Capital Control Policy and Trade

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Work in Progress - Preliminary

Motivation

- Capital Control Policy is a highly debated topic in International Macroeconomics
  - Currently: "Capital Wars" (Jeanne, 2018); Costinot et. al. (2014)
- Macro evidence of capital control policy has been mixed:
  - $(+)$ Quinn and Toyoda (2008); Cline (2010); Eichengreen, Gullapalli, and Panizza (2011); Pasricha et. al. (2018)
  - $(-)$ Bhagwati (1998); Kose et. al. (2006); Jeanne, Subramanian, and Williamson (2012)
  - Views have changed over time: Kaplan and Rodrik (2001); IMF institutional views (2011)
- Microeconomic effects of capital controls: Forbes (2007)

Motivation (cont.)

A "classic" example of capital controls on trade in China:

> *China was able to enjoy the boost in exports largely because of its undervalued currency, which could not have been maintained without a closed capital account. (Jeanne, 2012)*

Capital Controls and Trade in the Literature

- Exchange Rate: Flemming (1962); Mundell (1963); Dornbusch (1987)
  - Control on Capital Inflows → Prevent Appreciation → Cheaper Exports
- Cost of Capital: Manova (2008, 2012); Auboin and Engemann (2014); Paravisni et al. (2014); Eck, Engemann and Schnitzer (2015); Manova, Wei, and Zhang (2015)
  - Firms depend on external finance for operation and investment
  - Capital controls limits access to foreign capital
- Cost of Trade: Tamarisa (1997); Wei and Zhang (2007)
  - Effect of capital controls on trade
  - Capital controls affect bank-intermediated funding

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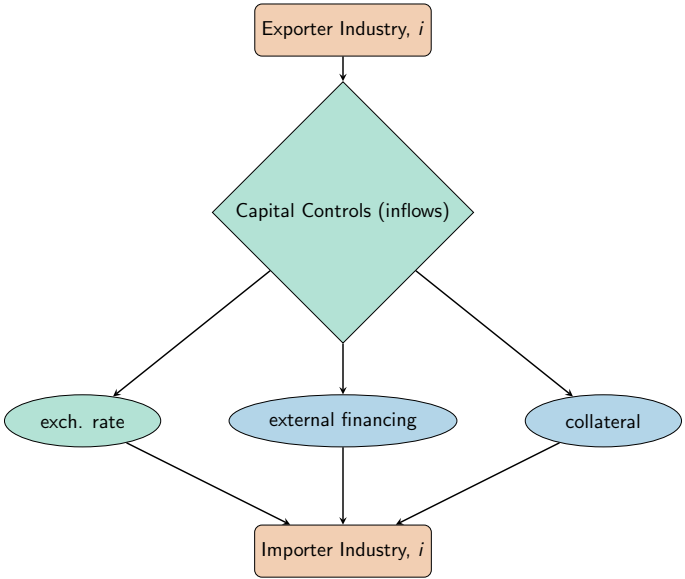

Exporter Industry, i
Capital Controls (inflows)
exch. rate
external financing
collateral
Importer Industry, i

Initial Results

- Higher levels of capital controls impact exports more negatively for industries that rely more on external financing, after controlling for the availability of domestic credit
  - Minimal evidence of the effects capital controls on trade across industries with varying levels of asset tangibility (collateral)
  - External financing and asset tangibility are country-invariant and time-invariant (Rajan and Zingales, 1998; Braun, 2003)
  - Relaxing country-invariant external financing and asset tangibility produces similar, but interesting, results
- The effect of capital controls on trade across industries with varying levels of external financing vary between countries with low and high financial development

Presentation Roadmap

1 Data

2 Empirical Strategy

3 Results

4 Conclusion

Components of Final Sample

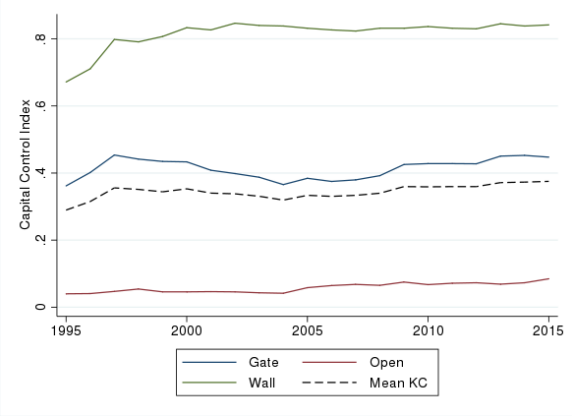
- **Capital Controls:** Fernandez et. al. (2016)
- **Industry Financial Vulnerability:** Rajan and Zingales (1998); Braun (2003); Compustat
- **Trade:** UN Comtrade
- **Country Characteristics:** World Bank WEO, Penn World Table 9.0, IMF data, CEPII

Capital Controls

- Fernandez Et. Al. (2016) measure constructed based on restrictions by asset class and by inflows and outflows:
  - (0,1) measure: ▸ KC construction
  - Based on IMF AREAER (*de jure*): ▸ Examples of Capital Controls
  - Other measures: KC Trade, *de facto*, Chinn-Ito ▸ Other Capital Control Measures
- 99 countries (groups are time-consistent)
  - Income: High Income (42), High Middle Income (26), Low Middle Income (23), and Low Income (8)
  - Capital Control Tightness Category: Wall (16), Gate (48), and Open (36)
- Annual (1995-2015)

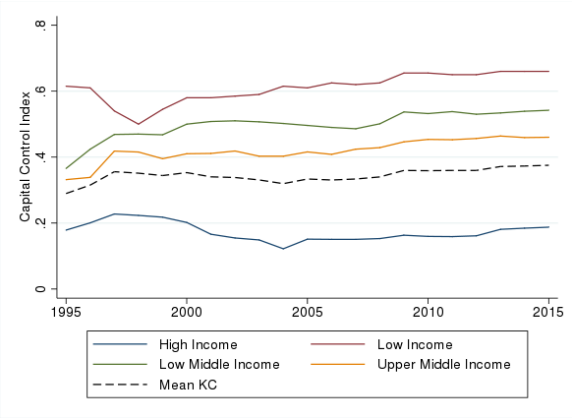
Capital Controls

By Capital Control Tightness Category



Capital Controls

By Income Group



Industry Financial Vulnerability

- Two main measures of financial vulnerability (27 3-digit ISIC industries)
  - External Finance Dependence (Rajan and Zinagles, 1998) ▸ Calculate efd
    - ★ $efd = \frac{CapitalExpenditures - CashFlowFromOperations}{CapitalExpenditures}$
  - Asset Tangibility (Braun, 2003) ▸ Calculate at
    - ★ $at = \frac{\text{Net Property, Plant \& Equipment}}{TotalAssets}$
- These measures are country- and time-invariant
  - Assumptions: US optimal external financing and asset structure; technology to manufacturing process similar across countries.
  - Choi (2019) will look at country-variant industry *efd*

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Industry Financial Vulnerability

isic3d	industry	efd	at	pci	hci	nri	isic3d	industry	efd	at	pci	hci	nri
311	food products	0.137	0.378	0.062	0.812	0	356	plastic products	1.140	0.345	0.088	0.827	0
313	beverages	0.077	0.279	0.062	1.135	0	361	pottery, china, earthenware	-0.146	0.075	0.055	0.804	0
314	tobacco	-0.451	0.221	0.018	1.354	0	362	glass and products	0.529	0.331	0.090	1.012	0
321	textiles	0.401	0.373	0.073	0.688	0	369	other non-metallic products	0.062	0.420	0.068	0.952	1
322	wearing apparel, except footwear	0.029	0.132	0.019	0.502	0	371	iron and steel	0.087	0.458	0.102	1.251	1
323	leather products	-0.140	0.091	0.032	0.687	0	372	non-ferrous metals	0.006	0.383	0.101	1.098	1
331	wood products, except furniture	0.284	0.380	0.065	0.741	1	381	fabricated metal products	0.237	0.281	0.056	0.914	0
332	furniture, except metal	0.236	0.263	0.039	0.698	0	382	machinery, except electrical	0.445	0.183	0.058	1.119	0
341	paper and products	0.176	0.558	0.132	1.139	1	383	machinery, electric	0.768	0.213	0.077	1.064	0
342	printing and publishing	0.204	0.301	0.052	0.934	0	384	transport equipment	0.307	0.255	0.071	1.322	0
352	other chemicals	0.219	0.197	0.060	1.209	0	385	prof and scient. equipment	0.961	0.151	0.053	1.234	0
353	petroleum refineries	0.042	0.671	0.196	1.656	1	390	other manufactured products	0.470	0.188	0.039	0.755	0
354	misc. petroleum and coal products	0.334	0.304	0.074	1.153	1	3511	industrial chemicals	0.205	0.412	0.124	1.408	0
355	rubber products	0.227	0.379	0.066	0.985	0							

Trade

- UN Comtrade (1995-2014): 2,112,778 exporter trade entries
  - 27 industries (HS 6-digit $\rightarrow$ ISIC 3-digit)
  - Bilateral trade entries between the 99 countries
  - Normalize all trade values to 2010 US dollars
- Use exports to avoid inclusion of trade frictions and costs

Country Characteristics

- Use Penn World Table 9.0 (1995-2014), World Bank WEO indicators, IMF:
  - Real GDP
  - Real Effective Exchange Rate
  - Capital-Labor ratio (capital stock/pop)
  - Human Capital
  - Tariffs (average on manufactured good)
  - Financial Development (Svirydzenka, 2016)
- Bilateral data (CEPII):
  - Distance
  - Common Currency, Common Language, Common Religion

Final Sample

- Annual bilateral trade level data between 99 countries, 27 industries, 1995-2014 (20 years)
  - Level of capital controls in exporter and importer country
  - Characteristics of exporter and importer country
  - Bilateral variables
- Use exports data
  - Imports data is a robustness checks

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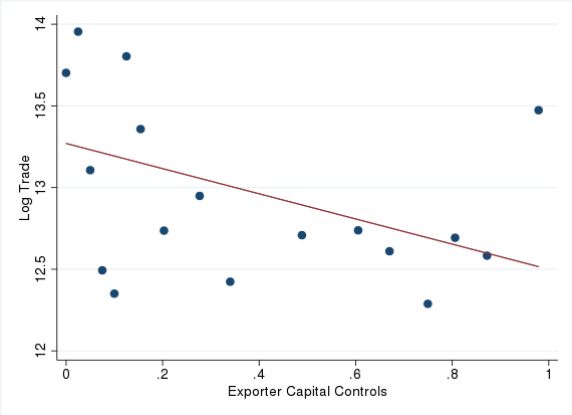
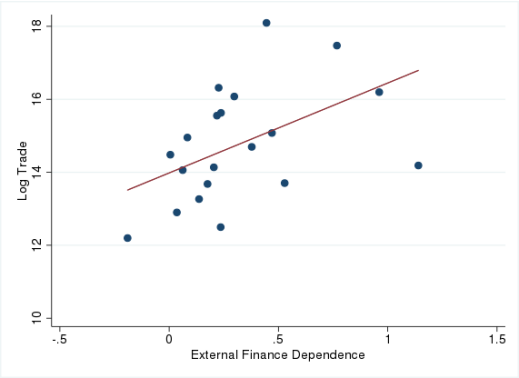
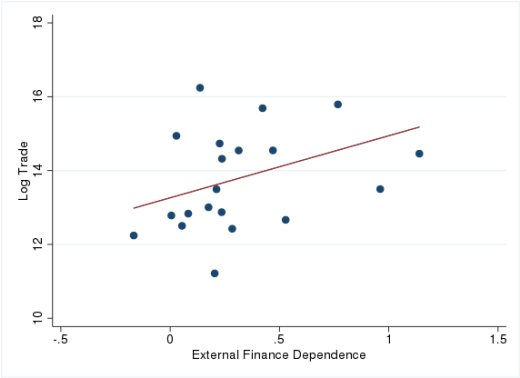
Visual Evidence - Capital Controls and Trade



Visual Evidence - "Differences-in-Differences"



Japan (KC = 0)



Thailand (KC = 0.75)

Empirical Method

Differences-in-differences approach: KC "diff" vs Industry "diff"

- Baseline: $log(Trade_{ijnt}) =$
  $\beta X_{ijnt} + \gamma Z_{ijt} + \theta_1 KC_{jt} + \theta_2 KC_{it,jt} \times efd_n + \theta_3 KC_{it,jt} \times at_n + \delta_i \times \delta_t + \delta_j \times \delta_n + \epsilon_{ijnt}$

Fixed effects and Standard Errors:

- Control(X and Z): exporter and importer GDP, importer tariffs, capital labor ratio, other gravity model variables (distance, WTO member, etc.), REER
- Fixed Effects: $Exporter \times Time$, $Importer \times Industry$
- Cluster SEs on exporter-importer pair

Empirical Method

Differences-in-differences approach: KC "diff" vs Industry "diff"

- Baseline w/ Domestic Credit:
  $log(Trade_{ijnt}) = \beta X_{ijnt} + \gamma Z_{ijn} + \theta_1 KC_{jt} + \theta_2 KC_{it,jt} \times efd_n + \theta_3 KC_{it,jt} \times at_n +$
  $\phi_1 DomCredit_{it} \times efd_n + \phi_2 DomCredit_{it} \times at_n + \delta_i \times \delta_t + \delta_j \times \delta_n + \epsilon_{xmit}$

Fixed effects and Standard Errors:

- Control(X and Z): exporter and importer GDP, importer tariffs, capital labor ratio, other gravity model variables (distance, WTO member, etc.), REER
- Fixed Effects: *Exporter* $\times$ *Time*, *Importer* $\times$ *Industry*
- Cluster SEs on exporter-importer pair

Financial Development

Include third "diff" of low versus high financial development (median cutoff at 1995)

- $log(Trade_{ijnt}) =$
  $\beta X_{ijnt} + \gamma Z_{ijn} + \theta_1 KC_{jt} + \theta_2 KC_{it,jt} \times efd_n + \theta_3 KC_{it,jt} \times at_n + \phi_1 DomCredit_{it} \times efd_n +$
  $\phi_2 DomCredit_{it} \times at_n + HighFD_{it} \times (\psi_1 KC_{jt} + \psi_2 KC_{it,jt} \times efd_n + \psi_3 KC_{it,jt} \times at_n) +$
  $HighFD_{it} \times (\tau_1 DomCredit_{it} \times efd_n + \tau_2 DomCredit_{it} \times at_n) + \delta_i \times \delta_t + \delta_j \times \delta_n + \epsilon_{ijnt}$

Fixed effects and Standard Errors:

- *HighFD* is high financial development
- Control(X and Z): exporter and importer GDP, importer tariffs, capital labor ratio, other gravity model variables (distance, WTO member, etc.), REER
- Fixed Effects: *Exporter* $\times$ *Time*, *Importer* $\times$ *Industry*
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Baseline Results

	Baseline			w/ Domestic Credit	
	(1)	(2)	(3)	(4)	(5)
	Ex. Side	Im. Side	Full Reg	BIS Banks	Full Sample
Importer KC outflows		-0.082*	-0.079*	-0.114**	-0.091*
		(0.04)	(0.04)	(0.05)	(0.05)
Exporter KC inflows × external finance dependence	-1.225***		-1.225***	-0.530***	-0.459***
	(0.06)		(0.06)	(0.06)	(0.06)
Exporter KC inflows × asset tangibility	1.064***		1.064***	-0.169	-0.112
	(0.16)		(0.16)	(0.17)	(0.15)
Importer KC outflows × external finance dependence		0.008	0.011	-0.124***	-0.004
		(0.05)	(0.05)	(0.05)	(0.05)
Importer KC outflows × asset tangibility		0.049	0.034	0.154	0.010
		(0.12)	(0.12)	(0.14)	(0.14)
Exporter Dom. Credit × external finance dependence				0.390***	0.013***
				(0.02)	(0.00)
Exporter Dom. Credit × asset tangibility				-0.953***	-0.026***
				(0.06)	(0.00)
Observations	2112778	2112778	2112778	1354840	1957117
R^2	0.619	0.618	0.619	0.673	0.620
Ex. × Time, Im. × Industry	Y	Y	Y	Y	Y

Interpretation

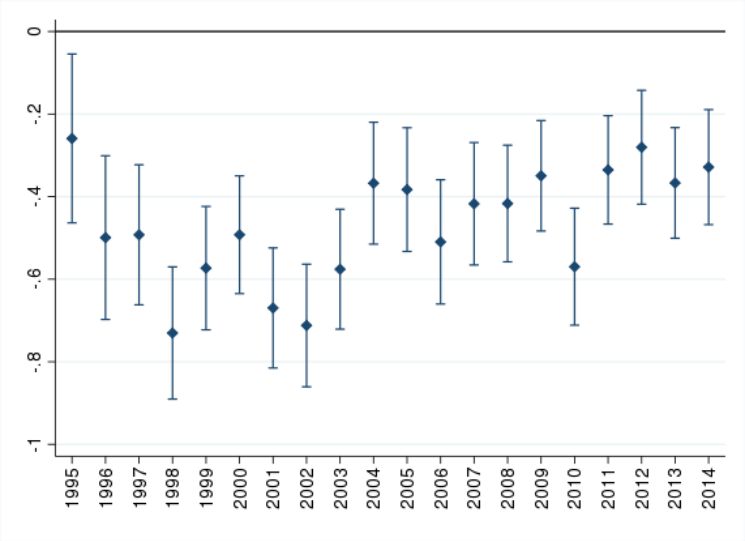
Looking at *efd*:

$$Effect = -0.5 \times [KC_h - KC_l] \cdot [efd_h - efd_l]$$

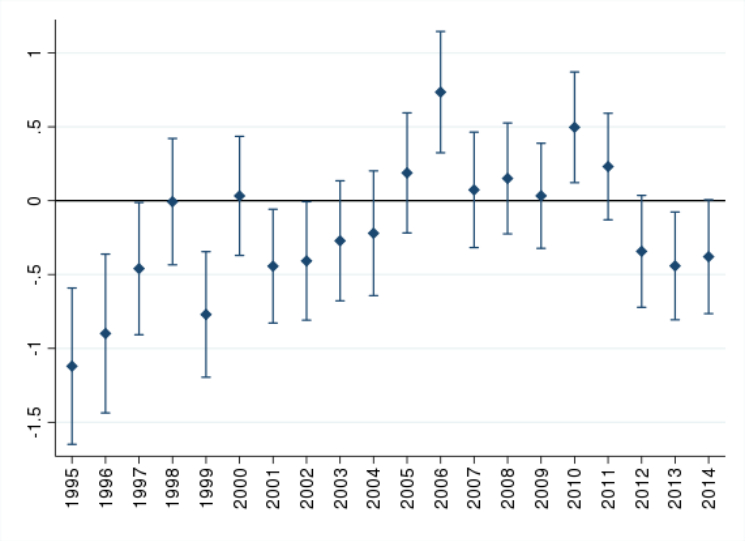
Example:

- Two Country: Low KC (KC $= 0.1$) to High KC (KC $= 0.7$)
- Two Industries: Beverage ($efd = 0.07$) vs Electric Machinery ($efd = 0.768$)
- The negative effects of capital controls on trade is 20% more for electric machinery industry than in the beverage industry
  - $-0.5 \times [0.6] \cdot [0.7] = -0.21$

Baseline Results: Reporter KC × efd



Baseline Results: Reporter KC × at



Robustness of KC Choice

	(1) Baseline	(2) KC Trade	(3) De-facto	(4) Chinn-Ito
Importer KC	-0.091*	-0.109**	-0.006***	-0.011
	(0.05)	(0.04)	(0.00)	(0.05)
Exporter KC × external finance dependence	-0.459***	-0.634***	0.016***	0.730***
	(0.06)	(0.05)	(0.00)	(0.05)
Exporter KC × asset tangibility	-0.112	0.077	-0.072***	-1.161***
	(0.15)	(0.14)	(0.01)	(0.14)
Importer KC × external finance dependence	-0.004	0.025	-0.001	-0.071
	(0.05)	(0.05)	(0.00)	(0.05)
Importer KC × asset tangibility	0.010	-0.126	0.014***	0.723***
	(0.14)	(0.12)	(0.01)	(0.14)
Exporter Dom. Credit × external finance dependence	0.013***	0.012***	0.012***	0.012***
	(0.00)	(0.00)	(0.00)	(0.00)
Exporter Dom. Credit × asset tangibility	-0.026***	-0.025***	-0.018***	-0.023***
	(0.00)	(0.00)	(0.00)	(0.00)
Observations	1957117	1957117	1491137	1937855
R^2	0.620	0.620	0.636	0.620
Ex. × Time, Im. × Industry	Y	Y	Y	Y

Robustness

	Import Data	No Large	t-1 lags	K/L Ratio		
	(1)	(2)	(3)	(4) rkle	(5) klp-a	(6) rklp
Importer KC outflows	-0.105**	-0.084	-0.112**	-0.096**	-0.090*	-0.088*
	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Exporter KC inflows × external finance dependence	-0.896***	-0.634***	-0.491***	-0.445***	-0.464***	-0.458***
	(0.06)	(0.07)	(0.06)	(0.06)	(0.06)	(0.06)
Exporter KC inflows × asset tangibility	0.886***	0.108	-0.176	0.104	-0.193	-0.101
	(0.17)	(0.17)	(0.16)	(0.16)	(0.15)	(0.16)
Importer KC outflows × external finance dependence	0.022	-0.023	-0.003	0.002	-0.004	0.002
	(0.04)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
Importer KC outflows × asset tangibility	0.403***	-0.037	0.057	0.070	0.009	0.059
	(0.12)	(0.15)	(0.14)	(0.13)	(0.14)	(0.13)
Exporter Dom. Credit × external finance dependence	0.002***	0.012***	0.012***	0.013***	0.013***	0.013***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Exporter Dom. Credit × asset tangibility	-0.001	-0.028***	-0.026***	-0.027***	-0.025***	-0.026***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	2173103	1615891	1796800	1957117	1957117	1957117
R^2	0.637	0.568	0.613	0.620	0.620	0.620
Ex. × Time, Im. × Industry	Y	Y	Y	Y	Y	Y

Reconstructing *efd* and *at*

- Reconstruct *efd* and *at* using US Compustat
  - Follows Rajan and Zinagles (1998) and Braun (2003)
  - Sum across years (1995-2014)
  - Country- and time-invariant
- Construct *efd* and *at* using Global Compustat
  - Follows Choi (2019)
  - Summed across years (1995-2014)
  - Country-variant (by headquarters location), Time-invariant

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Using new *efd* and *at*

	(1) RZ 1998 efd/at	(2) US efd/at	(3) Exporter efd/at
Importer KC outflows	-0.091*	-0.052	-0.376***
	(0.05)	(0.05)	(0.12)
Exporter KC inflows × external finance dependence	-0.459***	-0.088***	0.038
	(0.06)	(0.02)	(0.04)
Exporter KC inflows × asset tangibility	-0.112	0.450**	2.021***
	(0.15)	(0.18)	(0.26)
Importer KC outflows × external finance dependence	-0.004	-0.019	-0.003
	(0.05)	(0.02)	(0.02)
Importer KC outflows × asset tangibility	0.010	-0.139	0.774**
	(0.14)	(0.17)	(0.35)
Exporter Dom. Credit × external finance dependence	0.013***	0.003***	-0.001***
	(0.00)	(0.00)	(0.00)
Exporter Dom. Credit × asset tangibility	-0.026***	-0.041***	-0.005**
	(0.00)	(0.00)	(0.00)
Observations	1957117	1825267	284294
R^2	0.620	0.619	0.758
Ex. × Time, Im. × Industry	Y	Y	Y

Financial Development

	(1) Fin Dev	(2) Fin Mkt	(3) Fin Inst.
Importer KC outflows	-0.316***	-0.309***	-0.281***
	(0.09)	(0.09)	(0.08)
Exporter KC inflows × external finance dependence	-0.379***	-0.638***	-0.109
	(0.09)	(0.08)	(0.08)
Exporter KC inflows × asset tangibility	0.040	-0.223	-1.068***
	(0.26)	(0.25)	(0.23)
Exporter Dom. Credit × external finance dependence	-0.004***	0.002***	-0.001
	(0.00)	(0.00)	(0.00)
Exporter Dom. Credit × asset tangibility	-0.014***	-0.007***	-0.011***
	(0.00)	(0.00)	(0.00)
Exporter High Fin Dev=1 × Exporter KC inflows × external finance dependence	0.349***	0.781***	-0.391***
	(0.09)	(0.08)	(0.10)
Exporter High Fin Dev=1 × Exporter KC inflows × asset tangibility	-0.558*	-0.403	1.597***
	(0.30)	(0.28)	(0.30)
Exporter High Fin Dev=1 × Exporter Dom. Credit × external finance dependence	0.015***	0.011***	0.012***
	(0.00)	(0.00)	(0.00)
Exporter High Fin Dev=1 × Exporter Dom. Credit × asset tangibility	-0.010***	-0.019***	-0.015***
	(0.00)	(0.00)	(0.00)
Observations	1957117	1957117	1957117
R^2	0.621	0.622	0.620
Ex. × Time, Im. × Industry	Y	Y	Y

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Conclusion

- Capital control influences trade patterns:
  - Higher levels of capital controls impact exports more negatively for industries that rely more on external financing
    - ⋆ This holds after controlling for the availability of domestic credit.
    - ⋆ Magnitude determined by back-of-envelope calculation.
    - ⋆ Fairly robust.
  - Explored results using replicated *efd*/*at* and country-variant *efd* and *at*
  - The interaction of *efd* and capital controls vary between countries with low and high financial development

Future Work

- Finer industry disaggregation and alternative measures for external finance dependence
  - Narrower industry classification?
  - Use better international firm-level data?
- Event Study: Malaysia and Asian Financial Crisis, Brazil and Great Recession, Iceland Bank Runs, China
- Importer country story: intermediate goods?

Fernandez Et. Al. (2016) Capital Controls Measure

- Let KC_i be a capital flow restriction, where $i = \{1, 2, ..., 10\}$.
  - There are 10 asset classes, each with an inflow and outflow restriction indicator. $KC_i = \{0, 1\}$
  - **Asset classes:** Money market instruments, bonds, equity, collective investment securities, financial credit, derivatives, commercial credit, guarantees, real estate, and direct investment.
  - Inflow controls: financial instruments purchase locally by non-residents or sold abroad by residents
  - Outflow controls: financial instruments purchased abroad by residents or sold locally by non-residents
- Inflows or Outflows: $KC_{in,out} = \frac{\sum_{i=1}^{10} KC_i}{10}$
- KC Overall $= \frac{KC_{in} + KC_{out}}{2}$

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Examples of Capital Controls

- Administrative - command and control policies
  - Greece: preventing depositors from withdrawing from banks and bringing Euros outside of the country.
  - Prohibition of transactions
- Market-based controls - taxes
  - Thailand: 15% withholding tax on interest payments and capital gains on bonds held by foreign investors.
  - Taxing capital flows: selling assets locally by non-residents (outflow control) vs. selling assets abroad by residents (inflow control)

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Other Capital Controls Measures

- KC Trade = mean(commercial credits, financial credit, guarantees, direct investment)
- *de facto* KC = (foreign assets + foreign liabilities)/GDP
- Chinn-Ito (Financial openness indicator: 0 - not open, 1 - open)

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Calculating *efd*

$$efd = \frac{CapitalExpenditures - CashFlowFromOperations}{CapitalExpenditures}$$

- Sum each component across years by firm (min. 15). Find the median firm by industry code.
  - Capital Expenditures (capx)
  - Cashflow from Operations = funds from operations (fopt) + decreases in inventories (invch) + decreases in accounts receivable (recch) + increases in accounts payable (apalch in NA Compustat or apch in Global Compustat)

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Calculating *at*

$$at = \frac{\text{Net Property, Plant \& Equipment}}{TotalAssets}$$

- Sum each component across years by firm (min. 15). Find the median firm by industry code.
  - Net Property, Plant & Equipment (ppent)
  - Total assets (at)

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