



Trade Diversion, Supply-Chain Reconfiguration, and Rerouting During the U.S.–China Trade War

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- ▶ The 2018 U.S.–China trade war significantly disrupted global trade flows, creating substantial uncertainty for exporters worldwide
 - Elevated tariffs covered 360 and 110 billion dollars of Chinese and U.S. exports
 - Continued over Biden administration

- ▶ Tariffs do not merely affect trade between the U.S. and China, but have spillover effects on third countries
 - Literature has documented trade diversion toward bystander economies (Fajgelbaum et al., 2024; Alfaro and Chor, 2023)
 - However, less is known about mechanisms that drive such trade diversion, as it might reflect rerouting or deeper supply chain integration with China (Freund et al., 2024)

Thai Exports to Major Export Destinations

- ▶ *Thailand* emerges as an interesting case study: highly trade-dependent, tied to both the U.S. and China, and strategically located within ASEAN
- ▶ Since 2018, exports to the U.S. have expanded strongly from 10% to almost 20%

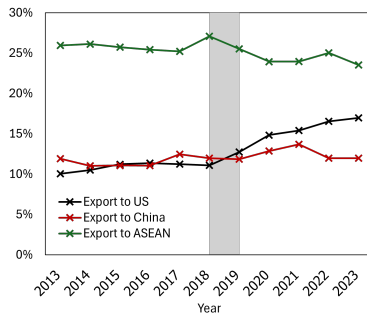


Figure: Share of Thai Exports by Export Destinations

- ▶ We investigate how Thailand's exports respond to bilateral tariff shocks using detailed Customs data from 2013–2023
- ▶ Our analysis exploits cross-product variations in tariff exposure to identify the spill-over effects on Thailand's exports to major destinations
- ▶ We use firms' export reactions to examine potential transshipment or supply chain reconfiguration with China, which potentially limits gains from trade
- ▶ Finally, netting out transshipment and imported input content, we examine the domestic value-added effects of the trade war

Preview of Empirical Results

- ▶ Thailand gains delayed **trade diversion benefits** from U.S. tariffs on China, strongly mediated by GVCs with **pre-existing supply-chain ties to China**.
- ▶ Suggestive **evidence of both transshipment** of Chinese goods to the U.S. and **increased supply-chain integration** with China (mainly along the extensive margin).
- ▶ Accounting for these channels, trade diversion still results in **domestic value-added expansion**.
- ▶ Rather limited spillover effects from China retaliation, with some negative responses of exports to China

Contributions to the Literature

- ▶ Literature on **third-country spillovers** of trade policy shocks (Alfaro and Chor, 2023; Fajgelbaum et al, 2024; Alfaro et al, 2025)
- ▶ Two main contributions
 - ⇒ Identify both **rerouting and supply chain channels** in the same empirical setting
 - On supply chain links to China: Utar et al (2025), Hayakawa (2024), Beason et al (2025), Garred and Yuan (2025)
 - Transshipment: Iyoha et al (2024), Ngoc and Wie (2025)
 - ⇒ Quantify net benefits on Thai exporters in terms of domestic value-added (Utar et al, 2025)
- ▶ Impact of trade war on the U.S. and Chinese economies: Amiti et al (2020), Cavallo et al. (2021), Fajgelbaum et al (2020), Handley et al (2020), Jiao et al (2024)

- ▶ **Thai exports data:** from Customs database
 - We aggregate these transaction-level data into annual data at the HS 6-digit product level (3,765 products).
- ▶ **U.S.-China tariff data:** from Fajgelbaum et al. (2024) and Bown (2021)
 - For each HS-6 product i , we compute weighted-average changes in the HS 10-digit tariff rates between Dec 2017 and Dec 2019:

$$\Delta \tau_i^{US} = \sum_{j \in i} w_{j,pre}^{US \leftarrow CN} \Delta \tau_j^{US \rightarrow CN} \quad (1)$$

$$\Delta \tau_i^{CN} = \sum_{j \in i} w_{j,pre}^{CN \leftarrow US} \Delta \tau_j^{CN \rightarrow US} \quad (2)$$

- $w_{j,pre}^{US \leftarrow CN}$ - the share of U.S. imports of Chinese products j within the corresponding HS-6 product category i during 2013–17 ($w_{j,pre}^{CN \leftarrow US}$ - share of Chinese imports of U.S. products).

Additional Tariffs from the 2018 U.S.–China Trade War

- Significant variations in additional tariffs within and across industries

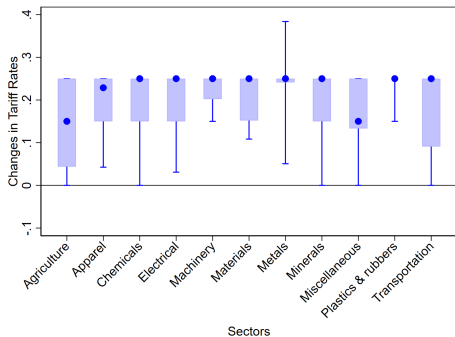


Figure: U.S. tariffs on Chinese goods:
 $\Delta\tau_i^{US}$

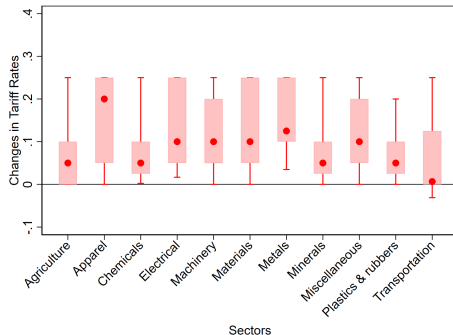


Figure: China tariffs on U.S. goods: $\Delta\tau_i^{CN}$

- ▶ Panel regression at the HS-6 product-year level to be separately estimated for each export destination

$$EX_{it}^d = \beta^{US} \left(Post_{it} \times \Delta \tau_i^{US} \right) + \beta^{CN} \left(Post_{it} \times \Delta \tau_i^{CN} \right) + \gamma^d \cdot \mathbf{X}_{it}^d + \epsilon_{it}^d \quad (3)$$

- EX_{it}^d - export value of product i to destination d
 - $Post_{it}$ - the dummy variable for the period that product i faces tariff hikes
 - $\mathbf{X}_{it}^d$ includes tariff rates the destination country imposes on imports of product i from Thailand
 - Time and product fixed effects
- ▶ Focus on four export destinations: U.S., China, ASEAN and the rest of the world (ROW)

Export Responses to the U.S.–China Trade War

- ▶ Thai exports may gain from the Trade War, as Thai goods substitute for Chinese products in the U.S. market.

Table: The Effect of U.S.–China Trade War on Thai Exports by Destination

	Total	U.S.	China	ASEAN	ROW
$\text{Post}_{it} \times \Delta \tau_i^{US}$	0.400* (0.207)	0.628* (0.354)	0.629 (0.457)	0.387* (0.224)	0.544* (0.278)
$\text{Post}_{it} \times \Delta \tau_i^{CN}$	-0.119 (0.227)	-0.467 (0.377)	-1.115** (0.434)	-0.049 (0.262)	0.077 (0.311)
Observations	33,990	15,235	13,299	29,601	22,770
Adjusted R^2	0.854	0.795	0.772	0.804	0.806
HS6 FEs & Time FEs	Yes	Yes	Yes	Yes	Yes

Note: Standard errors in parentheses are clustered at the HS-6 product level.

- We extend the baseline specification by replacing the post-treatment indicator with a set of year-specific indicators.

$$EX_{it}^d = \sum_{k=-3}^4 \beta_k^{US} \left(\text{Dur}_{it}^{US,k} \times \Delta \tau_i^{US} \right) + \sum_{k=-3}^4 \beta_k^{CN} \left(\text{Dur}_{it}^{CN,k} \times \Delta \tau_i^{CN} \right) + \gamma^d \cdot \mathbf{X}_{it}^d + \varepsilon_{it}^d \quad (4)$$

- $\text{Dur}_{it}^{US,k}, \text{Dur}_{it}^{CN,k}$ - the dummy variables indicating the number of years (k) relative to the treatment period

Dynamic Effects of the US–CN Trade War on Exports

- ▶ Exports to the U.S. exhibit a delayed but pronounced response to $\Delta\tau^{US}$.
- ▶ Thai exports barely respond to $\Delta\tau^{CN}$.

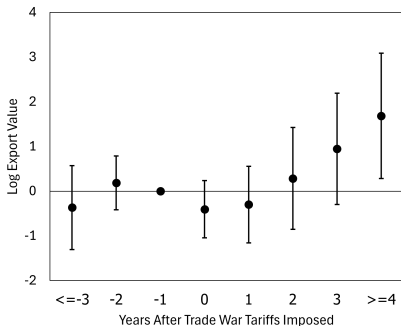


Figure: Responses of Exports to U.S. to $\Delta\tau^{US}$

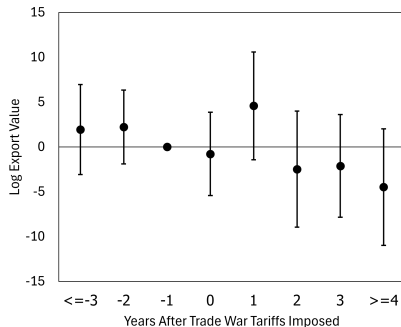


Figure: Responses of Exports to China to $\Delta\tau^{CN}$

- ▶ Explore three potential factors to explain positive responses of exports to the U.S.:
 - Comparative advantage of Thai products in the U.S. market
 - Use Revealed Comparative Advantage (RCA) index
 - China's lost market share in the U.S. market
 - Dummy variable = 1 if product i 's lost market share > average
 - Products with supply chain link to China or ASEAN
 - Use Grubel-Lloyd index (GLI) of intra-industry trade

Underlying factors: Results

- Products with pre-existing Chinese supply-chain ties expanded the most.

Table: Effects of U.S. Tariffs on Thai Exports to the U.S. by Product Characteristics.

	(1)	(2)	(3)	(4)
$\text{Post}_{it} \times \Delta\tau_i^{US}$	0.241 (0.393)	0.500 (0.544)	0.243 (0.409)	0.064 (0.467)
$\text{Post}_{it} \times \Delta\tau_i^{US} \times \text{RCA}_i^{US}$	0.366** (0.152)			
$\text{Post}_{it} \times \Delta\tau_i^{US} \times \text{CN Loss}_i$		0.297 (0.339)		
$\text{Post}_{it} \times \Delta\tau_i^{US} \times \text{GLI}_i^{\text{China}}$			1.371** (0.629)	
$\text{Post}_{it} \times \Delta\tau_i^{US} \times \text{GLI}_i^{\text{ASEAN}}$				1.144* (0.607)
Observations	15,235	15,235	15,224	15,235
Adjusted R^2	0.814	0.814	0.814	0.814
HS6 FEs & Time FEs	Yes	Yes	Yes	Yes

Rising Trend of Chinese Imports

- ▶ Thailand may be serving as a link in the supply chain for Chinese products or a route for the transshipment of Chinese goods to the U.S.

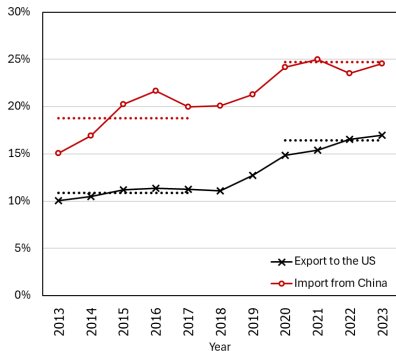


Figure: Thai Export Share to the U.S. versus Thai Import Share from China

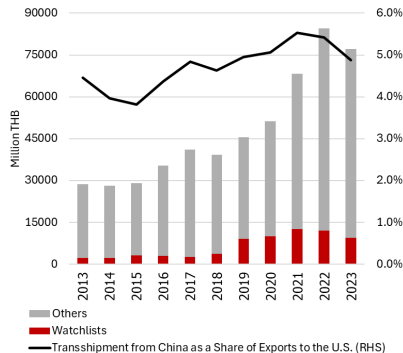


Figure: Transshipment from China

Firm-level analyses to trace mechanisms of trade diversion

- Construct **firm-level exposure** to the U.S.-China trade war, in particular **U.S. tariffs on Chinese goods**:

$$\Delta \tau_f^{US} = \frac{\sum_i EX_{f,i,pre}^{Total} \Delta \tau_i^{US}}{\sum_i EX_{f,i,pre}^{Total}} \quad (5)$$

- And also firm exposure to U.S. tariffs on Thai products:

$$\tau_{f,t}^{US,TH} = \frac{\sum_i EX_{f,i,pre}^{US} \tau_{i,t}^{US,TH}}{\sum_i EX_{f,i,pre}^{US}} \quad (6)$$

- Focus on firms that export their products to the U.S. market

Firm-level Regression Specification

$$y_{ft} = \beta Post_{ft} \Delta \tau_f^{US} + \gamma \cdot \mathbf{X}_{ft} + \alpha_f + \delta_t + \epsilon_{ft} \quad (7)$$

► Dependent variables (y_{ft}):

1. Firm f 's exports to the U.S., $EX_{f,t}^{US}$
2. Firm f 's transshipment of Chinese products to the US, $\sum_i \min\{EX_{f,i,t}^{US}, IM_{f,i,t}^{CN}\}$
3. Firm f 's imports of Chinese inputs, $\sum_k IM_{f,k,t}^{CN}$
 - Product k must be raw material or intermediate goods and is not the same product that firm f exports to the US

Transshipment and Supply Chain Integration with China

- Significant evidence of both the increased supply chain integration with China and the transshipment of Chinese products through Thailand

Table: Transshipment and Supply Chain Integration with China

	(1) EX^{US}	(2) Transshipment	(3) Ratio to EX^{US}	(4)	(5) Import of Chinese Inputs	(6)
	Value	Value	Ratio to EX^{US}	Value	Ratio to EX^{Total}	Ratio to Revenue
Full:						
$Post_{f,t} \times \Delta \tau_f^{US}$	7.879*** (1.159)	2.646*** (0.560)	0.045* (0.026)	4.439*** (0.837)	0.054 (0.039)	0.016 (0.010)
Observations	62,975	62,975	62,975	62,975	54,624	50,705
Adjusted R^2	0.442	0.634	0.659	0.646	0.543	0.663

Extensive versus Intensive Margins

- Estimates driven mainly by **extensive margins**

Table: Transshipment and Supply Chain Integration with China

	(1) EX^{US}	(2)	(3)	(4)	(5)
		Transshipment		Import of Chinese Inputs	
Intensive Margins:	Value	Value	Ratio to EX^{US}	Value	Ratio to EX^{Total}
$Post_{f,t} \times \Delta \tau_f^{US}$	1.002*** (0.261)	1.922** (0.754)	0.035 (0.028)	2.051*** (0.755)	-0.013 (0.066)
Observations	34,162	34,162	34,162	34,162	34,162
Adjusted R^2	0.815	0.737	0.650	0.831	0.720
Extensive Margins:	$1\{EX_{ft}^{US} > 0\}$	$1\{TRSM_{ft} > 0\}$		$1\{IM_{f,t}^{CN} > 0\}$	
$Post_{f,t} \times \Delta \tau_f^{US}$	0.454*** (0.072)	0.175*** (0.039)		0.277*** (0.052)	
Observations	62,975	62,975		62,975	
Adjusted R^2	0.304	0.569		0.573	

- Impact concentrated in certain manufacturing sectors

Table: Evidence of Transshipment and Supply Chain Effects across Sectors

	EX_{ft}^{US}	Transshipment		Import of Chinese Inputs	
	Value (1)	Value (2)	Ratio to EX_{ft}^{US} (3)	Value (4)	Ratio to EX_{ft}^{Total} (5)
$Post_{ft} \times \Delta\tau_f^{US} \times \text{Sector}_{fj}$					
Food	7.741***	0.065	0.015	2.029	0.028
Apparel	-5.056*	0.609	0.028	-5.260**	0.106
Rubber&Wood	8.499***	2.875**	0.036	3.189*	-0.015
Petrochemical	10.970***	3.388***	0.075	7.743***	0.151**
Metal	14.761***	6.171***	0.021	8.674***	0.203**
Electrical Appliances	11.745***	1.931	-0.103	7.377***	0.328***
Electronics	20.227***	9.011***	0.039	13.399***	0.279**
Machinery	11.542***	4.659***	0.087	7.414***	0.206**
Automotive	9.573***	3.188**	0.151**	5.356***	0.062
Other Manufacturing	0.711	1.332	0.018	1.177	0.063
Observations	62,975	62,975	43,953	62,975	54,621
Adjusted R^2	0.447	0.635	0.659	0.648	0.544
Firm FEs & Industry $\times$ Time FEs	Yes	Yes	Yes	Yes	Yes

Did trade diversion lead to domestic value-added gains?

- Compute the **domestic content** of exports to the U.S.

$$DC_{f,t}^{US} = EX_{f,t}^{US} - \underbrace{TRSM_t}_{\text{Product transshipped from China}} - \underbrace{\sum_j INPUT_{f,t}^{j,US}}_{\text{Imported Input from all countries } j},$$

$$\text{where } INPUT_{f,t}^{j,US} = \left(IM_{f,t}^j \right) \left(\frac{EX_{f,t}^{US} - TRSM_{f,t}}{REV_{f,t} - TRSM_{f,t}} \right)$$

- Also examine effects on the **domestic-content share** ($DCS_{f,t}^{US} = DC_{f,t}^{US} / EX_{f,t}^{US}$) and the **number of employed workers**

Evolution of Domestic vs. Foreign Input Content

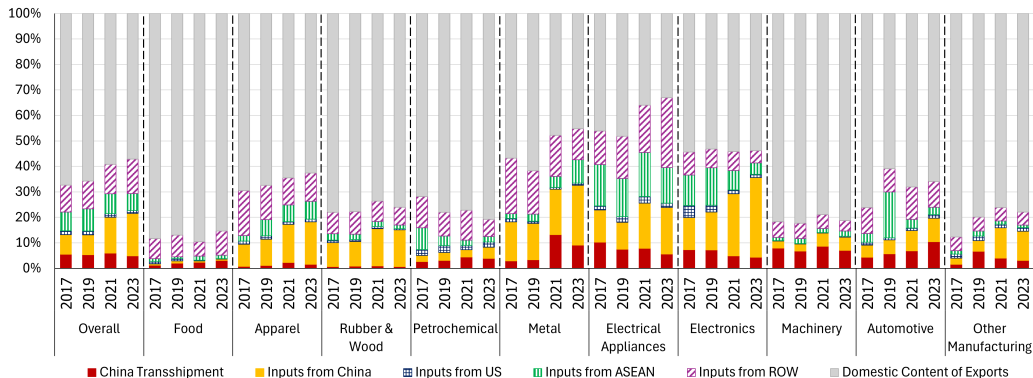


Figure: Decomposition of Thai Exports to US by Input Source

Results on Domestic Value-added of Exports to the U.S.

- Still a positive net benefit from trade diversion

Table: Domestic Value Added of Exports

	(1) EX^{US}	(2) Domestic Content of EX^{US}	(3) Domestic-content Share	(4) Employment
Full:				
$Post_{f,t} \times \Delta \tau_f^{US}$	5.931*** (1.106)	5.286*** (1.095)	-0.015 (0.028)	0.542*** (0.091)
Observations	54,339	54,339	40,761	48,816
Adjusted R-squared	0.467	0.493	0.754	0.950
Intensive Margins:				
$Post_{f,t} \times \Delta \tau_f^{US}$	0.951*** (0.256)	0.979*** (0.314)	-0.000 (0.023)	0.616*** (0.096)
Observations	30,963	30,963	30,963	27,397
Adjusted R-squared	0.835	0.738	0.769	0.970
Firm FEs	Yes	Yes	Yes	Yes
Industry x Time FEs	Yes	Yes	Yes	Yes

- Domestic content in U.S.-bound exports rises in many manufacturing sectors, i.e., those with positive export responses

Table: Domestic Value Added of Exports across Sectors

	EX^{US} (1)	Domestic Content of EX^{US} (2)	Employment (3)
$Post_{it} \times \Delta \tau_f^{US} \times \text{Sector}_{fj}$			
Food	6.400***	6.041***	0.824***
Apparel	-5.012**	-4.766*	-0.329
Rubber&Wood	6.296***	6.130***	0.716***
Petrochemical	8.188***	7.598***	0.760***
Metal	11.846***	10.597***	0.755***
Electrical Appliances	9.048***	9.249***	0.742***
Electronics	16.548***	14.947***	0.766***
Machinery	9.478***	7.746***	0.614***
Automotive	7.073***	5.898***	0.269*
Other Manufacturing	0.757	1.005	-0.109
Observations	54,339	54,339	48,816
Adjusted R^2	0.470	0.496	0.950
Firm FEs & Industry $\times$ Time FEs	Yes	Yes	Yes

- ▶ Robust evidence of third-country **trade diversion**: Thailand experiences an increase in exports to the U.S.
- ▶ The positive effects on exports to the U.S. emerge with a delay and vary across sectors, while potentially reflecting both **transshipment of Chinese** and **increases in supply chain links with China**
- ▶ Even when controlling for these rerouting and supply chain channels, we still observe large and positive **domestic value-added** gains
 - Thailand's role as a bystander in the trade war has resulted in meaningful economic contributions