

Capital Controls and Macroprudential Measures: What are They Good For?

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Bank of Korea and IMF Conference
Challenges of Stability and Growth

Seoul, Korea

09/26/2013

Motivation

- Increased interest in “capital-flow management” measures (CFMs) to address challenges related to large and volatile capital flows
 - International institutions & policymakers
 - Theoretical literature
- Empirical evidence mixed and inconclusive
- Two major empirical challenges:
 - Selection Bias
 - Endogeneity
- This paper: addresses econometric challenges using a propensity-score matching methodology

Key Results

- Key Results: Some CFMs work, not others
 - Main significant and robust results: macroprudential measures (and to lesser extent controls) effective in reducing several forms of financial fragility
 - Removing controls on capital outflows → small ER depreciation
 - No consistent effects of capital controls and macroprudential measures on other key goals (macroeconomic variables or financial volatilities)
- Comments today
 - New database
 - Propensity-score methodology



Results

New Database

- Large sample of 60 countries
 - All advanced economies, emerging markets and frontier economies
 - Exclude members of euro area, US, UK & Japan
 - Require information on capital flows in EPFR
- Weekly information on changes in capital controls & macroprudential measures
 - Primary source: AREARS, then supplemented
 - Code detailed information on type of CFM
 - Controls on inflows/outflows
 - Measures affect equity, bonds, FDI
 - Measures affect banks, foreign exchange
 - Measures viewed as “major”
- Final Database: 220 CFM events



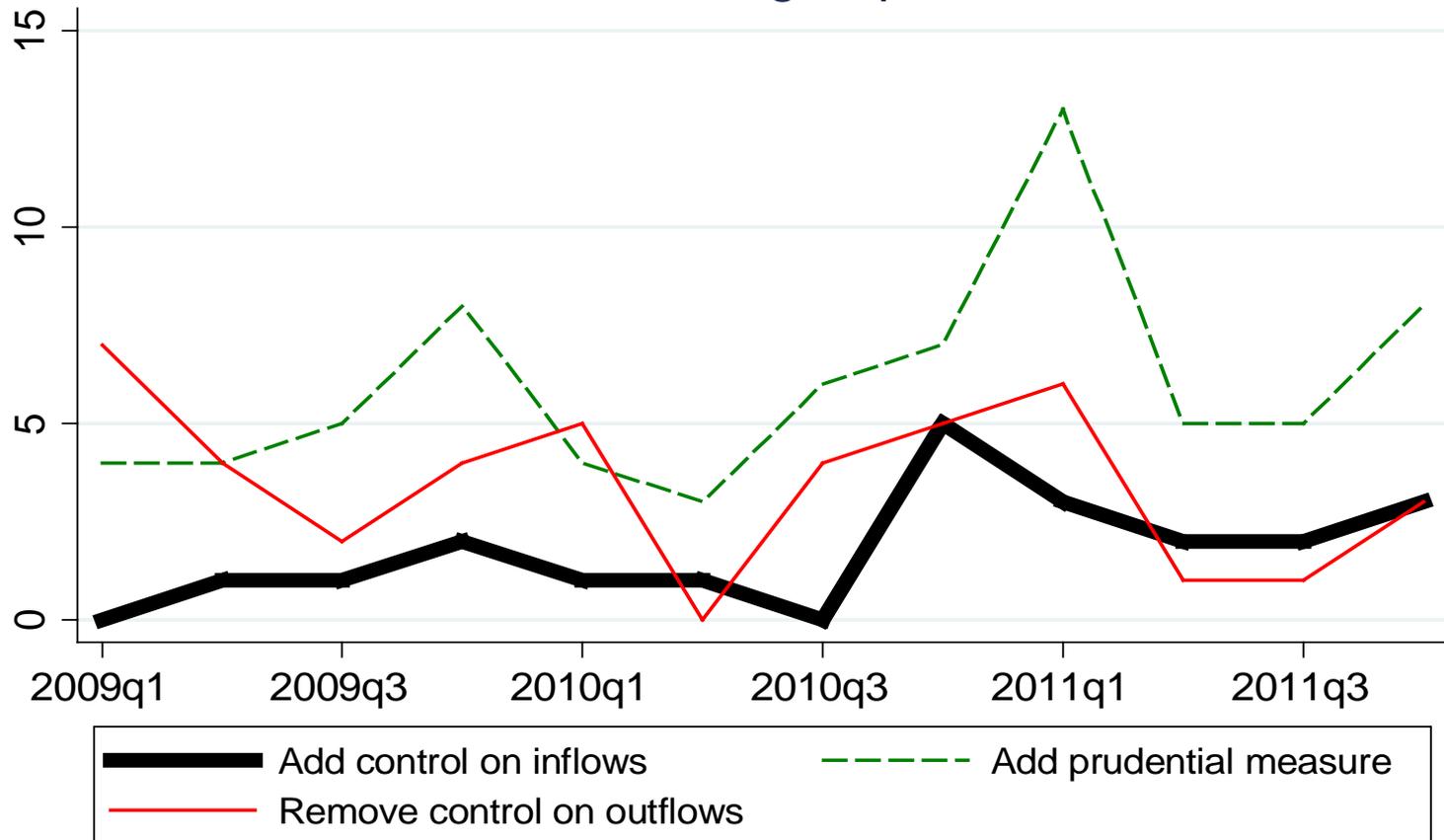
2/3 of countries in sample change a CFM from 2009-2011

of Capital Flow Measures

Controls on Inflows		Controls on Outflows		Macro-Prudential Measures		Related to Pressures From Capital:		
-	+	-	+	-	+	Outflows	Inflows	Total
29	21	42	7	49	72	85	135	220

Incidence of CFMs

Number of CFMs
Aimed at Reducing Capital Inflows



Propensity-Score Methodology

- See paper for details on methodology
- “Treated” observations
 - Country-weeks when a country changes a CFM
 - Country-weeks with no change are “controls”
 - “Exclusion window” for 3 months before & after
- Estimate logit model to calculate propensity scores
 - Probability that each country changes its CFMs each period as a function of observable domestic & global variables:
 - Real effective ER & 6-month net portfolio inflows
 - Domestic credit/GDP & CPI inflation forecasts
 - Global risk (VIX) & TED spread
 - Commodity prices & interest rates differentials (vs. US)
 - Reserves/GDP, ER regime, capital account openness
 - Income level, size of financial sector, institutions

LOGIT RESULTS	Increased Inflow Controls	Decreased Outflow Controls	Increased Macroprudential
Real exchange rate (%ch)	11.222***	6.006**	1.317
Portfolio flows (6 mo, %ch)	0.001	0.004	0.000
Consensus CPI, 52-wk	0.207*	-0.148	0.337***
Private credit / GDP (%ch)	0.652	1.157	4.501**
VIX	0.052	-0.032	-0.045
TED Spread	-2.381	1.077	-0.646
Commodity prices (%ch)	-0.334	-2.536*	0.217
Interest rate vs. US (ch)	-0.037	-0.031	0.042
FX Reserves/GDP (% ch)	-0.663	-0.846	-0.817
Floating ER dummy	-0.349	0.488	1.615***
Capital account openness	-0.097	-1.008***	0.579***
Stock market cap. (% GDP)	-0.012*	0.006**	-0.000
Log GDP per capita	0.224	0.802**	0.052
Legal compliance	-17.397	105.058**	79.502***
Legal compliance ²	3.100	-25.638**	-18.826***
<i>Observations</i>	4,953	4,708	4,394
<i>Pseudo R²</i>	0.192	0.222	0.155

Matching Algorithms

- **5 Matching Algorithms**

1. **Nearest neighbor without replacement**

- Brazil \uparrow tax on inflows (wk 42, 2010) matches w/ Mexico (wk 20, 2010)
- Indonesia \uparrow macropru (2011, wk 4) matches w/ Turkey (2011, wk 31)
- Korea \uparrow macropru (2010, wk 1) matches w/ New Zealand (2010, wk 3)

2. **5 nearest neighbors**

3. **Radius** (with caliper = 0.005)

4. **Kernel**

5. **Local-linear:** Weighted average of all observations in control group

- Non-parametric estimator with general weighting function to assign higher weight to controls closer to treated observation

- **Tests of methodology**

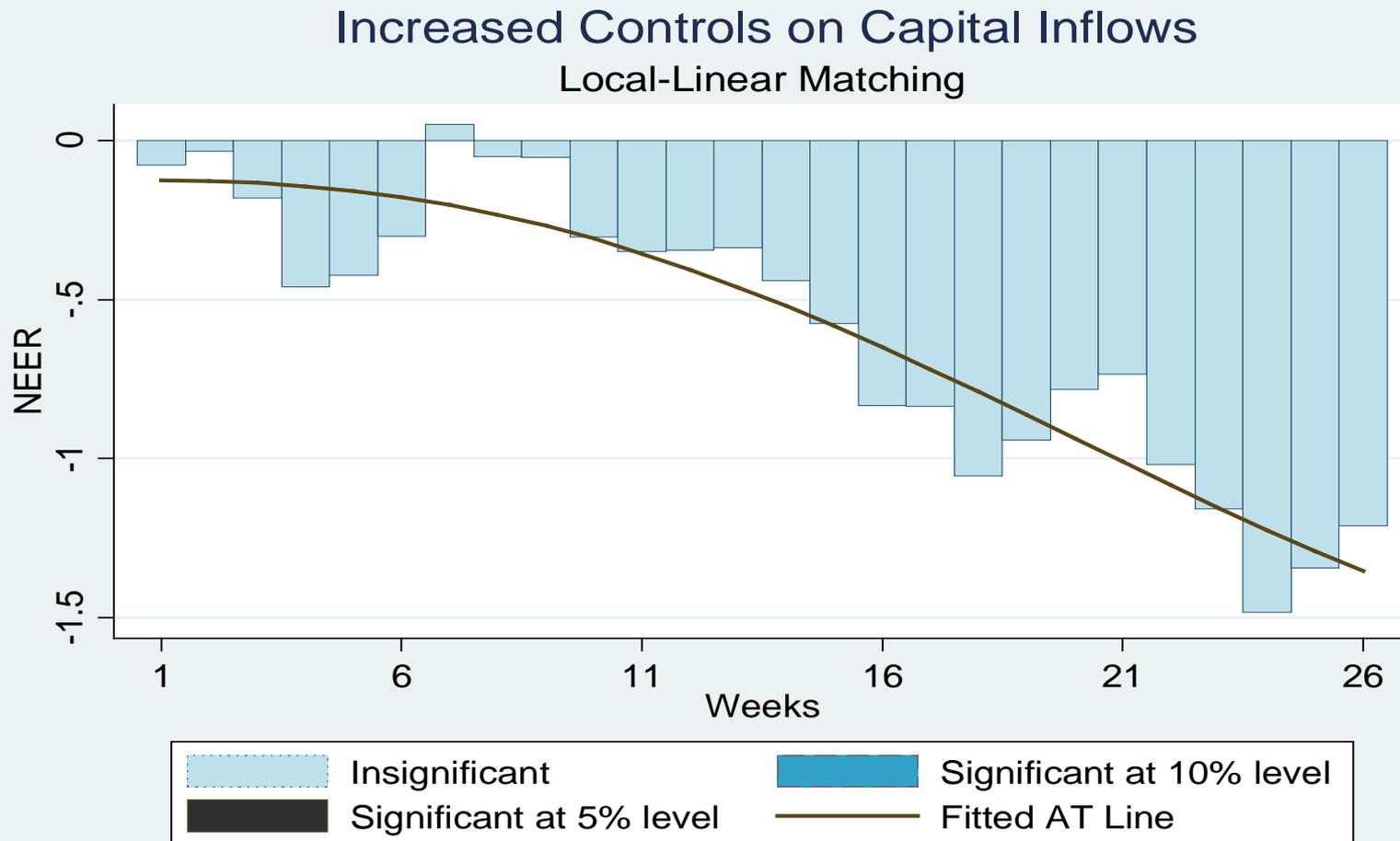
- Preferred method (bias/efficiency tradeoff)
- All treatments meet “common support condition”
- Meets “independence” assumption/”balancing assumption”

Matching Tests: Controls on Inflows	Mean: Treated Group (μ_T)	Mean: Unmatched Control (μ_C)	t-Statistics (H0: $\mu_T = \mu_C$)	Local-linear	
				Mean Matched Control (μ_C)	t-stat (H0: $\mu_T = \mu_C$)
Real ER	0.090	0.008	4.21***	0.099	-0.33
Portfolio flows	0.401	-2.541	0.21	1.955	-0.58
Consensus CPI	7.156	4.158	4.78***	6.115	1.03
Credit growth	0.044	0.026	0.99	0.012	1.12
VIX	25.752	26.482	-0.39	27.791	-0.82
TED	0.268	0.351	-1.39	0.271	-0.08
Commodities	0.068	-0.007	1.30	0.058	0.18
Interest rate - US	-0.523	-0.149	-0.56	-1.006	0.22
FX Reserves/GDP	0.080	0.084	-0.06	0.134	-0.73
Floating ER	0.667	0.744	-0.81	0.714	-0.33
CA openness	0.073	1.016	-2.97***	0.234	-0.51
Stock mktcap.	43.231	84.666	-1.98**	48.162	-0.40
GDP per capita	8.443	9.295	-3.26***	8.535	-0.31
Legal compliance	2.046	2.229	-3.82***	2.029	0.32
Legal comp. ²	4.216	5.018	-3.76***	4.144	0.33

Impact of CFMs on Outcomes

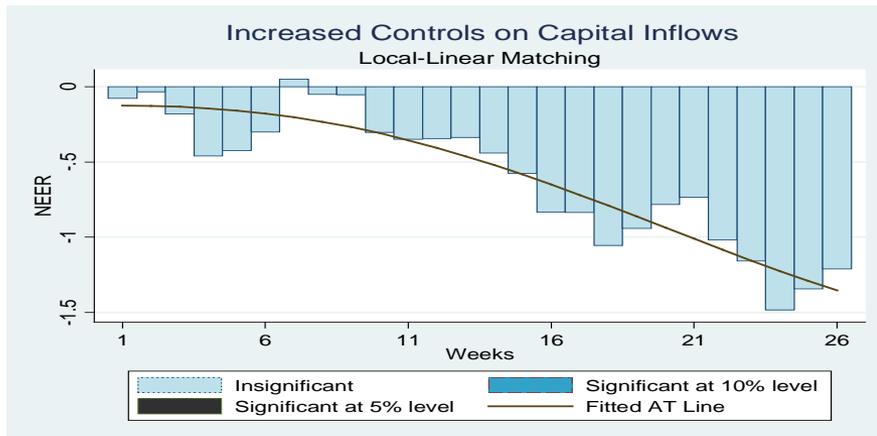
- Calculate **average treatment effect on the treated (ATT)** for each CFM on each outcome variable
 - Compare average values for treated observations with average for matched controls
 - Estimate cumulative ATT for each week over 6-months
 - Bootstrapped standard errors
- Test for impact on 4 cited goals (outcome variables):
 - **Exchange rate** (nominal & real) & **portfolio flows**
 - **Other macroeconomic variables** (interest rate differentials, equity markets, inflation)
 - **Financial market volatility** (exchange rate, portfolio flows, interest rates)
 - **Financial fragilities** (bank leverage, private credit growth, bank credit growth, inflation expectations, & exposure to short-term debt, portfolio liabilities & foreign-currency liabilities)

Impact on Nominal Exchange Rate Increased Controls on Capital Inflows

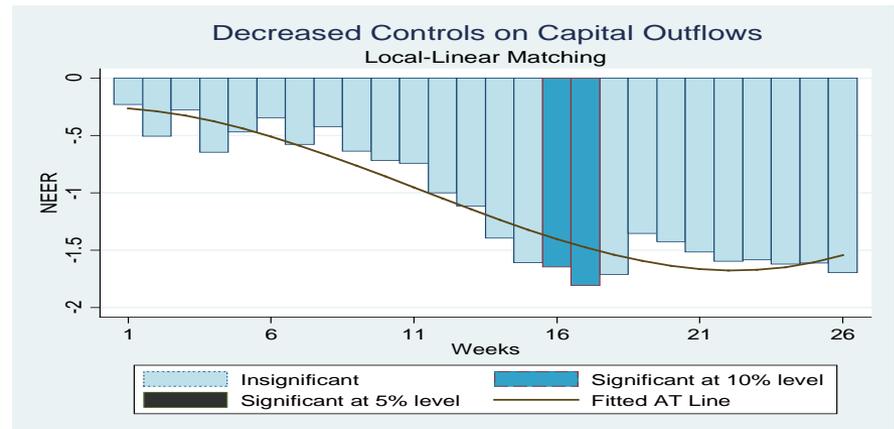


Impact on Nominal Exchange Rate

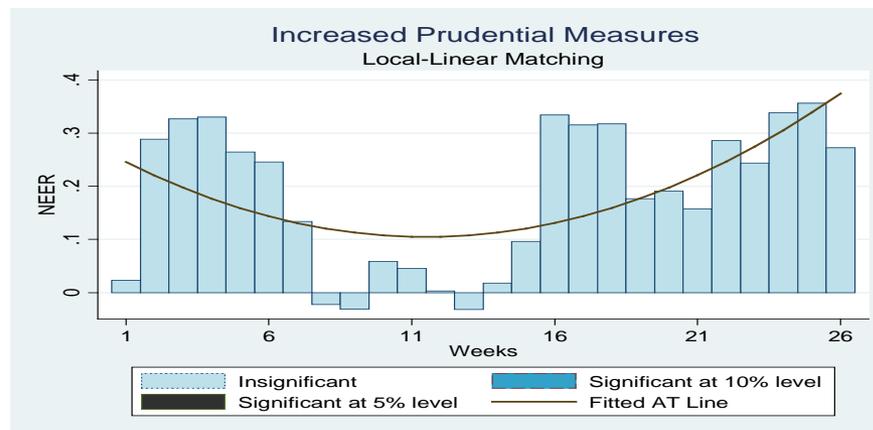
Increased controls on inflows



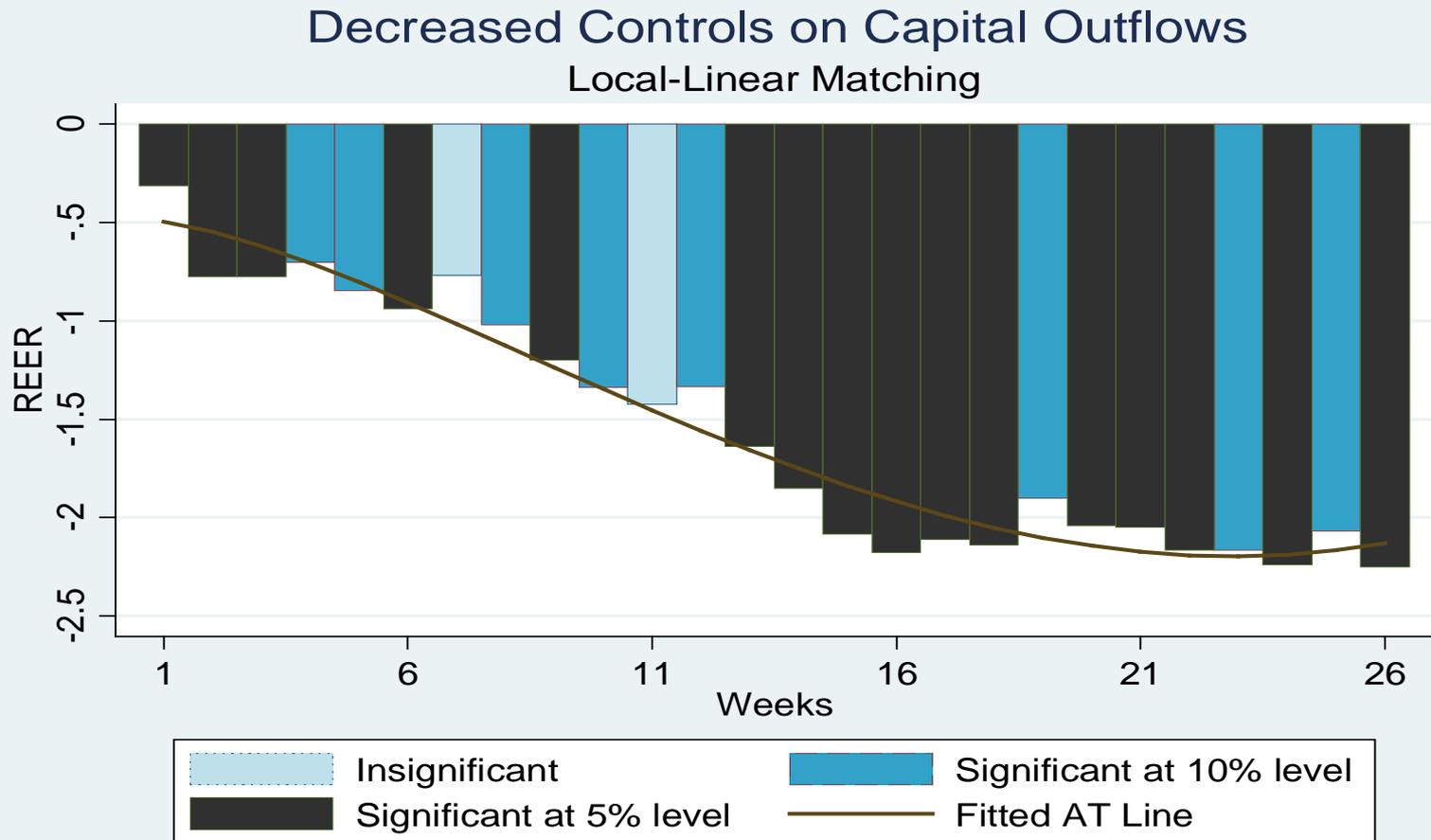
Decreased controls on outflows



Increased prudential measures

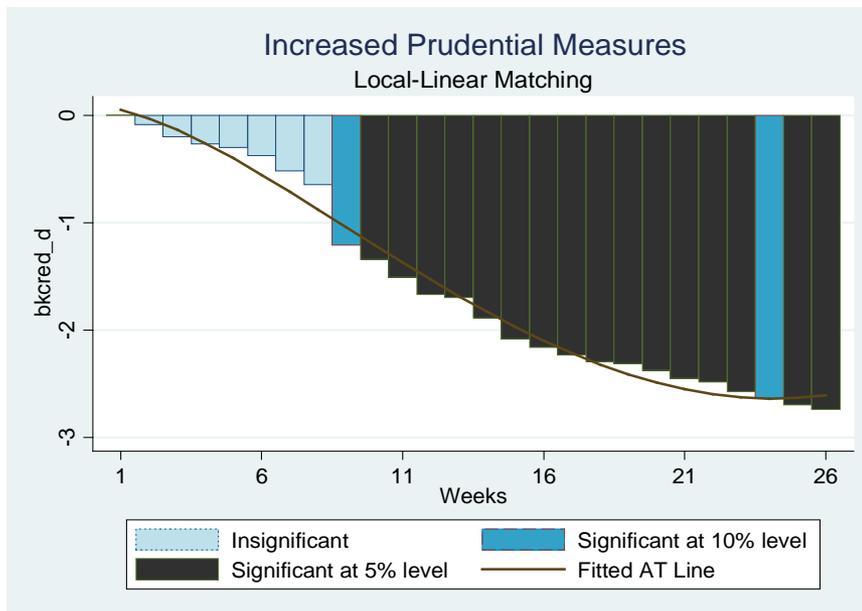


Impact on Real Exchange Rate Decreased Controls on Capital Outflows

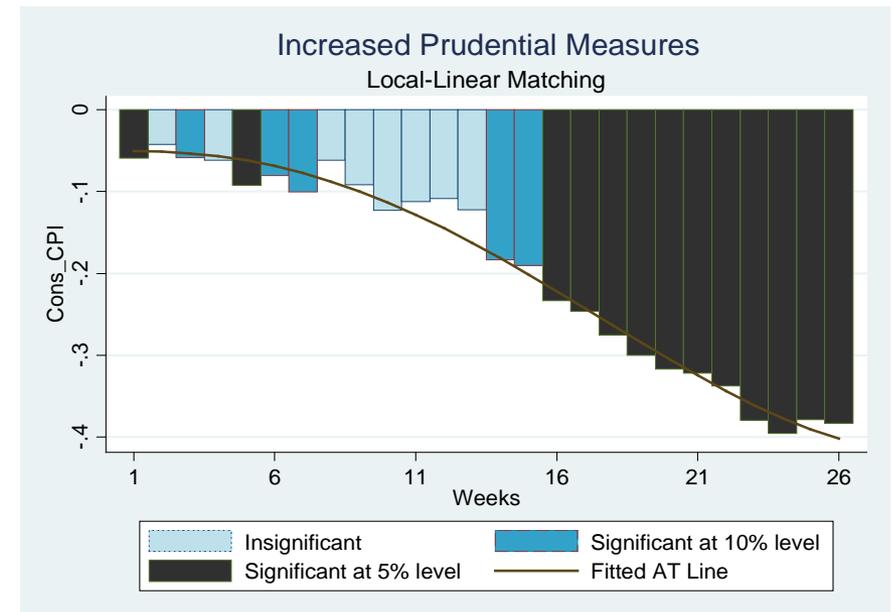


Increased Macprudential Measures Impact on Financial Fragility

% Change in Bank Leverage

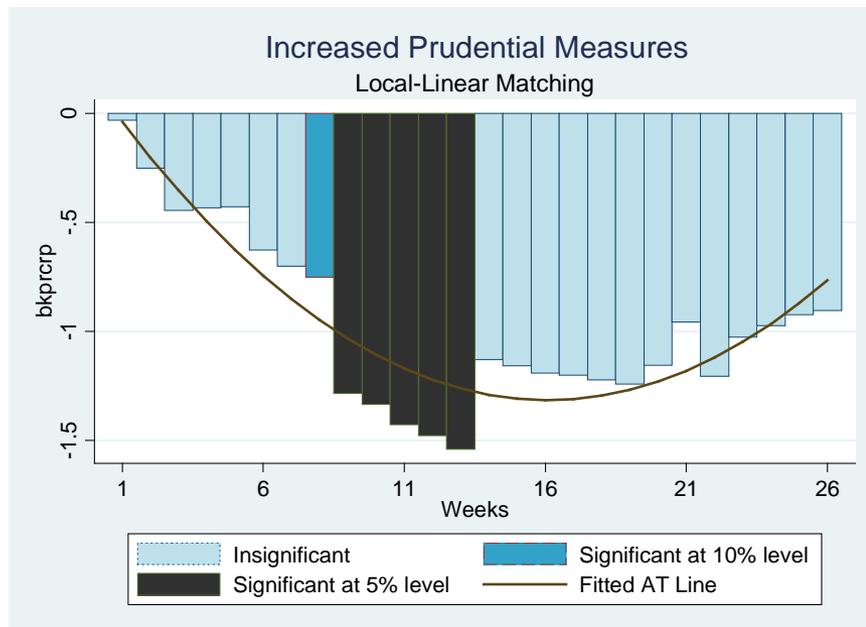


Change in Expected Inflation

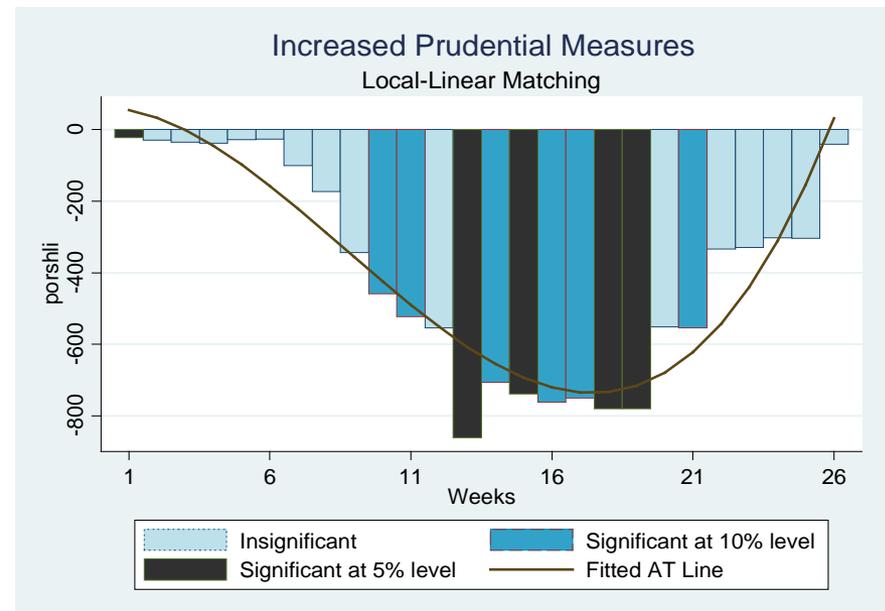


Increased Macprudential Measures Impact on Financial Fragility

% Change in Bank Credit

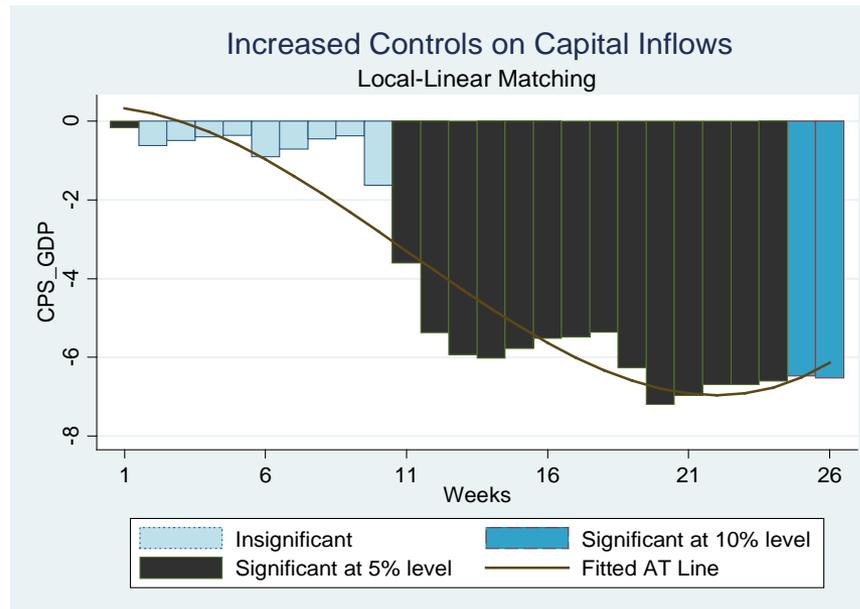


Change in Exposure to Portfolio Liabilities



Increased Capital Inflow Controls Impact on Financial Fragility

% Change in Private Credit



Summary of Key Results

- **Most effects in expected direction, but not significant and robust**
- **Exchange rate (real & nominal) and portfolio flows**
 - Reduced controls on outflows → real ER depreciation (2.5% max)
 - Increasing controls on inflows and prudential measures do not have significant effects
 - (Controls on inflows reduce equity inflows, but not ER or net flows)
- **Other macroeconomic variables** (i differentials, equities, inflation)
 - No consistently significant effect of any CFMs
- **Financial market volatility** (ER, portfolio flows, interest rates)
 - No consistently significant effect of any CFMs
- **Financial vulnerabilities: many significant effects**
 - Increased prudential measures reduces bank leverage, inflation expectations, bank credit growth, exposure to portfolio liabilities
 - Increased controls on inflows reduces private credit growth (maybe bank leverage)

Extensions

- **Focus on “major” CFMs**
 - Only 39 of 135 events
 - Controls on inflows and outflows reduce net inflows, but increase flow volatility
 - Only significant effects on ER from removing controls on outflows
- **Differentiate capital control based on whether target equity or debt flows**
 - Equity flows significantly affected by capital controls, but no effect on net flows or exchange rate
- **Differentiate type of prudential regulation based on whether targets banks or forex**
 - Similar results

What are They Good For?

- Empirical literature needs to take endogeneity & selection bias seriously
- CFMs can be “good for” reducing forms of financial vulnerability (especially macropru)
- CFMs are generally NOT “good for” affecting exchange rates, portfolio flows, volatilities & other macro variables
 - Except removing controls on outflows may reduce ER appreciation
- Implications:
 - Why not focus more on changes in controls on outflows than inflows?
 - Justifies shift away from using CFMs to target macro variables (ER, flows) and instead toward reducing financial fragilities (Ostry et al., 2012)