

# Capital Control Policy and Trade

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## **Work in Progress - Preliminary**

The views expressed are those of the authors and do not necessarily represent those of the Federal Reserve Bank of New York, Federal Reserve System, or the Peterson Institute for International Economics.

# 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

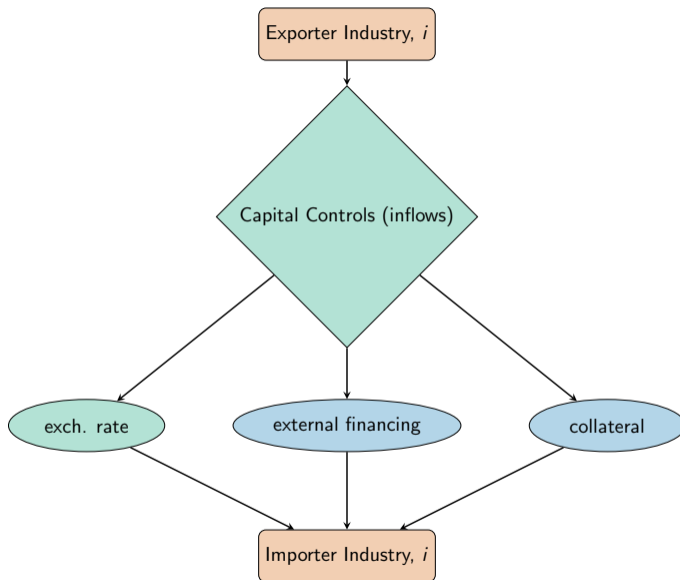
- Exchange Rate: Flemming (1962); Mundell (1963); Dornbusch (1987)
  - ▶ Control on Capital Inflows → Prevent Appreciation → Cheaper Exports
- Cost of Capital: Manova (2008, 2012); Auboin and Engemann (2014); Paravisni et al. (2014); Eck, Engemann and Schnitzer (2015); Manova, Wei, and Zhang (2015)
  - ▶ 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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# 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

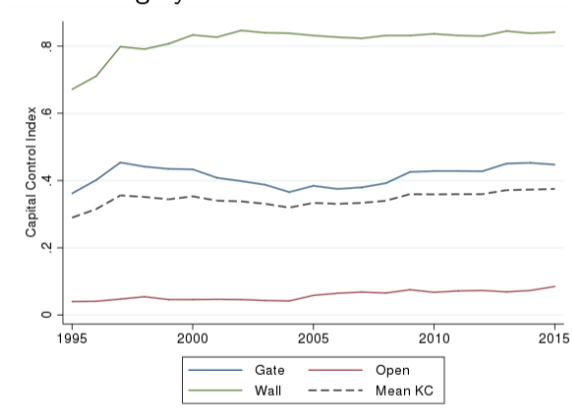
- **Capital Controls:** Fernandez et. al. (2016)
- **Industry Financial Vulnerability:** Rajan and Zingales (1998); Braun (2003); Compustat
- **Trade:** UN Comtrade
- **Country Characteristics:** World Bank WEO, Penn World Table 9.0, IMF data, CEPII

# 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)

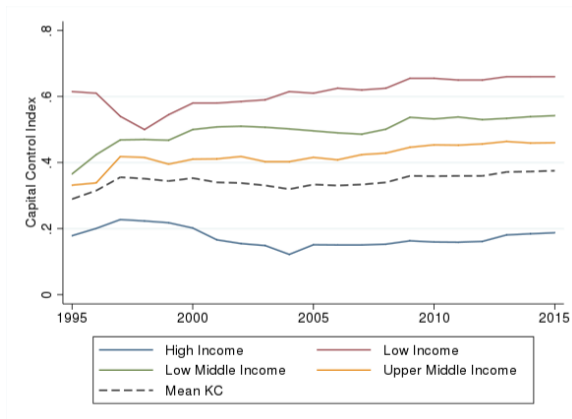
# Capital Controls

## 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](#)
    - ★  $at = \frac{Net\ Property,\ Plant\ \&\ Equipment}{TotalAssets}$
- 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 → 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

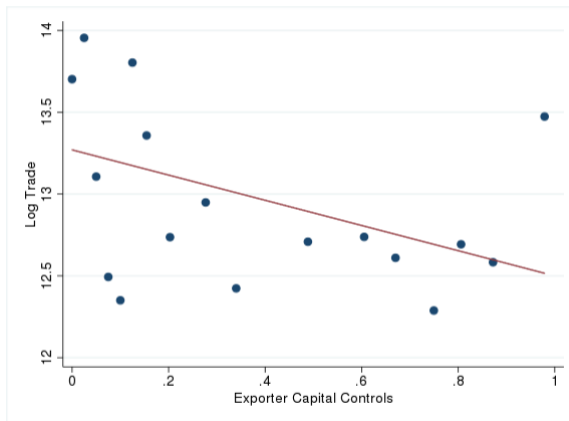
# Final Sample

- 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

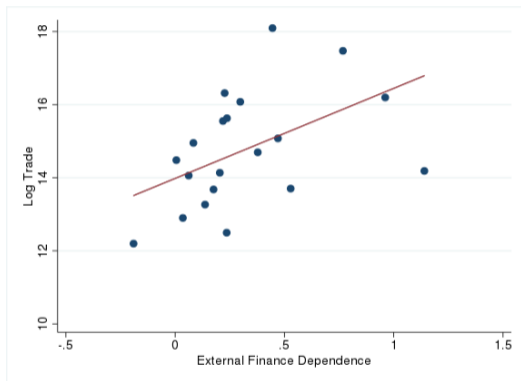
# Presentation Roadmap

- 1 Data
- 2 Empirical Strategy**
- 3 Results
- 4 Conclusion

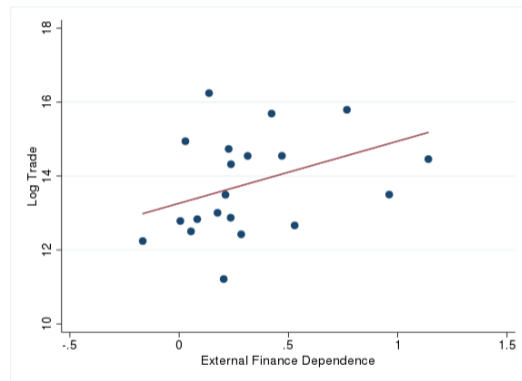
# Visual Evidence - Capital Controls and Trade



# 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:

$$\log(\text{Trade}_{ijnt}) = \beta X_{ijnt} + \gamma Z_{ijn} + \theta_1 KC_{jt} + \theta_2 KC_{it,jt} \times efd_n + \theta_3 KC_{it,jt} \times at_n + \phi_1 \text{DomCredit}_{it} \times efd_n + \phi_2 \text{DomCredit}_{it} \times at_n + \delta_i \times \delta_t + \delta_j \times \delta_n + \epsilon_{xmit}$$

Fixed effects and Standard Errors:

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- 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)

$$\bullet \log(\text{Trade}_{ijnt}) = \beta X_{ijnt} + \gamma Z_{ijn} + \theta_1 KC_{jt} + \theta_2 KC_{it,jt} \times efd_n + \theta_3 KC_{it,jt} \times at_n + \phi_1 \text{DomCredit}_{it} \times efd_n + \phi_2 \text{DomCredit}_{it} \times at_n + \text{HighFD}_{it} \times (\psi_1 KC_{jt} + \psi_2 KC_{it,jt} \times efd_n + \psi_3 KC_{it,jt} \times at_n) + \text{HighFD}_{it} \times (\tau_1 \text{DomCredit}_{it} \times efd_n + \tau_2 \text{DomCredit}_{it} \times at_n) + \delta_i \times \delta_t + \delta_j \times \delta_n + \epsilon_{ijnt}$$

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

# Interpretation

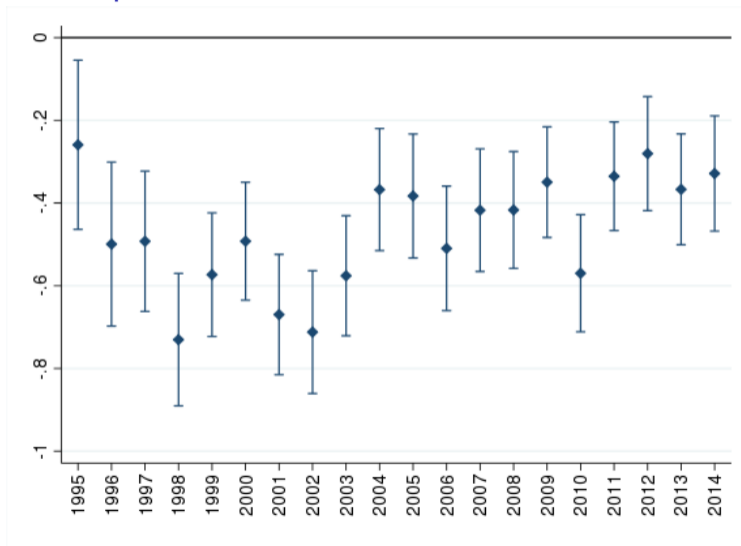
Looking at  $efd$ :

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

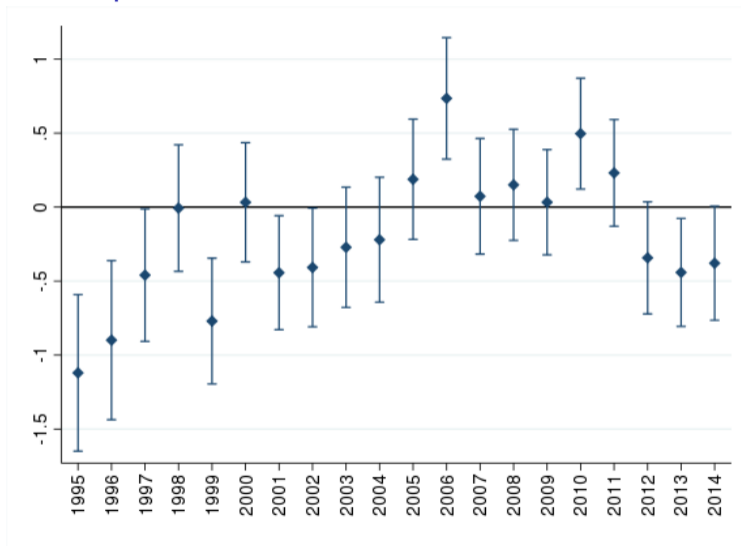
Example:

- 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 $\times$ efd



# Baseline Results: Reporter KC $\times$ at



# Robustness of KC Choice

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

## Robustness

	Import Data	No Large	t-1 lags	K/L Ratio		
	(1)	(2)	(3)	(4)	(5)	(6)
				rkle	k1p-a	rk1p
Importer KC outflows	-0.105** (0.04)	-0.084 (0.05)	-0.112** (0.05)	-0.096** (0.05)	-0.090* (0.05)	-0.088* (0.05)
Exporter KC inflows $\times$ external finance dependence	-0.896*** (0.06)	-0.634*** (0.07)	-0.491*** (0.06)	-0.445*** (0.06)	-0.464*** (0.06)	-0.458*** (0.06)
Exporter KC inflows $\times$ asset tangibility	0.886*** (0.17)	0.108 (0.17)	-0.176 (0.16)	0.104 (0.16)	-0.193 (0.15)	-0.101 (0.16)
Importer KC outflows $\times$ external finance dependence	0.022 (0.04)	-0.023 (0.06)	-0.003 (0.05)	0.002 (0.05)	-0.004 (0.05)	0.002 (0.05)
Importer KC outflows $\times$ asset tangibility	0.403*** (0.12)	-0.037 (0.15)	0.057 (0.14)	0.070 (0.13)	0.009 (0.14)	0.059 (0.13)
Exporter Dom. Credit $\times$ external finance dependence	0.002*** (0.00)	0.012*** (0.00)	0.012*** (0.00)	0.013*** (0.00)	0.013*** (0.00)	0.013*** (0.00)
Exporter Dom. Credit $\times$ asset tangibility	-0.001 (0.00)	-0.028*** (0.00)	-0.026*** (0.00)	-0.027*** (0.00)	-0.025*** (0.00)	-0.026*** (0.00)
Observations	2173103	1615891	1796800	1957117	1957117	1957117
$R^2$	0.637	0.568	0.613	0.620	0.620	0.620
Ex. $\times$ Time, Im. $\times$ 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 <i>efd/at</i>	(2) US <i>efd/at</i>	(3) Exporter <i>efd/at</i>
Importer KC outflows	-0.091* (0.05)	-0.052 (0.05)	-0.376*** (0.12)
Exporter KC inflows $\times$ external finance dependence	-0.459*** (0.06)	-0.088*** (0.02)	0.038 (0.04)
Exporter KC inflows $\times$ asset tangibility	-0.112 (0.15)	0.450** (0.18)	2.021*** (0.26)
Importer KC outflows $\times$ external finance dependence	-0.004 (0.05)	-0.019 (0.02)	-0.003 (0.02)
Importer KC outflows $\times$ asset tangibility	0.010 (0.14)	-0.139 (0.17)	0.774** (0.35)
Exporter Dom. Credit $\times$ external finance dependence	0.013*** (0.00)	0.003*** (0.00)	-0.001*** (0.00)
Exporter Dom. Credit $\times$ asset tangibility	-0.026*** (0.00)	-0.041*** (0.00)	-0.005** (0.00)
Observations	1957117	1825267	284294
$R^2$	0.620	0.619	0.758
Ex. $\times$ Time, Im. $\times$ Industry	Y	Y	Y

# Financial Development

	(1) Fin Dev	(2) Fin Mkt	(3) Fin Inst.
Importer KC outflows	-0.316*** (0.09)	-0.309*** (0.09)	-0.281*** (0.08)
Exporter KC inflows $\times$ external finance dependence	-0.379*** (0.09)	-0.638*** (0.08)	-0.109 (0.08)
Exporter KC inflows $\times$ asset tangibility	0.040 (0.26)	-0.223 (0.25)	-1.068*** (0.23)
Exporter Dom. Credit $\times$ external finance dependence	-0.004*** (0.00)	0.002*** (0.00)	-0.001 (0.00)
Exporter Dom. Credit $\times$ asset tangibility	-0.014*** (0.00)	-0.007*** (0.00)	-0.011*** (0.00)
Exporter High Fin Dev=1 $\times$ Exporter KC inflows $\times$ external finance dependence	0.349*** (0.09)	0.781*** (0.08)	-0.391*** (0.10)
Exporter High Fin Dev=1 $\times$ Exporter KC inflows $\times$ asset tangibility	-0.558* (0.30)	-0.403 (0.28)	1.597*** (0.30)
Exporter High Fin Dev=1 $\times$ Exporter Dom. Credit $\times$ external finance dependence	0.015*** (0.00)	0.011*** (0.00)	0.012*** (0.00)
Exporter High Fin Dev=1 $\times$ Exporter Dom. Credit $\times$ asset tangibility	-0.010*** (0.00)	-0.019*** (0.00)	-0.015*** (0.00)
Observations	1957117	1957117	1957117
$R^2$	0.621	0.622	0.620
Ex. $\times$ Time, Im. $\times$ 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  $i = \{1, 2, \dots, 10\}$ .
  - ▶ 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 =  $\frac{KC_{in} + KC_{out}}{2}$

# 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)

## Other Capital Controls Measures

- $KC\ Trade = \text{mean}(\text{commercial credits, financial credit, guarantees, direct investment})$
- $de\ fact\ KC = (\text{foreign assets} + \text{foreign liabilities}) / GDP$
- 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)

## Calculating *at*

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

- 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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