

ESTIMATED POLICY RULES FOR CAPITAL CONTROLS

Gurnain Kaur Pasricha
International Monetary Fund

POSTER SESSION AT 2021 ASSA MEETINGS

Disclaimer: The views in the presentation are those of the author(s). No responsibility for them should be attributed to the IMF

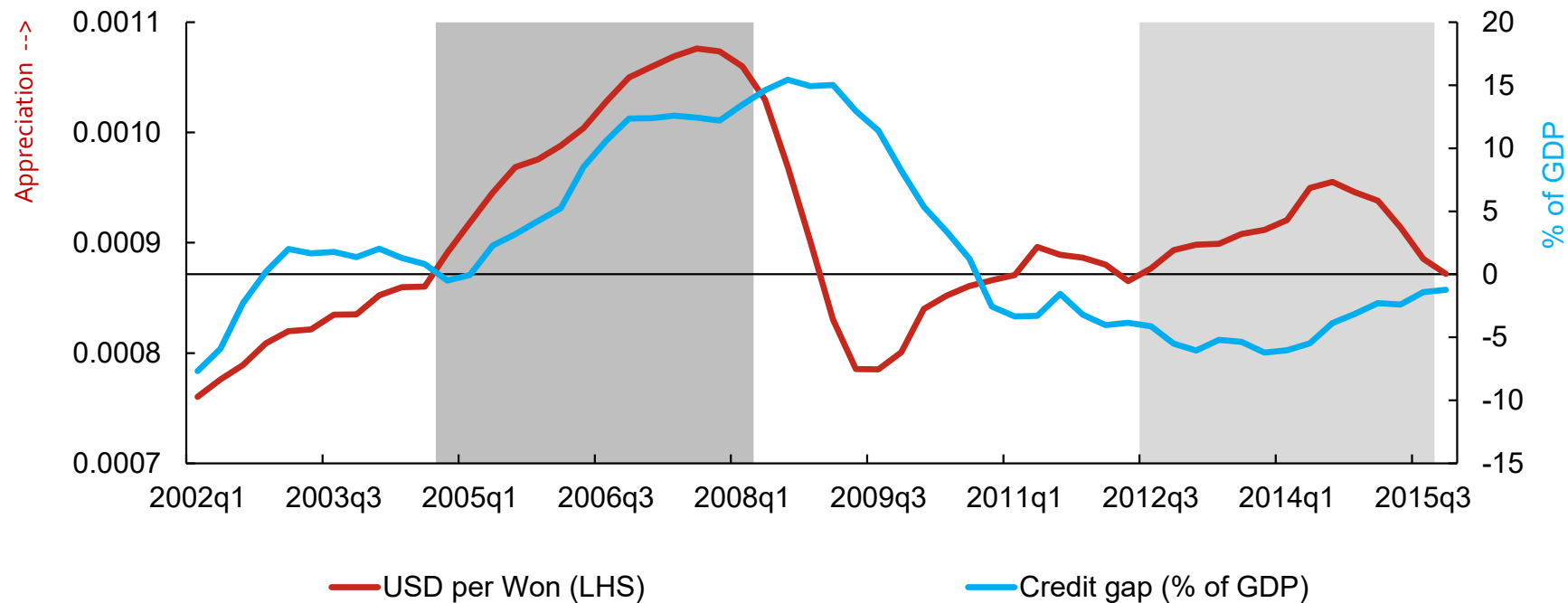
Two main objectives of capital controls policy

- **Macroprudential:** Mitigate systemic risk from excessive foreign borrowing
 - Mendoza, 2002; Korinek, 2011; Bianchi, 2011; Uribe, 2007
- **Mercantilist:** Exchange rate management to maintain export competitiveness
 - Heathcote and Perri, 2016; Dooley et al., 2014; Acharya and Bengui, 2018

The different objectives of capital controls policy can involve trade-offs

Korea

4-Quarter Moving Averages



Source: BIS, IMF International Financial Statistics and Datastream

Last observation: 2015q4

A policy rule describes systematic response of policy to competing objectives

- Long tradition of estimating policy rules for monetary policy (Taylor, 1993, 1999)
- Recent theoretical literature on financial Taylor rules (Bianchi and Mendoza, 2016)
- This paper estimates a descriptive policy reaction function for capital controls
- A systematic and transparent policy can (Carney, 2019):
 - Help attract capital inflows and prevent destabilizing outflows when the controls are used
 - Prevent retaliation by other countries by establishing intent

Contributions to literature

- **Systematically examines the different motivations** for capital controls policy actions
 - Fernandez et al. (2015) , Fratzscher (2015), Forbes et al. (2015), Aizenman and Pasricha (2013) focus on variables, not motivations
- Proposes a **new proxy for mercantilist concerns**
 - Validates it using data on non-tariff barriers
- Uses a **new dataset on capital control policy actions**
 - Extends Pasricha, Falagiarda, Bijsterbosch, Aizenman (2018 JIE) data from 2013 to 2015
 - 21 EMEs, 2001 - 2015, weekly frequency

Preview of Results

- Capital controls are both macroprudential and mercantilist
- There is a method to the choice of instruments:
 - Policymakers respond to mercantilist concerns by using **both** instruments: inflow tightenings and outflow easings
 - **Only** inflow tightenings in response to macroprudential concerns
- However, policy is not well-targeted:
 - Inflow controls do not respond to foreign currency debt or external credit
- Factors that increase responsiveness to mercantilist motivations:
 - Low or moderate foreign currency debt
 - Higher exchange rate pass-through to export prices
 - IT and non-freely floating regime

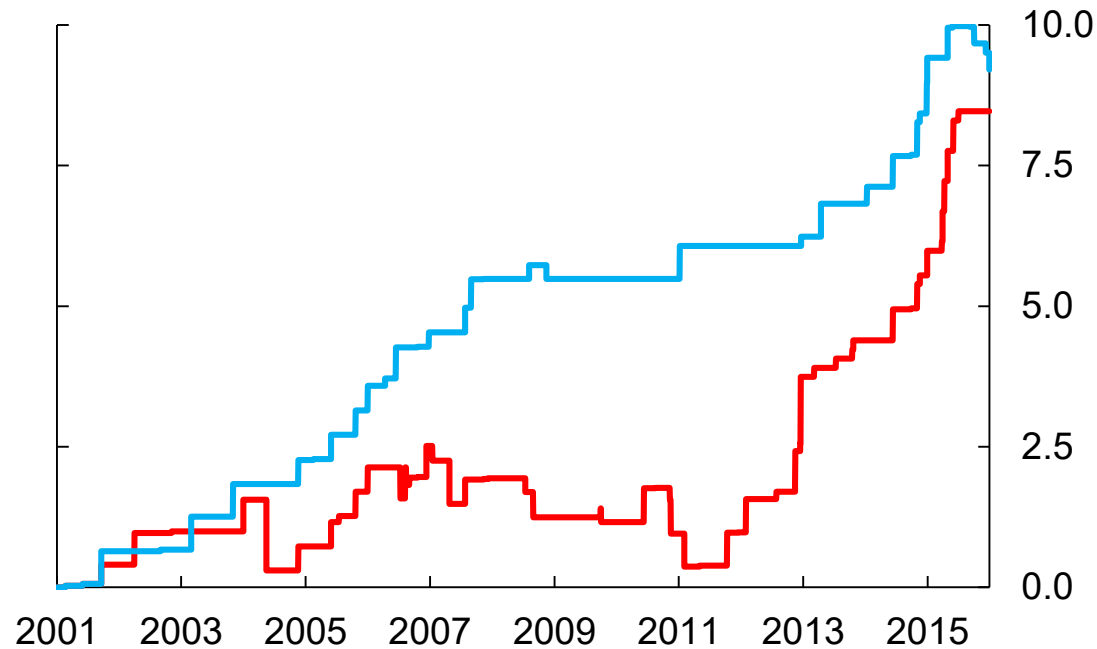
Dataset on capital control policy actions

Dataset contains ~1300 policy actions for 21 EMEs, 1 January 2001 - 31 December 2015

- **A policy action:** Easing or tightening of a regulation affecting cross-border transactions.
 - Example: Brazil's 2% tax on inflows, effective 20 October 2009
- **Sources:** IMF AREAER, Central Banks/Regulators' websites, OECD reports, news sources, other research papers
- **Methodology:** Count the number of policy actions per week
 - Example: Number of inflow tightenings per week

New dataset allows us to better capture the evolution of policy

China: Pasricha et al. (2018) index
Higher Values = More openness



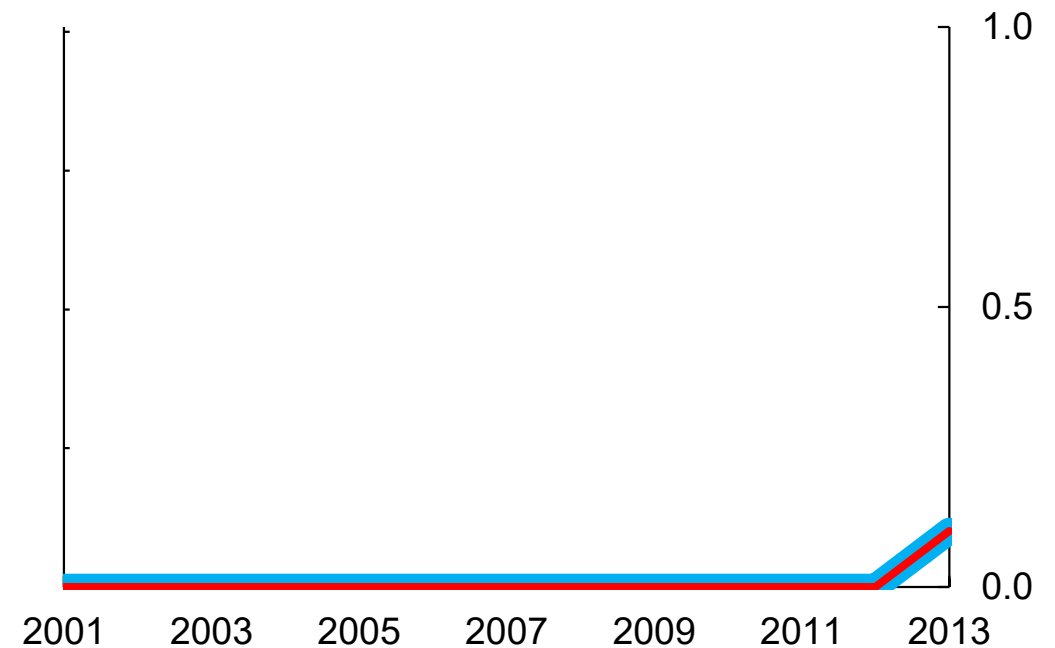
— Cumulative number of weighted net inflow easings
— Cumulative number of weighted net outflow easings

Note: Figures include policy actions related to FDI and exclude those that were implemented more than 60 days after announcement. Actions that affect both inflows and outflows are included in both red and blue lines.

Source: Authors' calculations

Last observation: 31 December 2015

China: Fernandez et al. (2016) Index
Higher values = More openness



— Outflow Index — Inflow Index

Source: Fernández, Klein, Rebucci, Schindler and Uribe (2016)

Last observation: 2013

Mercantilism Proxy

Issue: Resisting nominal/real appreciation could be both mercantilist and macroprudential

- Simply finding that policy responds to exchange rate doesn't imply policy is mercantilist (or macroprudential)
- Exchange rate appreciation relaxes collateral constraint (denominated in creditors' currency) and facilitates over-borrowing (Bianchi, AER 2011; Korinek and Sandri, 2015)
- **Appreciation against USD makes you uncompetitive and increases systemic risk**
- **Proposed Solution:** Mercantilism Proxy: Measure nominal/real appreciation against trade competitors
 - Most trade competitors of EMEs are other EMEs and EMEs do not borrow in other EME's currencies
 - **Appreciation against competitors makes you uncompetitive but doesn't increase systemic risk**

Mercantilism proxy measures exchange rate appreciation against trade competitors

- Identify top 5 trade competitors for each EME:
 - Merchandise Trade Correlation Index from UNCTAD (w_{ijt})
 - 1995-2012

Example: Top 5 trade competitors of India in 2012

Pakistan	China	Turkey	Vietnam	Thailand
0.44	0.31	0.29	0.27	0.26

- Construct weighted appreciation against trade competitors, at different horizons
Example: Weighted real appreciation over previous year

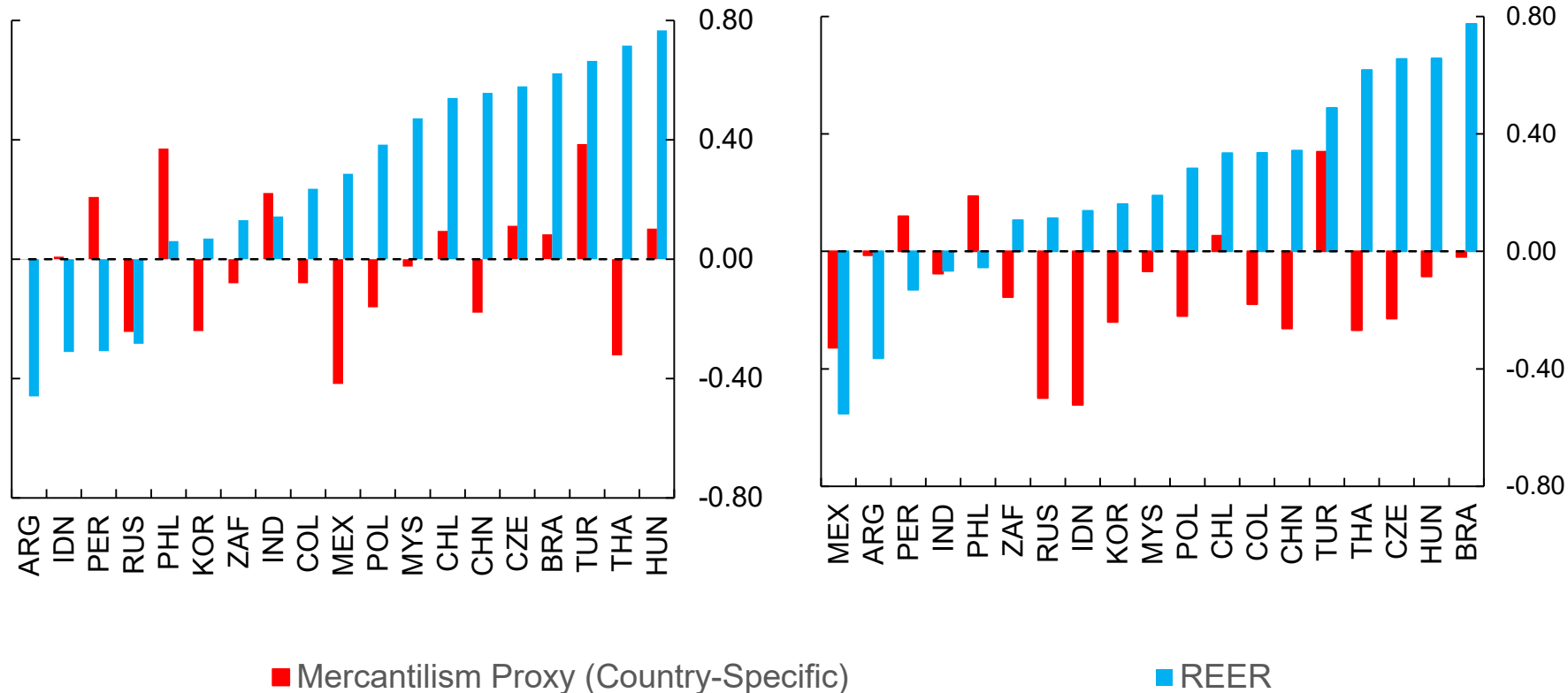
$$WRAPPRY_{it} = 100 * \left[\sum_{j=1}^5 w_{ijt} \{ (x_{it} - L^{52}x_{it}) - (x_{jt} - L^{52}x_{jt}) + (\pi_{it-1} - \pi_{jt-1}) \} \right]$$

x_{it}, x_{jt} = Log of exchange rates against USD

Mercantilism proxy is uncorrelated or negatively correlated with Bank Credit to GDP gap and growth

(a) Correlations with Bank Credit to GDP gap

(b) Correlations with Bank Credit to GDP growth



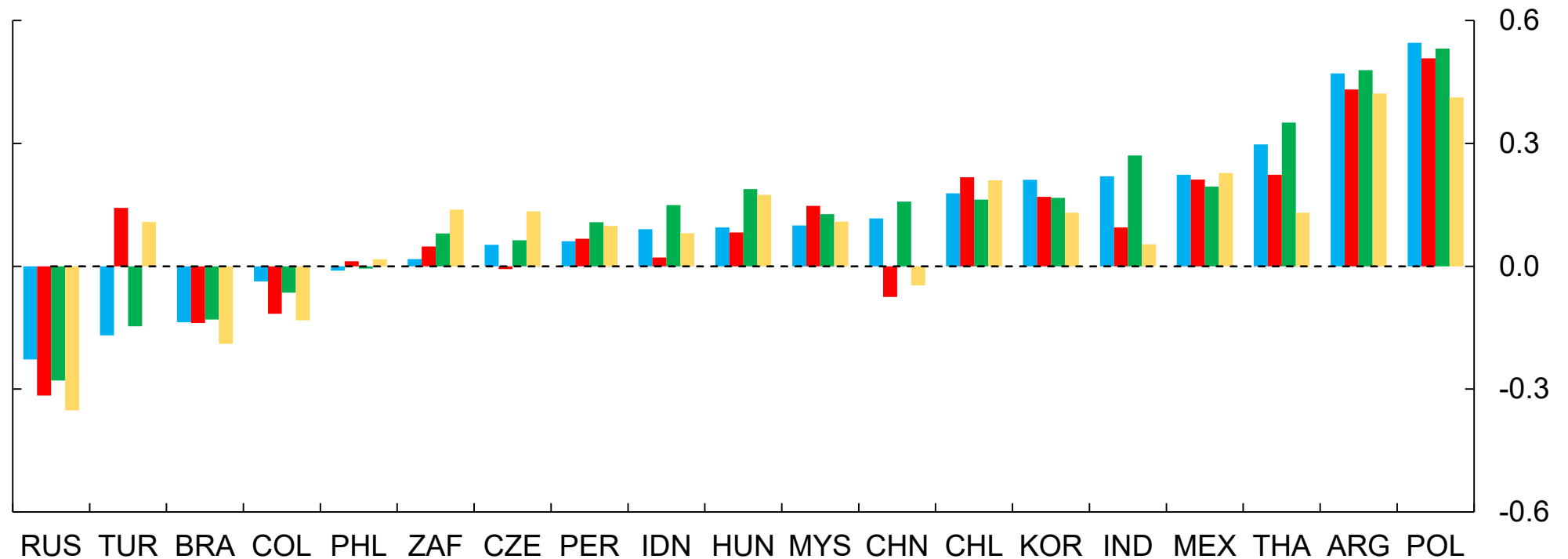
Note: Bank credit to GDP growth is the year over year change in domestic bank credit to the private sector as percentage of GDP. REER is the real effective exchange rate. Mercantilism proxy is as defined in the text.

External validation of mercantilism proxies

- Are mercantilism proxies correlated with, and Granger cause, future non-tariff barriers to trade?
- Web scraped WTO-I-TIP data on 4 types of non-tariff barriers at weekly frequency:
 - Anti-dumping duties
 - Quantitative restrictions
 - Countervailing duties
 - Safeguards
- 4 Variables:
 - Measures coming into force
 - Measures initiated
 - Measures withdrawn
 - Net initiations

Mercantilism proxies are positively correlated with future net initiations of non-tariff barriers

Correlation coefficients, with future net initiations of non-tariff barriers



- Mercantilism Proxy (Nominal, 13-wk appr., %, 1-y MA)
- Mercantilism Proxy (Real, 13-wk appr., %, 1-y MA)
- Mercantilism Proxy (Nominal, yoy appr., %)
- Mercantilism Proxy (Real, yoy appr., %)

Note: The figure plots the correlations of past appreciation of currency against trade competitors with future initiations of non-tariff barriers. 1-y Ma refers to a 52-week backward looking moving average. Future net initiations of non-tariff barriers refer to a forward looking 52-week moving average of net initiations of non-tariff barriers.

Evidence of Granger causality for most countries

Granger causality tests: χ^2 statistics.

H₀: A does not Granger cause B. H₁: A Granger causes B

A →	Mercantilism Proxy (Real, yoy appr., %)		Mercantilism Proxy (Nominal, yoy appr., %)		Mercantilism Proxy (Real, 13-wk appr.)		Mercantilism Proxy (Nominal, 13-wk appr., %)	
	Measures in Force	Net Initiations	Measures in Force	Net Initiations	Measures in Force	Net Initiations	Measures in Force	Net Initiations
ARG	26.4*	6.9	13.2	8.5	13.9	32.3*	12.5	26.7
BRA	28.2	0.7	59.1*	1	27.3	28.3	27.1	28.5
CHL	4.2	9.4	6.6*	8.7	30.6	4.1	31.6	3.8
CHN	21.3	7.8	23.7*	6.7	27.1	56.7	25.1	52.5
COL	3.2	1.4	2.2	1.5	61.1*	44.1*	98.8*	70.9*
CZE	82.8*	59.1	86.8*	64.3	105.3*	48.5	104.7*	57.7
EGY	1.9	2.3	1.8	1.8	19.5	10.7	19.7	15.4
HUN	82.2*	69*	85.7*	69.9*	81.5*	65.2	83.1*	64.8
IDN	56.9	2	58.6	5	27.3	40.5*	27.7	56.5*
IND	0.7	8.5	5.1*	3.7	15.4	21.9	17	7.8
KOR	0.7	0.7	0.5	0.5	12.9	14.7	13	23.2
MAR	1.2	3	1	2.7	17.2	17.5	17	16.5
MEX	11.5	0.6	12.4	0.5	21.3	15.9	21.5	16.4
MYS	2.4	28	1.4	32.5*	37.3*	45*	37.1*	44.5*
PER	1.5	0.2	1.7	0.1	7.2	6.1	7.5	6
PHL	172.8*	118*	203.9*	128.3*	83.6*	107.8*	72.1*	103.9*
POL	14.2*	7.5	13.9*	10.1*	28.1	35.5	26	35
RUS	35.4*	29.3*	32.3*	29.1*	56.7*	16.7	57.6*	16.5
THA	37.1*	12.1*	36.7*	5.3*	37.9	34.8*	36.9	33.9*
TUR	12.7	8.7	12.6	6.2	35.4	59.7*	37.7	58.6*
ZAF	1.6	27.7*	1.5	26.8*	15.1	108.1*	14.9	54.1*

Methodology

Empirical Strategy: Panel Ordered Logit

$$\Pr(y_{it} = s_k | w_{it-1}) = f\{X_{it-1}^{MP}\beta^{MP} + X_{it-1}^{FX}\beta^{FX} + X_t^G\beta^G + X_{it-1}^O\beta^O\}$$

- Baseline: y_{it} = Number of Net Inflow Tightening Actions
- Macroprudential proxy: Bank credit to GDP gap
- Mercantilism proxy: Exchange rate appreciation against trade competitors

Other controls:

- Other domestic policies - monetary, fiscal, reserves accumulation*
- Inflation rate (Macroeconomic motivation/overheating)
- Global variable (VIX), crisis dummy, previous policy action

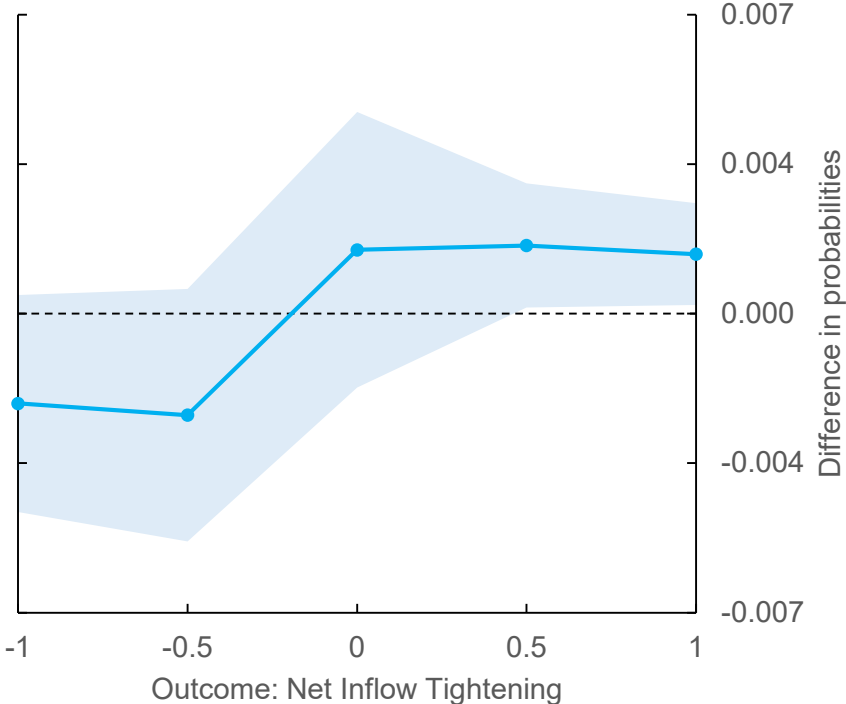
Results

Baseline — Inflow controls respond to both mercantilist and macroprudential concerns

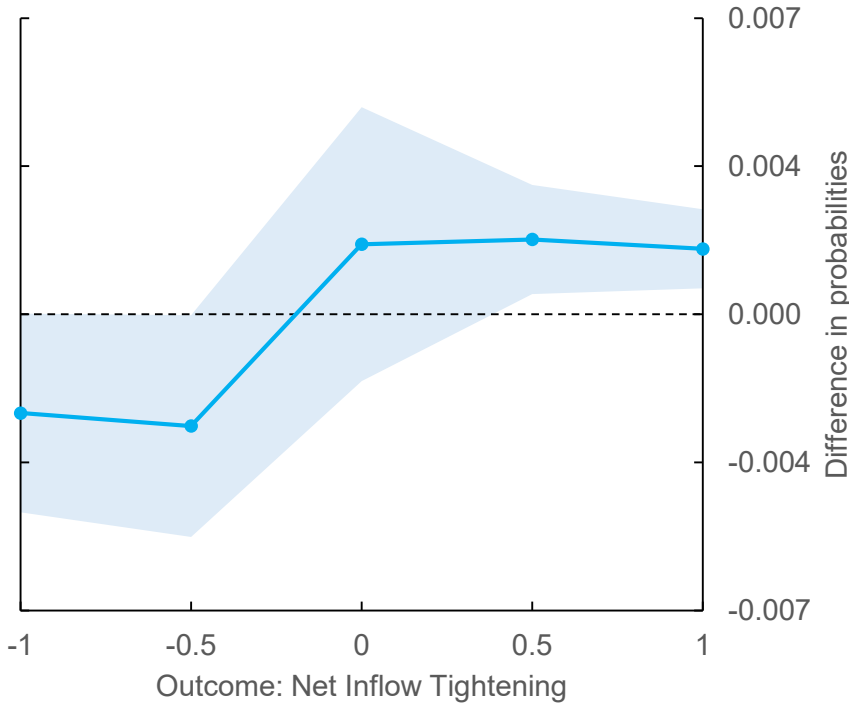
	Dependent Variable: Weighted Net Inflow Tightenings (non-FDI)					
	(1)	(2)	(3)	(4)	(5)	(6)
Mercantilism Proxy (Country-Specific)	1.21**					
Mercantilism Proxy (Nominal, 13-wk appr, %)		1.18**				
Mercantilism Proxy (Real, 13-wk appr, %)			1.19**			
Mercantilism Proxy (Nominal, yoy appr, %)				1.22**		
Mercantilism Proxy (Real, yoy appr, %)					1.22***	
Mercantilism Proxy (Orthogonal to USD appreciation)						1.18**
Bank Credit-GDP gap (%)	1.24***	1.24***	1.25***	1.23***	1.24***	1.24***
Previous policy action (T, E)	1.37***	1.37***	1.37***	1.37***	1.37***	1.36***
Fiscal Stance	1.11	1.11	1.12	1.12	1.12*	1.11
Monetary Stance	0.91*	0.91*	0.91**	0.90*	0.90**	0.90*
ΔReserves/GDP (% , residuals)	1.32***	1.32***	1.32***	1.31***	1.31***	1.37***
Inflation	0.94	0.93	0.91*	0.97	0.93	0.95
VIX	0.99	0.99	0.99	0.99	0.99	0.99
Crisis Dummy	0.62	0.59	0.57	0.62	0.57	0.54*
Observations	8,558	8,558	8,558	8,558	8,558	8,550
Number of Countries	11	11	11	11	11	11
Chi-Squared (All coefficients =0)	667.8	866.6	1260	217.9	360.8	135.7
P-value (Chi-Squared)	0	0	0	0	0	0

Appreciation against trade competitors increases likelihood of inflow tightening; Inflow controls are countercyclical to systemic risk

(a) Mercantilism Proxy



(b) Macroprudential Proxy

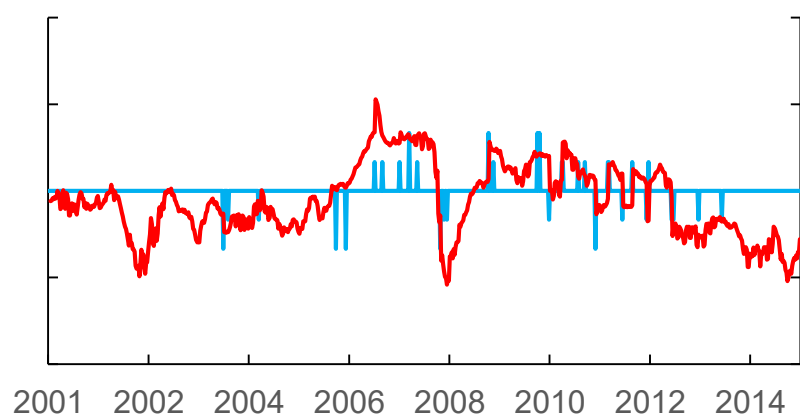


90% Confidence Interval

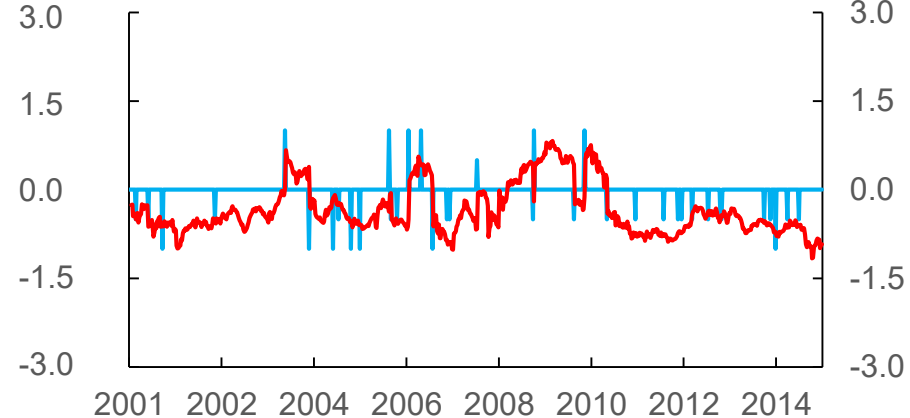
Average Marginal Effect

Predicted latent variable has a high degree of co-movement with actual net inflow tightening actions

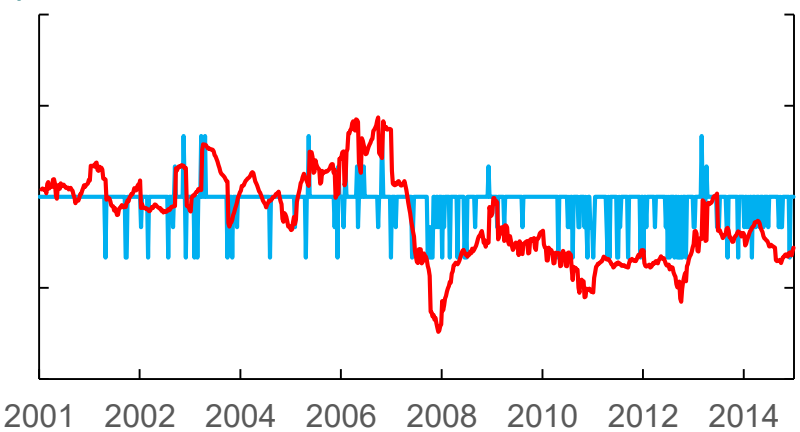
(a) Brazil: Actual vs. Predicted



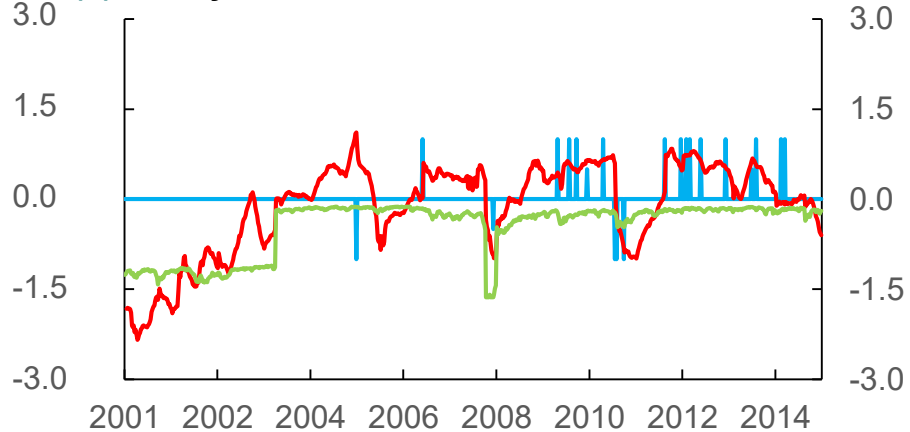
(b) China: Actual vs. Predicted



(c) India: Actual vs. Predicted



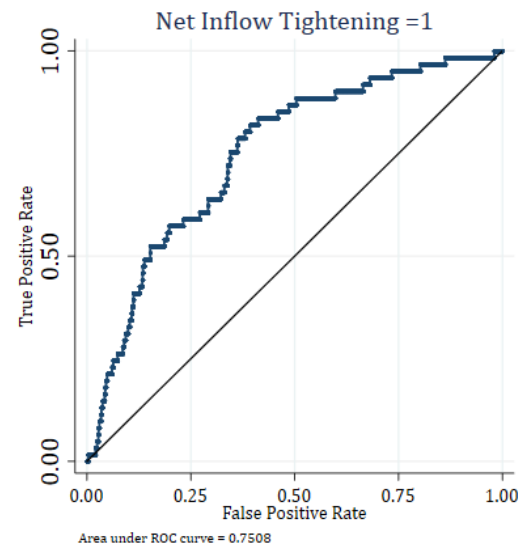
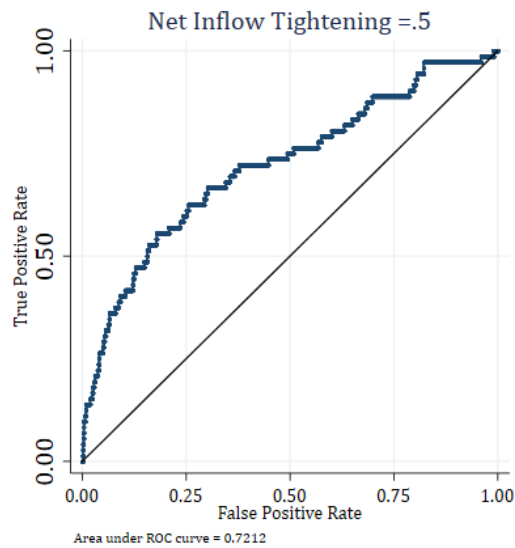
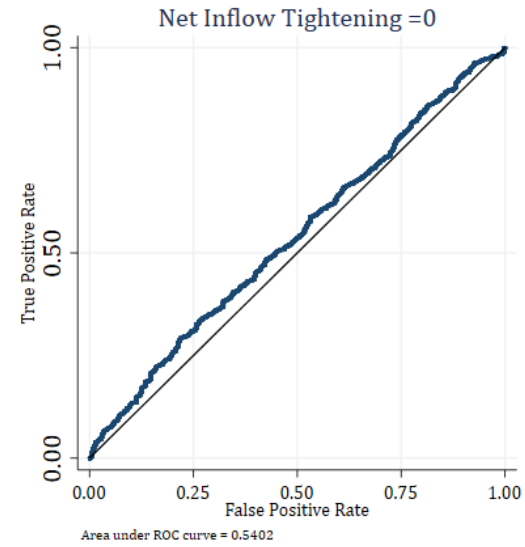
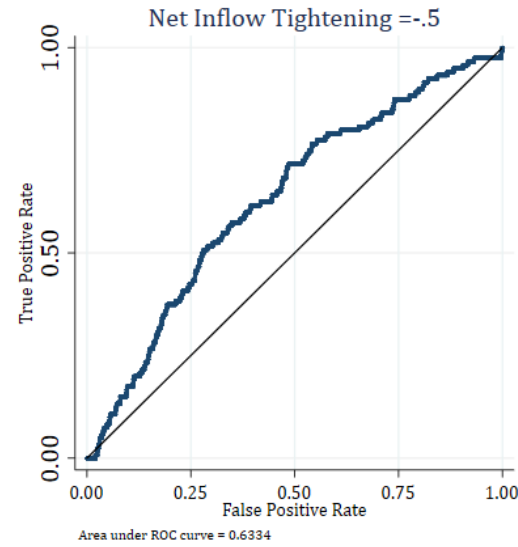
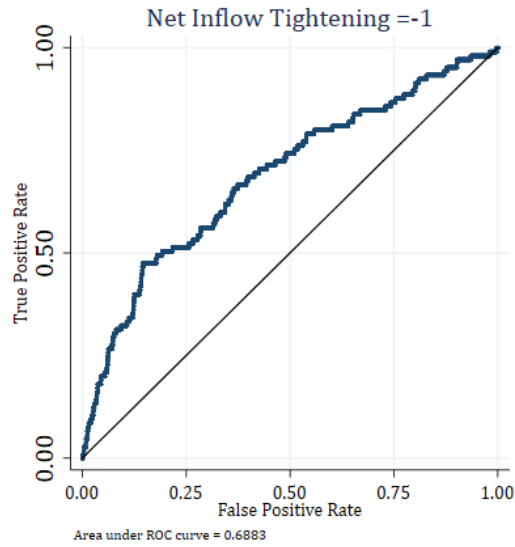
(d) Turkey: Actual vs. Predicted



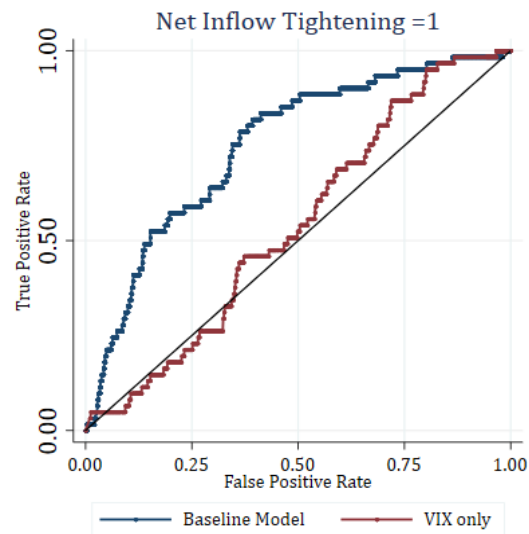
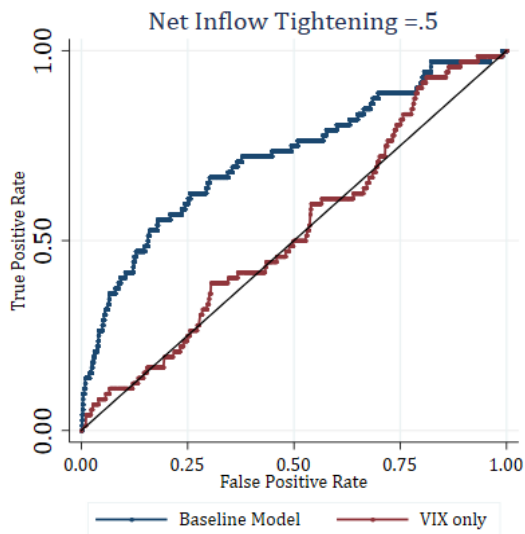
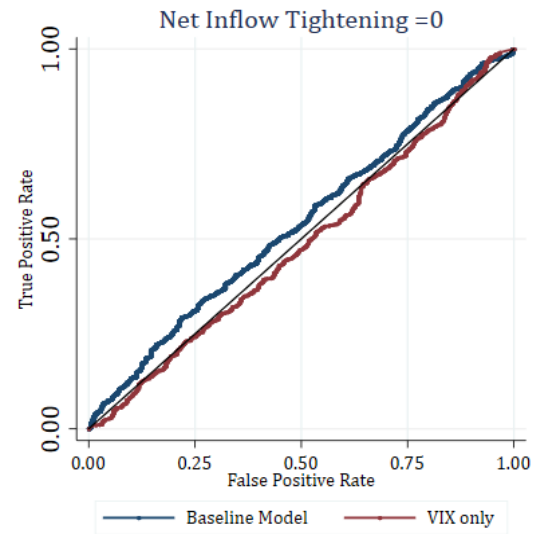
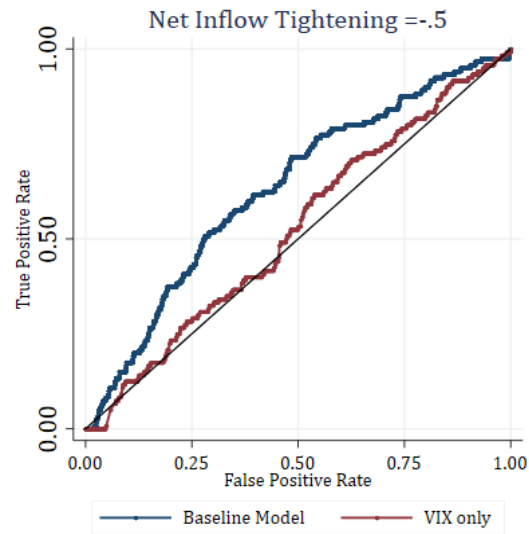
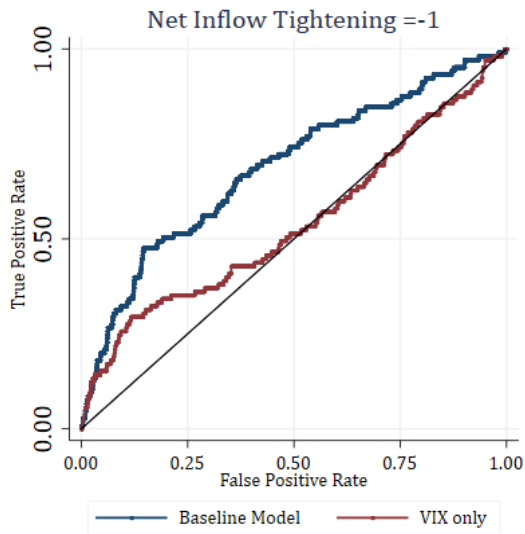
— Net Inflow Tightening (Weighted, non-FDI, Ordered) — Linear Predictions (Baseline)

— Linear Predictions (VIX only)

The baseline model has good predictive power



VIX-only model has poor predictive power



Results so far:

- Capital controls are both mercantilist and macroprudential
 - Inflow controls are countercyclical to appreciation against trade competitors and to domestic credit
 - Policy responds to domestic factors – not just global
- A simple reaction function with the chosen mercantilist and macroprudential proxies predicts policy well

Exploring the two motivations further

- Macroprudential motivations:
 1. Additional proxies for macroprudential motivation
 2. Do capital controls target foreign credit?
- Mercantilist Motivations:
 3. Predicting net NKI restricting actions
 4. Additional proxies for mercantilist motivation
 5. The role of exchange rate pass-through to export prices

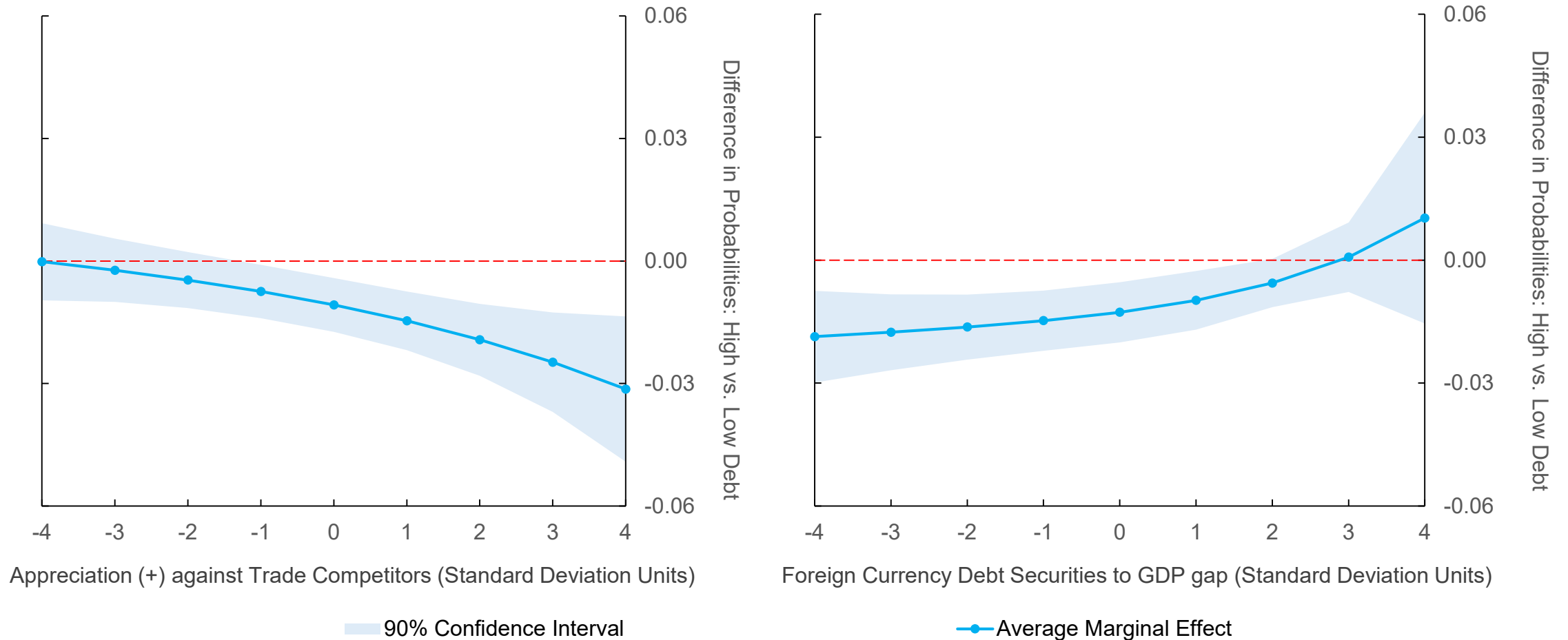
1. Most additional macroprudential proxies do not have significant marginal effects on average

	Average Marginal Effect on Pr(Net Inflow Tightening =i)				
	Probabilities expressed in percentage points				
	<i>i</i> = -1	<i>i</i> = -0.5	<i>i</i> = 0	<i>i</i> = 0.5	<i>i</i> = 1
Bank credit to GDP gap (%)	-0.29*	-0.39*	0.18	0.27*	0.23*
Balance Sheet Exposure	0.01	0.01	0	-0.01	0
Bank Credit/GDP, (yoy gr)	-0.01	-0.01	0	0	0
Equity inflows/Total mutual fund inflows (% , 12-wk MA)	0.08*	0.1*	-0.05	-0.07*	-0.06*
Equity Prices (Trend Dev.)	-0.08	-0.1	0.05	0.07	0.06
Equity Prices (yoy gr)	0.01	0.01	0	-0.01	-0.01
External Credit, Non-banks (% of GDP)	0.05	0.06	-0.03	-0.04	-0.04
External Credit/GDP (%)	-0.02	-0.02	0.01	0.01	0.01
External Credit/GDP (Trend Dev.)	-0.07	-0.1	0.05	0.07	0.06
External Credit/GDP (yoy gr, %)	-0.07	-0.09	0.04	0.06	0.05
External Credit/GDP, Non-banks (yoy gr, %)	-0.01	-0.01	0.01	0.01	0.01
External Debt Securities Net Flow (% of GDP)	0.11	0.15	-0.07	-0.11	-0.09
External Debt Securities Stock (% of GDP)	-0.04	-0.05	0.02	0.04	0.03
Foreign Currency Debt Securities Stock (% of GDP)	-0.04	-0.05	0.02	0.03	0.03
Foreign Currency Debt Securities Stock (Trend Dev.)	-0.05	-0.07	0.03	0.05	0.04
Foreign Currency Debt Securities, Net Flows (% of GDP)	0.11	0.15	-0.07	-0.1	-0.09
Foreign Currency Debt Securities, Short Term, Net Flows (% of GDP)	-0.01	-0.01	0.01	0	0
Other Investment Inflows/GDP (Trend Dev.)	0.06	0.09	-0.04	-0.06	-0.05
Other Investment/GDP (%)	0.11	0.14	-0.07	-0.1	-0.08
Portfolio Liabilities/Total External Liabilities (%)	0.02	0.02	-0.01	-0.02	-0.01
Residential Property Prices (yoy gr, %)	0.07	0.11	-0.05	-0.07	-0.06

Note: Dependent variable is the ordered weighted, non-FDI net inflow tightening measures. Estimation method is panel ordered logit, assuming random effects and using robust standard errors.

2. Policy reaction function changes in high foreign currency debt states

Average marginal effect of high foreign currency debt state on probability of net inflow tightening > 0



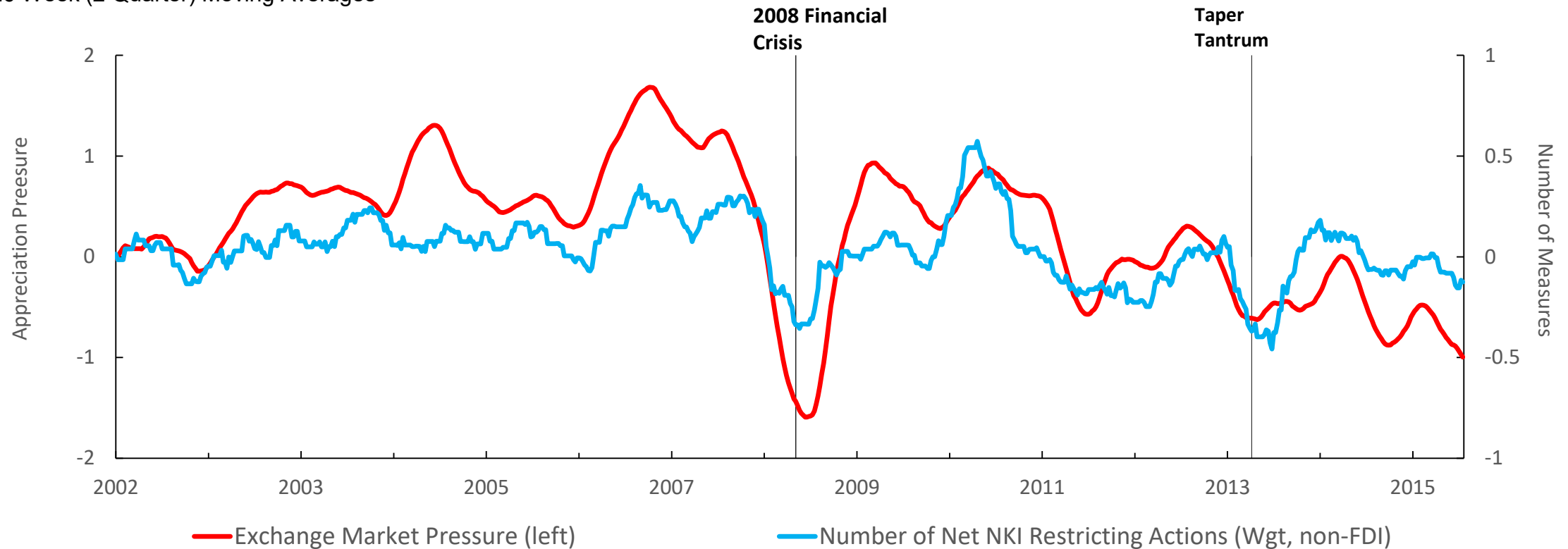
Net Capital Inflows = Inflows-Outflows

- Two possible tools to respond to mercantilist concerns/appreciation pressures
- Summary measure:

Net NKI Restricting Actions = Net Inflow Tightenings + Net Outflow Easings

Net NKI restricting measures respond strongly to appreciation pressures against US dollar

26 Week (2 Quarter) Moving Averages



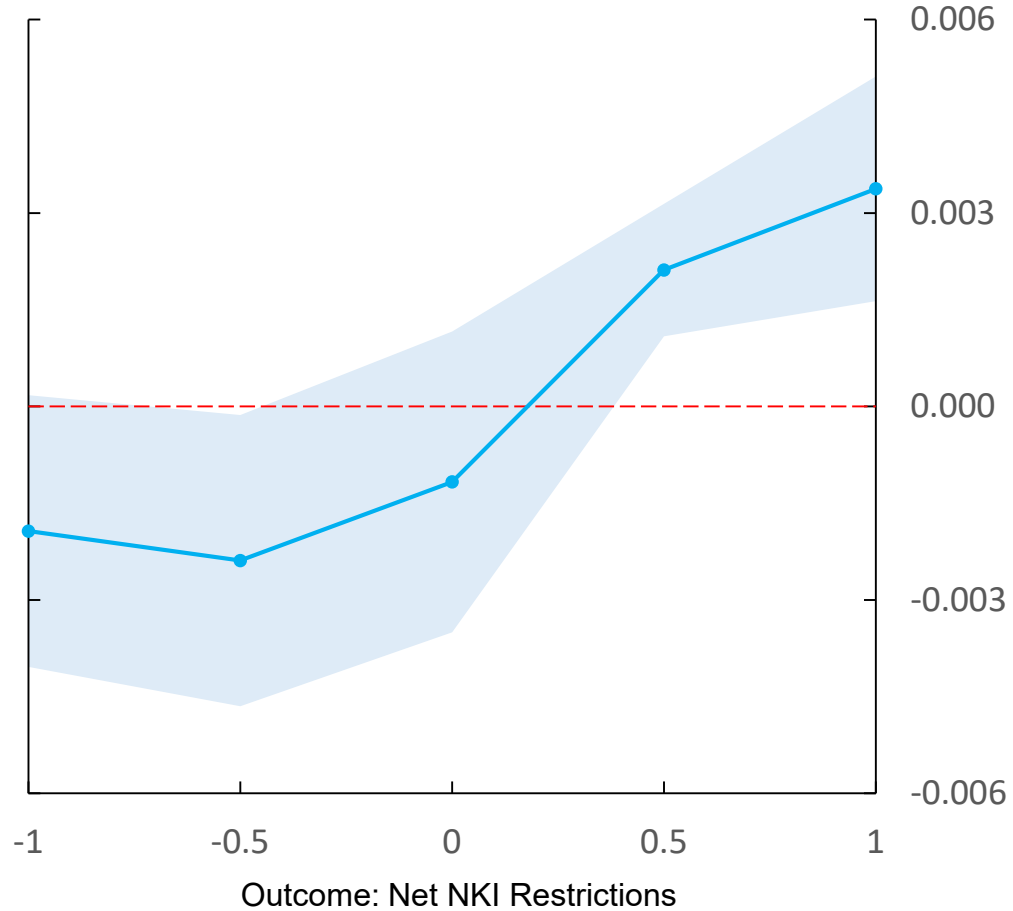
Note: Exchange market pressure index is the EME average. Each emerging market's EMP is computed as the sum of standardized appreciation in nominal exchange rate against US dollar and standardized percentage increase in foreign exchange reserves excluding gold. The reserves series is interpolated from quarterly data before computing percentage changes. Net NKI Restricting actions are computed as (Inflow Tightenings - Inflow Easings) + (Outflow Easings - Outflow Tightenings). The measures are weighted and exclude those related to FDI but include currency-based measures.

Source: IMF International Financial Statistics, Datastream and Author's calculations

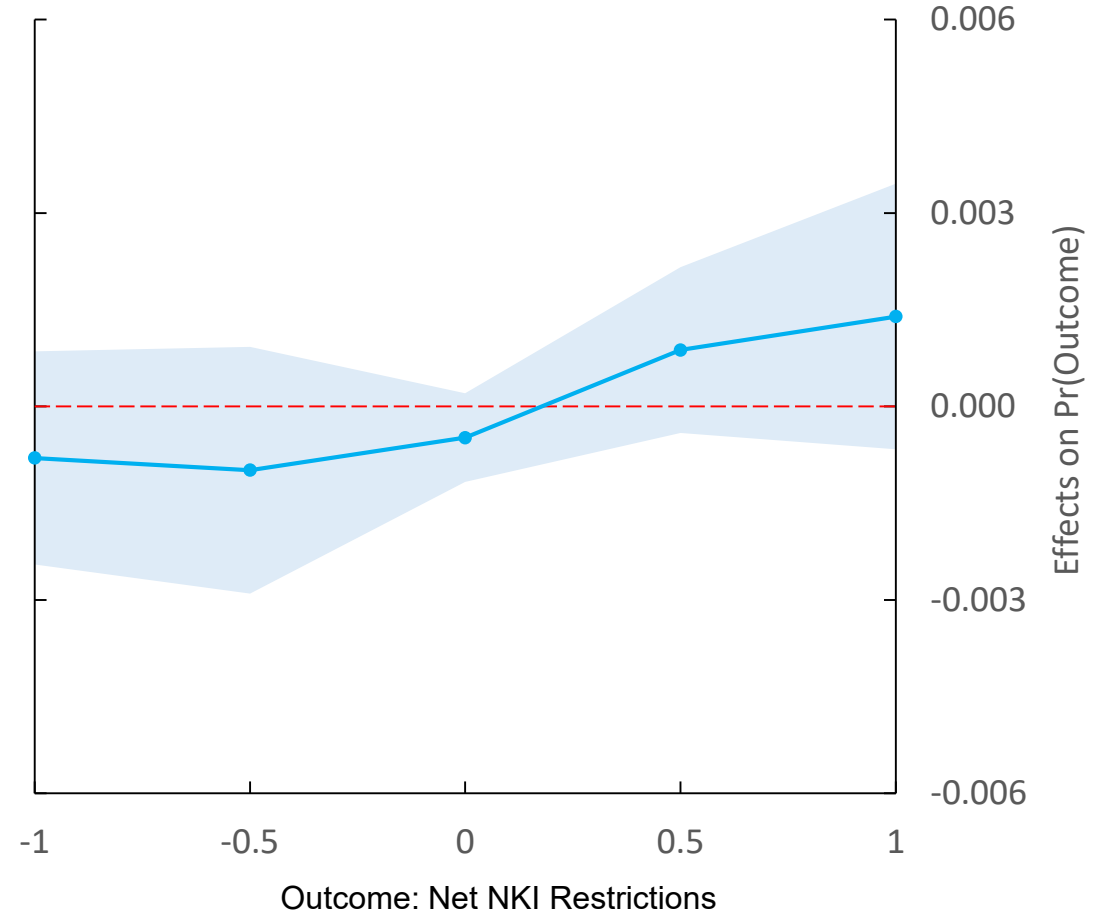
Last Observation: 2015w52

3. Net NKI Restrictions respond only to mercantilist concerns

(a) Mercantilism Proxy



(b) Macroprudential Proxy



90% Confidence Interval

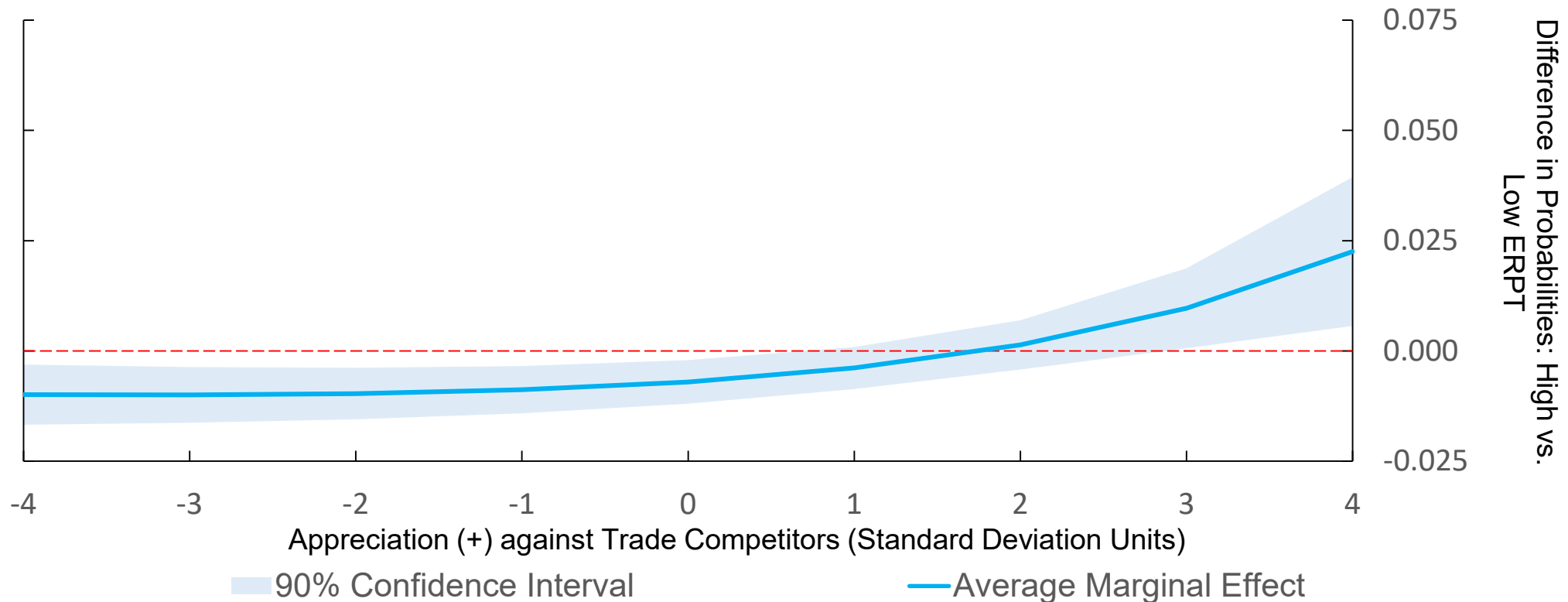
Average Marginal Effect

4. Additional mercantilism proxies are not significant and do not improve model predictions

	Dependent Variable: Weighted Net Inflow Tightenings (non-FDI)				
	1	2	3	4	5
Mercantilism Proxy (Country-Specific)	1.35***	1.36***	1.36***	1.37***	1.35**
Bank Credit-GDP gap (%)	1.32***	1.33***	1.32***	1.36***	1.35***
Relative GDP Growth		0.97			
Manufacturing IIP Growth			0.98		
Relative Manufacturing IIP Growth				0.90	
Export Volume Growth (yoy, %)					1.00
Previous policy action (T, E)	1.28***	1.29***	1.29***	1.30***	1.31***
Fiscal Stance	1.17**	1.17**	1.18**	1.16**	1.16*
Monetary Stance	0.86**	0.86**	0.86**	0.86**	0.87*
Δ Reserves/GDP (%)	1.33***	1.34***	1.34***	1.36***	1.26*
Inflation	1.03	1.03	1.03	1.01	1.00
VIX	0.99	0.99	0.99	1.00	0.99
Crisis Dummy	0.43	0.44	0.44	0.45	0.38
Observations	6,769	6,769	6,762	6,762	5,064
Number of Countries	11	11	11	11	9
Pseudo-Log Likelihood	-1585	-1585	-1585	-1584	-1296

5. Countries with high exchange rate pass-through to export prices respond more to mercantilist concerns

Average Marginal Effect of High ERPT on Probability of Net NKI Restrictions = 1



Notes: The graphs plot the predicted probabilities of taking no net NKI restricting actions (inflow tightening + outflow easing actions) against values of country-specific mercantilism proxy (measured in standard deviation units). All other variables are held at their mean values.

Robustness checks

- Alternative measures of capital controls policy (including FDI-related actions, unweighted data, etc.)
- Including all countries, not only active ones
- Control for corruption, governance, openness
- Replacing VIX by Global bank claims, oil prices, US Federal funds shadow rate
- Out of sample fit of the model

Conclusions

- Capital controls are both macroprudential and mercantilist
- There is a method to the choice of instruments:
 - Policymakers respond to mercantilist concerns by using **both** instruments: inflow tightenings and outflow easings
 - **Only** inflow tightenings in response to macroprudential concerns
- Contrary to theoretical predictions, policy is not countercyclical to foreign debt:
 - Inflow controls do not respond to foreign currency debt or external credit on average
- Factors that increase responsiveness to mercantilist motivations:
 - Low or moderate foreign currency debt
 - Higher exchange rate pass-through to export prices
 - Inflation targeting without freely floating exchange rate

