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Structural Transformation in the Era of Trade Protectionism

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Selected presentation for the International Agricultural Trade Research Consortium's (IATRC's) 2023 Annual Meeting: The Future of (Ag-) Trade and Trade Governance in Times of Economic Sanctions and Declining Multilateralism, December 10-12, 2023, Clearwater Beach, FL.

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Structural Transformation in the Era of Trade Protectionism

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US-China Trade War



Source: *marketwatch*

US-China Trade War

- **US Tariffs** Trump administration imposed a series of **tariffs** on named trading partners, including **China**.
 - Donald Trump's speech in Penn (June 28, 2016): *If China does not stop its illegal activities, including its theft of America trade secrets, I will use every lawful presidential power to remedy trade disputes...*
- **Retaliatory Tariffs** The return to protectionism brought a reaction from China in the form of **retaliatory tariffs**, especially on **US agricultural products**.

Timeline: US-China trade war

Date	Description	%targeted HS6
February 07, 2018	Section 201: Solar and washing machine tariff (20-30%)	0.14
March 23, 2018	Section 232: Steel and aluminum tariff (10-25%)	3.8
July 06, 2018	Section 301, List 1: China \$50 billion tariff (25%)	14.38
August 23, 2018	Section 301, List 2: China \$50 billion tariff (25%)	17.48
September 24, 2018	Section 301, List 3: China \$200 billion tariff (10%)	72.63
June 01, 2019	Section 301, List 3: China \$200 billion tariff (+15%)	72.3
September 01, 2019	Section 301, List 4A: China \$112 billion tariff ^a (15%)	93.02

Source: Chor and Li (2021).

^a List 4A tariff rates were later reduced to 7.5%, effective from February 14, 2020.

Evolution of the Trade War Tariff

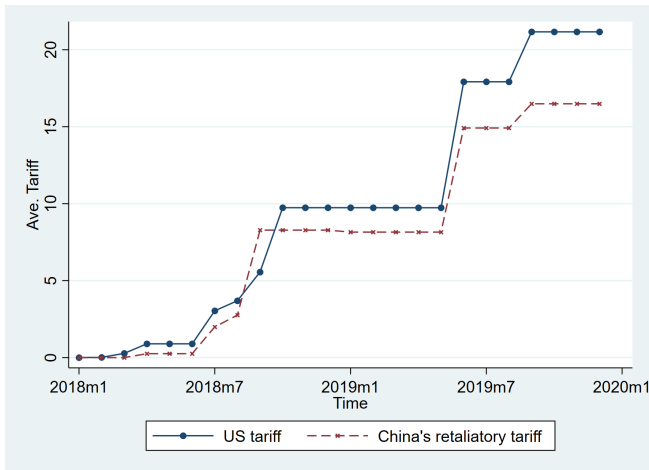


Fig.1: US/China trade war tariff

Outcomes of US-China Trade War

- Impacts of US-China Trade war:
 - **US/China labor market and firms responses:** Benguria and Saffie (2020); Benguria et al (2022); Chor and Li (2021); Jiao et al (2022)
 - **Price pass-through:** Amiti et al (2018); Fajgelbaum et al (2020)
 - **Political economy of trade protection:** Blanchard et al. (2019); Lake and Nie (2022); Choi and Lim (2022)
- These studies look at some pieces of economic/political outcomes in **either US or China.**
- Impact on outsiders through **trade reallocation:** Choi and Nguyen (2021); Freund et al (2020); Fajgelbaum et al (2021); Mao and Görg (2020); Sanyal (2021)

Motivation

Who is the real winner of the US-China trade war?

Motivation



THE WALL STREET JOURNAL.

THE SATURDAY ESSAY

Who Won the U.S.-China Trade War?

Neither country got the concessions it sought, and both damaged their economies. The real beneficiaries? Vietnam and others who stepped into the breach.



Source: *The Wall Street Journal*

China and Vietnam's exports to US and ROW

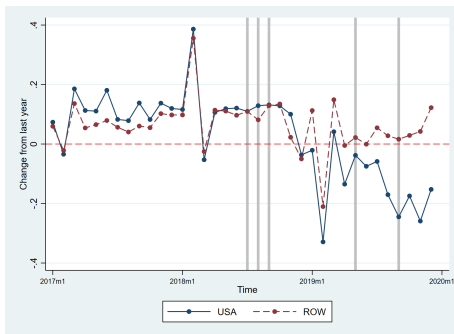


Fig.1: China's exports

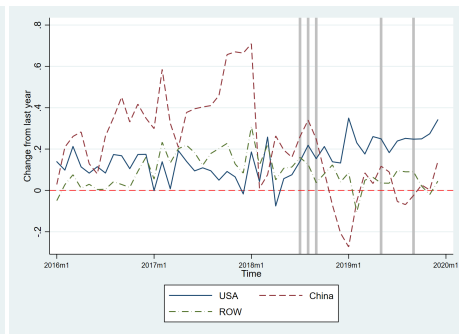
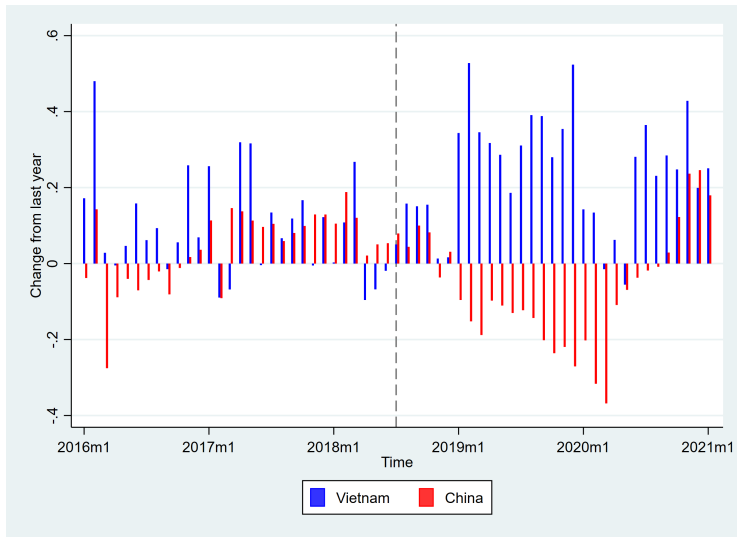


Fig.2 Vietnam's exports

Monthly US imports from China and Vietnam, YoY change



Trade diversion to Vietnam: Product-level regression

Regress YoY change in exports of each HS6-digit product to Section 301 tariff:

$$\Delta X_{pm} = \sum_{r=-6}^{r=6} \phi_r^{Sec301} \Delta USTariff_{p,m+r}^{Sec301} + \sum_{r=-6}^{r=6} \phi_r^{other} \Delta USTariff_{p,m+r}^{other} + \sum_{r=-6}^{r=6} \mu_r \Delta ChinaTariff_{p,m+r} + D_p + D_{sm} + \epsilon_{pm}$$

where:

- $USTariff_{p,m+r}^{Sec301}$ = Section 301 tariff; $ChinaTariff_{p,m+r}$ = retaliatory tariff
- $USTariff_{p,m+r}^{other}$ = Section 201 and 232 tariff
- D_p : HS 6-digit FE
- D_{sm} : HS section-by-month FE (15 HS sections)
- Clustered at HS 2-digit level
- Data: COMTRADE and Bown (2021)

Product-level regression: Cumulative effects of tariff

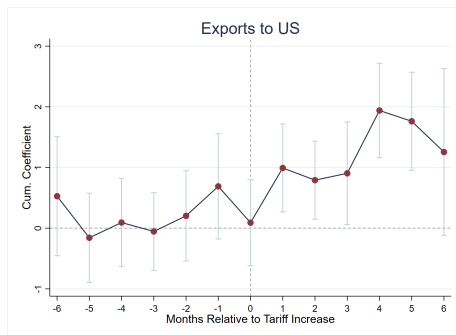


Fig.1: $\Delta USTariff^{Sec301}$

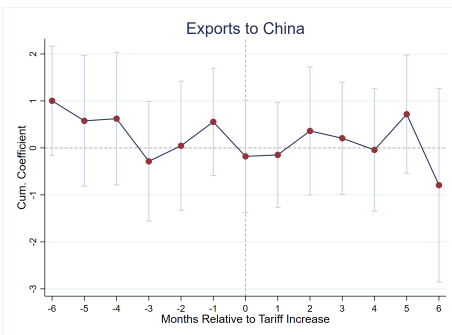


Fig.2 $\Delta ChinaTariff$

Product-level regression: Cumulative effects of tariff

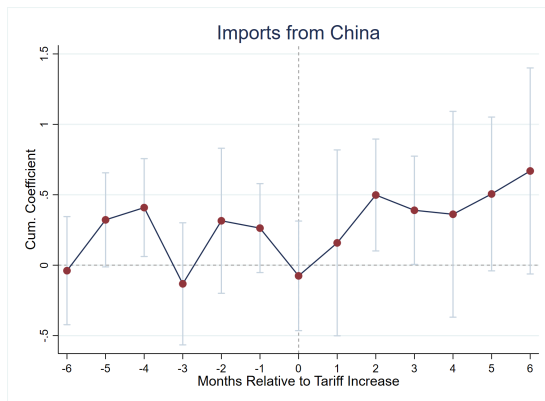


Fig.3: $\Delta USTariff^{Sec301}$

Research Question

- How do the unexpected impacts of **trade protectionism** between the world's largest economies affect a **bystander** developing country's economy?
- Specifically, we investigate how trade protectionism between the US and China and the subsequent trade diversion to Vietnam influence **the FDI inflow** and **unexpectedly transform the economic structure in Vietnam**.

Data

- Our analysis leverages a novel combination of five principal sources of data to measure **FDI inflow**, the **US-China trade diversion exposure**, and various aspects of **structural transformation** in Vietnam.³

1 Foreign Direct Investment Data

- cross-border greenfield FDI data obtained from fDi Markets database; a real-time record of investment announcements at the project-month level; categorized by their sector, sub-sector, cluster and business activity

2 Vietnam Labor Force Survey

- industry (ISIC 4-digit), occupation, employment, wage, work hours, migration; Years 2017 and 2019 [Summary](#)

3 Vietnam Enterprise Survey

- census on registered firms covering firm's employment (total, female, workers with social security contribution), industry, ownership, location; Years 2015-19

4 Trade data: UN COMTRADE at HS 6-digit level

- Match each HS6 product to corresponding ISIC 4-digit industry using concordance table from WITS

5 Tariff data: Bown (2021)

- HS 10-digit for US tariff and 8-digit for China tariff \Rightarrow simple average to HS 6-digit

³VLFS and VES data are acquired directly from the General Statistic Office (GSO) of Vietnam.

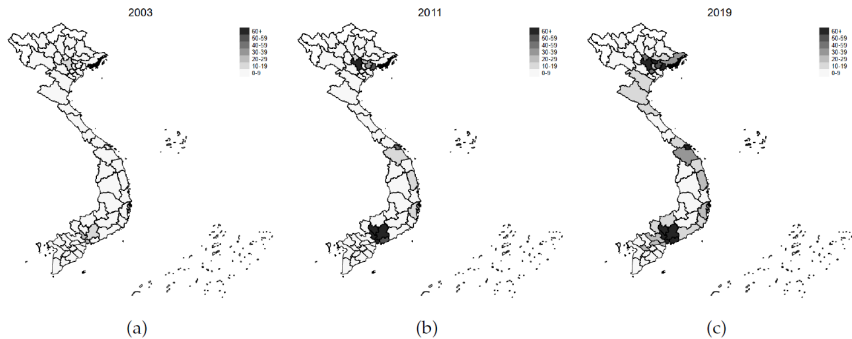
Empirical analysis: Outline

- Part 1: US-China Trade War \Rightarrow Reallocation of FDI into Vietnam
- Part 2: US-China Trade War \Rightarrow Structural Transformation in Vietnam

The Impact of US-China Trade War on FDI Inflow in Vietnam

- We begin by investigating the impact of trade war on FDI inflow in Vietnam using the project-level data.
- We assess the different evolution of **sectors exposed to trade war tariffs** vs. **non-exposed sectors**.
 - Within each 2-digit industry classification, projects are divided into two main groups: affected and non-affected projects.
 - FDI projects are considered affected by trade war tariffs if their primary sector aligns with the U.S. tariff targets and their functional focus is on manufacturing.
 - Projects categorized as affected include those involved in manufacturing, logistics, distribution, and extraction, as per a broader classification method adopted from Blanchard et al. (2021).

Spatial distribution of FDI in Vietnam



The Impact of US-China Trade War on FDI Inflow in Vietnam

To examine the impact of the trade war on FDI inflows, we use the bilateral quarterly FDI data from FDi Markets. We narrow the data to the 2016Q1-2019Q4 period, which amounts to 30 months before and 18 months after Section 301 tariff schedule was in place.

The regression specification is as follows:

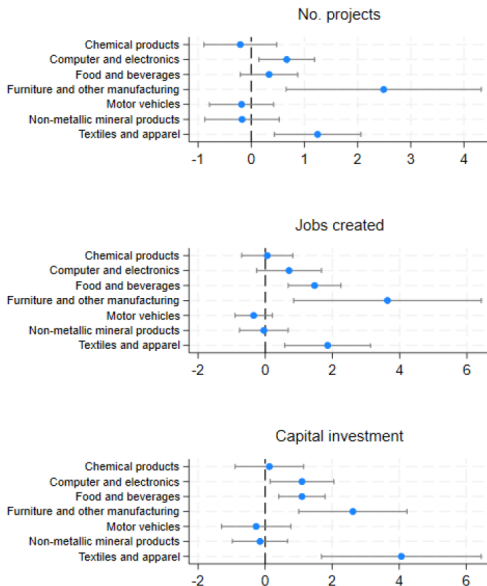
$$FDI_{ijkt} = \beta_0 + \beta_1 \text{Vietnam}_j \times \text{Affected}_k \times \text{Post}_t + \beta_2 \text{Vietnam}_j \times \text{Affected}_k + \beta_3 \text{Affected}_k + \alpha_{it} + \alpha_{ij} + \varepsilon_{ijkt}, \quad (1)$$

- FDI_{ijkt} : quarterly FDI outcomes from origin country i to destination country j for group $k = \{\text{affected, non-affected}\}$ at time t
- Vietnam_j : a dummy equal to 1 if the destination country j is Vietnam
- Affected_k : a dummy equal to 1 for the affected group
- Post_t : time dummy equal to 1 for 2018Q3 onward, coinciding with the initiation of U.S. Section 301 imposing tariffs on Chinese products.
- The regression is controlled for origin-time fixed effect α_{it} and origin-destination fixed effect σ_{ij} .
- The standard errors are clustered at the country-pair level.

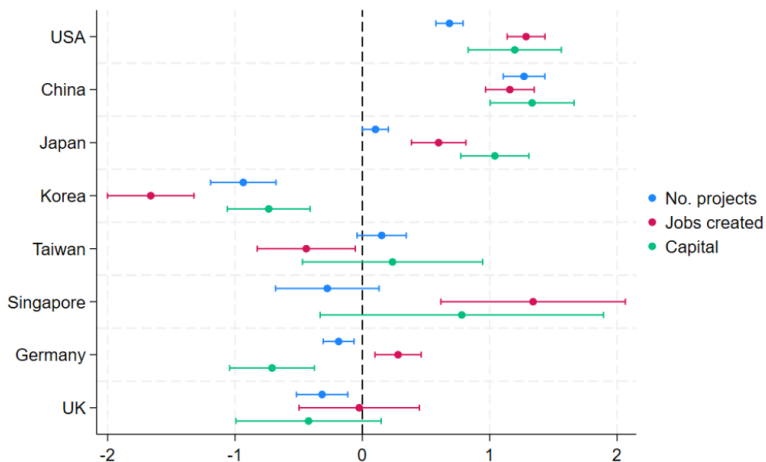
Results: Impact of US-China trade war on FDI in Vietnam

	PPML: Origin-destination			PPML: Origin-destination-sector		
	FDI Projects (1)	Jobs (2)	Capital (3)	FDI Projects (4)	Jobs (5)	Capital (6)
$VN \times Affected \times Post$	0.19050 (0.17928)	0.46608* (0.24665)	0.88476*** (0.28624)	0.21491 (0.14247)	0.47263** (0.21896)	0.88678** (0.37224)
$VN \times Affected$	0.34167 (0.23317)	0.78067 (0.48259)	-0.38050 (0.37828)	0.20023 (0.16626)	0.54051* (0.28799)	-0.29452 (0.35559)
Affected	-1.03138*** (0.15769)	-0.21137 (0.30864)	-0.82844*** (0.18629)	0.21106*** (0.07120)	1.59434*** (0.16319)	1.24088*** (0.17785)
Observations	10169	10169	10169	54177	54177	54177
R-squared	0.5165	0.6765	0.6110	0.1768	0.3825	0.4066
Origin-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Origin-destination FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	Yes	Yes	Yes

Heterogeneity of FDI inflow by sectors



Heterogeneity of FDI Inflow by Top Senders



Part 2. Structural Transformation

To show the impact of US-China Trade war on the reallocation of economic activities in Vietnam, we assess the following structural transformation aspects.

- ① Sectoral Reallocation
- ② Firm Structural Transformation
- ③ Reallocation of Skilled Workers
- ④ Female Labor Reallocation
- ⑤ Migration Inflow

1. Sectoral Reallocation

- We start by exploring the labor market flow and the sectoral reallocation to provide evidence on whether the US-China trade war transformed the structure of the Vietnamese economy at the regional level.
- The VLFS is representative at provincial level which allows us to credibly estimate changes in a province's labor market outcomes (McCaig (2011) and Fukase (2013)).

1. Sectoral Reallocation: Empirical strategy (1)

To study the relationship between the US trade diversion to Vietnam driven by the US-China trade war and regional-level outcomes of structural transformation, we estimate the following first-difference regression as a baseline:

$$\Delta Y_r = \beta_1 \Delta \text{Export}_r^{US} + \mathbf{X}'_{r,2017} \beta_2 + \Delta \epsilon_r \quad (2)$$

- ΔY_p : Change in outcomes in region (province) r between 2019 and 2017
- $\Delta \text{Export}_r^{US}$: Change in provincial exposure to US export

$$\Delta \text{Export}_r^{US} = \sum_j \left(\frac{L_{rj,2017}}{L_{r,2017}} \times \frac{\Delta \text{Export}_j^{US}}{L_{j,2017}} \right) \quad (3)$$

- X_r : provincial baseline (2017) controls
 - working-age population share of the urban population, the share of females, college-educated, employed, married, youth, migrants
- $\Delta \text{Export}_i^{US}$: Change in US exports at 4-digit industry between 2019 and 2017

1. Sectoral Reallocation: Empirical strategy (2)

- We then construct our instrument variable by measuring regional exposure to trade diversion based on the structure of employment prior to the US-China trade war.
- More specifically, we exploit provincial variation in Vietnam's exports to US that were solely driven by the US trade war diversion shock.
- We instrument for $\Delta Export_r^{US}$ by first calculating the tariff for each 4-digit industry i that is potentially affected by the Section 301 tariff:

$$TS_j^{US \rightarrow VNM} = \sum_{p \in j} \left(\frac{Exp_{p,2017}^{VNM \rightarrow US}}{\sum_{p \in j} Exp_{p,2017}^{VNM \rightarrow US}} Tariff_p^{US \rightarrow CHN} \right) \quad (4)$$

- p = HS6 product; j = 4-digit industry

- Then, we use $TS_j^{US \rightarrow VNM}$ to calculate provincial-level tariff exposure:

$$\Delta TD_r^{VNM \rightarrow US} = \sum_j \left(\frac{L_{rj,2017}}{L_{r,2017}} \times \frac{TS_j^{US \rightarrow VNM}}{L_{j,2017}} \right) \quad (5)$$

- We also try another instrument: share of HS product within 4-digit industry that are targeted by Section 301 tariff

Results 1.1: Labor Markets Flow

The Effect of Exposure to Trade War on Gross Labor Market Flow

	Employed (1)	Unemployed (2)	NILF (3)	Employed (4)	Unemployed (5)	NILF (6)
<i>Panel A: OLS</i>						
Export exposure	0.05748*** (0.01924)	0.03808 (0.06200)	0.09861*** (0.02442)	0.03833*** (0.00943)	0.03792 (0.05887)	0.09254*** (0.02902)
Baseline controls	No	No	No	Yes	Yes	Yes
Observations	63	63	63	63	63	63
R-squared	0.1868	0.0034	0.2278	0.5399	0.2301	0.5117
<i>Panel B. IV</i>						
	IV = tariff			IV = share of HS		
	Employed (1)	Unemployed (2)	NILF (3)	Employed (4)	Unemployed (5)	NILF (6)
Export exposure	0.09441*** (0.02828)	-0.21927 (0.20240)	0.12346*** (0.03696)	0.09305*** (0.02730)	-0.19723 (0.18101)	0.12036*** (0.03255)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63	63	63	63	63	63
Effective F-stat	13.10	13.10	13.10	12.41	12.41	12.41

All regressions are weighted by the 2016 provincial population. Robust standard errors are in parentheses.

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

As higher labor market flows reflect more flexible labor institutions (Jung & Kuhn, 2014; Engbom, 2022), this suggests that the US-China trade war helps a more reallocation between employed workers and persons who exit from the labor market in Vietnam, which is more observed in developing countries than rich countries.

Results 1.2: Out of Agriculture

The Effect of Exposure to Trade War on Labor Reallocation: Sectoral Reallocation				
	Agriculture (1)	Manufacture (2)	Service (3)	Industry (4)
<i>Panel A: OLS</i>				
Export exposure	-0.00781 (0.00506)	0.01238** (0.00549)	-0.00215 (0.00310)	0.00394 (0.00646)
R-squared	0.1951	0.2346	0.0749	0.1430
<i>Panel B: IV = Tariff</i>				
Export exposure	-0.02777*** (0.01058)	0.03886** (0.01568)	-0.00682 (0.01155)	0.03703** (0.01840)
Effective F-stat	13.10	13.10	13.10	13.10
<i>Panel C: IV = % targeted HS</i>				
Export exposure	-0.02710*** (0.00986)	0.03787** (0.01497)	-0.00471 (0.01077)	0.03425* (0.01770)
Baseline controls	Yes	Yes	Yes	Yes
Observations	63	63	63	63
Effective F-stat	12.41	12.41	12.41	12.41

All regressions are weighted by the 2016 provincial population.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

This finding suggests that increases in Vietnam's export demand from the US driven by declined imports from China to the US spontaneously pull factors from the agricultural sector to the production of exportable manufacturing goods and firms that participate in exporting.

Results 1.3: Moving toward Formal Sectors

The Effect of Exposure to Trade War on Labor Reallocation: Type of Employment								
	Households Types			Wage Types			Ownership Types	
	Agriculture HH (1)	Non-agri. HH (2)	HH Business (3)	Waged (4)	Formal (5)	Informal (6)	FDI (7)	Private (8)
<i>Panel A: OLS</i>								
Export exposure	-0.0061 (0.0046)	-0.0150*** (0.0029)	-0.0211*** (0.0045)	0.0056 (0.0063)	0.0197*** (0.0070)	-0.0141*** (0.0042)	0.0191*** (0.0048)	-0.0039 (0.0024)
R-squared	0.225	0.240	0.243	0.135	0.312	0.332	0.374	0.304
<i>Panel B: IV = Tariff</i>								
Export exposure	-0.0243** (0.0104)	-0.0271*** (0.0097)	-0.0514*** (0.0140)	0.0323* (0.0172)	0.0561*** (0.0149)	-0.0238** (0.0114)	0.0382*** (0.0140)	0.0051 (0.0059)
Effective F-stat	13.10	13.10	13.10	13.10	13.10	13.10	13.10	13.10
<i>Panel C: IV = % targeted HS</i>								
Export exposure	-0.0235** (0.0096)	-0.0227*** (0.0082)	-0.0463*** (0.0122)	0.0295* (0.0162)	0.0546*** (0.0156)	-0.0250** (0.0109)	0.0383*** (0.0132)	0.00368 (0.0053)
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63	63	63	63	63	63	63	63
Effective F-stat	12.41	12.41	12.41	12.41	12.41	12.41	12.41	12.41

All regressions are weighted by the 2016 provincial population.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

The results indicate that the US-China trade war and its subsequent US import demand unintentionally transforms the structure of Vietnam's employment from the informal sector to the formal sector.

2. Firm Structural Transformation

- We find that the episode of the US-China trade war and the subsequent trade diversion to Vietnam reallocated Vietnamese economic activities at the regional level.
- We now turn to a discussion of structural transformation [at the firm level](#).
- Using Vietnam firm census data, we examine whether firms improve their formality in the response to their trade exposure.
- We measure firm formality as the number of workers with [social security contribution](#).
 - The extent of social security is correlated with the firm structural transformation such as [higher job security, lower volatility in earnings, and higher on-the-job human capital accumulation](#) (Gomes et al., 2020; Donovan et al., 2020; Bobba et al., 2021).

2. Firm Structural Transformation: Empirical Strategy

- Our empirical strategy follows a difference-in-difference framework in which we regress a firm's outcomes on the trade war tariff exposure at the 4-digit industry corresponding to the firm's main industry.
- To examine firm formality, we now run the following regression using the Vietnam Enterprise Survey Data (Firm Census) 2015-19:

$$Y_{ijt} = \beta_1 \text{Exposure}_j \times \text{Post}_t + \mu_j + \delta_t + \epsilon_{ijt}$$

- i = firm; j = 4-digit industry; t = year
 - $\text{Post}_t = 1$ if $t > 2017$
 - The industry-level tariff exposure is the weighted average of Section 301 tariff.
 - Standard errors clustered at industry level
- We also examine the dynamic of trade war tariff:

$$Y_{ijt} = \sum_{t'=2015, t' \neq 2017}^{2019} \beta_1 \text{Exposure}_j \times \mathbb{1}\{t' = t\} + \mu_j + \delta_t + \epsilon_{ijt}$$

Results 2.1: Improving Firm Formality

The Effect of Exposure to Trade War on Firm Formal Employment (log)			
	FDI (1)	Private (2)	SOE (3)
<i>Panel A. OLS</i>			
Tariff exposure	0.00508 (0.00381)	-0.00710 (0.00798)	-0.01294** (0.00530)
Observations	21731	100007	1209
R-squared	0.2866	0.1800	0.4694
<i>Panel B. Dynamic Effects</i>			
Tariff in 2015	-0.00276 (0.00411)	-0.00205 (0.00472)	0.00366 (0.00398)
Tariff in 2016	-0.00172 (0.00215)	0.00906 (0.00682)	-0.00179 (0.00470)
Tariff in 2018	-0.00123 (0.00332)	0.00288 (0.00395)	-0.01322*** (0.00402)
Tariff in 2019	0.00847*** (0.00321)	-0.02748 (0.02516)	-0.01138** (0.00515)
Observations	21731	100007	1209
R-squared	0.2867	0.1803	0.4695
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Province FE	Yes	Yes	Yes
Clustered by industry	Yes	Yes	Yes

Firm formal employment is the number of workers with social security contribution

[Robustness](#)
[Skills upgrade](#)

The results indicate that the US-China trade war transforms Vietnam's economy even at the firm level by improving firm formality driven by FDI firms that take the most advantage of the US trade diversion to Vietnam.

3. Reallocation of Skilled Workers

- We next turn attention to another key feature of structural transformation in the labor market, [the reallocation to skilled workers](#).
- More jobs for the skilled-labor force and its corresponding labor adjustment from the low-skill intensive sector to the high-skill intensive sector play an important role in the structural transformation [by reducing labor market frictions and offering higher returns to education](#) (Caselli and Coleman II, 2001; Herrendorf and Schoellman, 2018; Porzio et al., 2022; Buera et al., 2022).
- We now explore whether the US-China trade war exposure on Vietnam influenced labor adjustment in Vietnam where the misallocation of skilled-workers has been much pronounced (Vu, 2022).
- To do so, we use a sample of working-age population between 15-65 years old from the VLFS.

3. Reallocation of Skilled Workers: Empirical Strategy

- Our worker-level estimating equation is:

$$Y_{ijdm} = \beta_1 Exposure_j + \mathbf{X}_i' \beta_2 + \mu_m + \delta_d + \epsilon_{ijdm}$$

- Y_{ijdm} is outcome for individual i employed in industry j in district d in month m ; \mathbf{X}_i' individual characteristics
- $Exposure_j$ is industry-level exposure measure calculated by:

$$Exposure_j = \frac{\Delta Export_{j,2017-19}^{US}}{L_{j,2017}}$$

- We instrument $Exposure_j$ using our measured of industry j exposure to Section 301 tariff (Equation (3))

Results 3.1: Monthly Earning by Education

The Effects of the US-China Trade War Exposure on Monthly Earnings, by Education

	Baseline (1)	IV=Tariff (2)	IV=%HS (3)
<i>Panel A: All jobs, some college</i>			
Trade Exposure	0.00658*** (0.00063)	0.02078*** (0.00744)	0.02192*** (0.00715)
Observations	56763	56763	56763
<i>Panel B: All jobs, upper secondary</i>			
Trade Exposure	0.00349*** (0.00048)	0.02054*** (0.00563)	0.01956*** (0.00506)
Observations	41735	41735	41735
<i>Panel C: All job, lower secondary</i>			
Trade Exposure	0.00413*** (0.00050)	0.01582*** (0.00586)	0.01692*** (0.00605)
Observations	52163	52163	52163
<i>Panel D: All jobs, primary</i>			
Trade Exposure	0.00416*** (0.00136)	0.01047*** (0.00389)	0.00583 (0.00369)
Observations	29858	29858	29858
<i>Panel E: All job, lower than primary</i>			
Trade Exposure	0.00879 (0.00712)	0.00948 (0.00698)	0.01230 (0.00821)
Observations	13535	13535	13535
Month FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Clustered by district	Yes	Yes	Yes

Results 3.2: Monthly Earning by Education

The Effects of the US-China Trade War Exposure on Work Hours, by Education

	Baseline (1)	IV=Tariff (2)	IV=%HS (3)
<i>Panel A: All jobs, some college</i>			
Trade Exposure	0.11074*** (0.02055)	0.53149*** (0.15112)	0.52593*** (0.13979)
Observations	56763	56763	56763
<i>Panel B: All jobs, upper secondary</i>			
Trade Exposure	0.06990*** (0.01349)	0.05127 (0.07833)	0.07962 (0.06736)
Observations	41735	41735	41735
<i>Panel C: All job, lower secondary</i>			
Trade Exposure	0.05610*** (0.01617)	0.31668** (0.13877)	0.28678** (0.14229)
Observations	52163	52163	52163
<i>Panel D: All jobs, primary</i>			
Trade Exposure	0.07130*** (0.02071)	0.17079* (0.09990)	0.12053* (0.06197)
Observations	29858	29858	29858
<i>Panel E: All job, lower than primary</i>			
Trade Exposure	0.12865 (0.08335)	0.46342 (0.46766)	0.68192 (0.84998)
Observations	13535	13535	13535
Month FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Clustered by district	Yes	Yes	Yes

The results suggest that the trade diversion driven by the US tariff shock on China during the trade war adjust Vietnam's labor market by increasing earnings and work hours for high-skilled labor and decreasing those for less-skilled labor. This finding implies that Vietnam transforms their labor market by reducing labor markets frictions and misallocation from the low-skilled sector to the high-skilled sector.

4. Female Labor Reallocation

- The reallocation of female employment is also one of the key features of structural transformation.
- Compare to higher GDP countries, developing countries experience a large portion of economic activities that are conducted within households mainly by informal female workers, particularly as unpaid agricultural workers (Dinkelman and Ngai (2022)).
- As an economy grows and the non-agricultural sector expands, unpaid economic activities within households can be outsourced to the formal market.
- In turn, this trend transforms its economic structure by generating more female labor participation out of the agricultural sector and allocating more earnings and job opportunities to high-skilled female workers (Rendall, 2017; Buera et al., 2019).

Results 4.1: Sectoral Reallocation

The Effect of Exposure to Trade War on Labor Reallocation: Sectoral Reallocation by Gender						
	IV = tariff			IV = % targeted HS		
	Agriculture (1)	Manufacture (2)	Service (3)	Agriculture (4)	Manufacture (5)	Service (6)
<i>Panel A: Male</i>						
Export exposure	-0.02108 (0.01365)	0.03768** (0.01505)	-0.00277 (0.00986)	-0.02046* (0.01225)	0.03731*** (0.01430)	-0.00178 (0.00896)
Observations	63	63	63	63	63	63
Effective F-stat	13.10	13.10	13.10	12.41	12.41	12.41
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes
<i>Panel B: Female</i>						
Export exposure	-0.03417*** (0.01243)	0.04144** (0.01754)	-0.01161 (0.01481)	-0.03345*** (0.01164)	0.03988** (0.01676)	-0.00836 (0.01381)
Observations	63	63	63	63	63	63
Effective F-stat	13.10	13.10	13.10	12.41	12.41	12.41
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes

All regressions are weighted by the 2016 provincial population.

Robust standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Vietnam reallocates its female employment from the agriculture sector to the manufacturing sector in the response to greater export exposure.

Results 4.2: Firm Formality for Female Worker

Tariff exposure effects on firm female employment						
	FDI		Private		SOE	
	Log (1)	share (2)	Log (3)	share (4)	Log (5)	share (6)
<i>Panel A. OLS</i>						
Tariff exposure	0.00712** (0.00280)	0.00006 (0.00058)	0.00958*** (0.00349)	0.00274** (0.00112)	-0.00570 (0.00425)	0.00021 (0.00097)
Observations	22049	22049	131138	131138	1208	1208
R-squared	0.4168	0.5308	0.2616	0.3332	0.5400	0.7729
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	-0.00467 (0.00479)	-0.00016 (0.00041)	-0.00077 (0.00262)	-0.00112 (0.00117)	0.00512* (0.00303)	-0.00055 (0.00093)
Tariff in 2016	-0.00254 (0.00288)	0.00020 (0.00033)	0.00090 (0.00160)	-0.00068 (0.00046)	0.00777 (0.00553)	0.00144 (0.00217)
Tariff in 2018	0.00194 (0.00172)	-0.00010 (0.00032)	0.00542** (0.00227)	0.00121* (0.00061)	-0.00401 (0.00432)	0.00006 (0.00109)
Tariff in 2019	0.00750** (0.00346)	0.00024 (0.00066)	0.01377*** (0.00455)	0.00305*** (0.00107)	0.00126 (0.00422)	0.00095 (0.00060)
Observations	22049	22049	131138	131138	1208	1208
R-squared	0.4169	0.5308	0.2617	0.3333	0.5401	0.7731
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Province FE	Yes	Yes	Yes	Yes	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes
Robustness						

The tariff exposure to Vietnam increases the total female employment not only in FDI firms but also in domestic private-invested enterprises.

Results 4.3: Monthly Earnings and Work Hours

Log monthly earnings and work hours by gender			
	Baseline (1)	IV=Tariff (2)	IV=%HS (3)
<i>Panel A: Monthly log earnings</i>			
Male	0.00350*** (0.00045)	0.01530*** (0.00325)	0.01324*** (0.00399)
Observations	109722	109722	109722
Female	0.00559*** (0.00045)	0.01607*** (0.00385)	0.01546*** (0.00387)
Observations	84393	84393	84393
<i>Panel B: Work hours</i>			
Male	0.06862*** (0.01110)	0.23844** (0.09425)	0.22159*** (0.07984)
Observations	109722	109722	109722
Female	0.08126*** (0.01366)	0.39951*** (0.11504)	0.34514*** (0.10803)
Observations	84393	84393	84393
Month FE	Yes	Yes	Yes
District FE	Yes	Yes	Yes
Clustered by district	Yes	Yes	Yes

The regressions are based on waged workers sample.

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

Tariff exposure increases female monthly earnings and work hours with larger effects than male workers.

5. Migration Inflows

- This section lastly explores another piece of evidence of structural transformation in the view of [spatial reallocation of labor](#).
- Structural transformation often induces [internal migration from rural to urban](#) areas where most manufacturing industries take place (De Brauw et al., 2014; Garriga et al., 2017).
- As economic shocks to a certain sector occurred in a location occur, workers migrate across locations to [seek arbitrage away real wage differences](#) by switching from the agricultural sector and the non-agricultural sectors (Michaels et al., 2012).
- We use a survey question from VLFS that asked an [individual's length of stay in their current locality](#) to define an individual as an internal migrant if they resided in a different location prior to the survey time point similar to Imbert and Papp (2020); Gollin et al. (2021).

Results 5.1: Migration Inflows

Migrant as share of working-age population						
	OLS		IV = tariff		IV = % targeted HS	
	Mig.all (1)	Mig.work (2)	Mig.all (3)	Mig.work (4)	Mig.all (5)	Mig.work (6)
Export exposure	0.00478* (0.00244)	0.00462** (0.00191)	-0.00040 (0.00243)	0.00120 (0.00179)	-0.00010 (0.00266)	0.00125 (0.00199)
Observations	63	63	63	63	63	63
Effective F-stat			13.10	13.10	12.41	12.41
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes

Column 1,3,5: change in inter-provincial migrants as a share of working-age population.

Column 2,4,6 only consider migrants for work purpose.

All regressions are weighted by 2016 provincial population.

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

One limitation of the migration questions in the VLFS is that the survey classifies an individual's length of stay in their current locality based on 5 categories: under 1 month, 1 to under 6 months, 6 to under 12 months, 12 months to under 5 years, 5 years and more.

To complement this analysis, we use the provincial population growth between 2017 and 2019 to capture whether the export exposure induced a stark increase in the workingage population in more exposed provinces which implies migration inflow (McCaig et al. (2022a)).

Results 5.2: Population Growth by Working Age Groups

Population growth by age group						
	IV = tariff			IV = % targeted HS		
	Age 0-14 (1)	Age 15-65 (2)	Age 66+ (3)	Age 0-14 (4)	Age 15-65 (5)	Age 66+ (6)
Export exposure	0.13915*** (0.03998)	0.09077*** (0.02456)	-0.02258 (0.02898)	0.12841*** (0.03977)	0.08937*** (0.02287)	-0.02296 (0.02681)
Observations	63	63	63	63	63	63
Effective F-stat	13.10	13.10	13.10	12.41	12.41	12.41
Baseline controls	Yes	Yes	Yes	Yes	Yes	Yes

All regressions are weighted by 2016 provincial population.

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

Vietnam workers are spatially reallocated toward more export-exposed locations (i.e., the manufacturing-intensive provinces) driven by the US-China trade war, implying that Vietnam transforms their economy by accelerating urbanization (Michaels et al., 2012).

Summary of Core Findings

- We find that the reallocation of GVCs from China to Vietnam **increased the FDI inflows** to Vietnam.
- We find a series of patterns of **structural transformation** in Vietnam amid a harbinger of the end of globalization.
 - Sectoral Reallocation
 - gross labor market flow $\uparrow\uparrow$
 - the agricultural sector \Rightarrow the manufacturing sector
 - the informal sector \Rightarrow the formal sector
 - Firm-level Structural Transformation
 - Firm Formality $\uparrow\uparrow$
 - Skill Upgrading $\uparrow\uparrow$
 - Reallocation of Skilled Workers $\uparrow\uparrow$
 - Female Labor Reallocation $\uparrow\uparrow$
 - Migration Inflow $\uparrow\uparrow$

Back to our research motivation

Who is the real winner of the US-China trade war?

Conclusion

- This paper provides evidence of the unexpected impacts of **trade protectionism** between the world's largest economies on **structural transformation in a bystander** developing country.
- To guide empirical work, we exploit the exogenous export exposure from the **US-China-Vietnam trade triangle** by combining a set of confidential and administrative data.
- We find a series of patterns of structural transformation in Vietnam amid a harbinger of the end of globalization.
 - More trade-war exposed regions in Vietnam exhibit moving out of agriculture **toward manufacturing**.
 - Vietnam reallocates its economic activities from the informal sector **to the formal sector**, mainly driven by FDI firms.
 - Vietnam also adjusts their labors to **high-skilled** and **female workers**, along with a rise in **employment growth** and **urban migration inflow**.
- Our findings provide one evidence that **low-income countries still undergo the structural transformation** in the era of trade protectionism.

Contribution

Our paper speaks to different strands of the literature:

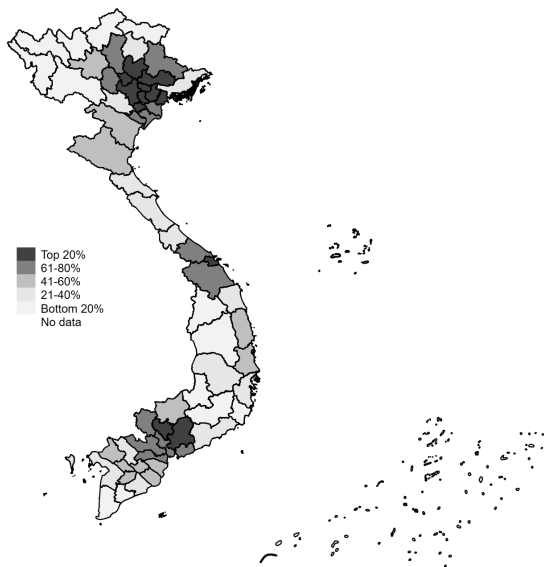
- First, our work contributes to classic literature on **structural transformation**.
- Second, this study also contributes to the vast literature that aims to understand the **impacts of trade protection**.
- Third, our study is related to a large body of literature that investigates **labor market adjustment** in the response to trade liberalization and competition.
- Finally, we complement the literature on **informality and development**.

Contribution

- Impact of trade exposure on:
 - Labor market: Dix-Carneiro and Kovak (2017); Erten et al (2019); McCaig (2011); McCaig and Pavcnik (2018); Topalova (2010)
 - Firms: Ahsan and Mitra (2014); Bustos (2011); McCaig et al (2022)
- Import competition from China:
 - Autor et al (2013); Dell et al (2019); Ultaar and Ruiz (2013); Iacovone et al (2013)
 - [Our work](#): Implications from a large trade disruption between US and China
- US-China Trade war implications:
 - Price pass-through: Amiti et al (2018); Fajgelbaum et al (2020)
 - Impact on US/China labor market and firms responses: Benguria and Saffie (2020); Benguria et al (2022); Chor and Li (2021); Jiao et al (2022)
 - Impact on outsiders through trade reallocation: Choi and Nguyen (2021); Freund et al (2020); Fajgelbaum et al (2021); Mao and Görg (2020); Sanyal (2021)
 - [Our work](#): Impact on an outsider through labor market and firms response

Appendix

Distribution of US export exposure at provincial level



Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Formal Employment - FDI Firms

	(1) Log emp	(2) Log emp	(3) Log emp	(4) Share	(5) Share	(6) Share
<i>Panel A. OLS</i>						
Tariff exposure	0.00508 (0.00381)	0.00538 (0.00368)	-0.00012 (0.00237)	0.00032 (0.00061)	0.00033 (0.00060)	-0.00033 (0.00053)
Observations	21731	21725	21725	21731	21725	21725
R-squared	0.2866	0.9034	0.9041	0.0658	0.5067	0.5092
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	-0.00276 (0.00411)	-0.00077 (0.00391)	0.00457** (0.00196)	0.00083* (0.00048)	0.00096** (0.00042)	0.00123** (0.00050)
Tariff in 2016	-0.00172 (0.00215)	-0.00056 (0.00231)	0.00267 (0.00208)	-0.00001 (0.00051)	0.00002 (0.00050)	-0.00038 (0.00061)
Tariff in 2018	-0.00123 (0.00332)	0.00032 (0.00273)	-0.00106 (0.00216)	-0.00064 (0.00071)	-0.00053 (0.00067)	-0.00088* (0.00053)
Tariff in 2019	0.00847*** (0.00321)	0.00962*** (0.00292)	0.00564* (0.00316)	0.00183** (0.00087)	0.00185** (0.00086)	0.00079 (0.00099)
Observations	21731	21725	21725	21731	21725	21725
R-squared	0.2867	0.9034	0.9042	0.0662	0.5071	0.5094
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

Firm formal employment is the number of workers with social security contribution

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Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Formal Employment - Private Firms

	(1) Log emp	(2) Log emp	(3) Log emp	(4) Share	(5) Share	(6) Share
<i>Panel A. OLS</i>						
Tariff exposure	-0.00710 (0.00798)	0.00108 (0.00286)	0.00269 (0.00313)	-0.00038 (0.00150)	0.00019 (0.00102)	0.00117 (0.00139)
Observations	100007	99062	99061	100007	99062	99061
R-squared	0.1800	0.8655	0.8667	0.1483	0.6381	0.6428
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	-0.00205 (0.00472)	-0.00414 (0.00472)	-0.00707 (0.00472)	0.00051 (0.00235)	0.00016 (0.00242)	-0.00297 (0.00271)
Tariff in 2016	0.00906 (0.00682)	0.00628 (0.00458)	-0.00114 (0.00525)	0.00411** (0.00195)	0.00318* (0.00177)	0.00136 (0.00248)
Tariff in 2018	0.00288 (0.00395)	0.00190 (0.00372)	-0.00078 (0.00503)	0.00134 (0.00177)	0.00114 (0.00177)	0.00030 (0.00241)
Tariff in 2019	-0.02748 (0.02516)	-0.00049 (0.00583)	0.00181 (0.00561)	-0.00006 (0.00392)	0.00112 (0.00203)	0.00105 (0.00259)
Observations	100007	99062	99061	100007	99062	99061
R-squared	0.1803	0.8656	0.8667	0.1485	0.6382	0.6430
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

Firm formal employment is the number of workers with social security contribution

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Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Formal Employment - SOE Firms

	(1) Log emp	(2) Log emp	(3) Log emp	(4) Share	(5) Share	(6) Share
<i>Panel A. OLS</i>						
Tariff exposure	-0.01294** (0.00530)	-0.01176** (0.00463)	-0.02172** (0.00939)	-0.00310** (0.00152)	-0.00296** (0.00144)	-0.00477* (0.00239)
Observations	1209	1209	1200	1209	1209	1200
R-squared	0.4694	0.9446	0.9488	0.2643	0.4569	0.5005
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	0.00366 (0.00398)	0.00366 (0.00391)	0.01507* (0.00885)	0.00088 (0.00257)	0.00088 (0.00253)	0.00661 (0.00431)
Tariff in 2016	-0.00179 (0.00470)	-0.00179 (0.00461)	0.01270 (0.00889)	0.00012 (0.00282)	0.00012 (0.00277)	0.00846* (0.00451)
Tariff in 2018	-0.01322*** (0.00402)	-0.01322*** (0.00395)	-0.01571** (0.00774)	-0.00374* (0.00214)	-0.00374* (0.00210)	-0.00023 (0.00300)
Tariff in 2019	-0.01138** (0.00515)	-0.00898* (0.00513)	-0.00902 (0.01248)	-0.00177 (0.00230)	-0.00149 (0.00233)	0.00078 (0.00488)
Observations	1209	1209	1200	1209	1209	1200
R-squared	0.4695	0.9447	0.9490	0.2647	0.4574	0.5030
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

Firm formal employment is the number of workers with social security contribution

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Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Female Employment - FDI Firms

	(1) Female emp.	(2) Female emp.	(3) Female emp.	(4) Female share	(5) Female share	(6) Female share
<i>Panel A. OLS</i>						
Tariff exposure	0.00712** (0.00280)	0.00692** (0.00281)	0.00158 (0.00202)	0.00006 (0.00058)	0.00005 (0.00057)	0.00011 (0.00029)
Observations	22049	22049	22049	22049	22049	22049
R-squared	0.4168	0.9570	0.9576	0.5308	0.9121	0.9128
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	-0.00467 (0.00479)	-0.00488 (0.00464)	-0.00120 (0.00134)	-0.00016 (0.00041)	-0.00021 (0.00042)	-0.00096*** (0.00033)
Tariff in 2016	-0.00254 (0.00288)	-0.00285 (0.00272)	0.00053 (0.00098)	0.00020 (0.00033)	0.00019 (0.00032)	-0.00006 (0.00035)
Tariff in 2018	0.00194 (0.00172)	0.00160 (0.00170)	-0.00090 (0.00156)	-0.00010 (0.00032)	-0.00012 (0.00031)	-0.00045 (0.00030)
Tariff in 2019	0.00750** (0.00346)	0.00708** (0.00325)	0.00362 (0.00232)	0.00024 (0.00066)	0.00021 (0.00064)	-0.00001 (0.00037)
Observations	22049	22049	22049	22049	22049	22049
R-squared	0.4169	0.9571	0.9577	0.5308	0.9121	0.9128
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Female Employment - Private Firms

	(1) Female emp.	(2) Female emp.	(3) Female emp.	(4) Female share	(5) Female share	(6) Female share
<i>Panel A. OLS</i>						
Tariff exposure	0.00958*** (0.00349)	0.00960*** (0.00327)	0.00171 (0.00272)	0.00274** (0.00112)	0.00272** (0.00111)	0.00053 (0.00064)
Observations	131138	131116	131116	131138	131116	131116
R-squared	0.2616	0.8907	0.8913	0.3332	0.6683	0.6697
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	-0.00077 (0.00262)	-0.00290 (0.00278)	0.00306 (0.00287)	-0.00112 (0.00117)	-0.00142 (0.00116)	0.00097 (0.00112)
Tariff in 2016	0.00090 (0.00160)	-0.00276 (0.00180)	0.00267 (0.00170)	-0.00068 (0.00046)	-0.00117** (0.00050)	0.00022 (0.00052)
Tariff in 2018	0.00542** (0.00227)	0.00309** (0.00126)	0.00122 (0.00168)	0.00121* (0.00061)	0.00087* (0.00047)	0.00046 (0.00045)
Tariff in 2019	0.01377*** (0.00455)	0.01223*** (0.00363)	0.00608* (0.00329)	0.00305*** (0.00107)	0.00281*** (0.00098)	0.00141** (0.00070)
Observations	131138	131116	131116	131138	131116	131116
R-squared	0.2617	0.8908	0.8913	0.3333	0.6684	0.6697
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

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Robustness check: Firm-level regression

The Effect of Exposure to Trade War on Firm Female Employment - SOE

	(1) Female emp.	(2) Female emp.	(3) Female emp.	(4) Female share	(5) Female share	(6) Female share
<i>Panel A. OLS</i>						
Tariff exposure	-0.00570 (0.00425)	-0.00748 (0.00467)	-0.02094* (0.01048)	0.00021 (0.00097)	0.00005 (0.00101)	-0.00222 (0.00201)
Observations	1208	1207	1197	1208	1207	1197
R-squared	0.5400	0.9763	0.9779	0.7729	0.9329	0.9368
<i>Panel B. Dynamic Effects</i>						
Tariff in 2015	0.00512* (0.00303)	0.00524* (0.00294)	0.01115* (0.00626)	-0.00055 (0.00093)	-0.00045 (0.00089)	0.00058 (0.00169)
Tariff in 2016	0.00777 (0.00553)	0.00790 (0.00547)	0.01812 (0.01291)	0.00144 (0.00217)	0.00154 (0.00213)	0.00623 (0.00505)
Tariff in 2018	-0.00401 (0.00432)	-0.00388 (0.00432)	-0.01426** (0.00703)	0.00006 (0.00109)	0.00016 (0.00116)	-0.00107 (0.00071)
Tariff in 2019	0.00126 (0.00422)	-0.00227 (0.00390)	-0.00798 (0.00867)	0.00095 (0.00060)	0.00067 (0.00046)	0.00123 (0.00091)
Observations	1208	1207	1197	1208	1207	1197
R-squared	0.5401	0.9763	0.9780	0.7731	0.9331	0.9377
Year FE	Yes	Yes	No	Yes	Yes	No
Industry FE	Yes	No	No	Yes	No	No
Province FE	Yes	No	No	Yes	No	No
Industry-year FE	No	No	Yes	No	No	Yes
Firm FE	No	Yes	Yes	No	Yes	Yes
Clustered by industry	Yes	Yes	Yes	Yes	Yes	Yes

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Firm investment in technology and workers training

Tariff exposure effects on firm ICT usage

	(1) Skill 1 ^a	(2) Skill 2	(3) Skill 3	(4) Skill 4	(5) Skill 5	(6) Skill 6	(7) Skill 7	(8) Training
SOE	-0.01218 (0.01840)	-0.00878 (0.01748)	-0.01469 (0.01972)	-0.02278 (0.02266)	-0.01592 (0.02051)	-0.00603 (0.02041)	0.02072 (0.01804)	0.03192** (0.01508)
Observations	39	39	39	39	39	39	39	39
R-squared	0.6737	0.6170	0.5067	0.5613	0.5934	0.4978	0.5718	0.7777
Private	0.00472 (0.00313)	0.00310 (0.00340)	-0.00106 (0.00335)	0.00377 (0.00288)	-0.00091 (0.00283)	-0.00001 (0.00373)	-0.00448 (0.00318)	-0.00166 (0.00255)
Observations	1607	1607	1607	1607	1607	1607	1607	1607
R-squared	0.0951	0.1127	0.1077	0.1121	0.0877	0.1007	0.0872	0.1327
FDI	0.00422 (0.00294)	0.00449 (0.00383)	0.00671** (0.00316)	0.00688* (0.00372)	0.00837*** (0.00316)	0.01121*** (0.00308)	0.01270*** (0.00342)	0.00784* (0.00436)
Observations	752	752	752	752	752	752	752	752
R-squared	0.0861	0.0818	0.0776	0.1072	0.0941	0.1011	0.0933	0.1693

Notes:

a. *Skill 1* = information technology platform, *Skill 2* = Automation technology, *Skill 3* = Data analysis, *Skill 4* = Information/Data security, *Skill 5* = Development of support systems, *Skill 6* = Usage of collaborative software, *Skill 7* = Non-technical thinking

b. *Training* = if sent staff to workers training

c. The data is taken from the ICT module of VES 2019. All regressions control for (2017 baseline) employment, capital, capital intensity, whether the firm exported or imported, age, age squared, industry's technology group (high, medium or low-tech) and province fixed effects

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