US-China Tensions and Trade Relocation: The Role of Financial Development

Hui Tong (IMF) and Entian Zhang (U. of Minnesota)

October 24, 2023

Motivation

- The US-China trade tension has resulted in significant trade relocation.
- Documented by Freund, Mattoo, Mulabdic and Ruta (2023):
  - In 2018 and 2019, the US imposed tariffs on more than 60% of its imports from China, with many tariffs set at the 25 percent level.
  - Between 2017 and 2022, US imports from China in tariffed goods declined by 12.5%.
  - Imports from other parts of the world saw a surge in the same product categories.
- This paper: Study what country-sector characteristics facilitate the relocation of US imports.
  - Especially, the interaction of a country's financial development, and the financial dependence of a sector.

Why Financial Factors?

- In order to pick up the market share in a sector where China exits, a country needs to increase its production.
- Increasing production is associated with up-front cost, especially in sectors with high financial dependence.
- An inefficient financial system may fail to allocate the resources, and hence a country may not be able to seize the market share, even with comparative advantage.

Main Findings

- Upon China exiting the US market:
  - **Finding 1**: For sectors with high financial dependence, countries with better financial development will gain more market share.
  - **Finding 2**: The effect of the interaction of a country's financial development and a sector's financial dependence will be stronger if the country-sector has a larger initial share.
- The results are robust if we control for: FDI inflow, GVC participation, business environment and other factors.

Contribution

- The impact of financial frictions on trade flows
  - Manova and Chor (2012); Manova (2013); Caggese and Cunat (2013); Chaney (2016); Kohn et al. (2020); Brooks and Dovis (2020); Leibovici (2021)...
  - This paper treats the US-China trade tension as a natural experiment and provides new evidence on the impact of financial frictions on trade flows.
- The economic effects of the US-China trade war
  - Amiti, Redding, and Weinstein (2019); Fajgelbaum, Goldberg, Kennedy, and Khandelwal (2020); Flaaen, Hortaçsu, and Tintelnot (2020); Cavallo, Gopinath, Neiman, and Tang (2021); Freund, Mattoo, Mulabdic and Ruta (2023)...
  - The US-China trade war impacts exports of third countries. This paper studies how financial frictions affect the export growth.

Data

- US imports data from US Customs, 2017 and 2022
  - Data at HS 10-digit level; aggregated to US SIC 4-digit level.
- Tariff data from Bown (2023) and USITC, 2022
  - In 2017, the US imports 14,330 HS 10-digit varieties from China.
  - By 2022, 12,690 varieties were under tariff punishment: 8,622 were punished by 25% tariff, and the remaining 4,068 were punished by 7.5%.
  - Tariffs at SIC 4-digit level is calculated as the trade-weighted average of HS 10-digit level.

Data Cont.

- Country level financial development (GFD, WB 2017):

$$\text{FinDev} = \frac{\text{private credit by bank}}{\text{GDP}} + \frac{\text{stock market capitalization}}{\text{GDP}} + \frac{\text{private debt securities}}{\text{GDP}}$$

median $= 0.389$, mean $= 0.722$, standard deviation $= 1.26$

- Exogenous sector level financial dependence: details
  - Working capital requirement, Tong and Wei (2011)
  - Dependence on External Finance for Capital Expenditure (Rajan and Zingales 1998 Index), Tong and Wei (2020)

- Other country characteristics that may affect trade (CEPII): population, GDP, distance to the US, trade agreement with the US...

Testable Hypotheses

What features would facilitate a country's exports to the US upon China's exit?

- **Hypothesis 1**: For sectors with high financial dependence, countries with better financial development will gain more market share in the US.

- **Hypothesis 2**: A country-sector's initial market share in the US matters. The effect of a country's financial development interacted with a sector's financial dependence will be stronger if the country-sector has a larger initial share in the US.

Estimation Strategy I

Study the effect of the interaction of a country's financial development and a sector's financial dependence:

$$\Delta Share_{ij}^{US} = \alpha_i + \sigma_j + \beta * [\Delta Share_{CHN,j}^{US} * \text{characteristic}_i] + \gamma_1 * Share_{ij,2017}^{US} + \gamma_2 * FinDev_i * FinDepen_j + \epsilon_{ij}$$

- US imports in sector j from country i.
- $\Delta Share_{ij}^{US}$: market share change between 2017 and 2022
- $\Delta Share_{CHN,j}^{US}$: China's market share change between 2017 and 2022.
- characteristic$_i$: other characteristics of country i, population, GDP...
- $Share_{ij,2017}$: country i's initial market share in sector j.
- $FinDev^i$: financial development of country i.
- $FinDepen_j$: financial dependence of sector j.

Estimation Strategy I: Cont.

- We focus on sectors that China exits due to the tariff punishment.
- We restrict our sample to the SIC 4-digit manufacturing sectors where the tariff punishment equals 25% and China's market share declines between 2017 and 2022.

Estimation Strategy I: Results (Table 1)

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*RZ	0.0978*	0.240***	0.366***	0.0385
	(0.0516)	(0.0827)	(0.128)	(0.0377)
Share_2017	0.0217***	0.0315***	0.0422***	0.0514***
	(0.00769)	(0.0106)	(0.0146)	(0.00738)
Observations	4,717	3,141	2,082	8,390
R-squared	0.134	0.188	0.244	0.118
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

Economics Significance

Estimation Strategy II

Study the three-way interaction of initial share, financial development and financial dependence:

$$\begin{aligned}\Delta Share_{ij}^{US} =& \alpha_i + \sigma_j + \beta * [\Delta Share_{CHN,j}^{\mathsf{US}} * \mathsf{characteristic}_i] + \gamma_1 * Share_{ij,2017}^{US} \\ &+ \gamma_2 * FinDev_i * FinDepen_j + \gamma_3 * Share_{ij,2017}^{US} * FinDev_i \\ &+ \gamma_4 * Share_{ij,2017}^{US} * FinDepen_j \\ &+ \gamma_5 * Share_{ij,2017}^{US} * FinDev_i * FinDepen_j + \epsilon_{ij}\end{aligned}$$

Estimation Strategy II: Results, RZ index. Table 2

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*RZ*Share_2017	0.179***	0.418***	0.755***	0.194***
	(0.0218)	(0.0361)	(0.0555)	(0.0171)
RZ* Share_2017	-0.315***	-0.780***	-1.370***	-0.341***
	(0.0465)	(0.0834)	(0.123)	(0.0367)
FD* Share_2017	-0.0297***	-0.0278**	-0.0109	-0.101***
	(0.00954)	(0.0137)	(0.0206)	(0.00880)
FD*RZ	-0.0587	-0.0396	-0.0154	-0.0575
	(0.0543)	(0.0836)	(0.123)	(0.0382)
Share_2017	0.0845***	0.139***	0.150***	0.263***
	(0.0193)	(0.0283)	(0.0372)	(0.0188)
Observations	4,717	3,141	2,082	8,390
R-squared	0.155	0.235	0.332	0.148
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

Estimation Strategy II: Working Capital Requirement. Table 3

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*WCR*Share_2017	0.0959***	0.195***	0.207**	0.255***
	(0.0270)	(0.0420)	(0.0900)	(0.0258)
WCR* Share_2017	-0.267***	-0.400***	-0.429***	-0.526***
	(0.0549)	(0.0826)	(0.148)	(0.0544)
FD* Share_2017	-0.621***	-1.056***	-1.054***	-1.269***
	(0.119)	(0.181)	(0.400)	(0.115)
FD*WCR	-0.0963	-0.124	-0.0405	-0.0492
	(0.110)	(0.152)	(0.237)	(0.0791)
Share_2017	1.503***	2.080***	2.115***	2.584***
	(0.248)	(0.371)	(0.663)	(0.249)
Observations	5,101	3,506	2,057	8,632
R-squared	0.133	0.138	0.143	0.100
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

Economics Significance

FDI Inflow

- Our starting assumption is that financing is raised mainly from domestic market.
- Foreign investment may also increase a country's production in financially dependent sectors, and that foreign investment correlates with financial development.
  - Desbordes and Wei (2017): financial development correlates positively with FDI.
- Control for FDI inflow between 2017 and 2022 of country i.

$$\begin{aligned}\Delta Share_{ij}^{US} =& \alpha_i + \sigma_j + \beta * [\Delta Share_{CHN,j}^{\text{US}} * \text{characteristic}_i] + \gamma_1 * Share_{ij,2017}^{US} \\ &+ \gamma_2 * FinDev_i * FinDepen_j + \gamma_3 * FDI_i * FinDepen_j \\ &+ \gamma_4 * Share_{ij,2017}^{US} * FinDepen_j + \gamma_5 * Share_{ij,2017}^{US} * FinDev_i \\ &+ \gamma_6 * Share_{ij,2017}^{US} * FinDev_i * FinDepen_j + \epsilon_{ij}\end{aligned}$$

FDI Inflow: Results. Table 4

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*RZ*Share_2017	0.179***	0.417***	0.754***	0.195***
	(0.0220)	(0.0364)	(0.0557)	(0.0172)
RZ* Share_2017	-0.315***	-0.779***	-1.370***	-0.343***
	(0.0468)	(0.0838)	(0.124)	(0.0369)
FD* Share_2017	-0.0297***	-0.0280**	-0.0111	-0.101***
	(0.00958)	(0.0138)	(0.0207)	(0.00884)
FD*RZ	-0.0590	-0.0347	-0.00941	-0.0689*
	(0.0576)	(0.0900)	(0.130)	(0.0415)
Share_2017	0.0845***	0.140***	0.151***	0.263***
	(0.0194)	(0.0284)	(0.0373)	(0.0189)
RZ*FDI	0.00168	0.00915	0.0123	-0.0175
	(0.0388)	(0.0522)	(0.0892)	(0.0233)
Observations	4,680	3,120	2,068	8,315
R-squared	0.155	0.235	0.332	0.148
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

GVC Participation

- We control for country-sector level GVC participation.
  - country i, sector j, participation into global value chain.
  - country i, sector j, participation into China's value chain.

$$\begin{aligned}\Delta Share_{ij}^{US} =& \alpha_i + \sigma_j + \beta * [\Delta Share_{CHN,j}^{\text{US}} * \text{characteristic}_i] + \gamma_1 * Share_{ij,2017}^{US} \\ &+ \gamma_2 * FinDev_i * FinDepen_j + \gamma_3 * GVC_{ij} + \gamma_4 * GVC_{ij} * FinDepen_j \\ &+ \gamma_5 * Share_{ij,2017}^{US} * FinDepen_j + \gamma_6 * Share_{ij,2017}^{US} * FinDev_i \\ &+ \gamma_7 * Share_{ij,2017}^{US} * FinDev_i * FinDepen_j + \epsilon_{ij}\end{aligned}$$

GVC Participation

GVC Participation: Results. Table 5

	(1) ΔShare_CHN<-5.3% Tariff = 25% Global Value Chain	(2) ΔShare_CHN<-5.3% Tariff = 25% China's Value Chain
FD*RZ*Share_2017	0.396***	0.373***
	(0.0393)	(0.0371)
RZ* Share_2017	-0.883***	-1.951***
	(0.107)	(0.182)
FD* Share_2017	-0.0235	-0.0174
	(0.0145)	(0.0142)
FD*RZ	-0.0130	0.0444
	(0.0862)	(0.0857)
Share_2017	0.164***	0.304***
	(0.0366)	(0.0691)
GVC	-0.116	-0.0622
	(0.130)	(0.0987)
GVC*RZ	0.237	0.0994
	(0.236)	(0.138)
Observations	3,097	3,099
R-squared	0.237	0.251
Country FE	Y	Y
SIC4 FE	Y	Y

Business Environment

- Financial development could also be correlated with:
  - Political Distance: Diplomatic disagreement, measured through UN votes
  - Country's governance, and trade environment. ⏩ Measures
- Control for the cross-terms of financial dependence with political distance, governance, and trade score.

Business Environment: Results. Table 6

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*RZ*Share_2017	0.178***	0.414***	0.764***	0.196***
	(0.0221)	(0.0366)	(0.0565)	(0.0173)
RZ* Share_2017	-0.315***	-0.775***	-1.389***	-0.345***
	(0.0469)	(0.0843)	(0.125)	(0.0371)
FD* Share_2017	-0.0297***	-0.0281**	-0.0102	-0.101***
	(0.00961)	(0.0138)	(0.0208)	(0.00887)
FD*RZ	-0.101	-0.0970	0.0787	-0.0769
	(0.0686)	(0.103)	(0.156)	(0.0496)
Share_2017	0.0843***	0.140***	0.149***	0.263***
	(0.0195)	(0.0284)	(0.0374)	(0.0190)
RZ*				
TradeScore	-0.00337	-0.00670	-0.00193	0.00117
	(0.00442)	(0.00764)	(0.0110)	(0.00313)
Governance	0.129	0.152	-0.243	0.0109
	(0.113)	(0.181)	(0.273)	(0.0816)
Diplo_USA	-0.0766	-0.131	-0.409	-0.212**
	(0.152)	(0.266)	(0.381)	(0.102)
Diplo_CHN	-0.103	-0.0315	-0.423	-0.271**
	(0.195)	(0.333)	(0.477)	(0.130)
Observations	4,649	3,105	2,059	8,249
R-squared	0.155	0.235	0.332	0.148
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

Other Explanations

- Upon China's exit, what if countries do not increase their production, instead reallocate their exports from other destinations to the US?
  - Control for a country-sector's export growth to the world except the US.
- What if China exports via a third country to circumvent the tariffs?
  - Control for a country-sector's import growth from China between 2017 and 2022.

Other Explanations: Results. Table 7

	(1) ΔShare_CHN<-2% Tariff = 25%	(2) ΔShare_CHN<-5.3% Tariff = 25%	(3) ΔShare_CHN<-9% Tariff = 25%	(4) ΔShare_CHN<-5.3% Tariff >= 10%
FD*RZ*Share_2017	0.186***	0.463***	0.833***	0.202***
	(0.0225)	(0.0376)	(0.0578)	(0.0177)
RZ* Share_2017	-0.333***	-0.897***	-1.600***	-0.360***
	(0.0479)	(0.0871)	(0.130)	(0.0381)
FD* Share_2017	-0.0221**	-0.0409***	-0.0515**	-0.0984***
	(0.0100)	(0.0145)	(0.0216)	(0.00977)
FD*RZ	-0.0596	-0.0423	-0.00937	-0.0585
	(0.0583)	(0.0880)	(0.130)	(0.0410)
Share_2017	0.0632***	0.177***	0.239***	0.257***
	(0.0206)	(0.0304)	(0.0397)	(0.0217)
Import_growth_CHN	-0.00589	0.0337	0.0561*	-0.00480
	(0.0177)	(0.0227)	(0.0337)	(0.0159)
Export_growth_N_US	0.00687	-0.0141	-0.0213	-0.00294
	(0.0144)	(0.0172)	(0.0225)	(0.0109)
Observations	4,276	2,812	1,895	7,619
R-squared	0.159	0.251	0.354	0.145
Country FE	Y	Y	Y	Y
SIC4 FE	Y	Y	Y	Y

Conclusion

- This paper investigates the relocation of US imports following the US-China trade tensions.
- The study focuses on identifying country-sector characteristics that facilitate this relocation process, with emphasis on the interplay between a country's financial development and the financial dependence of sectors.
- We find that:
  - For sectors with high financial dependence, countries with better financial development will absorb more market share.
  - The effect of a country's financial development interacted with a sector's financial dependence will be stronger if the country-sector has a larger initial share.

Financial Dependence

- Working Capital Requirement (from US data, 1990-2006):

$$\text{Cash Conversion Cycle} = 365 * \left(\frac{\text{inventories - accounts payable}}{\text{cost of goods sold}} + \frac{\text{accounts receivable}}{\text{total sales}} \right)$$

- Dependence on External Finance for Capital Expenditure (from US data, 1990-2006).

$$\text{Financial dependence} = \frac{\text{Capital expenditures - Cash flow}}{\text{Capital expenditures}}$$

back

Economic Significance of the Interaction Term

- The country at the ninetieth percentile of financial development is South Korea (with a financial development value of 3.22), while the country at the tenth percentile is Nigeria (with a financial development value of 0.24)
- The ninetieth percentile of financial dependence is electronic components (with a RZ Index of 0.29), while the tenth percentile is cutlery and handtools (with a RZ Index of -0.62)
- Based on Column (2) of Table 1, the market share increase in electronic components should be higher than that of cutlery by 0.65 percentage points in South Korea as compared to in Nigeria.
- The difference is not trivial compared to the median market share change (0.00027 percentage points), or the mean (0.2 percentage points)

back

Economic Significance of the Three-Way Interaction Term

Similar to the process for the two-way interaction term, we take the initial market share as 0.05, then:

- with RZ index, the difference is 5.5 percentage points
- with working capital requirement, the difference is 2.25 percentage points

The difference is not trivial compared to the median market share change (0.00027 percentage points), or the mean (0.2 percentage points)

back

How to measure GVC participation?

- Data: Eora Multi-Region Input-Output (MRIO) database, 2017
- Method: following Koopman et al. (2014) and Ignatenko et al. (2019):
  - Participation into global value chain of country i, sector j:

$$\text{Participation}_j^i = \frac{\text{FVA}_j^i + \text{DVX}_j^i}{\text{Export}_j^i}$$

    where FVA_j^i refers to foreign value added, how much foreign inputs are used in the production of sector j in country i; DVX_j^i refers to indirect value added, how much outputs of country i sector j are used for foreign production.

  - Participation into China's value chain of country i, sector j:

$$\text{Participation}_j^{i,CHN} = \frac{\text{FVA}_j^{i,CHN} + \text{DVX}_j^{i,CHN}}{\text{Export}_j^i}$$

back

Measures of Business and Trade Environment

- Business Environment: *Worldwide Governance Indicator*
  - Control for Corruption, Government Effectiveness, Political Stability, Regulation Quality, Rule of Law, Voice and Accountability.
  - Take the simple average of the six indicators as an index for governance.
- Trade Environment: Trade Score from the World Bank

back