile of the firm size distribution using the following equation:

$$Y_{ijt} = \alpha + \sum_{r=1}^{4} \beta_{jt}^{r}(\tau_{jt} * Q_{ij}^{r}) + \gamma_p + \theta_t + \mu_i + \varepsilon_{ijt} \qquad (5)$$

where r indexes each of the four quartiles of the size distribution and Q_{ij}^{r} are dummy variables taking the value of 1 when firm i belongs to quartile r. The specification is identical to Equation (4), except the quartile indicators, as it also includes province, year, and firm fixed effects. Error terms are clustered within each three-digit industry.

Estimation results are provided in Table 3.12. Overall, the US-China trade war influenced the performance of large firms substantially. The effect of increased differences between the US import tariffs on Vietnam and those on China on the probability of entering the export market and the export amount is around five times larger among the firms in the fourth quartile compared to smaller firms. The point estimates β_{jt}^{4} imply that an average of 1.5 percentage point increase in weighted difference in the tariffs will lead to a 0.687% (=0.458*1.5%) increase in the probability of entering the export market and an 8.235% (=5.49*1.5%) increase in export volume for firms in the fourth quartile. It also leads to a 0.38% (=0.253*1.5%) increase in the probability of being an FDI Exporter and a 0.876% (=0.584*1.5%) increase in the log of FDI for firms in the fourth quartile.

[Table 3.12 to be Inserted Here]

Tables 3.13 and 3.14 present the Equation (5) estimation but restrict the sample to firms in the manufacturing and trading sectors. The estimated coefficients are smaller than that in Table 3.12, but the results are similar: the estimations of β_{jt}^{r} are the largest in the fourth quartile and the only statistically significant. The effects of the US-China trade war on the rest of the quartiles are insignificant when we narrowed the sample to manufacturing and trading sectors. The results suggest that manufacturing and trading firms in the first, second, and third quartiles were not affected by the increase in US import tariffs on Chinese products.

[Table 3.13 to be Inserted Here]

[Table 3.14 to be Inserted Here]

3.6 The impact of export status on productivity using tariff difference as IV

3.6.1 Productivity estimation

To investigate the impact of exportation on firms' productivity, we used two measures of productivity: labor productivity and TFP. Labor productivity is measured as the total sale per worker, while TFP is obtained as the residual in the production function of the firm's inputs and productivity. Both measures have been widely used in the literature to examine the effect of trade policies on firms' productivity. Lileeva and Trefler (2010) and McCaig and Pavcnik (2018) used labor productivity while Amiti and Konings (2007) and De Loecker (2007) employed TFP measures in their studies.

To identify firms' productivity, we consider a firm with a Cobb-Douglas production function:

$$Y_{it} = A_{it} L_{it}^{\beta_l} K_{it}^{\beta_k} \qquad (6)$$

where output of firm i at time t, Y_{it}, is a function of labor $L_{it}^{\beta_l}$ and capital $K_{it}^{\beta_k}$. We are interested in assessing whether A_{it} − the TFP of firm i at time t—is a function of firms' exportation status. Taking the natural logs of Equation (6), we get Equation (7), whereby logarithms are denoted by small letters as follows.

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \epsilon_{it} \qquad (7)$$

The productivity of firms A_{it} is now included in the error term ϵ_{it}. To estimate Equation (7), we utilized the total sales at the firm level deflated by PPI, as the dependent variable. We used the total wage bill to employees and the value of a firm's fixed assets as variables for labor and capital inputs.

A great number of methodologies have been developed in the literature to estimate Equation (7) and acquire the unbiased estimates of TFP at the individual firm level. In this study, we applied two methods developed by Wooldridge (2009) and Ackerberg–Caves–Frazer (2015)[20]. These two recent methods have an essential advantage as they overcome the collinearity issue, whereby labor appears both as a free variable and in the nonparametric polynomial approximation. Both methods provide estimators of the log of

[20] Please refer to the Appendix for a more detailed description of the TFP estimation using the Wooldridge (2009) and Ackerberg–Caves–Frazer (2015) methods. We also estimated TFP using Olley and Pakes's (1996) as well as Levinsohn and Petrin's (2003) methods to test the robustness. The estimated results for the effect of the US-China trade war on Vietnamese firms' TFP, using these methods, are reported in Appendix Tables A.3.7 and A.3.8.

measured TFP at the firm level (tfp_{it}), defined as the difference between the observed output and the predicted output function using the estimated coefficients of the production function, as in Equation (8).

$$tfp_{it} = y_{it} - \widehat{\beta_l} l_{it} - \widehat{\beta_k} k_{it} \quad (8)$$

We used the logarithm of electricity bill[21] as a proxy for unobserved time-varying productivity shock to estimate TFP using the Wooldridge and ACF methods. In this part, we restricted the sample to firms with more than 100 employees, because majority of small firms do not report their electricity bills[22].

We estimated the production functions for firms in each two-digit industry separately[23]. The estimated production function results in Equation (7) using these above methods are reported in Appendix Table A.3.3. The OLS estimates are also included for comparison. In general, compared to those estimated using OLS, the labor coefficients are under estimated while the capital coefficients are over estimated. It confirms that OLS estimates of production function have simultaneous bias: companies with a large positive

[21] Total payment to electricity is deflated by PPI for electricity, gas, steam, and air conditioning supply industry (industry D).

[22] Only 37.13% of firms with less than 100 employees reported their electricity bills, while 93.69% of firms with more than 100 employees reported this information.

[23] There are 80 industries in total. The production function at the more disaggregated level cannot be estimated because the number of firm observations for these sectors was too small to allow for statistically sensible estimates.

productivity shock may respond using more input. The summary statistics of TFP estimations using Equation (8) and labor productivity are presented in Appendix Table A.3.4.

3.6.2 The impact of export status on productivity

The next step entails estimating the effect of export status on TFP, using the US-China trade war as instrument variable (IV). The effects of exportation on firms' TFP are difficult to estimate because of several endogeneity issues. The US-China trade war, measured as weighted tariffs in previous sections, is a strong predictor for firms' exportation. At the same time, it caused an unexpected random shock to Vietnamese firms, as tariff rates targeted Chinese products and were not directly related to the Vietnamese economy.

Our dependent variables are labor productivity and TFP. EX_{ijt} is the export status of firm i in industry j at time t. We separately estimated equations using different definitions of EX_{ijt}: exporter, domestic exporter, FDI exporter, and FDI non-exporter. We used weighted tariff differences τ_{jt} (as defined in Section 3.4) as instrument variable for EX_{ijt}. The province, industry, year, and firm fixed effect were employed. Based on these notations, we estimated the following two-stage least squares model:

$$productivity_{ijt} = \alpha EX_{ijt} + \delta_p + \lambda_j + \sigma_t + \upsilon_i + \epsilon_{ijt} \qquad (9)$$

$$EX_{ijt} = \beta \tau_{jt} + \gamma_p + \mu_j + \theta_t + \vartheta_i + \varepsilon_{ijt}$$

The estimates for labor productivity outcomes are provided in Table 3.15. The coefficient for Export is 1.48, which indicates that improved access to foreign markets raised the labor productivity of firms by 148% points. The coefficients for both domestic exporter and FDI exporter are positive, highlighting that being an exporter (either domestically or FDI financed) has significantly positive effects on firms' labor productivity. On average, being a domestic exporter increases firms' labor productivity by 314% points, while becoming FDI exporters increases firms' labor productivity by 280% points. Meanwhile, being an FDI non-exporter reduces firms' labor productivity.

[Table 3.15 to be Inserted Here]

Table 3.16 reports the estimation results of Equation (9) for TFP outcome using the Wooldridge and ACF methods. Similar to the results for labor productivity, the effect of Export status on TFP is statistically significant for both Wooldridge and ACF methods. Overall, the coefficients in the ACF method are slightly smaller compared to those in the Wooldridge method. As shown in Table 3.16, being an exporter has significantly positive effects on the firms' TFP. On average, entering foreign markets increases the firms' TFP by 203% points using the Wooldridge method and 180% points using the ACF method. This finding is consistent with previous empirical studies, which found a positive relationship between export status and firms' productivity (Clerides et al., 1998, Biesebroeck, 2005, and De Loecker, 2007).

Furthermore, being an FDI exporter has significantly positive effects on the firms' TFP, with the TFP estimated by Wooldridge and ACF methods increasing by 362% points and 319% points, respectively. Conversely, being domestic exporters has statistically significant on the TFP estimated using the Wooldridge method, but insignificant effects on TFP using ACF method. The reason is that the US-China trade war increases the probability of being a domestic exporter for a few firms. Therefore, the weighted tariff difference is a weak IV when examining the effect of being a domestic exporter on firms' TFP. However, the magnitude of the coefficients in both methods is similar, being domestic exporters increases Wooldridge's TFP by 463% points and ACF's TFP by 410% points. Notably, the productivity of domestic exported firms is slightly more than that of FDI exporters. Domestic firms are expected to receive technological information benefits after exporting, which improves their productivity. Meanwhile, FDI already has well-developed mechanisms for transferring technological information efficiently from one country to another before exporting (Caves, 1982; McFetridge and Corvari, 1986). Therefore, by entering export markets, FDI are less likely to improve the flow of information and receive fewer information benefits, ceteris paribus.

Conversely, being an FDI non-exporter reduces the firms' productivity estimated by Wooldridge and ACF methods by 349% points and 309% points, respectively.

[Table 3.16 to be Inserted Here]

3.6.3 The impact of export status on product shifting

The estimated results in the previous part show that export status significantly impacts Vietnamese firms' revenue productivity. The huge increase in productivity is probably due to (1) an increase in the unit price of affected goods; (2) an increase in export volume; (3) changing the firm main product in responding to the trade war. The first two reasons are already shown in Chapter 2: the US-China trade war increased export volume and unit price of those affected goods that Vietnam exports to the US. In this section, we will test whether the US-China trade war, though the export activity of firms, leads to product shifting by estimating the following Equation:

$$Y_{ijt} = \alpha EX_{ijt} + \delta_p + \lambda_j + \sigma_t + \upsilon_i + \epsilon_{ijt} \qquad (10)$$

$$EX_{ijt} = \beta\tau_{jt} + \gamma_p + \mu_j + \theta_t + \vartheta_i + \varepsilon_{ijt}$$

where Y_{ijt} is a dummy variable indicating whether firm i in industry j changes its main product or not. Y_{ijt} It takes a value of 1 if the firm changes its main product code (eight-digit) compared to the previous year. The province, industry, year, and firm fixed effect were employed. The estimated results are presented in Table 3.17. The coefficients for Exporter and FDI Exporter are statistically significant, indicating that being an exporter or FDI exporter increases the probability of changing the main product of firms. Meanwhile, the coefficients for Domestic Exporter and FDI Non-Exporter are insignificant, meaning that there is no evidence for the impact of Domestic Exporter and FDI Non-Exporter on the product shifting among firms. However, the third reason for the huge increase in revenue productivity still needs to be further explored in the future by using extensive datasets such as customs data with a unique firm ID or firm-level data matched with product data at the customs.

[Table 3.17 to be Inserted Here]

3.7 Conclusion

In recent years, there has been an increasing interest in the trade diversion effect of the tariff hikes policies on third countries. We investigated the effect of the 2018 US-China trade war on Vietnamese firms by using the heterogeneity in the US tariff increases on Chinese products across industries as well as the firm-level data from Vietnam. We provided empirical evidence that increasing the US tariff against Chinese products increased the probability of entering the export market among Vietnamese firms in the targeted industries. At the same time, our analysis highlights heterogeneous responses to the trade war. The effect of the US-China trade war on the probability of being an exporter and FDI exporter are more significant for big firms with higher numbers of employees.

Our results also relate to the literature that emphasizes the positive relationship between exporter and firm productivity (Yeaple, 2005; Bustos, 2011). We employed weighted tariff increases as the exogenous shock that induces firms to become exporters and estimated the effect of exportation on firm productivity. The instrument variable estimation shows that being an exporter increases firms' productivity: both labor productivity and TFP.

Given the continuous US-China trade war and the increasing availability of longer-term micro-survey data, we expect that studying the effect of the trade war on enterprises in third countries will continue to be a topic for future research. Future studies could assess the long-term effects of the US-China trade war on other outcomes of interest, such as firm technology investment and innovation. A deeper understanding of the 2018 US-China trade war will have several important implications for future practice, both in academic and policy research.

Chapter 4

The Impact of the US-China Trade War on Vietnam's Labor Market

4.1 Introduction

In developing countries, informal and uninsured workers account for a significant proportion of the workforce. According to Deléchat and Medina (2021), 60% of the world's population is employed in the informal sector, and it is most prevalent in emerging and developing countries. Informal and uninsured workers–often termed precarious workers or temporary workers–hold short-term labor contracts, do not have social insurance, and can be fired without notice. They work in inferior conditions with lower job "quality," have fewer training opportunities, receive lower wages, suffer from job insecurity, and exhibit lower productivity than permanently employed workers (De Cuyper et al., 2008; Booth et al., 2002; Gollin, 2002; Nataraj, 2011; Porta and Shleifer, 2008 and Tybout, 2000).

Although employment in the informal sector is often voluntary for people who value flexible and short work hours, it is often considered undesirable for several reasons. Precarious workers are the most vulnerable during economic downturns (Boeri, 2011). They are easy victims of unemployment and suffer considerable welfare losses (Lucas, 2007; Frey and Stutzer, 2002). Lowering employment protection for firms to hire temporary fixed-term workers could also increase worker turnover and unemployment spells (Blanchard and Landier, 2002).

Factors related to the size of informal employment across economies are relatively under investigated in the literature. Some global trends in developed countries (the United States, the United Kingdom, and Japan) show a steady increase in the share of informal employment (Organisation for Economic Co-operation and Development (OECD), 2002).

There are also huge disparities across economies; the average share of the informal economy of OECD countries out of GDP was around 15% from 2010 to 2017, while that of Sub-Saharan African countries was around 34% during the same period (Deléchat and Medina, 2021).

Studies have examined the effects of trade on the informality of the economy. The seminal paper by Goldberg and Pavcnik (2003) provided a theoretical framework in which trade affects the informal sector. Foreign competition caused by tariff cuts would lead to a decline in output price; when the firm is hit with such a negative shock and expects it to be permanent, firms will reallocate the workforce from formal to informal sectors due to high efficiency wages they need to pay to formal workers. The prediction was empirically tested and partially supported by Goldberg and Pavcnik (2003) and largely confirmed by Bosch et al. (2012), Acosta and Montes-Rojas (2014), and Arias et al. (2018) in the context of developing countries that experienced tariff cuts. As mentioned in Bosch et al. (2012), the estimated effect could be underestimated because the literature does not consider the impact of trade liberalization on the informal sector through input tariffs. Dix-Carneiro and Kovak (2017) also showed that the long-run impacts (20 years after the tariff changes) of such tariff cuts on labor reallocation could be much larger than what we observe in the short run.

This chapter examines the impact of US–China trade war on Vietnam's informality. The US–China trade war is a unique trade shock that has not been utilized in the literature for its effects on a third-party country's informality. The US–China trade war has been a series of import tariff increases against each other's products since 2018. Utilizing US–China trade as a trade shock in our empirical strategy provides several advantages. The trade shock is plausibly exogenous as tariffs increase during the trade war targeting either China or the United States and has no systematic relationship with Vietnam's industry or labor market structures. However, as shown in Chapter 1, the war significantly expanded Vietnam's relative access to the US market and increased the price of Vietnam's exports to the United States. The differences in tariffs reflect the relative gain of Vietnam's access to the US market and have no impact on the price of intermediate goods imported into Vietnam.

A study of the impact of trade shocks on Vietnam's labor market is significant for several reasons. Vietnam is a fast-growing economy, especially in terms of its involvement in global trade and supply chains. Vietnam's export value increased by approximately 15 times from 2000 to 2017. The share of trade out of GDP increased from less than 100% in 2000 to 200% in 2017; however, most employment remained in informal contracts and was uninsured.

This chapter utilizes the nationally representative Vietnam Labor Force Survey data from 2017 to 2019. The data contain comprehensive information on individuals and workers in all industries such as labor contracts, employment status, and social insurance coverage. This chapter utilizes US tariff differences against China and Vietnam products calculated at the three-digit industry level as a measure of a positive trade shock. It then examines how tariff changes affect individual workers' probability of being hired as informal or uninsured workers. The size and information of the data also allow us to investigate the heterogeneity in the effects of trade shocks on workers.

To preview the results, we first show that the US–China trade war positively affected employment in industries that experienced a larger advantage in tariffs. Economy-wide, this effect is driven mainly by the reallocation between industries rather than within industries. However, when the agricultural sector is excluded, we show that reallocation within industries is the primary source of the observed changes. We then show that workers in an industry that experienced a greater advantage in tariffs relative to China were less likely to be hired as informal or uninsured workers. The estimated magnitudes imply that, for workers in the affected industry, the probability of being an informal worker on average declined by 0.519 percentage points, while that of being uninsured workers decreased by 0.57 percentage points. We provide several robustness and falsification tests to ensure that the estimation results do not capture the confounding effects or outliers.

This chapter contributes to the rapidly developing literature on the effect of the US–China trade war. Although extensive literature has provided evidence of the negative effects of the trade war on both the United States and China (Bollen and Rojas-Romagosa, 2018, Guo et al., 2019, Fajgelbaum et al., 2020), there has been little discussion about the impacts of the trade war on third countries affected through the global supply chain. To the best of our knowledge, the empirical evidence in this chapter is among the very few studies that have investigated the effects of the US–China trade war on the third country's labor market.

This chapter is related to the literature that highlights the role of demand-side factors in resource allocation across formal and informal sectors. McCaig and Pavcnik (2018) showed that the US–Vietnam Bilateral Trade Agreement in 2001 increased the formal sector by five percentage points. The empirical findings support the importance of the positive demand shock, which the literature has not paid much attention to previously. Furthermore, Ono and Sullivan (2006) showed that output uncertainty caused by demand fluctuation is positively associated with the hiring of temporary workers.

In addition, this chapter relates to the literature on the formalization or reallocation of resources from informal to formal sectors in developing countries. Evidence on the economy-wide movement of individuals from the informal sector in the context of developing economies is scarce. Evidence in the literature largely supports dual models of informality (La Porta and Shleifer, 2014) while government intervention to encourage firms' formalization has largely no impact (de Mel et al., 2013; de Andrade et al., 2016). The empirical evidence in this chapter is the most consistent finding reported by McCaig and Pavcnik (2015) that the expansion of exports is a driving force behind the fast transition to the formal sector in Vietnam.

The remainder of this paper is organized as follows. Section 4.2 discusses the conceptual framework related to trade shocks and labor market informality. The detailed definitions of informal and uninsured workers are described in Section 4.3. Section 4.4 discusses the data and summarizes the statistics. Sections 4.5 and 4.6 present the main empirical results and several robustness checks. Section 4.7 focuses on the heterogeneity in worker responses to the US–China trade war. Section 4.8 presents the conclusions and suggests directions for future studies.

4.2 Conceptual Framework

Several decades of research have not led to a consensus on the definition or characteristics of the informal sector. In this section, we describe a conceptual framework largely based on Goldberg and Pavcnik (2003) to understand the US–China trade war on Vietnam's informality. Saint-Paul (1996) and Goldberg and Pavcnik (2003) conceptualized the distinctive differences between informal and formal workers. The employment of formal workers is regulated by labor regulations and laws. Therefore, firms provide more benefits to formal workers, but it is difficult to fire them, as firms need to provide justifications to meet the standard dictated by unjust dismissal legislation. Thus, the cost of monitoring is higher for formal workers than for informal workers. Consequently, firms monitor only informal workers and pay reservation wages based on perfectly monitored productivity. On the contrary, firms offer efficient wages to formal employees to prevent shirking. The important implication of this framework is that formal workers incur higher adjustment costs.

Due to the above difference between formal and informal workers, Goldberg and Pavcnik (2003) showed that in equilibrium, firms hire or fire informal workers first when there is a temporary demand shock. This prediction is confirmed by Houseman (2001), who showed that companies reportedly use temporary workers to meet their fluctuations in demand in the United States. Ono and Sullivan (2006) suggested that firms would hire more temporary workers when their output is expected to fall. Plants facing a high degree of output demand uncertainty also tend to utilize informal workers as a buffer against employment fluctuations.

By contrast, firms fire or hire formal workers in response to permanent demand shocks (Goldberg and Pavcnik, 2003). For example, trade liberalization leads to lower prices due to foreign competition. The increased probability of being fired encourages formal workers to shirk, eventually leading to an increased cost of hiring formal workers. Therefore, firms reduce their share of formal workers while maintaining informal workers. The positive demand shock will result in the opposite outcome in equilibrium: the reallocation of workers from the informal to the formal sector. This prediction was largely supported by Bosch et al. (2012), Acosta and Montes-Rojas (2014), and Arias et al. (2018). Alemán-Castilla (2006) also showed that the elimination of import tariffs due to North

American Free Trade Agreement could lead to an increase in the formality of profitable firms, as less productive firms exit the market.

Based on Godlberg and Pavcnik's (2003) predictions, we can test the way Vietnamese firms interpreted the US–China trade war. If firms understand the relative gain in the US market as a positive but temporary demand shock, they would increase the number of temporary workers. Furthermore, if firms consider the US–China trade war as an export opportunity equivalent to the permanent demand shock, this would increase the hiring of formal workers. This chapter aims to understand not only the effects of the US–China trade war on Vietnam's labor market but also how Vietnamese firms perceive the shock by observing the way they responded based on the conceptual framework discussed in this section.

4.3 Definition of Informal Workers and Uninsured Worker

Vietnam has two types of social security systems: compulsory and voluntary. Until 2018, the 2006 Law of Social Insurance regulated compulsory social insurance for all employed individuals in Vietnam, with labor contracts longer than three months. From 2018 to date, according to the 2014 Law of Social Insurance, which came into effect in January 2018, workers with labor contracts one to three months in length are also required to participate in social insurance. However, the Vietnamese government still faces issues and difficulties in enforcing compulsory insurance. The proportion of people who have compulsory social insurance by law but do not have insurance remains high in Vietnam. In 2017, around 12% of people had more than three months of labor contracts, but did not have compulsory social insurance. The proportion of eligible workers without insurance decreased slightly to 11.75% in 2019.

The high cost of social contributions, along with increases in the minimum wage, is a critical impediment to enrollment in social insurance in many enterprises, particularly small firms. The social contribution rate increased by 1.5 times of 10 years, from 22% in 2006 to 32.5% in 2016, which is higher than that in most East Asian countries (Schmillen and Packard, 2016). In theory, both employers (22%) and employees (10.5%) pay social contributions, but ultimately, firms bear the total labor cost. Therefore, around one-third of small and medium firms with less than 100 employees did not participate in the social system in 2017, according to the Vietnam Enterprise Survey (VES) 2017.

Workers in other categories who cannot participate in compulsory social insurance are entitled to participate in the voluntary social insurance system. The rate of social contribution to voluntary social insurance is approximately 22% of the employee's salary, paid entirely by the employee.

Both compulsory and voluntary social insurance systems are managed by the Viet Nam Social Insurance Agency (VSI); both provide coverage for sickness, maternity, occupational diseases, and accidents, as well as retirement and death. In this study, we examined worker participation in social insurance (compulsory or voluntary) by examining responses to one question in the Vietnam Labor Force Survey (LFS): "Do you subscribe to social insurance?"

The distinction between informal and formal workers varies by country and across the literature. La Porta and Shleiffer (2008) defined informal workers in 13 developing countries (Bangladesh, Brazil, Cambodia, Cape Verde, Guatemala, India, Indonesia, Kenya, Niger, Pakistan, Senegal, Tanzania, and Uganda) via the formality of the company where the employee works: informal employees work in unregistered companies such as household businesses. A study in South Asia by Artuc et al. (2019) defined formal status based on the nature of workers' employment: unpaid family workers, own-accounts, or casual workers are classified as informal workers.

According to the law and statistical system, Vietnam has five categories of businesses: state-owned enterprises (SOEs), private domestic companies, foreign-invested companies, cooperatives, and household businesses. The General Statistics Office of Vietnam (GSO) defines the informal sector as all private companies in the non-agricultural sector that produce products and services for sale but do not have a business license (business registration). In other words, informal workers are those who work in unregistered enterprises. Although this definition provides a uniform foundation for measuring and analyzing the informal sector, it ignores the role of employees in the agricultural sector, which accounts for the majority of employees in Vietnam. McCaig and Pavcnik (2018) classified informal employees as those who work for a household business, whereas formal workers work for a registered enterprise, including state, collective, foreign, and domestic private. However, beginning in 2015, all household businesses, except street vendors and other low-income businesses, had to register their businesses with the People's Committee at the district level, and they had to register tax codes (Decree No. 78/2015/ND-CP on business registration). Consequently, the definition of McCaig and Pavcnik appears to be inappropriate in Vietnam after 2015.

This study adopts the International Labor Organization (ILO) definition: an informal worker is one who (i) has a labor contract of less than three months or (ii) does not have compulsory social insurance. Based on this definition, unpaid family workers are informal workers, while own-account workers and casual workers are informal if they do not have labor contracts longer than three months or do not have compulsory social insurance. This means that even workers in registered companies could be informal workers if they have short-term labor contracts or do not have social insurance. The ILO (2016) recommends this definition of informal workers for the Vietnamese situation. Although the Law of Social Insurance 2014 has been amended to be consistent across the study and to eliminate any effect of such changes on the reallocation of informal and formal worker status, this study adopts the 2016 ILO definition of informal workers.

4.4 Data and Summary Statistics

4.4.1 Vietnam Labor Force Survey

For household-level data, we used three waves from the Vietnam Labor Force Survey (LFS) collected in 2017, 2018, and 2019. LFS datasets have been collected annually since 2007 by the GSO. LFS is representative at the provincial level; information was collected through face-to-face interviews with household heads and household members. It includes demographic information on education, occupation, and other employment variables.

This study examines employed individuals, aged 20 to 64, in their main job (the most time-consuming job)[24][25]. Several variables reflecting individuals' demographic, educational, and employment characteristics and geographic location were created. They included gender, age, highest level of completed education, experience, urban-rural residence, province, and industry affiliation. Appendix Table 4.A.1 provides summary statistics for all variables employed in this study for 1,254,954 workers.

LFS reports the employment industry at the four-digit Vietnam Standard Industrial Classification (VSIC) version[26]. The three-digit VSIC was converted to three-digit ISIC. The VSIC three-digit code perfectly matches the ISIC three-digit code in most industries. The sample covers 237 three-digit industries, 90 of which are in the trade

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[24] For each individual in the LFS, the dataset collects information on whether the individual is employed, unable to find work or out of the labor force, or aboard. Employed individuals include those who are working as employees, as well as family workers (paid or unpaid) and self-employed. Unemployment and out of the labor force is very infrequent in this dataset. For instance, in 2019, among individuals aged 20 to 64 years, 87.01% reported working, while only 12.99% reported being unable to find job or out of the labor force.

[25] Among employees aged 20 to 64 years in LFS 2019, only 15.7% reported working more than one job. Among these individuals, the average hours worked per week was 27.42 and 14.96 hours in their primary and others jobs, respectively, as compared to 40.08 hours for workers who reported working only one job.

[26] The survey in 2017 and 2018 classified industries using Vietnam Standard Industry Code 2007 (VSIC 2007), while Vietnam Standard Industry Code 2018 (VSIC 2018) is used in LFS 2019.

sector. The employment industry links individual-level data to industry-level US import tariff differences between Vietnam and China.

The main variables of interest are constructed as dummy variables for informal workers and uninsured workers. The dummy variable for informal workers indicates whether a worker's employment status is formal or informal. Three survey questions are used to determine whether a worker is informal through two characteristics of informal workers: (i) has less than a three-month labor contract or (ii) does not have compulsory social insurance. The indicator takes a value of 1 if the worker is informal and 0 otherwise. Another main variable is a dummy variable for uninsured workers, which indicates whether workers have insurance (compulsory social insurance or voluntary insurance) or not. The indicator takes a value of 1 if the worker does not have insurance and 0 otherwise.

4.4.2 Aggregate Trends Informal Employment and Uninsured Employment in Vietnam

Table 4.1 presents an overview of the share of informal and insured workers in Vietnam's workforce. Panel A of Table 4.1 shows that Vietnam is a developing country with a large share of its working population in the informal sector, accounting for 78% of the total employment in all industries in 2017. In 2017, nearly half of the informal workers were individuals working in agriculture and aquaculture. In the non-agricultural sector, 64% of individuals are informal workers, mainly working in construction, retail, transportation, and food and beverage service activities.

[Table 4.1 to be Inserted Here]

Regarding insured and uninsured workers, Panel B of Table 4.1 shows that 77% of total employment in all industries in 2017 were uninsured workers; this figure decreased slightly to 72% in 2019. The trading sector had an even higher proportion of uninsured workers (81% in 2017 and 74% in 2019). In 2017, uninsured workers in the trading sector accounted for 58.07% of the total uninsured workers in Vietnam. Figures 4.1 and 4.2 show that the wholesale and retail trade industry experienced a significant decrease in the share of informal workers and uninsured employees along with mining, manufacturing, administrative service, and real estate industries. Overall, industries with a larger proportion of uninsured workers also have a larger share of informal employees.

[Figure 4.1 to be Inserted Here]

[Figure 4.2 to be Inserted Here]

Table 4.2 presents a statistical summary of several worker-related characteristics and outcomes of informal and formal workers. To begin with, on average, informal workers have a lower education level than formal workers during the period from 2017 to 2019. The average number of schooling years for informal and formal workers are 7.38 and 12.39 years, respectively. Moreover, hourly income is lower for informal workers. In the non-agricultural sector, for instance, informal workers earn approximately 22% less per hour than formal workers working in the same industry and province. These characteristics of informal workers in Vietnam are consistent with the literature on informality and earnings (Marcouiller, Ruiz de Castilla, and Woodruff 1997; Goldberg and Pavcnick 2003).

[Table 4.2 to be Inserted Here]

Table 4.2 also shows that informal workers across all industries work an average of 13% less per week than formal workers in their primary jobs and are more likely to have a second job. In terms of the average number of working hours per worker (including all jobs), informal workers work an average of 7.53% fewer than formal workers. As informal workers have short-term labor contracts, they have less stable employment and are thus more concerned about work precarity than formal workers with labor contracts of more than three months.

[Table 4.3 to be Inserted Here]

Table 4.3 provides a statistical summary of several worker-related characteristics and outcomes for insured and uninsured employees. Overall, insured employees have more years of education and a higher income than uninsured employees do. During 2018 and 2019, the average schooling years for insured and uninsured workers were 12.37 and 7.31 years, respectively. In addition, insured employees earn about 1.6 times more than uninsured workers working in the same industry and province. This income gap is slightly narrower in the non-agricultural sectors, where workers with social insurance earn 1.3 times more than those without insurance. Similar to informal workers, uninsured workers work fewer hours than insured workers in their primary jobs and are more likely to have second jobs. Overall, the average number of working hours per week per worker for insured workers was 1.16 times higher than for uninsured workers. The difference in average primary job working hours between insured and uninsured workers increases in the trading sectors (14.13 hours). In non-agricultural sectors, uninsured workers work more than insured workers by approximately 0.51 hours. Furthermore, only 5% of insured workers had a second job, whereas 23% of uninsured workers had more than one job.

4.5 Impacts of the US–China Trade war on Vietnam's labor market

4.5.1 Impacts of the US–China Trade war on Industry Employment

We analyze the extensive margin effect of the US–China trade war on industry employment. We examine the effect of the weighted tariff difference on the structure of employment across industries by estimating the following model:

$$s_{jt} = \beta\, \tau_{jt} + \theta_t + \mu_j + \varepsilon_{jt} \qquad (1)$$

where s_{jt} is the share of employment in industry j at time t in the total employment. τ_{jt} is the weighted difference between US import tariffs on Vietnam and China in industry j at time t (see Sections 3.4 and Appendix Table 4.A.2 for more details). The specification also includes industry μ_j and time θ_t as fixed effects. Panel A of Table 4.4 shows the results of estimating Equation (1) using LFS data, with an industry's employment share in total employment as a dependent variable. Surprisingly, the magnitude of the coefficients of the weighted tariff difference is negligible and statistically insignificant for all industries and trading sectors. These results show no evidence of changes in total industry employment in response to the increase in US import tariffs on Chinese products. These results are consistent with the findings of Feliciano (2001) for Mexico and Goldberg and Pavcnik (2004) for Columbia, who showed no link between changes in total industrial employment and changes in import tariffs.

[Table 4.4 to be Inserted Here]

Furthermore, we estimate Equation (1) using VES data, which cover registered firms in the enterprise sector, the sector most directly impacted by export trade policies. Panel B in Table 4.4 presents the results. The positive and significant coefficients of the weighted tariff difference demonstrate that the employment structure across industries is shifting toward industries that experienced a higher difference in US import tariffs on Vietnamese and Chinese products in the enterprise sector. The magnitude of the coefficient (0.007) suggests that, on average, the US–China trade war increases the share of industry employment in the affected industry by 0.01 (0.007=*1.39) percentage points. Moreover, the magnitude of the coefficients in Panel B is larger than the corresponding coefficients obtained for the overall industry employment in Panel A, indicating an extensive margin effect of the US–China trade war on the shifting employment in industries among employers in the enterprise sector, but not overall. These results are consistent with the existing literature from Bernard, Redding, and Schott (2007) and McCaig and Pavcnik (2018), as registered firms in the enterprise sector benefit more directly from positive changes in trade policies.

4.5.2 Decomposing changes in employment

Existing literature emphasizes that trade can influence employment composition through the reallocation of different types of employment across employers within and between industries. Thus, we further examined whether the extensive margin effect in the previous part stems from changes in the structure of informal-formal employment (and insured-uninsured employment) across industries or from within-industry reallocation of workers. We decomposed the change in the share of informal workers (uninsured workers) in total employment between 2017 and 2019, denoted by ΔH_t into within- and between-industry shifts by estimating the following equation:

$$\Delta H_t = H_t - H_{t-1} = \sum_j \Delta h_{jt} s_j + \sum_j \Delta s_{jt} h_j \qquad (2)$$

where h_{jt} is the share of informal (uninsured) workers in total employment in industry j, s_{jt} is the share of industry j's employment in total employment at time t. $s_j = 0.5(s_{jt} + s_{jt-1})$ and $h_j = 0.5(h_{jt} + h_{jt-1})$. The first summation term represents the mobility of workers across employers in an industry, whereas the second summation term represents the prevalence of workers' mobility across industries. The decomposition results are listed in Table 4.5. According to the results in Panel A of Table 4.5, overall, the decline in the aggregate share of informal workers is mainly driven by between-industry allocation, accounting for 64.86%. This between-industry allocation reflects the relative contraction of informal employment in agriculture and aquaculture, where more than 90% of the workers are informal. The contribution of the within-industry channel increases from 35.14 to 80% when agriculture and fisheries are excluded.

[Table 4.5 to be Inserted Here]

Similar results were found for the reallocation of insured and uninsured workers. According to the results in Panel B of Table 4.5, between-industry allocation contributes approximately 60% of the decrease in the aggregate share of uninsured workers. The contribution of this channel decreased to approximately 20% in the non-agricultural sector. The results of decomposing changes in the share of both informal and uninsured workers show that between-industry allocation could have driven the extensive margin effect of the US–China trade war in Section 4.5.1. Thus, these aggregate trends motivate our empirical examination of the impact of the US–China trade war on informal and uninsured employees.

4.5.3 Impact of the US–China Trade war on Informal and Uninsured Workers

The US tariff increases on Chinese exports varied across industries, and this heterogeneity is used to examine the impact of the US–China trade war on the reallocation of workers from informal to formal sectors and the reallocation from uninsured to insured employment. This study considers two main outcome variables: the probability that a worker is informal and the probability that a worker is uninsured. The methodology is based on a comparison of the probability of working as an informal worker (or uninsured worker) before and after the US–China trade war across industries differentially exposed to US tariff increases. Therefore, the linear probability model is estimated as

$$H_{ijt} = X_{ijt}\,\delta + \beta\,\tau_{jt} + \gamma_p + \theta_t + \mu_j + \varepsilon_{ijt} \qquad (3)$$

where H_{ijt} is the main outcome variable, which is an informal worker or an uninsured worker. An informal worker is an indicator of whether worker i employed in industry j at time t is an informal worker, while an uninsured worker is an indicator of whether worker i employed in industry j at time t has social insurance. X_{ijt} is a vector of worker characteristics (including experience, experience squared, sex, schooling years, and an indicator of whether a person lives in an urban area). τ_{jt} is the weighted difference between the US import tariffs on Vietnam and those on China in industry j at time t. The specification also includes province γ_p , industry μ_j , and time θ_t fixed effect. The main parameter of interest is the coefficient of the tariff difference between US import tariffs on Vietnam and China. For the informal outcome variable, a negative coefficient implies that an increase in US tariffs on Chinese exports will decrease the probability of working as an informal worker in Vietnam. Moreover, for the uninsured outcome variable, a negative coefficient indicates a decrease in the probability of working as an insured worker in the industry affected by the US–China trade war.

Standard errors are clustered by three-digit industry to account for heteroscedasticity and serial correlation in the error term within an industry. In addition, the province fixed effect is used to control for any time-invariant province characteristics that may affect the allocation of workers between informal and formal employees in a province. The industry fixed effect controls for all time-invariant features of the industry that are correlated with labor market conditions. In model (3), the coefficient of tariff difference between US import tariffs on Vietnam and those in China is identified by comparing the effect of the tariff difference on individuals with the same observable characteristics within a province but working in industries with different levels of tariff difference.

[Table 4.6 to be Inserted Here]

Table 4.6 presents primary regression results for Equation (3) for informal worker outcomes. Column 1 displays the estimation results using Equation (3) for all industries, including non-traded industries. The non-traded sector was not directly affected by the increased tariff difference resulting from the trade war. The estimated coefficient of the tariff difference in all industries is negative and significant. We find that employees working in industries with greater differences between US import tariffs on Vietnam and those in China experienced larger decreases in the probability of being informal workers relative to equivalent employees in industries with a smaller tariff difference. The magnitude of the coefficient (0.706) suggests that, on average, an industry that experienced an average increase in weighted tariff difference, 0.735 percentage points, saw the probability of a worker working as an informal worker fall by 0.519 (=0.706*0.735) percentage points relative to industries facing no tariff difference. Columns 2 and 3 present estimates of Equation (1) for employees in the non-agricultural and trading sectors. The coefficients continue to be statistically significant, and the magnitudes change slightly to 0.672 and 0.804 for the nonagricultural and trading sectors, respectively. The coefficients suggest that an industry in the non-agricultural sector with an average increase in weighted tariff difference is associated with a 1.13 (=0.672*1.68) percentage point reduction in the probability of a worker being employed in the informal sector. For trading sectors directly affected by the US–China trade war, the average increase in the weighted tariff difference of 0.72 percentage points is associated with a 0.58 (=0.804*0.72) reduction in the probability of working as informal.

[Table 4.7 to be Inserted Here]

Table 4.7 provides the regression results for the effect of the US–China trade war on the probability of a worker without insurance in Vietnam. The estimated results for all industries, non-agriculture, and trading sectors are displayed in Columns 1, 2, and 3, respectively. The estimated coefficients of tariff difference are negative and statistically significant. They reveal that employees working in an industry with a greater weighted tariff difference tend to have a lower chance of being uninsured than their counterparts working in industries with smaller tariff differences. For all industries, including non-traded sectors, an industry with an average increase in the weighted tariff difference will be associated with a 0.573 (=0.780*0.735) percentage point decrease in the probability of a worker being an uninsured employee. The magnitude of that impact increased slightly to 1.22 (=0.724*1.68) and 0.66 (=0.923*0.72) percentage points for the non-agriculture and trading sectors, respectively, which were directly impacted by increased US import tariffs on China.

It is important to note that our estimates reflect short-run responses and that, as a result, the results may underestimate the long-term effect of the trade war on the probability of a worker being an informal worker (or uninsured worker) in Vietnam, as, in the long term, there would be more time for labor market adjustment.

The results presented in Tables 4.6 and 4.7 are also robust because of the exclusion of some industries affected by other Trump policies in 2018, including the imposition of tariff increases on solar panels, washing machines, aluminum, iron, and steel. We report the robustness regression results in Appendix Tables 4.A.3 and 4.A.4; the estimated coefficients are still negative and statistically significant, and remain consistent with the results in Tables 4.6 and 4.7. Moreover, one may worry that although the US–China trade war started in 2018, investors and firms may have some predictions about the US tariff increases on Chinese products in 2017 and started to respond. Thus, we use LFS 2016 instead of LFS 2017 to run robustness regressions and report the estimated results in

Appendix Tables 4.A.5 and 4.A.6. The coefficients are negative, statistically significant, and consistent with those in Tables 4.6 and 4.7.

4.5.4 Impact of the US-China trade war on the income of workers in Vietnam

A possible concern is that the reallocation of workers may affect worker income: when workers move from informal to formal sectors (or from uninsured to insured employment) as a result of the US–China trade war, they experience a decrease (increase) in income. This section presents an analysis of the effect of the trade war on worker income conditional on employment status. Therefore, we estimate the following model:

$$\log\,(income)_{ijt} = \beta\,\tau_{jt} + X_{ijt}\,\delta + \gamma_p + \theta_t + \mu_j + \varepsilon_{ijt} \quad (4)$$

where $\log\,(income)_{ijt}$ is the logarithm of the total income per hour earned by workers in industry j at time t. The LFS collected worker income[27] data for the previous month through interviews. However, for the number of working hours, the LFS does not report the actual number of working hours for the previous month; instead, it reports only the usual number of working hours for any given week and the actual number of working hours for the previous week[28]. Thus, this study uses the usual number of working hours

[27] Worker income is the total income, including wage, overtime income and all kinds of benefits that workers received in the month prior to the interview. LFS data do not provide the information about wage of employees.

[28] The actual number of working hours is the number of hours that workers actually worked in the previous week. It includes overtime working hours, but excluding the hours

per week to construct monthly working hours and simply divides the total income received by the corresponding usual number of hours worked. For comparability of income, we use consumer price indices in our calculation of real income in the 2016 Vietnamese Dong values.

[Table 4.8 to be Inserted Here]

Panel A of Table 4.8 presents the estimated results for Equation (4) for informal workers only, whereas Panel B provides the results for uninsured workers. In both cases, the estimated coefficients of the weighted tariff differences are insignificant. These insignificant coefficients imply that there is no evidence that the change in worker income resulting from the trade war tariff increase depends on the worker employment status. In other words, the reallocation from informal to formal employment (or from uninsured to insured employment) due to the trade war does not alter worker income.

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that workers did not work but still received payment for. Meanwhile, the usual number of working hours is the average number of hours per week that workers actually worked in the last four weeks (or in the previous month). It is self-estimated by the interviewee and includes the hours that workers did not work but still received payment for, and excludes overtime working hours. In 2019, among working individuals aged 20 to 64 years, the average usual hours worked per week was 43.1, while the average actual worked hours per week was 38.1. Only 1.69% workers reported higher actual working hours, compared to usual working hours.

4.6 Robustness Check

4.6.1 Robustness test: Placebo testing for the pre-trade war period

A falsification test using three rounds of data covering the pre-reform period found no evidence of a correlation between an increase in the difference between US import tariffs on Vietnam and China and preexisting trends in informal workers and insured workers across industries. We performed this test using LFS data for 2014[29], 2016, and 2017 and assigned pre-trade war tariff differences (0) to 2014 data and post-trade war tariff differences in 2018–2019 to 2016–2017 data. Equation (3) is estimated using the datasets with an indicator for informal and uninsured workers as the dependent variable. If pre-existing trends in informal workers or uninsured workers were correlated with industry-specific tariff differences between US import tariffs on Vietnam and China, the estimated tariff difference coefficients in this specification would have the same signs and magnitudes as those of the coefficients obtained in the corresponding analysis based on data reflecting the actual policy change (as in Tables 4.6 and 4.7). The results of the falsification tests are presented in Table 4.9.

[Table 4.9 to be Inserted Here]

[29] We used the data in 2014 for placebo test, instead of data in 2015 since our weighted tariff differences were constructed by using the US trade data in 2015 (which also included the Vietnam export to US in 2015) as the weight. Moreover, whether an industry is trading or non-trading sector is classified based on the Vietnam export data in 2015. Thus, using the 2015 data may give us the biased estimations.

The estimated coefficients of the tariff difference for both informal and uninsured workers' outcomes are always statistically insignificant. They differ from the estimates of the corresponding coefficients in Tables 4.6 and 4.7 using the data surrounding the period when the US–China trade war was actually taking place. As a result, the underlying trends cannot account for the relationship between the increase in the difference between US import tariffs on Vietnam and China and the probability of workers working as informal workers and uninsured workers, as presented in Tables 4.6 and 4.7.

4.6.2 Uninsured Workers in Enterprise Sector

As analyzed in Section 4.5.1, there is shifting employment in industries with higher weighted tariff differences among employers in the enterprise sector (but not overall). Our analysis in Section 4.5.3 already examined the change in the probability of being informal and uninsured at an individual level in response to the US–China trade war. Therefore, in this section, we further examine whether the US–China trade war impacts workers with and without insurance at the firm level using VES data[30]. The following model is estimated:

$$s_{kt} = \beta\, \tau_{jt} + \gamma_p + \theta_t + \mu_j + \vartheta_k + \varepsilon_{jkt} \qquad (5)$$

[30] VES data provide only the information about the firm's total employees and total insured employees and do not provide the number of informal workers. Thus, in this research, we can examine only the impact of the US-China trade war on the share of insured workers at firm-level.

where s_{kt} is the share of workers without insurance among the total workers of firm k at time t. The specification also includes province γ_p , industry μ_j, firm ϑ_k, and time θ_t fixed effects. Columns (1)–(3) provide the results for estimating Equation (5) using all firms in the dataset. Interestingly, the coefficients of the weighted tariff differences are insignificant for all industries and non-agricultural sectors. Overall, there is no evidence of changes in firms' share of uninsured workers in response to changes in tariff differences. However, the coefficient of the weighted tariff difference is negative and significant for trading sectors, meaning that the share of uninsured workers decreases due to the trade war, and workers in trading sectors benefit more directly from the increase in US import tariffs on Chinese products.

[Table 4.10 to be Inserted Here]

We then restrict the sample to firms with more than 100 employees. The estimated results in Columns (4)–(6) of Table 4.10 are always negative and significant. Economic-wide, a firm in an industry that experienced an average increase in weighted tariff difference, 1.72 percentage points, saw a 0.77 (=0.447*1.72) reduction in the share of workers without insurance. The magnitude of the coefficients, as well as the average effect of the weighted tariff difference on firms in the non-agriculture and trading sectors, are the same as the overall results. The estimated results in Table 4.10 demonstrate that the increase in demand for insured workers comes from firms with more than 100 employees. In other words, workers in firms with more than 100 employees and trading sectors benefit more directly from increasing the US import tariff on Chinese products.

4.7 Heterogeneity in worker responses to the US-China trade war

Overall, the results of estimations using Equation (3) show that, in an industry subject to an increase in US tariffs on Chinese exports, the probability of a worker becoming an informal worker (uninsured workers) would decrease. Thus far, these estimations of overall effects could mask the heterogeneity in worker responses. Thus, we analyze the potential heterogeneity of tariff increases during the trade war by age, gender, and education. The results of these heterogeneity analyses for informal worker outcomes are presented in Tables 4.11 and 4.12, respectively. To estimate the heterogeneity in workers' responses by age, we divided workers into five age groups (20–29, 30–39, 40–49, 50–59, and 60–64) and then estimated Equation (3) separately for each group. The probability of a worker working as an informal employee decreased more for middle-aged workers in response to the U.S.–China trade war economy-wide (Columns 1–11) and trade sectors (Columns 3–11). The impact of the US-China trade war appears to decline for young employees (aged 20–29 and 30–39). The estimated coefficients for old employees (60–64) in all industries are positive and not statistically significant. Similarly, the probability of a worker being an insured employee increases more for middle-aged workers than for young workers. The estimated coefficients based on the 60–64 age group in all industries are positive and insignificant.

[Table 4.11 to be Inserted Here]

[Table 4.12 to be Inserted Here]

Estimations of Equation (3) by gender suggest that the US–China trade war tended to affect men more than women: the magnitude of the corresponding coefficients for men is double that for women, in the case of the probability of a worker working informally. The same pattern is repeated in the case of the probability of a worker working as an uninsured: men are affected more by the US–China trade war. We also estimate Equation (3) separately for three main education groups: 0–4 years of formal education (i.e., did not complete primary school), 5–11 years of formal education (i.e., completed primary school but did not complete high school), and 11 or more years of formal education (i.e., completed high school or higher). We observe that workers with a relatively low level of education (i.e., did not complete high school or lower) consistently receive more benefits from the US–China trade war; they showed a greater decline in the probability of being informal workers and uninsured workers. These impacts are more salient among unskilled workers, showing that Vietnam has a comparative advantage in producing goods that hire unskilled workers.

4.8 Conclusion

Taking advantage of the unique trade shock created by the 2018 US–China trade war, this study investigates the impact of the trade war on Vietnam's labor market. We constructed and employed heterogeneity across Vietnamese industries in terms of differences in US import tariffs between Chinese and Vietnamese products. The impact of the differences in tariffs on the labor market reallocation of workers from formal to informal sectors is estimated using a nationally representative labor force survey. The chapter also separately estimated the same impacts on workers' probability of being hired as uninsured.

We found that employees working in an industry with a greater advantage in tariffs tend to have a lower probability of being informal workers or uninsured workers than employees in industries with less or no tariff advantages. The findings in this chapter are consistent with a conceptual framework devised by Goldberg and Pavcnik (2003). A positive and permanent demand shock that leads to an increase in the output price leads to labor reallocation from informal/uninsured workers to formal/insured workers.

This study had several limitations. First, the Vietnamese Labor Force Survey does not provide a unique individual identifier; therefore, we cannot utilize a panel structure to control unobserved individual-level characteristics. Second, our estimates only show short-run responses of the market, and the longer-term effects of the US–China trade war on the Vietnamese labor market could differ from those we provide here. Finally, the US–China trade war's general aquarium effects through the global supply chain would be much more complicated but could provide a different picture. We investigated the effects of the direct advantage that increased Vietnamese exports could have on its workers; however, some of the negative effects that the US and China caused on each other's economy would affect Vietnam through various channels and mechanisms.

Nevertheless, we believe that this study adds to our understanding of the US–China trade war and its effect on third countries. As the US–China trade war is still an ongoing trade conflict and many expect that the global supply chain is under many more threats, considerably more work will need to be done to understand the impacts of trade conflicts on various economic agents and outcomes across economies. A better understanding of the US–China trade war can also enable us to develop policies that can manage uncertainties related to trade conflicts and maximize potential gains from it.

Chapter 5

Conclusion

This dissertation presents an examination of the impact of the US-China trade war on Vietnam in three main aspects: it examines the impact of the trade war on Vietnam's export to the US; it analyzes the effects of the US-China trade war on the status of export, FDI, and on the productivity of Vietnamese firms; and it examines the impact of the US-China trade war on the Vietnam labor market.

5.1 The Effect of the US-China Trade War on Vietnam Exports to the US

In chapter 2, we analyzed the effect of the newly imposed tariffs on Chinese products on Vietnam exports. Using US import data for 2017–2019, we begin by demonstrating that the US-China trade war statistically increased the import of targeted products from Vietnam to the US. The volume of Vietnamese imports to the US began to increase three months after the imposition of tariff increases targeting equivalent Chinese products. Our results indicate that the increase in the export volume from Vietnam to the US was caused by increases in both quantity and unit price. The increase in export volume remains statistically significant even after eight months with tariffs in place. Due to the pandemic, which started in early 2020, we could examine only the short-run impact of the US-China trade war on Vietnam's exports. However, the estimated results provided in chapter 2 suggest that the market quickly reacted to the trade war and the US began importing from alternative countries in the global supply chain.

On the other hand, the analysis presented here found no significant relationship between the US-China trade war and the volume of exports of those targeted goods from China to Vietnam. Some additional analyses also found no significant changes in the volume of Vietnam's export volume of those affected goods to Japan (one of the major trading partners of Vietnam). These estimated changes are not statistically significant, which implies that increases in Vietnamese exports to the US since the US-China trade war were not driven by the detouring of Chinese products through Vietnam nor by the decrease in the volume of Vietnam's exports to other major trading partners – all of which implies that Vietnam's economy could quickly increase its output and export volume to meet the newly increased demand for Vietnamese products.

5.2 The Effect of the US-China Trade War on Vietnam's Firms

In chapter 3, we present an investigation of the effects of the US-China trade war on Vietnamese firms. Our empirical evidence shows that the increases in US import tariffs against Chinese products led to an increase in the likelihood of Vietnamese firms being exporters in the targeted industries. Moreover, further analysis demonstrates that firms in targeted industries are more likely to be FDI firms and hence experience an increase in the amount of FDI investment and export volume. The analysis also indicates that the effect of the US-China trade war was heterogeneous among firms: the probability of entering the export market is larger for the firms in the fourth quartile of the size distribution than for smaller firms. Entering the export market incurs sunk costs; thus, only large and more productive firms who earned enough profits to cover the fixed cost of exporting benefited from the foreign access opportunities resulting from the US-China trade war.

In addition, we employed weighted tariff increases as an instrument variable to estimate the effect of export status on firm productivity. Our results show that exporters who were induced to export because of the US-China trade war also experienced an increase in both labor productivity and total factor productivity. This finding is consistent with those of previous studies which found a positive correlation between export status and firm productivity (Clerides et al., 1998, Biesebroeck, 2005, Loecker, 2007, among many others).

This chapter investigates the effect of the US-China trade war on Vietnam's market using data for 2017–2019, so our estimates reflect only short-run responses of Vietnam's economy to the trade war. The longer-term effects of the US-China trade war on Vietnam may differ from the estimations presented. However, in 2020, there were no newly imposed tariffs on Chinese products; the US import tariffs on China were "kept in place", and the US government did not make any "immediate moves to lift trade war tariffs" (Joe Biden, 2020). Given the ongoing nature of the trade war and the increasing availability of longer-term micro-survey data, further work is needed to achieve a full understanding of the long-term effect of the US-China trade war on Vietnam and on other third countries.

In chapters 2 and 3, we presented evidence that the US-China trade war positively affected exportation from and FDI in Vietnam. The increase in exportation and FDI improved firm productivity, but we could not pinpoint the exact mechanism driving the increase in exportation and FDI resulting from the trade war. A more complete and extensive dataset covering the relocation of multinational firms before and after the trade war might enable more revealing empirical analysis and more specific policy implications. Moreover, although we have demonstrated that Vietnamese firms benefited from the US-China trade war, how much of this benefit actually stayed in Vietnam is an interesting question for future research.

5.3 The Effect of the US-China Trade War on Vietnam's Labor Market

In chapter 4, we examined the effect of US increases in import tariffs on Chinese products on Vietnam's labor market. Using data from a labor force survey, we first found that there is an increase in employment in affected industries when agriculture and fishing industries are excluded. A similar increase in extensive margin was found across all sectors when we employed analyzed data from the Vietnam Enterprise Survey. We also documented a decline in the share of uninsured and informal workers in the labor market. A simple decomposition analysis shows that the decrease in the share of informal and uninsured workers is driven by both between-industry allocation and within-industry decline in the share of informal and uninsured workers. Such an improvement in the quality of employment is surprising, given the increase in the extensive margin effect of the US-China trade war on affected industries.

We also investigated the effect of the US-China trade war on the reallocation of workers from informal to formal sectors and from uninsured to insured employment. The results of our estimation imply that workers in an industry that experienced an increase in the US tariffs on the import of Chinese products tends to have a lower probability of being an informal worker and a lower chance of being an uninsured worker than employees who work in industries not subject to a tariff increase. Our results also indicate that the effect was heterogeneous among individuals: middle-aged workers and those with a relatively low level of education experienced a larger decrease in the probability of being an informal (or uninsured) worker.

Furthermore, our analysis shows that the reallocation from informal to formal employment (or from uninsured to insured employment) due to the impact of the trade war does not affect worker income. Since our estimates reflect only short-run responses, the longer-term effects of the US-China trade war on the informal sector, and on the income of workers, may differ from those we estimate here.

In this chapter, we estimated the effect of the US-China trade war on reallocation from informal to formal sectors and from uninsured to insured employment. However, since the Vietnam Labor Force Survey does not provide a panel dataset at the individual level, we cannot analyze a longitudinal sample to investigate further the effect of the US-China trade war on labor employment, given unobserved individual-level characteristics. This effect could be examined by analyzing other panel datasets such as those from the Vietnam Household Living Standard Survey. In addition, further exploration of the US-China trade war and other outcomes of interest in Vietnam's labor market, such as human capital upgrading, appear to be a fruitful another area for future research.

5.4 Policy Implications

This thesis shows that the US-China trade war positively impacted Vietnam's market, a third country that was not involved in the trade war. Therefore, our findings from this study would be a good reference for Vietnam's policymakers to design policies related to exportation, FDI attraction and quality employment. The US-China trade war will be a good opportunity for Vietnam to attract more FDI. Thus, the Vietnamese central and local governments should adopt policies to increase FDI in both quantity and quality. Vietnam should establish a new FDI management agency with a larger budget and more power than the current one to execute government policies and strategies effectively. The local governments should focus on attracting investment projects in priority sectors such as high-tech farming and manufacturing, healthcare and education, and reject pollution-intensive investments or FDI projects that show signs of rerouting practices. At the same time, the Vietnamese government should have a more proactive support policy for domestic companies, particularly small and medium enterprises, to move up the value chain, maintain their export competitiveness, and achieve sustainable growth.

In addition, our results and the implications for policy in Vietnam may be a reference for other third countries indirectly affected by the US-China trade war. However, policies will differ depending on the competitive advantages of each country, its own trade liberalization policies, and integration into global value chains. For instance, countries relying on the products produced by multinational companies in China need to be ready for investment diversion or relocation. Meanwhile, the market-seeking FDI countries such as Thailand, which can benefit from the reallocation of multinational companies in China after the trade war, should develop appropriate policies to improve the investment climate and attract new investors.

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Appendix

A. Sampling of Vietnam Enterprise Survey (VES) Data

VES covers a population of all state-owned firms, foreign direct investment (FDI) firms, and firms with more than 100 employees in all industries. Firms with less than 100 employees are also included to represent Vietnam's industry properly. These firms are randomly selected within three levels of stratification: four-digit industry, the number of employees (fewer than 10, 10-49, and 50-99), and region. The proportion of firm selection was determined based on the size of each stratification. In Hanoi, for example, 50%, 20%, and 10% were assigned to firms with more than 50 but less than 99 workers, firms with more than 10 but less than 50 workers, and firms with less than 10 workers, respectively.

B. Olley and Pakes (1996) Methodology

The production technology of firm i presented by a Cobb-Douglas production function in Equation (7) is rewritten as follows:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \Omega_{it} + \eta_{it} \qquad \text{(B.1)}$$

where y_{it} is the logarithm of the firm's output (total sales), l_{it} the logarithm of the labor input, k_{it} is the logarithm of the capital. The error term has two components: the firm-specific productivity component given as Ω_{it} and an error term that is uncorrelated with input choices η_{it}. The Ordinary Least Squares (OLS) estimations of Equation (B.1) have simultaneity (between output and input) and selection bias (resulting from the exit of inefficient firms). Thus, Olley and Pakes (1996) introduced a semiparametric method that used investment as a proxy for unobserved time-varying productivity shock to control these biases. It is assumed that the firm's productivity follows a first-order Markov process, and firms accumulate capital through a deterministic dynamic investment process. Thus, the investment function i_{it} of firm i is given as:

$$i_{it} = i(k_{it}, \Omega_{it}) \qquad \text{(B.2)}$$

If investment is strictly positive, it can be inverted to obtain the productivity shock Ω_{it} as a function of i_{it} and k_{it}:

$$\Omega_{it} = i^{-1}(i_{it}, k_{it}) = f(i_{it}, k_{it}) \qquad \text{(B.3)}$$

The production function in Equation (1) then can be rewritten as:

$$y_{it} = \beta_l l_{it} + \emptyset(i_{it}, k_{it}) + \eta_{it} \qquad \text{(B.4)}$$

where $\emptyset(i_{it}, k_{it}) = \beta_0 + \beta_k k_{it} + f(i_{it}, k_{it}) = \beta_0 + \beta_k k_{it} + \Omega_{it}$. The $\emptyset(.)$ can be estimated by a fourth-degree polynomial in i_{it} and k_{it}. In the first stage, we obtained the consistent estimates of β_l and $\emptyset(i_{it}, k_{it})$. In the second stage of the estimation procedure, the probability that a firm exits from the market is determined by the probability that the firm's productivity is lower than an exit threshold:

$$\chi_{it} = 1 \quad \Leftrightarrow \Omega_{it} \geq \underline{\Omega_{it}} \qquad \text{(B.5)}$$

where χ_{it} is a survival binary variable and $\underline{\Omega_{it}}$ is an industry-specific exit-triggering threshold. Thus, the probability of remaining in the market of a firm will be:

$$\widehat{Pr_{it+1}} = \Pr(\chi_{it+1} = 1 | \chi_{it}) \qquad \text{(B.6)}$$

We use the same polynomial defined as before to estimate this probability. In the third stage, the estimation of the state variable β_k is estimated using non-linear least squares.

$$y_{it} - \widehat{\beta_l} l_{it} = \beta_k k_{it} + g\left(\widehat{\Phi_{it-1}} - \beta_k k_{it-1}, \widehat{Pr_{it}}\right) + \eta_{it} \qquad \text{(B.7)}$$

C. Levinsohn and Petrin (2003) Methodology

Levinsohn and Petrin (2003) argued that the investment proxy in the Olley and Pakes method is only valid for firms reporting non-zero investment. Thus, intermediate inputs such as electricity or materials are used to estimate production function instead of investment. Levinsohn and Petrin assume that a first-order Markov process governs productivity. Thus, Equations (B.3) and (B.4) will be rewritten as:

$$y_{it} = \beta_l l_{it} + \phi(m_{it}, k_{it}) + \eta_{it} \qquad \text{(C.1)}$$

$$\Omega_{it} = E[\Omega_{it}|\Omega_{it-1}] + \zeta_{it} \qquad \text{(C.2)}$$

where $\phi(m_{it}, k_{it}) = \beta_0 + \beta_k k_{it} + \Omega_{it}(m_{it}, k_{it})$; and m_{it} are the logarithm of the intermediate inputs. In the first stage, the estimates of β_l is estimated by using OLS with a fourth-degree polynomial in m_{it} and k_{it}, in place of $\phi(m_{it}, k_{it})$. In the second stage of the estimation procedure, for any value of β_k^* and β_m^*, $\widehat{\Omega_{it}}$ and the residual for (β_k^*, β_m^*) are defined as:

$$\widehat{\Omega_{it}} = \widehat{\phi_{it}} - \beta_k^* k_{it} - \beta_m^* m_{it} \qquad \text{(C.3)}$$

$$\widehat{\eta_{it} + \zeta_{it}} = y_{it} - \widehat{\beta_l} l_{it} - \beta_k^* k_{it} - \beta_m^* m_{it} - E[\Omega_{it}|\widehat{\Omega_{it-1}}] \qquad \text{(C.4)}$$

Since the level of intermediate material in the previous period is uncorrelated with the current period's error term, $\hat{\beta}_k$ and $\hat{\beta}_m$ are estimated as the solution to:

$$\min_{(\beta_k^*, \beta_m^*)} \Sigma_h \{\Sigma_t (\eta_{it} \widehat{+ \zeta_{it}}) Z_{ht}\}^2 \qquad \text{(C.5)}$$

with $Z_{ht} \equiv (k_{it}, m_{it-1})$ and h indexing the elements of Z_t.

D. Wooldridge (2009) Methodology

Wooldridge (2009) replaced the two-step estimation procedure in OP and LP methods with a GM setup. This approach overcomes both serial correlation and heteroscedasticity. Moreover, robust standard errors can be easily obtained using this method.

In the second stage, Wooldridge used the Markovian process and the assumed orthogonality between productivity shocks and the current level of firm capital, as well as that between productivity shocks and the past level of the free variables and the material inputs:

$$E(\Omega_{it}|k_{it}, l_{it-1}, k_{it-1}, m_{it-1}, \dots, l_{i1}, k_{i1}, m_{i1}) = E(\Omega_{it}|\Omega_{it-1}) = f\{h(k_{it-1}, m_{it-1})\} \quad \text{(D.1)}$$

The production function can be written using the above Equation:

$$y_{it} = \alpha + l_{it}\beta + k_{it}\gamma + h(k_{it}, m_{it}) + \nu_{it} \quad \text{(D.2)}$$

$$y_{it} = \alpha + l_{it}\beta + k_{it}\gamma + f\{h(k_{it-1}, m_{it-1}) + \eta_{it}$$

Wooldridge assumed that:

$$h(k_{it}, m_{it}) = \lambda_0 + \psi(k_{it}, m_{it})\lambda \quad \text{(D.3)}$$

where $\psi(k_{it}, m_{it})$ is a 1xQ collection of functions:

$$f(h) = \delta_0 + \delta_1 h + \delta_2 h^2 + \cdots + \delta_G h^G \qquad \text{(D.4)}$$

Under the above assumption and for the sake of simplicity, the production function can be written in case G=1 and $\delta_1 = 1$:

$$y_{it} = \zeta + l_{it}\beta + k_{it}\gamma + \psi(k_{it}, m_{it})\lambda_1 + \nu_{it} \qquad \text{(D.5)}$$

$$y_{it} = \theta + l_{it}\beta + k_{it}\gamma + \psi(k_{it-1}, m_{it-1})\lambda_1 + \eta_{it}$$

System GMM now has linear moments, and for each t>1, the moment conditions are derived from the residual functions:

$$r_{it}(\theta) = \begin{bmatrix} r_{it1}(\theta) \\ r_{it2}(\theta) \end{bmatrix} = \begin{bmatrix} y_{it} - \zeta - l_{it}\beta - k_{it}\gamma - \psi(k_{it}, m_{it})\lambda_1 \\ y_{it} - \theta - l_{it}\beta - k_{it}\gamma - \psi(k_{it-1}, m_{it-1})\lambda_1 \end{bmatrix} \qquad \text{(D.6)}$$

and $E\{Z'_{it} r_{it}(\theta)\} = 0$; where $Z_{it} = \begin{pmatrix} 1, k_{it}, l_{it}, \psi(k_{it}, m_{it}) \\ 1, k_{it}, l_{it-1}, \psi(k_{it-1}, m_{it-1}) \end{pmatrix}$

The whole system now can be rewritten as: $\boldsymbol{y}_{it} = \boldsymbol{X}_{it}\boldsymbol{\theta} + \boldsymbol{r}_{it}$ where $\boldsymbol{y}_{it}$ is a vector containing y_{it} twice (stacked), and $\boldsymbol{\theta}$ is the vector of interested parameters, and

$$\boldsymbol{X}_{it} = \begin{bmatrix} 1 & 0 & l_{it} & k_{it} & \psi(k_{it}, m_{it}) \\ 0 & 1 & l_{it} & k_{it} & \psi(k_{it-1}, m_{it-1}) \end{bmatrix} \qquad \text{(D.7)}$$

E. Ackerberg–Caves–Frazer (2015) Methodology

Ackerberg–Caves–Frazer (ACF, 2015) point out that the coefficient of the labor variable can be consistently estimated only if the labor variable shows variability independently of the proxy variable. However, labor and materials are assumed to be allocated simultaneously at time t, in the setting of the LP method. It means that both labor and intermediate inputs are chosen as a function of productivity and capital variable:

$$m_{it} = m(k_{it}, \Omega_{it}) \qquad \text{(E.1)}$$

$$l_{it} = l(k_{it}, \Omega_{it}) = l\,\{h(m_{it}, k_{it}), k_{it}\,\}$$

To address the issue of collinearity in the first stage, where the labor variable appears both as a free variable and in the nonparametric polynomial approximation $\widehat{\phi}$, ACF assumes that the proxy variable p_{it} is function of k_{it}, l_{it}, and Ω_{it}, and the production output is value-added, whereby the materials do not enter the production function to be estimated. Under these assumptions, the production function will be rewritten as:

$$y_{it} = \phi(p_{it}, m_{it}, k_{it}, l_{it}) + \varepsilon_{it} \qquad \text{(E.2)}$$

where $\phi(p_{it}, m_{it}, k_{it}, l_{it}) = \gamma k_{it} + \beta m_{it} + \mu l_{it} + h(p_{it}, m_{it}, k_{it}, l_{it})$. The TFP will be obtained after estimating the $\widehat{\phi}$:

$$\widehat{\Omega_{it}} = \widehat{\phi_{it}} - \gamma k_{it} - \beta m_{it} - \mu l_{it} \qquad \text{(E.3)}$$

The coefficients for labor, capital, and material variables will be obtained as the solution to:

$$argmax\left\{-\sum_k\left(\sum_i \sum_t \xi_{it} z_{it}^k\right)^2\right\} \qquad \text{(E.4)}$$

where k is the index of the instrument vector z = $[m_{it-1}, k_{it}, l_{it-1}]$ and residuals ξ_{it} is obtained by exploiting the Markov chain assumption: $\Omega_{it} = E(\Omega_{it}|\Omega_{it-1}) + \xi_{it}$

Tables

Table 2.1: The 2018-2019 Trade War

Tariff wave	Date enacted	Chinese products targeted (#HS-10)	Vietnamese products affected (# HS-10)	Tariff difference (% point)		Imports to United States (mil US$) from Vietnam		
				2017	Upon implementation	2017	2018	2019
Solar panels & Washing machines	Feb 7th, 2018	18	14	-1.06	0	1,475	681	1,940
Aluminum, Iron, and Steel	Mar 23rd, 2018	578	138	-0.33	0	665	1,000	601
China 1	July 6th, 2018	1,629	439	-1.15	23.96	1,256	1,380	1,670
China 2	Aug 23rd, 2018	401	161	-2.20	22.97	2,467	1,768	2,694
China 3	Sep 24th, 2018	8,539	2,176	-2.86	7.23	14,303	16,336	21,483
China 4	Sep 1st, 2019	5,628	2,011	-10.03	4.07	21,057	21,847	25,733

Note. Tariff difference is defined as each wave's unweighted difference in tariffs applied to Chinese and Vietnamese imports, respectively. The positive number implies that on average, higher tariffs were imposed on Chinese good. The date enacted indicates the first date of tariff implementation during the trade war ignoring later changes. The number of products is calculated among Vietnamese imports to United States in 2018.

Table 2.2: China's Export to Vietnam vs. Vietnam's Export to the United States

Year	China's Export to Vietnam (A)			Vietnam's Export to the US (B)		
	# HS6 †	in billion (USD)	% HS6 under China tariff ‡	# HS6	In billion (USD)	#HS6 belongs to (A)
2017	4,015	71.62	0%	2,059	48.31	90.00%
2018	4,057	84.02	0.11%	2,145	50.94	89.79%
2019	4,133	98.00	26.79%	2,290	69.39	90.13%

Note. † The number includes the reported product code more aggregate than HS6 which was missing in the data. For the analyses, those observations were dropped. ‡ The number indicate the share of HS6 code indicates if any product under the HS6 was under the US-China trade war. The tariff increased targeted product rather than product-country, which was excluded when we calculated it.

Table 2.3. The Impact of US-China Trade War on Export from China to Vietnam 2017-2019

	Log (Export)					
	A: Products belong to both categories †			B: All products exported from China to Vietnam ‡		
US-China Trade War on Vietnam	(1)	(2)	(3)	(4)	(5)	(6)
The share of products under China tariffs (#)	0.266			-0.102		
	(0.637)			(0.205)		
The share of products under China tariffs (in USD)		0.549			-0.046	
		(0.522)			(0.199)	
Weighted tariffs			2.956			0.633
			(5.510)			(2.853)
Vietnam's tariffs against China	√	√	√	√	√	√
Constant	6.959***	6.931***	6.796***	6.997***	6.995***	6.982***
	(0.072)	(0.066)	(0.351)	(0.037)	(0.037)	(0.056)
Observations	1,819	1,819	1,819	8,070	8,070	8,070
R-squared	0.376	0.377	0.376	0.397	0.397	0.397

Note. † These are products whose HS6 belong to both (1) China's export to Vietnam and (2) Vietnam's export to the United States

‡ These are all products exported from China to Vietnam. If products exported from China to Vietnam do not have matching HS6 exported from Vietnam to the US, we coded measures of US-China Trade war to be zero.

All specifications include Vietnam's tariffs imposed on Chinese imports, HS6, and year fixed effects. The error terms are clustered within HS6.

Table 2.4. The Impact of US-China Trade War on Export from Vietnam to Japan 2017-2019

	Log (Export)					
	A: Products belong to both categories †			B: All products exported from Vietnam to Japan‡		
US-China Trade War on Vietnam	(1)	(2)	(3)	(4)	(5)	(6)
The share of products hit by China tariff (#)	0.079 (0.110)			-0.042 (0.070)		
The share of products under China tariffs (in USD)		0.085 (0.107)			-0.042 (0.070)	
Weighted tariffs			-1.639 (1.598)			-0.147 (0.791)
Japan's tariffs against Vietnamese goods	√	√	√	√	√	√
Constant	8.234*** (0.045)	8.236*** (0.044)	8.363*** (0.101)	5.879*** (0.016)	5.879*** (0.016)	5.877*** (0.024)
Observations	21,767	21,749	21,749	55,087	55,087	55,087
R-squared	0.776	0.777	0.777	0.727	0.727	0.727

Note. † These are products whose HS6 belong to both (1) Vietnam's export to Japan and (2) Vietnam's export to the United States.

‡ These are all products exported from Vietnam to Japan. If products exported from Vietnam to Japan do not have matching HS6 exported from Vietnam to the US, we coded measures of US-China Trade war to be zero.

All specifications include Japan's tariffs imposed on Vietnamese imports, HS6, and year fixed effects. The error terms are clustered within HS6.

Table 3.1: The Role of FDI receiving Firms in Vietnam's Export

Year	# of all firms	# of FDI firms (Share)	# of exporter (share)	# of FDI firms out of exporters (share)	The share of export by FDI firms (%)	The share of employment by FDI firms
2017	560,967	15,221 (2.71%)	12,540 (2.24%)	6,648 (53.01%)	51.35%	19.95%
2018	620,958	15,276 (2.46%)	13,388 (2.16%)	7,345 (54.86%)	63.03%	20.85%
2019	687,063	17,017 (2.48%)	14,727 (2.14%)	8,094 (54.96%)	51.26%	21.26%

Note. The numbers in the table are calculated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. Two survey questions were utilized to identify exporters during the sample period: (1) did the firm have selling or buying transactions with foreign partners? (2) Total payment that firms received from their foreign partners during the year.

Table 3.2: The Share of Continuing, New, and Previous Exporters

Year	All firms	Continuing exporters (Share)	New exporters (share)	Previous exporters (share)	Non-exporters (share)
		Firms in 2017 compared to 2014†			
2017	474,324	5,998 (1.26%)	5,782 (1.22%)	6,343 (1.34%)	456,201 (96.18%)
		Firms in 2018 compared to 2017			
2018	474,324	8,227 (1.73%)	4,233 (0.89%)	3,553 (0.75%)	458,311 (96.62%)
		Firms in 2019 compared to 2018			
2019	474,324	9,198 (1.94%)	3,938 (0.83%)	3,262 (0.69%)	457,926 (96.54%)

Note. The numbers in the table are calculated using three rounds of the Vietnamese Enterprise survey conducted in 2014, 2017, 2018, and 2019. See the note under Table 3.1 for the identification of exporters.

† We employed the 2014 round to identify firms' status because the 2015 and 2016 rounds do not contain any information to identify exporters.

Table 3.3: The Share of Continuing, New, and Previous Exporters

Among Firms with more than 100 Employees

Year	All firms with more than 100 employees	Continuing exporters (Share)	New exporters (share)	Previous exporters (share)	Non-exporters (share)
Firms in 2017 compared to 2014†					
2017	15,892	3,333 (20.97%)	1,902 (11.97%)	951 (5.98%)	9,706 (61.07%)
Firms in 2018 compared to 2017					
2018	15,499	4,346 (28.04%)	1,112 (7.17%)	802 (5.17%)	9,239 (59.61%)
Firms in 2019 compared to 2018					
2019	14,611	4,599 (31.48%)	1,130 (7.73%)	718 (4.91%)	8,164 (55.88%)

Note. The sample is restricted to firms with more than 100 employees. See the note under Table 3.2.

Table 3.4: Exporters and non-Exporters by the Type of Investment

	(1) log(sales)	(2) log(employment)	(3) log(fixed capital)	(4) log(wage bill)
Domestic Exporters	4.215***	2.196***	4.089***	0.216***
(DE)	(0.078)	(0.096)	(0.114)	(0.030)
FDI Non-exporters	1.996***	1.167***	2.536***	0.231***
(FN)	(0.105)	(0.100)	(0.252)	(0.064)
FDI Exporters	4.156***	2.277***	4.419***	0.565***
(FE)	(0.097)	(0.123)	(0.251)	(0.059)
Constant	6.290***	1.646***	3.551***	4.325***
	(0.002)	(0.003)	(0.007)	(0.002)
Observations	2,384,671	2,384,610	2,384,670	1,807,698
R-squared	0.120	0.242	0.158	0.245
F-statistic				
DE=FE	0.27	0.93	2.41	39.05
	(p=0.601)	(p=0.335)	(p=0.122)	(p=0.000)
FN=FE	314.99	290.69	195.35	60.60
	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. Standard errors are clustered at the three-digit industry level. Province and three-digit industry fixed effects are controlled in all regressions. Total sales and fixed assets are deflated by PPI (Producer Price Index) at the two-digit industry level (if available) or a letter code level. Export and FDI-receiving firms' premiums are estimated from a regression of the form: $Y_{ijp} = \alpha_0 + \alpha_1 DE_{ijp} + \alpha_2 FN_{ijp} + \alpha_3 FE_{ijP} + I_j + P_p + \varepsilon_{ijp}$, where i indexes firm and j indexes three-digit industry, and p indicates province. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.5: Continuing, new, and previous exporters vs. non-exporters

	(1) log(sales)	(2) log(employment)	(3) log(fixed capital)	(4) log(wage bill)
Continuing exporters	4.140***	2.476***	4.409***	0.492***
(EE)	(0.069)	(0.101)	(0.143)	(0.040)
New exporters	3.428***	1.737***	3.166***	0.274***
(NE)	(0.069)	(0.090)	(0.142)	(0.038)
Previous exporters	2.822***	1.300***	2.913***	0.169***
(EN)	(0.065)	(0.080)	(0.095)	(0.028)
Constant	6.744***	1.731***	3.952***	4.321***
	(0.002)	(0.003)	(0.004)	(0.001)
Observations	1,422,971	1,422,970	1,422,971	1,381,158
R-squared	0.124	0.272	0.171	0.240
F-statistic				
EE=EN	328.56	329.55	307.62	79.37
	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)
NE=EN	96.99	113.90	11.45	22.35
	(p=0.000)	(p=0.000)	(p=0.000)	(p=0.000)
Industry FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms that can be identified in all three rounds of survey data. Standard errors are clustered at the three-digit industry level. Province and three-digit industry fixed effects are controlled in all regressions. Total sales and fixed assets are deflated by PPI (Producer Price Index) at the two-digit industry level (if available) or a letter code level. Exporting firms' premiums are estimated from a regression of the form: $Y_{ijp} = \alpha_0 + \alpha_1 EE_{ijp} + \alpha_2 NE_{ijp} + \alpha_3 EN_{ijP} + I_j + P_p + \varepsilon_{ijp}$, where i indexes firm, and j indexes three-digit industry, and p indicates province. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.6: The Impact of the US-China Trade War on the Emergence of FDI Exporters

Sample: All firms identified in all survey rounds

	(1) Exporter	(2) Domestic Exporter	(3) FDI Exporter	(4) Continuing Exporter	(5) New Exporter
The weighted difference in tariff (A)	0.185***	0.052**	0.133***	0.407***	-0.222***
	(0.041)	(0.024)	(0.031)	(0.098)	(0.077)
Constant	0.026***	0.012***	0.014***	0.016***	0.010***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Mean of Dependent Variable	0.026	0.012	0.014	0.016	0.010
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.003	0.001	0.002	0.006	-0.003
Observations	1,422,971	1,422,971	1,422,971	1,422,971	1,422,971
R-squared	0.105	0.041	0.095	0.091	0.022
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.015. One standard deviation of weighted the difference in tariff is 0.019.

Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms identified in all three survey rounds. The firms' continuing exporters and new exporters in the 2017 survey were identified compared to their status in 2014. Standard errors are clustered at the three-digit industry level.

Table 3.7: The Impact of the US-China Trade War on the Emergence of FDI Exporters

Sample: Firms with more than 100 employees

	(1) Exporter	(2) Domestic Exporter	(3) FDI Exporter	(4) Continuing Exporter	(5) New Exporter
The weighted difference in tariff (A)	0.830***	0.087	0.743***	1.486***	-0.656*
	(0.140)	(0.119)	(0.109)	(0.412)	(0.340)
Constant	0.350***	0.157***	0.194***	0.235***	0.115***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Mean of Dependent Variable	0.355	0.157	0.198	0.244	0.111
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.014	0.001	0.013	0.025	-0.011
Observations	49,723	49,723	49,723	49,723	49,723
R-squared	0.369	0.162	0.320	0.280	0.068
Industry FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.017. One standard deviation of weighted the difference in tariff is 0.02.
Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees. The firms' continuing exporters and new exporters in the 2017 survey were identified compared to their status in 2014. Standard errors are clustered at the three-digit industry level.

Table 3.8: The Impact of the US-China Trade War on FDI and Export

All firms identified in all rounds of the survey

	(1) Exporter	(2) FDI Exporter	(3) Log (FDI)	(4) Log (Export)
The weighted difference in tariffs (A)	0.181***	0.134***	0.458**	2.016***
	(0.044)	(0.036)	(0.181)	(0.480)
Constant	0.026***	0.014***	0.166***	0.166***
	(0.000)	(0.000)	(0.000)	(0.001)
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.003	0.002	0.007	0.030
Observations	1,422,971	1,422,971	1,422,159	1,422,971
R-squared	0.779	0.863	0.958	0.814
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.015.

Note. See the Note for Table 3.6.

Table 3.9: The Impact of the US-China Trade War on FDI and Export

Firm Fixed Effects Analysis on Firms with more than 100 Employees

	(1) Exporter	(2) FDI Exporter	(3) Log (FDI)	(4) Log (Export)
The weighted difference in tariffs (A)	0.974***	0.518***	1.249***	10.546***
	(0.213)	(0.152)	(0.404)	(2.171)
Constant	0.376***	0.211***	2.205***	2.879***
	(0.001)	(0.001)	(0.002)	(0.013)
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.017	0.009	0.022	0.180
Observations	43,130	43,130	43,107	43,130
R-squared	0.825	0.907	0.980	0.841
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.017.

Note. See the Note for Table 3.7.

Table 3.10: The Impact of the US-China Trade War on FDI and Export

Firms in Manufacturing Sector with more than 100 Employees

	(1) Exporter	(2) FDI Exporter	(3) Log (FDI)	(4) Log (Export)
The weighted difference in tariff (A)	0.750**	0.421*	0.309	6.302***
	(0.332)	(0.223)	(0.437)	(2.041)
Constant	0.612***	0.361***	3.578***	4.811***
	(0.004)	(0.003)	(0.005)	(0.023)
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.014	0.008	0.006	0.113
Observations	22,625	22,625	22,615	22,625
R-squared	0.761	0.896	0.982	0.785
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.018.

Note. See the Note for Table 3.7.

Table 3.11: The Impact of the US-China Trade War on FDI and Export

Firms in Trading Sector with more than 100 Employees

	(1) Exporter	(2) FDI Exporter	(3) Log (FDI)	(4) Log (Export)
The weighted difference in tariff (A)	0.781**	0.443**	0.489	7.000***
	(0.298)	(0.210)	(0.383)	(1.998)
Constant	0.585***	0.344***	3.421***	4.589***
	(0.003)	(0.002)	(0.004)	(0.022)
(A) multiplied by the mean weight difference in tariffs in the affected industry†	0.013	0.008	0.009	0.119
Observations	23,934	23,934	23,924	23,934
R-squared	0.774	0.898	0.983	0.796
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

† Mean weighted difference in tariffs in the affected industry is 0.017.

Note. See the Note for Table 3.7.

Table 3.12: The Impact of the US-China Trade War on FDI and Export

by Quartile of the Firm Size Distribution

All firms identified in all rounds of the survey

	(1) Exporter	(2) FDI Exporter	(3) Log(FDI)	(4) Log(Export)
The weighted difference in tariffs x first size quartile	0.093**	0.086***	0.555**	0.669**
	(0.041)	(0.033)	(0.275)	(0.300)
The weighted difference in tariffs x second size quartile	0.072*	0.097**	0.401*	0.663*
	(0.040)	(0.046)	(0.228)	(0.371)
The weighted difference in tariffs x third size quartile	0.084*	0.097**	0.242	1.081***
	(0.048)	(0.044)	(0.191)	(0.364)
The weighted difference in tariffs x fourth size quartile	0.458***	0.253***	0.584***	5.490***
	(0.103)	(0.051)	(0.166)	(1.073)
Constant	0.026***	0.014***	0.166***	0.166***
	(0.000)	(0.000)	(0.000)	(0.001)
Observations	1,422,971	1,422,971	1,422,159	1,422,971
R-squared	0.779	0.863	0.958	0.814
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. See the Note for Table 3.6. We assign firms to one of four groups based on within-industry (three-digit code) quartiles of the distribution of initial firm size in terms of (log) number of employees at the end of 2017.

Table 3.13: The Impact of the US-China Trade War on FDI and Export

by Quartile of the Firm Size Distribution

All Manufacturing firms identified in all rounds of the survey

	(1) Exporter	(2) FDI Exporter	(3) Log(FDI)	(4) Log(Export)
The weighted difference in tariffs x first size quartile	0.003	0.010	0.102	-0.573
	(0.070)	(0.049)	(0.273)	(0.501)
The weighted difference in tariffs x second size quartile	-0.018	0.020	-0.052	-0.616
	(0.070)	(0.061)	(0.252)	(0.523)
The weighted difference in tariffs x third size quartile	-0.012	0.021	-0.268	-0.162
	(0.078)	(0.054)	(0.194)	(0.575)
The weighted difference in tariffs x fourth size quartile	0.369***	0.192***	0.164	4.472***
	(0.092)	(0.058)	(0.238)	(1.098)
Constant	0.111***	0.064***	0.688***	0.780***
	(0.001)	(0.001)	(0.002)	(0.007)
Observations	211,363	211,363	211,228	211,363
R-squared	0.824	0.889	0.977	0.847
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. See the Note for Table 3.12.

Table 3.14: The Impact of the US-China Trade War on FDI and Export

by Quartile of the Firm Size Distribution

All Trading firms identified in all rounds of the survey

	(1) Exporter	(2) FDI Exporter	(3) Log(FDI)	(4) Log(Export)
The weighted difference in tariffs x first size quartile	0.059	0.063	0.421	0.110
	(0.064)	(0.050)	(0.341)	(0.533)
The weighted difference in tariffs x second size quartile	0.042	0.075	0.290	0.116
	(0.065)	(0.064)	(0.312)	(0.595)
The weighted difference in tariffs x third size quartile	0.046	0.071	0.058	0.542
	(0.067)	(0.055)	(0.262)	(0.571)
The weighted difference in tariffs x fourth size quartile	0.426***	0.241***	0.457*	5.159***
	(0.104)	(0.063)	(0.238)	(1.185)
Constant	0.085***	0.048***	0.528***	0.588***
	(0.001)	(0.000)	(0.002)	(0.006)
Observations	283,580	283,580	283,420	283,580
R-squared	0.826	0.890	0.976	0.849
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. See the Note for Table 3.13.

Table 3.15: Effect of Export Status on Labor Productivity

IV Estimation

	Labor Productivity			
	(1)	(2)	(3)	(4)
Exporter	1.480***			
	(0.515)			
Domestic Exporter		3.141**		
		(1.336)		
FDI Exporter			2.800***	
			(1.042)	
FDI Non-Exporter				-2.897**
				(1.183)
F-statistic in first-stage	21.43	11.48	12.27	9.53
Observations	42,858	42,858	42,858	42,858
R-squared	-0.670	-2.160	-0.928	-0.998
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees. Standard errors are clustered at the three-digit industry level. Province, three-digit industry, firms, and year fixed effects are controlled in all regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.16: Effect of Export Status on Total Factor Productivity - GMM Wooldridge and ACF Method

IV Estimation

	(1) Wooldridge	(2) ACF	(3) Wooldridge	(4) ACF	(5) Wooldridge	(6) ACF	(7) Wooldridge	(8) ACF
Exporter	2.033**	1.798**						
	(0.878)	(0.877)						
Domestic Exporter			4.631*	4.107				
			(2.537)	(2.502)				
FDI Exporter					3.623**	3.199**		
					(1.532)	(1.484)		
FDI Non-Exporter							-3.499**	-3.089**
							(1.413)	(1.368)
F-statistic in first-stage	18.77	18.80	8.69	8.63	11.61	11.64	10.55	10.58
Observations	40,189	40,297	40,189	40,297	40,189	40,297	40,189	40,297
R-squared	-0.791	-0.925	-2.899	-3.534	-0.982	-1.158	-0.903	-1.062
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Columns (1), (3), (5), and (7) are estimations using TFP from Wooldridge methods, while Columns (2), (4), (6), and (8) are estimations using TFP from ACF methods. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees. Standard errors are clustered at the three-digit industry level. Province, three-digit industry, firms, and year fixed effects are controlled in all regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 3.17: Effect of Export Status on Product Changing

	Product Changing			
	(1)	(2)	(3)	(4)
Exporter	3.277**			
	(1.598)			
Domestic Exporter		8.286		
		(7.255)		
FDI Exporter			5.421*	
			(3.052)	
FDI Non-Exporter				-5.596
				(3.757)
Observations	45,921	45,921	45,921	45,921
R-squared	-5.199	-18.503	-6.973	-7.456
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Notes: The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms appear in all three round. Product changing variable is a dummy variable take the value of 1 if firm changed the product code (eight-digit product code) compared to previous year. Standard errors are clustered at the three-digit industry level. Province, three-digit industry, and year fixed effects are controlled in all regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10% respectively.

Appendix Table 3.A.1: VSIC – ISIC Modification

VSIC 2007		VSIC 2018		ISIC Rev 4	
Code	**Definition**	**Code**	**Definition**	**Code**	**Definition**
		23	Other forestry product logging	22	Logging
73	Mining of precious metals ores	73	Mining of precious metals ores	72	Mining of non-ferrous metal ores
132	Manufacture of other textiles			139	Manufacture of other textiles
493	Other land transport	493	Other land transport	492	Other land transport
494	Transport via pipeline	494	Transport via pipeline	493	Transport via pipeline
632	Other information service activities			639	Other information service activities
792	Other reservation service activities			799	Other reservation service and related activities
852	Primary education	8521	Primary education	851	Pre-primary and primary education
853	Secondary education			852	Secondary education
854	Higher education	854	Higher education	853	Higher education
855	Other educational activities	855	Other educational activities	854	Other education
856	Educational support services	856	Educational support services	855	Educational support activities
961	Sauna and steam baths, massage and similar health care services (except sport activities)	961	Sauna and steam baths, massage and similar health care services (except sport activities)	960	Other personal service activities
962	Washing and cleaning of textile and fur products	962	Washing and cleaning of textile and fur products		
963	Personal service activities n.e.c	963	Personal service activities n.e.c		

Appendix Table 3.A.2: US Import Tariff Difference against China and Vietnam

Industry	**Number of industries**	**Number of targeted industries**	**Mean tariff difference**	**Std. Dev**	**Min**	**Max**
			Panel A: Year 2018			
All	227	77	0.0015	0.004	0	0.043
Agriculture	12	6	0.0004	0.0008	0	0.003
Manufacturing	70	61	0.0046	0.0064	0	0.043
Traded	89	76	0.0037	0.006	0	0.043
			Panel B: Year 2019			
All	227	89	0.0087	0.018	0	0.101
Agriculture	12	7	0.003	0.0057	0	0.020
Manufacturing	69	66	0.0266	0.0247	0	0.101
Traded	89	86	0.0219	0.0236	0	0.101

Note. Tariff difference is the weighted US import tariff difference between Vietnam and China due to Trade war within 3-digit industry code. For each commodity-line tariff difference, its weight is the share of HS ten-digit imported product from China to total imported products of US within three-digit industry based on 2015 US import. In 2017, the import tariff difference is equal 0 due to the fact that it is before Trade War, and there is no difference between in US import tariff between Vietnam and China in 2017. There are 5 industries be affected by Trade war, but they do not belong to Traded sectors. These are: Manufacture of weapons and ammunition, Manufacture of military fighting vehicles, Postal activities, Motion picture, video, and television programmer activities, and Other personal service activities.

Appendix Table 3.A.3: Estimated Coefficients of the Production Function

Two-digit Industry code	Labor (1) OLS	(2) Wooldridge	(3) ACF	Capital (4) OLS	(5) Wooldridge	(6) ACF
1	0.372	0.675	0.404	0.026	-0.033	0.008
2	0.067	-0.500	0.153	0.176	0.312	0.015
3	0.234	0.852	0.354	0.199	-0.294	-0.241
5	0.174	0.273	0.182	0.215	-0.173	0.054
6	-1.312	-	-	0.000	-	-
7	0.870	2.943	0.886	0.038	-0.044	-0.017
8	0.818	0.602	0.837	0.087	0.009	0.076
9	0.741	-	0.786	0.197	-	-0.014
10	0.480	0.646	0.514	0.111	-0.004	0.060
11	0.733	0.780	0.779	0.170	0.065	0.073
12	1.277	1.361	1.243	-0.030	0.040	-0.006
13	0.402	0.566	0.423	0.113	0.020	0.044
14	0.548	0.753	0.579	0.075	0.009	0.038
15	0.625	0.703	0.612	0.072	0.009	0.051
16	0.396	0.466	0.418	0.130	0.029	0.071
17	0.448	0.493	0.477	0.125	0.023	0.060
18	0.457	0.786	0.483	0.135	0.024	0.020
19	1.548	-	4.800	-0.486	-	-1.554
20	0.617	0.653	0.643	0.133	0.023	0.071
21	0.717	0.858	0.683	0.006	-0.022	0.017
22	0.486	0.477	0.496	0.140	0.043	0.079
23	0.661	0.790	0.682	0.133	0.022	0.045
24	0.379	0.105	0.424	0.078	0.015	0.008
25	0.487	0.598	0.505	0.163	0.009	0.090
26	0.640	0.630	0.652	0.066	0.006	0.022
27	0.648	0.628	0.659	0.191	0.035	0.120
28	0.787	0.803	0.817	0.066	-0.029	-0.021
29	0.706	0.851	0.755	0.096	0.014	0.045
30	0.447	0.737	0.412	0.060	-0.012	0.000
31	0.536	0.804	0.547	0.117	0.042	0.072
32	0.618	0.739	0.617	0.124	0.048	0.107
33	0.637	1.026	0.674	0.094	0.087	0.016
35	0.175	0.165	0.263	0.185	0.017	0.035
36	0.779	0.987	0.812	0.049	0.007	0.027
37	0.842	0.782	0.874	0.107	0.013	0.065
38	0.378	0.678	0.399	0.101	-0.071	-0.017
39	1.937	-	1.933	0.085	-	0.081
41	0.594	0.970	0.605	0.125	0.049	0.113

Appendix Table 3.A.3: Estimated Coefficients of the Production Function

(continued)

Two-digit Industry code	Labor			Capital		
	(1) OLS	(2) Wooldridge	(3) ACF	(4) OLS	(5) Wooldridge	(6) ACF
42	0.533	0.680	0.564	0.145	0.039	0.102
43	0.563	0.928	0.574	0.143	0.007	0.097
45	0.534	0.665	0.541	0.195	0.071	0.228
46	0.399	0.557	0.422	0.184	0.039	0.176
47	0.604	0.730	0.623	0.108	0.020	0.090
49	0.455	0.734	0.465	0.079	-0.020	0.064
50	0.545	0.952	0.551	0.096	0.009	0.057
52	0.502	0.815	0.530	0.140	0.040	0.069
53	0.183	0.439	0.159	0.197	0.560	0.223
55	0.549	0.789	0.566	0.079	0.004	0.019
56	0.641	0.929	0.646	0.081	0.034	0.044
58	0.690	0.399	0.654	0.168	-0.197	0.192
59	0.810	0.619	0.855	0.052	-0.300	0.006
60	0.419	-	1.307	0.236	-	0.732
61	0.486	-6.301	0.502	0.143	0.336	0.040
62	0.627	0.776	0.644	0.095	0.027	0.087
63	0.619	0.949	0.828	0.170	-0.007	0.120
64	0.986	1.956	1.045	0.012	0.016	0.049
65	0.978	0.929	1.035	0.103	-0.109	-0.159
66	0.712	1.084	0.766	0.213	0.044	-0.019
68	0.727	1.085	0.668	0.178	0.082	0.154
69	0.713	1.035	0.725	0.063	-0.086	0.035
70	0.666	0.838	0.684	0.081	0.125	0.065
71	0.470	0.987	0.487	0.115	0.029	0.091
72	0.611	-	-0.067	0.272	-	-0.028
73	0.744	0.809	0.698	0.149	0.213	0.206
74	0.286	0.936	0.311	0.170	0.155	0.039
77	0.907	1.122	0.999	0.142	-0.061	-0.002
78	0.497	0.908	0.510	0.063	0.080	0.053
79	0.535	0.785	2.298	-0.012	-0.069	-0.024
80	0.480	0.883	0.497	0.054	-0.001	0.004
81	0.477	0.654	0.482	0.091	0.022	0.038
82	0.648	1.105	0.693	0.102	0.034	0.058
85	0.459	0.981	0.482	0.084	0.013	0.028
86	0.662	0.887	0.711	0.079	-0.020	0.011
90	0.983	-	0.985	-0.133	-	-0.131
91	1.036	-	1.033	0.033	-	0.030

Appendix Table 3.A.3: Estimated Coefficients of the Production Function

(continued)

Two-digit Industry code	Labor			Capital		
	(1) OLS	(2) Wooldridge	(3) ACF	(4) OLS	(5) Wooldridge	(6) ACF
92	1.861	-0.485	5.968	0.173	-0.005	-0.043
93	0.542	1.070	0.339	0.008	0.010	-0.028
94	4.860	-	-	0.000	-	-
95	0.849	-	0.796	0.004	-	0.005
96	0.490	0.435	0.478	0.065	-0.020	0.085

Note. Columns (1) to (3) show the estimated coefficients for Labor, while Columns (4) to (6) show the estimated coefficients for Capital. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees.

Appendix Table 3.A.4: Summary Statistics for Productivity

	Observations	Mean	Std. Dev	Min	Max
Logarithm of TFP using Wooldridge method	46,466	7.363	3.397	-64.39	33.12
Logarithm of TFP using ACF method	46,588	7.700	2.247	-1.681	56.77
Logarithm of Labor Productivity	49,372	6.100	1.389	-6.363	10.33

Note. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees.

Appendix Table 3.A.5: Effect of Export Status on Labor Productivity - OLS estimation

	Labor Productivity			
	(1)	(2)	(3)	(4)
Exporter	0.074***			
	(0.013)			
Domestic Exporter		0.048***		
		(0.013)		
FDI Exporter			0.112***	
			(0.024)	
FDI Non-Exporter				-0.100***
				(0.027)
Constant	6.157***	6.177***	6.161***	6.192***
	(0.005)	(0.002)	(0.005)	(0.002)
Observations	42,858	42,858	42,858	42,858
R-squared	0.931	0.931	0.931	0.931
Firm FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes

Note. See Table 3.15.

Appendix Table 3.A.6: Effect of Export Status on Total Factor Productivity GMM Wooldridge and ACF Method - OLS Estimation

	(1) Wooldridge	(2) ACF	(3) Wooldridge	(4) ACF	(5) Wooldridge	(6) ACF	(7) Wooldridge	(8) ACF
Exporter	0.089***	0.120***						
	(0.016)	(0.017)						
Domestic Exporter			0.071***	0.094***				
			(0.021)	(0.019)				
FDI Exporter					0.111***	0.153***		
					(0.025)	(0.025)		
FDI Non-Exporter							-0.098***	-0.143***
							(0.026)	(0.027)
Constant	7.389***	7.764***	7.412***	7.795***	7.400***	7.777***	7.431***	7.821***
	(0.007)	(0.007)	(0.004)	(0.003)	(0.005)	(0.006)	(0.002)	(0.002)
Observations	40,189	40,297	40,189	40,297	40,189	40,297	40,189	40,297
R-squared	0.983	0.974	0.983	0.974	0.983	0.974	0.983	0.974
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. See Table 3.16.

Appendix Table 3.A.7: Effect of Export Status on Total Factor Productivity - Olley Pakes Method

	Total Factor Productivity - Olley Pakes Method							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Exporter	0.091***	1.480**						
	(0.013)	(0.708)						
Domestic Exporter			0.068***	3.381*				
			(0.015)	(2.038)				
FDI Exporter					0.121***	2.633**		
					(0.021)	(1.193)		
FDI Non-Exporter							-0.113***	-2.542**
							(0.022)	(1.099)
Constant	6.081***		6.106***		6.090***		6.125***	
	(0.005)		(0.003)		(0.005)		(0.002)	
Observations	40,297	40,297	40,297	40,297	40,297	40,297	40,297	40,297
R-squared	0.969	-0.988	0.969	-3.748	0.969	-1.227	0.969	-1.125
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Columns (1), (3), (5), and (7) are OLS estimations, while Columns (2), (4), (6), and (8) are IV estimations with weight differences in tariff as IV. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees. Standard errors are clustered at the three-digit industry level. Province, three-digit industry, firms, and year fixed effects are controlled in all regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Appendix Table 3.A.8: Effect of Export Status on Total Factor Productivity - Levinsohn and Petrin Method

	Total Factor Productivity - Levinsohn and Petrin Method							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Exporter	0.075***	1.421**						
	(0.011)	(0.697)						
Domestic Exporter			0.056***	3.247				
			(0.013)	(2.007)				
FDI Exporter					0.100***	2.529**		
					(0.018)	(1.164)		
FDI Non-Exporter							-0.092***	-2.441**
							(0.019)	(1.073)
Constant	5.468***		5.488***		5.476***		5.504***	
	(0.005)		(0.002)		(0.004)		(0.001)	
Observations	40,297	40,297	40,297	40,297	40,297	40,297	40,297	40,297
R-squared	0.973	-1.126	0.973	-4.214	0.973	-1.391	0.973	-1.277
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note. Columns (1), (3), (5), and (7) are OLS estimations, while Columns (2), (4), (6), and (8) are IV estimations with weight differences in tariff as IV. The table is estimated using three rounds of the Vietnamese Enterprise survey conducted from 2017 to 2019. The sample is restricted to firms with more than 100 employees. Standard errors are clustered at the three-digit industry level. Province, three-digit industry, firms, and year fixed effects are controlled in all regressions. ***, **, and * indicate statistical significance at 1%, 5%, and 10%, respectively.

Table 4.1: The Share of Informal and Uninsured Workers in Vietnam

	All	Excluding agriculture and fishing	Trading
Panel A: Informal Workers			
2017	0.78	0.64	0.82
2018	0.77	0.64	0.80
2019	0.74	0.62	0.75
Panel B: Uninsured workers			
2017	0.77	0.63	0.81
2018	0.76	0.63	0.79
2019	0.72	0.60	0.74

Note. The dummy variable for the informal worker variable takes the value of one if an individual has less than a three-month labor contract or does not have compulsory insurance. Furthermore, the dummy variable for the uninsured worker variable takes the value of one if the individual does not have social insurance (compulsory or voluntary insurance). The above estimation is based on LFS 2017, 2018, and 2019 for workers aged 20–64 years. Survey sampling weights are also included.

Table 4.2: Difference in Characteristics and Job Outcomes between Formal and Informal Workers

	All		Excluding agriculture and fishing		Trading	
	Formal	Informal	Formal	Informal	Formal	Informal
Number of working hours per week in main job	45.24	39.34	45.27	45.96	48.40	34.47
Number of working hours per week in all jobs	45.82	42.37	45.84	47.52	48.73	38.58
Number of schooling year	12.39	7.38	12.42	8.42	10.22	6.62
Hourly income in main job (VND)[31]	35,473	22,474	35,578	27,746	30,888	18,319
Share with more than one job	0.05	0.23	0.05	0.12	0.03	0.3

Note. See the notes under Table 4.1.

[31] The US to VND exchange rate in 2018 is 22,602. Thus, in 2018, in main job, the formal workers received the average hourly income of 35,778 VND, equivalent to 1.58 USD, while the informal workers received 22,035 VND or 0.97 USD.

Table 4.3: Difference in Characteristics and Job Outcomes between Insured and Uninsured Workers

	All		Excluding agriculture and fishing		Trading	
	Insured	Uninsured	Insured	Uninsured	Insured	Uninsured
Number of working hours per week in main job	45.35	39.22	45.39	45.90	48.41	34.28
Number of working hours per week in all jobs	45.94	42.28	45.97	47.49	48.77	38.44
Number of schooling year	12.37	7.31	12.4	8.34	10.26	6.57
Hourly income in main job (VND)	35,840	22,382	35,970	27,691	31,121	18,239
Share with more than one job	0.05	0.23	0.05	0.12	0.04	0.31

Note. See the notes under Table 4.1.

Table 4.4: Impact of Trade War on the Industry Employment

	Share of industry employment in total employment		
	(1)	(2)	(3)
	All	Excluding agriculture and fishing	Trading
Panel A: Overall employment (LFS data)			
The weighted tariff difference divided by 1000	-0.018	0.016***	-0.019
	(0.022)	(0.006)	(0.024)
Observations	697	659	267
R-squared	0.993	0.995	0.993
Panel B: Enterprise Sector (VES data)			
The weighted tariff difference	0.007**	0.007**	0.006**
	(0.003)	(0.003)	(0.003)
Observations	680	644	267
R-squared	0.997	0.997	0.999

Note. Standard errors are clustered at the three-digit industry level. The dependent variable is the share of workers, calculated as the number of workers in industry j divided by the total number of workers each year. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). In Panel A, the industry employment share is based on LFS 2017, 2018 and 2019, and include workers between the ages of 20 and 64. In Panel B, the industry employment shares are data from the VES 2017, 2018, and 2019. These employment estimates include all workers in the enterprises at the end of the year. All regressions include the year fixed effect and three-digit industry fixed effect. *** $p<0.01$, ** $p<0.05$, * $p<0$.

Table 4.5: Decomposing changes in employment between 2017 and 2019

	All	Excluding agriculture and fishing	Trading
	Panel A: Informal Workers		
Within industries	-0.013	-0.020	-0.014
Between industries	-0.024	-0.005	-0.051
Total	-0.037	-0.025	-0.065
	Panel B: Uninsured workers		
Within industries	-0.017	-0.026	-0.017
Between industries	-0.025	-0.006	-0.053
Total	-0.042	-0.032	-0.070

Note. See the notes under Table 4.1.

Table 4.6: Impact of Trade War on Informal Workers in Vietnam

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
The weighted tariff difference	-0.706***	-0.672***	-0.804***
	(0.155)	(0.155)	(0.138)
Experience	0.004***	0.002	0.006**
	(0.001)	(0.002)	(0.002)
Square of Experience	-0.004**	0.002	-0.006**
	(0.002)	(0.004)	(0.003)
Female	-0.013**	-0.017*	-0.007
	(0.006)	(0.009)	(0.009)
Schooling years	-0.011***	-0.018***	-0.005**
	(0.003)	(0.003)	(0.002)
Urban	-0.030***	-0.029***	-0.009
	(0.007)	(0.007)	(0.010)
Constant	0.803***	0.775***	0.741***
	(0.037)	(0.049)	(0.048)
Observations	1,251,550	785,021	656,814
R-squared	0.609	0.557	0.610
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. The above estimation is based on LFS 2017, 2018 and 2019. The sample was restricted to workers between the ages of 20 and 64, inclusive at the time of the survey. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). Survey sampling weights are also included. All regressions include the year, three-digit industry, and province fixed effects. Standard errors are clustered at the three-digit industry-level. *** p<0.01, ** p<0.05, * p<0.1

Table 4.7: Impact of Trade War on Uninsured Employment in Vietnam

	(1)	(2)	(3)
	All	Excluding agriculture and fishing	Trading
The weighted tariff difference	-0.780***	-0.724***	-0.923***
	(0.130)	(0.128)	(0.145)
Experience	0.005***	0.003	0.006**
	(0.001)	(0.002)	(0.003)
Square of Experience	-0.005**	0.001	-0.007**
	(0.002)	(0.004)	(0.003)
Female	-0.013*	-0.017*	-0.006
	(0.007)	(0.010)	(0.009)
Schooling years	-0.013***	-0.020***	-0.005**
	(0.003)	(0.003)	(0.002)
Urban	-0.031***	-0.030***	-0.007
	(0.007)	(0.008)	(0.011)
Constant	0.793***	0.766***	0.725***
	(0.039)	(0.050)	(0.052)
Observations	1,254,915	788,264	657,706
R-squared	0.618	0.564	0.628
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. See the notes under Table 4.6.

Table 4.8: Impact of Trade War on the Income of Workers in Vietnam

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
	Panel A: Informal Workers Sample		
The weighted tariff difference	0.739	0.241	1.578
	(0.634)	(0.301)	(1.236)
Constant	2.660***	2.750***	2.556***
	(0.048)	(0.043)	(0.062)
Observations	564,712	324,410	297,661
R-squared	0.321	0.253	0.324
	Panel B: Uninsured Workers Sample		
The weighted tariff difference	0.801	0.292	1.629
	(0.644)	(0.306)	(1.248)
Constant	2.657***	2.755***	2.541***
	(0.047)	(0.043)	(0.061)
Observations	555,994	316,173	294,135
R-squared	0.322	0.254	0.324

Note. The above estimation is based on LFS 2017, 2018 and 2019. The sample was restricted to workers between the ages of 20 and 64, inclusive at the time of the survey. Column 1 includes all industries, Column 2 excludes agriculture and fishing, Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). All regressions include the usual controls for worker characteristics and province, industry and year fixed effects, as shown in Tables 4.6 and 4.7. Survey sampling weights are also included. Standard errors are clustered at three-digit industry-level. All regressions include the year, three-digit industry, and province fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4.9: Placebo Test Using Pre-Trade War Periods

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
	Panel A: Informal Workers		
The weighted tariff difference	-0.566	-0.516	-0.546
	(0.354)	(0.363)	(0.392)
Observations	1,208,383	724,679	650,561
R-squared	0.607	0.556	0.578
	Panel B: Uninsured Workers		
The weighted tariff difference	-0.454	-0.411	-0.402
	(0.300)	(0.303)	(0.317)
Observations	1,213,930	730,200	652,032
R-squared	0.612	0.561	0.590

Note. The estimation above is based on the LFS 2014, 2016 and 2017. The sample was restricted to workers between the ages of 20 and 64, inclusive at the time of the survey. The tariff difference data for 2018 and 2019 were matched with observations in 2016 and 2017. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). All regressions include the usual controls for worker characteristics and province, industry and year fixed effects as shown in Tables 4.6 and 4.7. Survey sampling weights are also included. Standard errors are clustered at the three-digit industry-level. All regressions include the year, three-digit industry, and province fixed effects. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4.10: Impact of Trade War on the Share of Uninsured Workers - Firm-level Analysis

	(1)	(2)	(3)	(4)	(5)	(6)
	All firms			Firms with more than 100 employees		
	All	Excluding agriculture and fishing	Trading	All	Excluding agriculture and fishing	Trading
The weighted tariff difference	0.033	0.062	-0.460**	-0.447***	-0.436***	-0.452**
	(0.162)	(0.160)	(0.202)	(0.142)	(0.143)	(0.177)
Constant	0.671***	0.668***	0.610***	0.309***	0.309***	0.209***
	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)
Observations	1,143,737	1,119,177	235,260	42,422	41,570	23,754
R-squared	0.743	0.743	0.779	0.866	0.865	0.799
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes

Note. The estimation above is based on the VES 2017, 2018 and 2019. Columns 1 and 4 include all industries; Columns 2 and 5 exclude agriculture and fishing; and Columns 3 and 6 include all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). Columns 1–3 include all firms in the VES, while Columns 4–6 restrict the sample to firms with more than 100 employees. Standard errors are clustered at the three-digit industry level. All regressions include the year, three-digit industry, province, and firm fixed effects. *** p<0.01, ** p<0.05, * p<0.1

Table 4.11: Impact of Trade War on Workers' Employment in Vietnam
By Age, Gender, and Education

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
	Panel A: Age		
Age 20 to 29	-0.592***	-0.531**	-0.655***
	(0.226)	(0.233)	(0.227)
Observations	258,490	178,800	140,078
Age 30 to 39	-0.524***	-0.473**	-0.550***
	(0.196)	(0.202)	(0.194)
Observations	348,340	245,103	168,692
Age 40 to 49	-0.996***	-0.999***	-1.001***
	(0.202)	(0.200)	(0.185)
Observations	324,402	205,428	161,345
Age 50 to 59	-0.884***	-0.943***	-0.986***
	(0.123)	(0.143)	(0.189)
Observations	250,337	128,655	140,135
Age 60 to 64	0.030	0.073	-0.046
	(0.319)	(0.371)	(0.295)
Observations	69,952	27,006	46,549
	Panel B: Sex		
Female	-0.441**	-0.395*	-0.615***
	(0.202)	(0.204)	(0.231)
Observations	608,656	374,306	337,207
Male	-0.813***	-0.790***	-0.859***
	(0.159)	(0.159)	(0.137)
Observations	642,892	410,713	319,607
	Panel C: Education		
Did not complete primary school	-1.554***	-1.617***	-1.707***
	(0.259)	(0.203)	(0.228)
Observations	169,106	52,334	125,205
Completed primary school, but did not complete high school	-0.822***	-0.752***	-0.891***
	(0.144)	(0.143)	(0.144)
Observations	643,749	354,592	387,514
Completed high school or higher	-0.249	-0.241	-0.237
	(0.155)	(0.158)	(0.160)
Observations	438,673	378,073	144,090

Note. Standard errors are clustered at the three-digit industry level. The table shows the estimated coefficient of tariff difference from regressing an indicator for informal workers for the indicated sample. All regressions include the usual controls for worker characteristics and province, industry, and year fixed effects, as shown in Table 4.6.

Table 4.12: Impact of Trade War on Workers without Social Insurance in Vietnam By Age, Gender, and Education

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
	Panel A: Age		
Age 20 to 29	-0.736***	-0.644***	-0.847***
	(0.196)	(0.204)	(0.217)
Observations	258,758	179,056	140,175
Age 30 to 39	-0.609***	-0.526***	-0.673***
	(0.189)	(0.193)	(0.218)
Observations	349,461	246,198	168,997
Age 40 to 49	-0.992***	-0.985***	-1.014***
	(0.207)	(0.200)	(0.190)
Observations	325,574	206,564	161,624
Age 50 to 59	-0.788***	-0.848***	-0.935***
	(0.124)	(0.148)	(0.209)
Observations	250,996	129,283	140,313
Age 60 to 64	0.043	0.094	-0.174
	(0.408)	(0.468)	(0.326)
Observations	70,096	27,133	46,582
	Panel B: Sex		
Female	-0.600***	-0.514**	-0.843***
	(0.215)	(0.201)	(0.272)
Observations	609,654	375,260	337,461
Male	-0.842***	-0.805***	-0.922***
	(0.162)	(0.166)	(0.157)
Observations	645,259	413,002	320,245
	Panel C: Education		
Did not complete primary school	-1.555***	-1.622***	-1.708***
	(0.261)	(0.208)	(0.232)
Observations	169,119	52,341	125,213
Completed primary school, but did not complete high school	-0.913***	-0.817***	-0.999***
	(0.122)	(0.125)	(0.162)
Observations	644,108	354,903	387,649
Completed high school or higher	-0.300*	-0.276*	-0.348**
	(0.152)	(0.156)	(0.171)
Observations	441,666	380,998	144,839

Note. Standard errors are clustered at the three-digit industry level. All regressions include the usual controls for worker characteristics and province, industry and year fixed effects, as shown in Table 4.7.

Appendix Table 4.A.1: Summary Statistics

Variable	All		Before Trade War		After Trade War	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev
Informal worker (=1 if yes)	0.76	0.43	0.78	0.41	0.75	0.43
Worker without insurance (=1 if yes)	0.75	0.43	0.77	0.42	0.74	0.44
Age	40.23	11.52	40.3	11.59	40.19	11.48
Year of experience	25.64	13.45	25.88	13.49	25.52	13.43
(Year of experience)^2 /100	8.38	7.36	8.52	7.41	8.32	7.33
Female (=1 if yes)	0.48	0.50	0.48	0.50	0.47	0.50
Year of education	8.58	4.65	8.42	4.68	8.67	4.63
Urban (=1 if yes)	0.33	0.47	0.33	0.47	0.33	0.47
Agriculture, forestry and aquaculture (=1 if yes)	0.35	0.48	0.38	0.49	0.34	0.47
Non-Agriculture (=1 if yes)	0.65	0.48	0.62	0.49	0.66	0.47
Weekly working hours (main job)	40.76	14.05	40.9	13.23	40.68	14.44
Working for more than one job (=1 if yes)	0.18	0.39	0.21	0.4	0.17	0.38
Logarithm of hourly income	3.14	0.70	3.11	0.71	3.17	0.70
Number of observations	1,254,954	1,254,954	423,351	423,351	831,603	831,603

Note. The sample consists of all employed individuals in LFS 2017, 2018, and 2019 who worked and were 20 to 64 years old of age inclusive at the time of the survey. Survey sampling weights are used to calculate all the statistics presented in this table. For the convenience, the experience square is divided by 100.

Appendix Table 4.A.2: US Import Tariff Difference against China and Vietnam

Industry	Number of industries	Number of targeted industries	Mean tariff difference	Std. Dev	Min	Max
			Panel A: Year 2018			
All	235	78	0.0014	0.004	0	0.043
Agriculture	13	7	0.0004	0.0007	0	0.0026
Manufacturing	70	61	0.0046	0.0064	0	0.043
Traded	89	77	0.0037	0.006	0	0.043
			Panel B: Year 2019			
All	233	91	0.0085	0.018	0	0.101
Agriculture	12	7	0.003	0.0057	0	0.020
Manufacturing	71	68	0.0259	0.0247	0	0.101
Traded	89	86	0.0219	0.0236	0	0.101

Note. The tariff difference is the weighted US import tariff difference between Vietnam and China due to the trade war within the three-digit industry code. For each commodity-line tariff difference, its weight is the share of the HS ten-digit imported product from China to the total imported products of the US within the three-digit industry based on 2015 US imports. In 2017, the import tariff difference was equal 0 due to the fact that it was before the trade war, and there was no difference between the US import tariffs between Vietnam and China in 2017. There are five industries that are affected by the trade war, but do not belong to traded sectors. These include the manufacture of weapons and ammunition, military fighting vehicles, postal activities, motion pictures, video and television programmer activities, and other personal service activities.

Appendix Table 4.A.3: Impact of Trade War on Informal Workers in Vietnam

(Excluding some industries affected by other Trump policies)

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
The weighted difference in tariff	-0.716***	-0.686***	-0.819***
	(0.156)	(0.155)	(0.138)
Experience	0.005***	0.003	0.006**
	(0.001)	(0.002)	(0.003)
Square of Experience	-0.005**	0.001	-0.006**
	(0.002)	(0.004)	(0.003)
Female	-0.013**	-0.017*	-0.006
	(0.006)	(0.010)	(0.009)
Schooling years	-0.011***	-0.018***	-0.005**
	(0.003)	(0.003)	(0.002)
Urban	-0.030***	-0.030***	-0.010
	(0.007)	(0.008)	(0.011)
Constant	0.808***	0.781***	0.750***
	(0.037)	(0.050)	(0.050)
Observations	1,240,548	774,019	645,812
R-squared	0.605	0.554	0.598
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. The estimation above is based on LFS 2017, 2018, and 2019. The sample was restricted to workers between the ages of 20 and 64, inclusive at the time of the survey. The sample excluded industries that were affected by other Trump policies, including industry codes 241, 242, 261, 275 and 282. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). Survey sampling weights are also included. All regressions include the year, three-digit industry, and province fixed effects. Standard errors are clustered at three-digit industry-level. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4.A.4: Impact of Trade War on Uninsured workers in Vietnam

(Excluding some industries affected by other Trump policies)

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
The weighted difference in tariff	-0.782***	-0.730***	-0.929***
	(0.133)	(0.131)	(0.146)
Experience	0.005***	0.003	0.006**
	(0.001)	(0.002)	(0.003)
Square of Experience	-0.005**	0.001	-0.007**
	(0.002)	(0.004)	(0.003)
Female	-0.012*	-0.016	-0.005
	(0.007)	(0.010)	(0.009)
Schooling years	-0.013***	-0.020***	-0.005**
	(0.003)	(0.003)	(0.002)
Urban	-0.031***	-0.030***	-0.007
	(0.008)	(0.008)	(0.012)
Constant	0.798***	0.773***	0.735***
	(0.039)	(0.051)	(0.054)
Observations	1,243,885	777,234	646,676
R-squared	0.612	0.560	0.614
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. See the notes under Appendix Table 4.A.3.

Appendix Table 4.A.5: Impact of Trade War on Informal Workers in Vietnam

(Using LFS 2016, 2018 and 2019)

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
The weighted difference in tariff	-0.791***	-0.742***	-0.886***
	(0.118)	(0.110)	(0.142)
Experience	0.005***	0.003	0.006**
	(0.001)	(0.002)	(0.003)
Square of Experience	-0.005**	0.001	-0.007**
	(0.002)	(0.004)	(0.003)
Female	-0.013**	-0.017*	-0.006
	(0.006)	(0.009)	(0.008)
Schooling years	-0.011***	-0.018***	-0.004**
	(0.003)	(0.003)	(0.002)
Urban	-0.033***	-0.033***	-0.012
	(0.007)	(0.007)	(0.010)
Constant	0.802***	0.773***	0.735***
	(0.037)	(0.050)	(0.050)
Observations	1,249,104	779,539	659,325
R-squared	0.606	0.554	0.606
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. The estimation above is based on LFS 2016, 2018 and 2019. The sample was restricted to workers between the ages of 20 and 64 inclusive at the time of the survey. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). The survey sampling weights are also included. All regressions include the year, three-digit industry, and province fixed effects. Standard errors are clustered at the three-digit industry-level. *** p<0.01, ** p<0.05, * p<0.1

Appendix Table 4.A.6: Impact of Trade War on Uninsured workers in Vietnam

(Using LFS 2016, 2018 and 2019)

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
The weighted difference in tariff	-0.866***	-0.795***	-0.983***
	(0.142)	(0.130)	(0.206)
Experience	0.005***	0.003	0.007**
	(0.002)	(0.002)	(0.003)
Square of Experience	-0.005**	0.000	-0.007**
	(0.002)	(0.004)	(0.003)
Female	-0.013*	-0.016*	-0.005
	(0.007)	(0.010)	(0.009)
Schooling years	-0.013***	-0.020***	-0.005**
	(0.003)	(0.003)	(0.002)
Urban	-0.034***	-0.034***	-0.010
	(0.007)	(0.008)	(0.011)
Constant	0.792***	0.765***	0.720***
	(0.040)	(0.051)	(0.055)
Observations	1,252,852	783,088	660,349
R-squared	0.614	0.561	0.622
Industry FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes

Note. See the notes under Appendix Table 4.A.5.

Appendix Table 4.A.7: Impact of Trade War on the Income of Workers in Vietnam

	(1) All	(2) Excluding agriculture and fishing	(3) Trading
	Panel A: Informal Workers		
The weighted difference in tariff	0.338	0.125	0.977
	(1.049)	(0.826)	(1.462)
Informal	-0.194***	-0.173***	-0.164***
	(0.042)	(0.040)	(0.025)
Tariff difference * Informal workers	0.953	0.703	0.640
	(1.188)	(1.060)	(0.945)
Observations	765,083	521,181	373,917
R-squared	0.353	0.286	0.364
F-statistics			
Tariff difference* Informal + Tariff difference = 0	0.43	0.26	0.26
	(p=0.514)	(p=0.608)	(p=0.614)
	Panel B: Uninsured Workers		
The weighted difference in tariff	0.261	0.053	0.839
	(1.022)	(0.788)	(1.451)
Uninsured	-0.207***	-0.183***	-0.185***
	(0.040)	(0.037)	(0.026)
Tariff difference * Uninsured workers	1.042	0.800	0.846
	(1.145)	(1.006)	(0.929)
Observations	767,283	523,304	374,504
R-squared	0.356	0.291	0.366
F-statistics			
Tariff difference* Uninsured + Tariff difference = 0	0.55	0.40	0.51
	(p=0.457)	(p=0.529)	(p=0.476)

Note. The estimation above is based on LFS 2017, 2018, and 2019. The sample is restricted to workers between the ages of 20 and 64, inclusive at the time of the survey. Column 1 includes all industries, Column 2 excludes agriculture and fishing, and Column 3 includes all traded industries (using Vietnam export data from the UN Comtrade Database in 2015, the industry has export activities). Survey sampling weights are also included. All regressions include the year, three-digit industry, and province fixed effect. Standard errors are clustered at the three-digit industry-level. *** p<0.01, ** p<0.05, * p<0.1

Figures

Figure 2.1

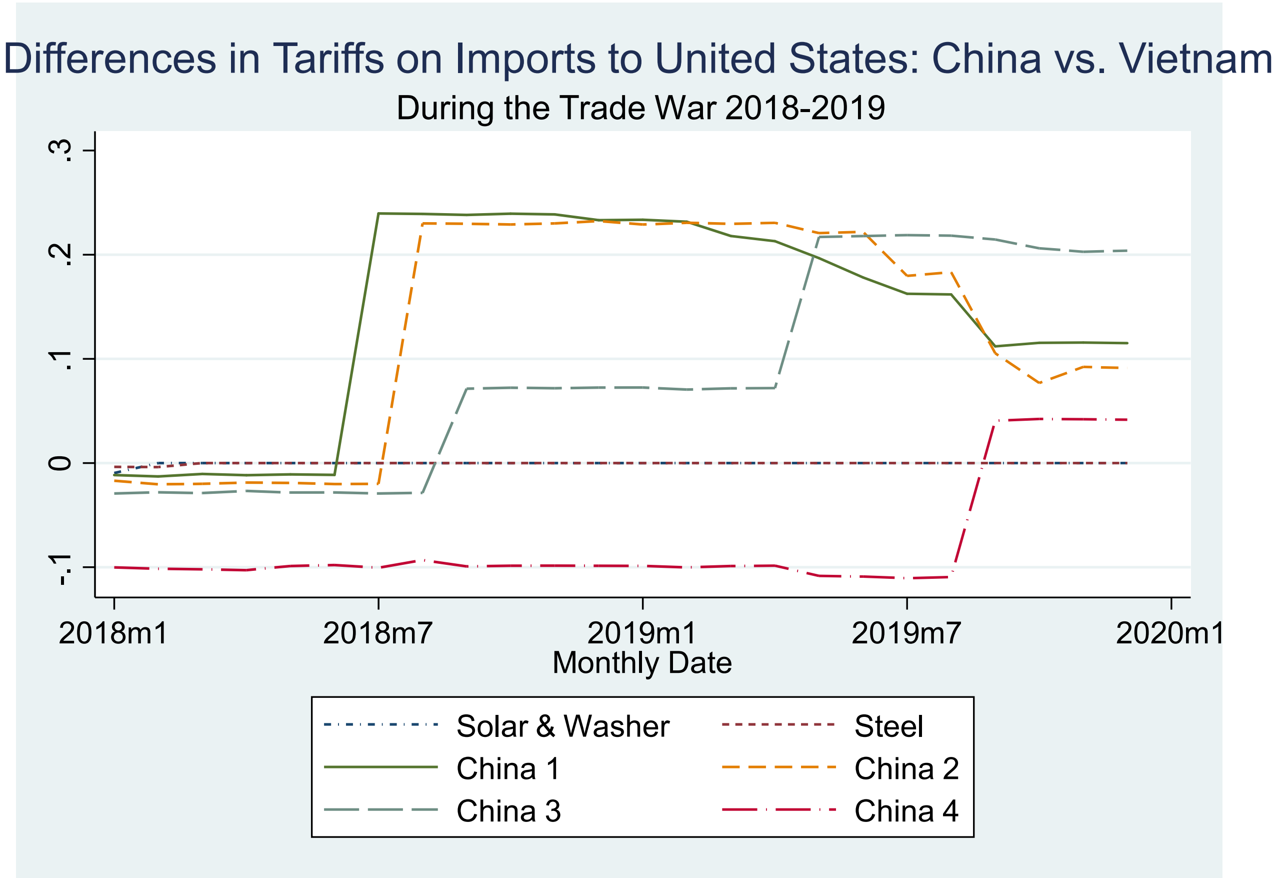
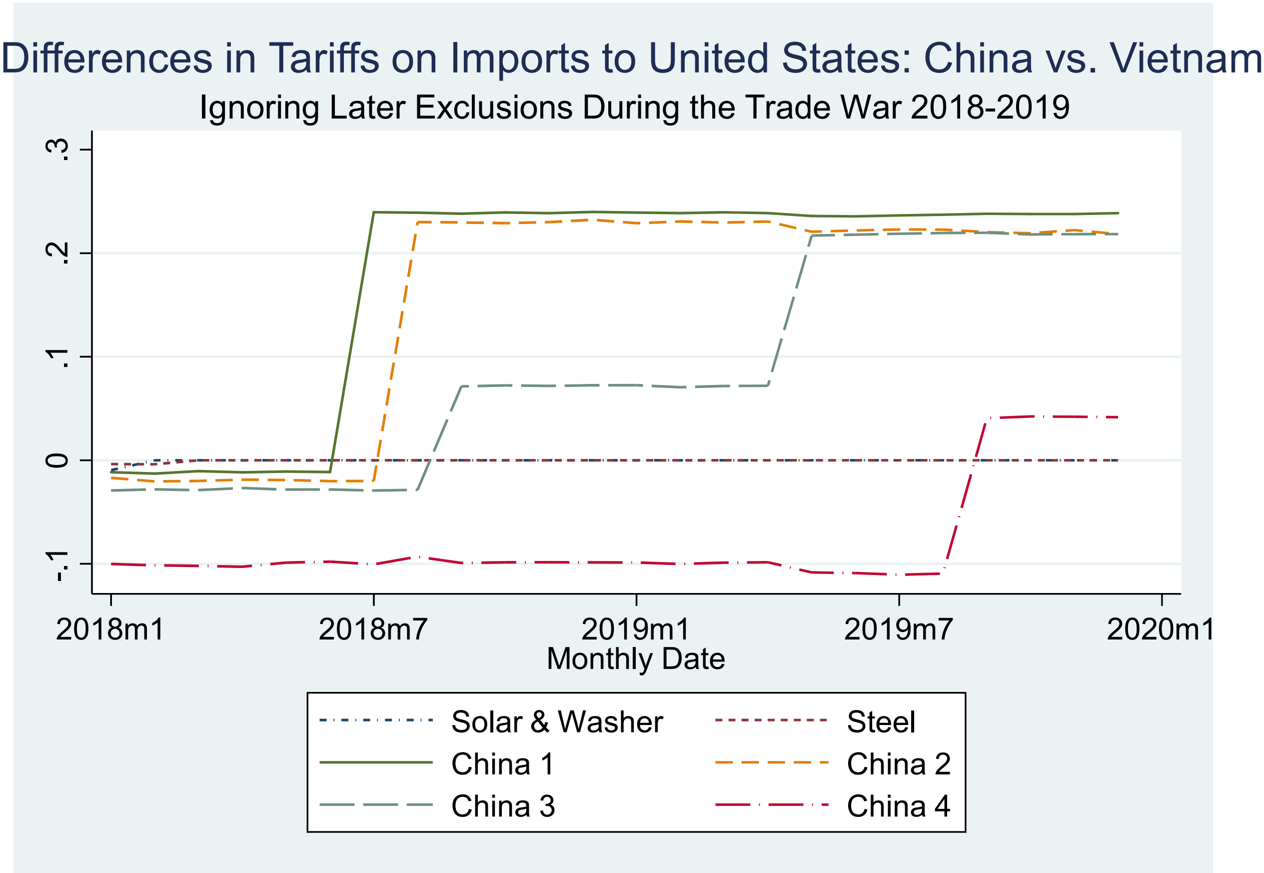


Figure 2.2


Differences in Tariffs on Imports to United States: China vs. Vietnam
Ignoring Later Exclusions During the Trade War 2018-2019
-.1
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2018m1
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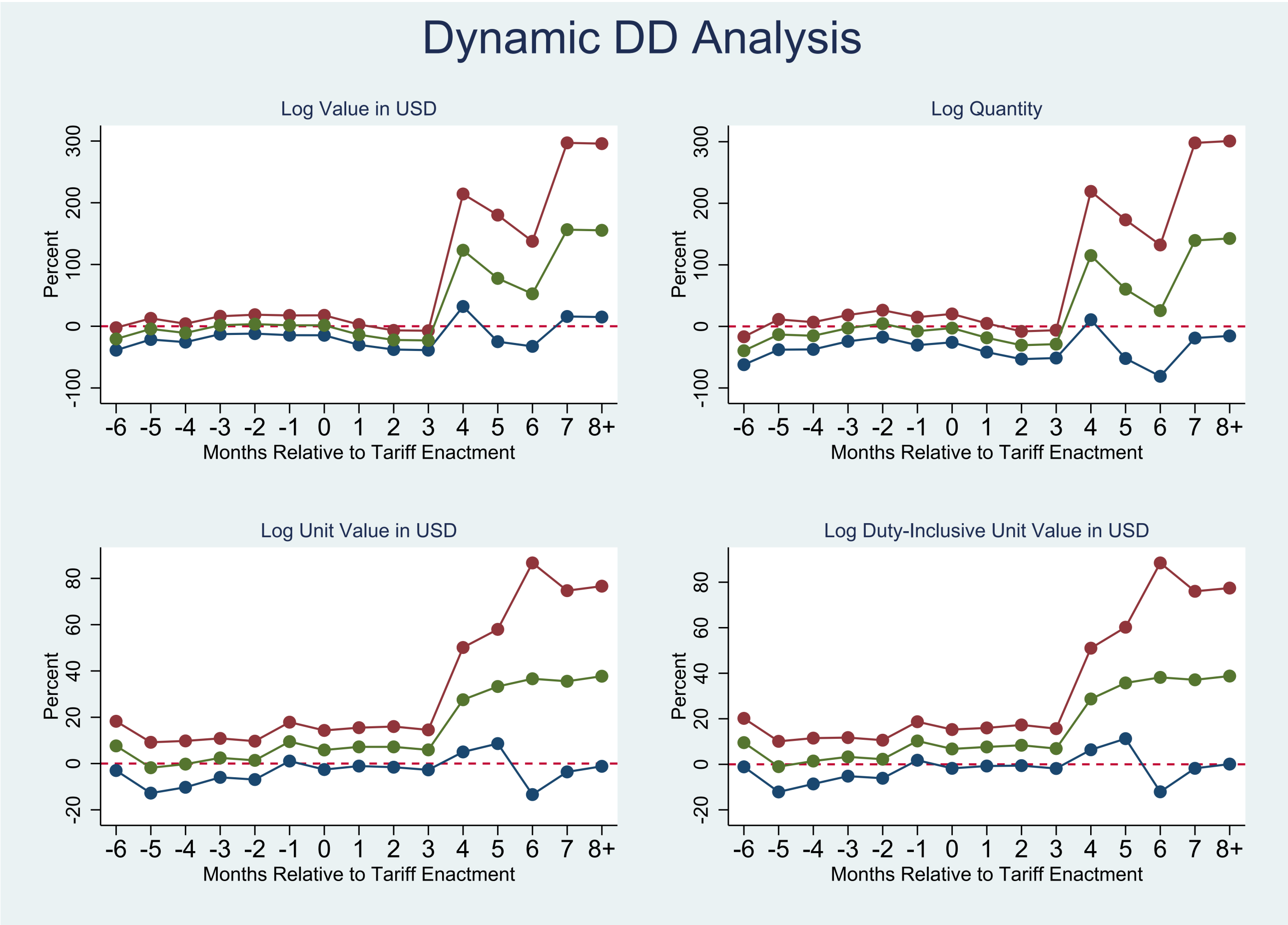
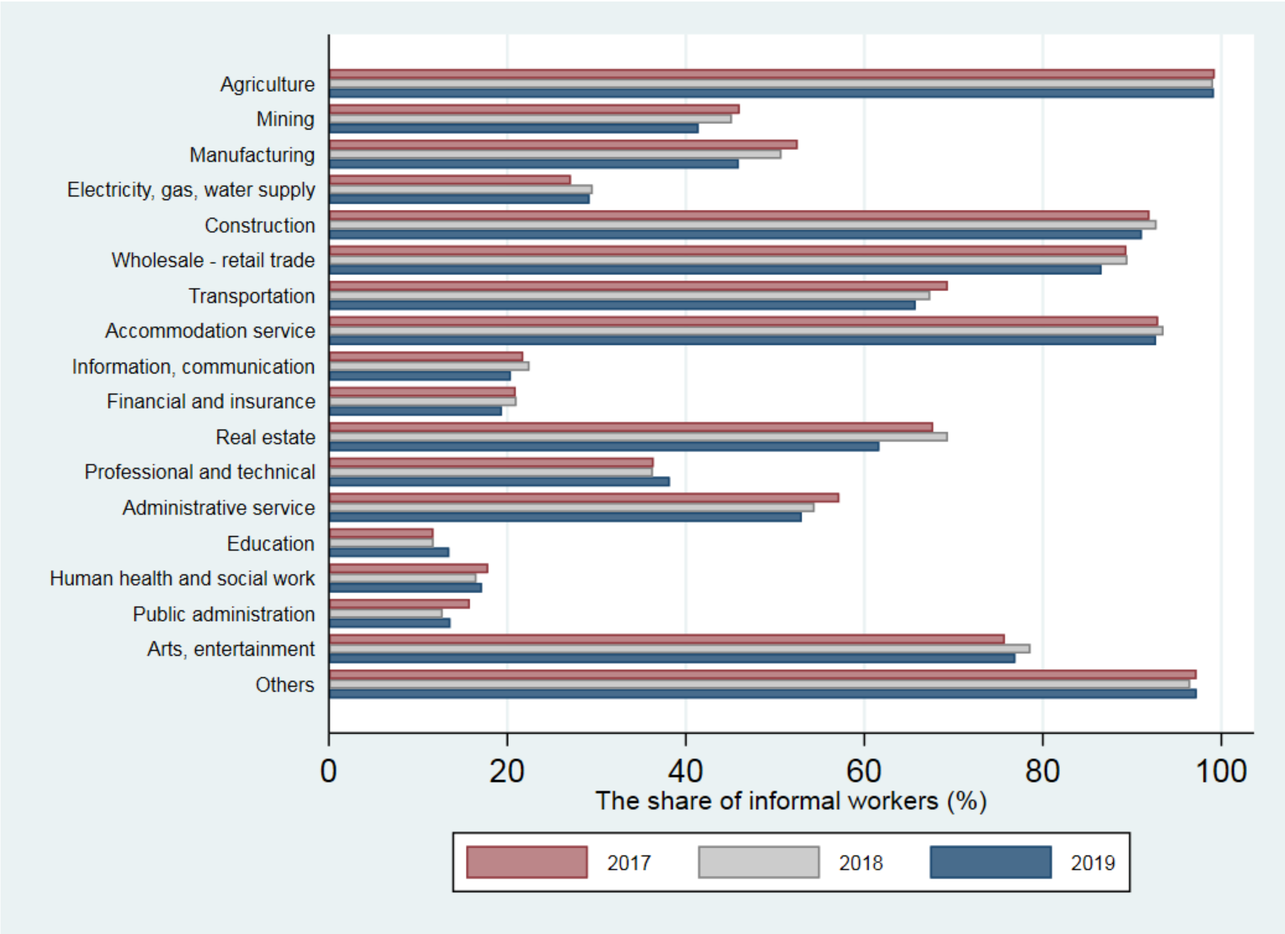
2019m1
2019m7
2020m1
Monthly Date
Solar & Washer
Steel
China 1
China 2
China 3
China 4

Figure 2.3



Dynamic DD Analysis
Log Value in USD
Percent
-100
0
100
200
300
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8+
Months Relative to Tariff Enactment
Log Quantity
Percent
-100
0
100
200
300
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8+
Months Relative to Tariff Enactment
Log Unit Value in USD
Percent
-20
0
20
40
60
80
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8+
Months Relative to Tariff Enactment
Log Duty-Inclusive Unit Value in USD
Percent
-20
0
20
40
60
80
-6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8+
Months Relative to Tariff Enactment

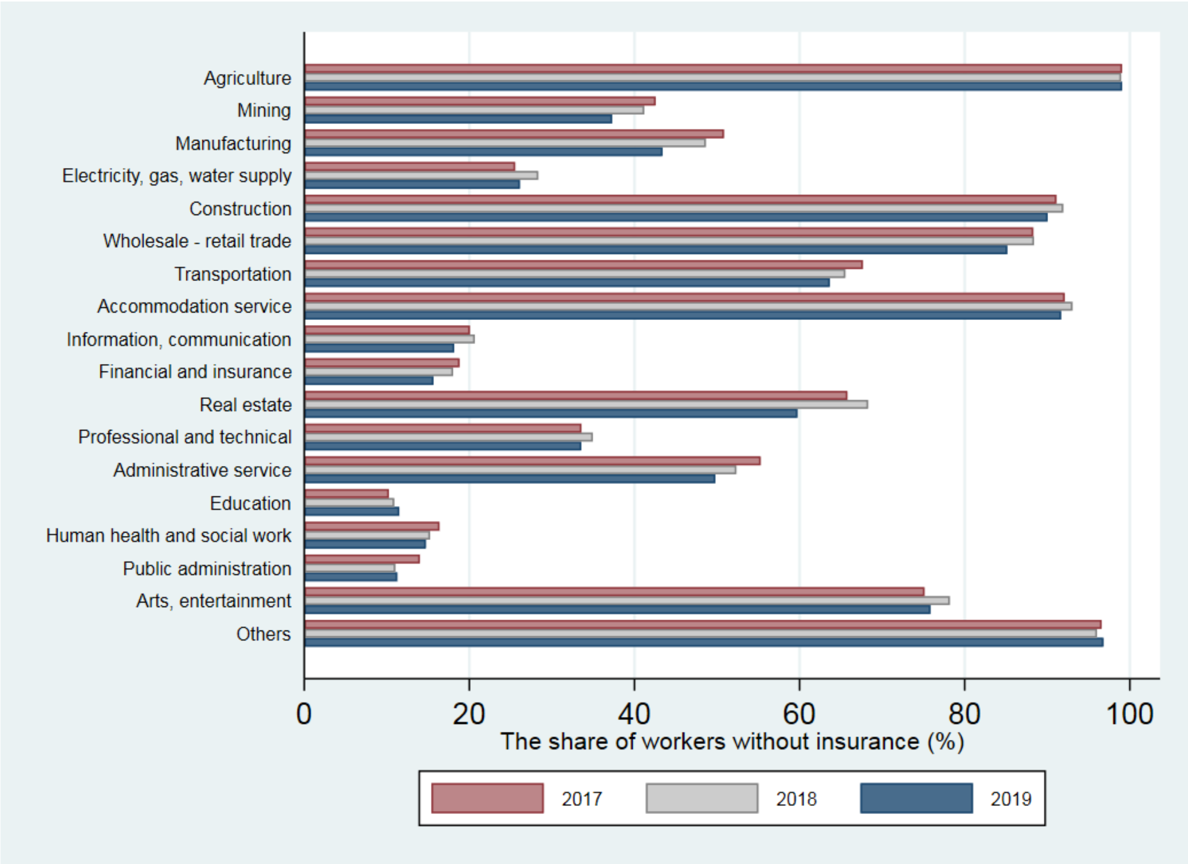
Figure 4.1: The Share of Informal Workers in Vietnam by Industry



Source: Authors' calculations from Vietnam Labor Force Survey

Note. Informal workers are individuals who have less than a three-month labor contract or do not have compulsory insurance. The above estimation is based on LFS 2017, 2018, and 2019 for workers aged 20 to 64. Survey sampling weights are also included.

Figure 4.2: The Share of Workers without Insurance in Vietnam by Industry



Source: Authors' calculations from Vietnam Labor Force Survey

Note. The above estimation is based on LFS 2017, 2018 and 2019 for workers aged 20 to 64. Survey sampling weights are also included.