Capital Controls and Misallocation in the Market for Risk: Bank Lending Channel

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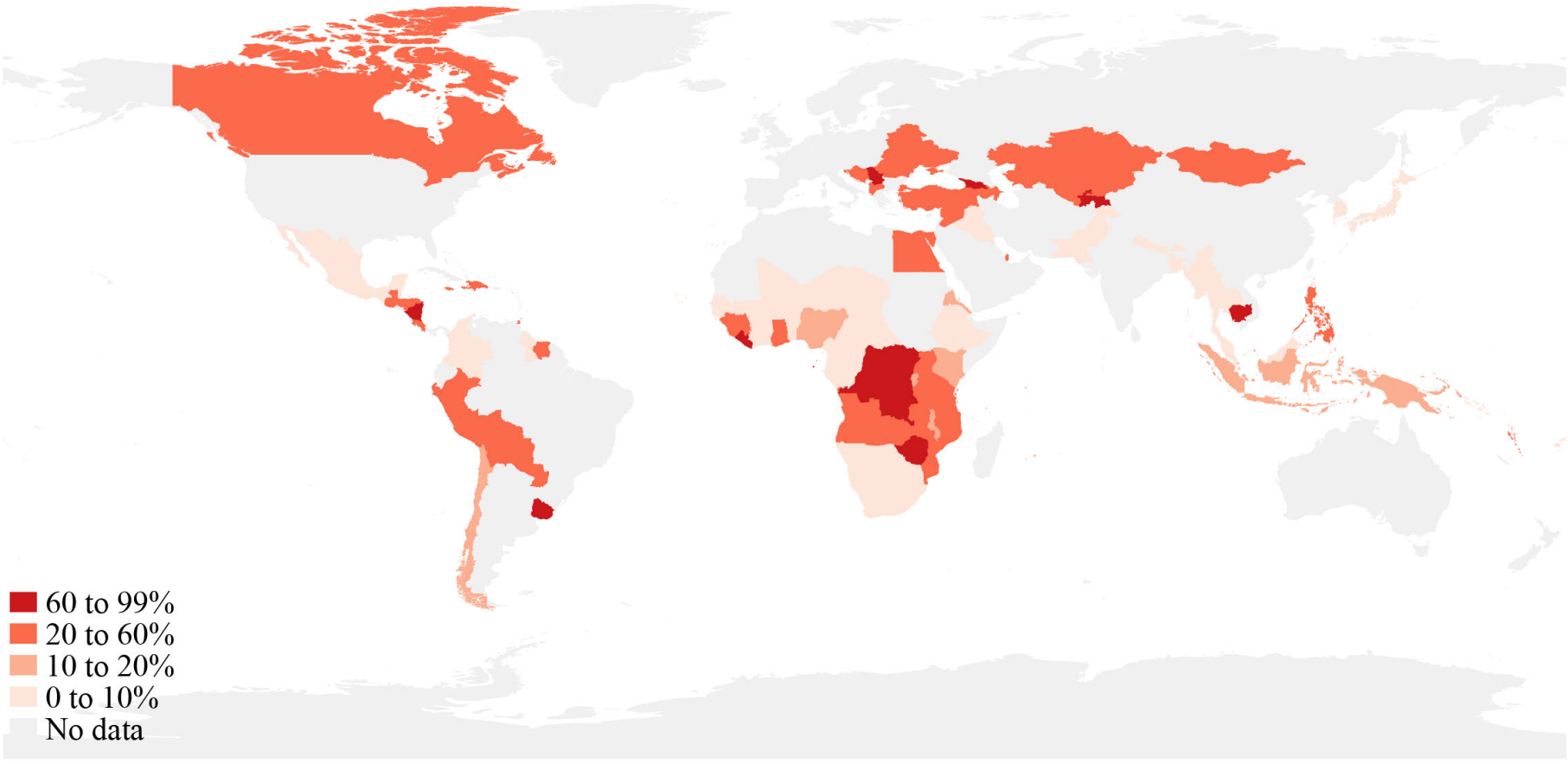
CONTEXT: CAPITAL CONTROLS, SUDDEN STOPS, DOLLARIZATION

- **Consensus:**
  - Post 2008 financial crisis: Capital controls (CC) help prevent crises. (eg. IMF)
- **An important reason**: Prevent sudden stops
  - Severe economic consequences (eg. real income dropped 10-30% after 1998 Asian crisis)
- **Relevance:**
  - Greater risk of happening: Low dollar rates led to trillions of dollar inflows to emerging markets (EM)
  - Countries have increased sensitivity to sudden stops
    - Non-US banks hold \$10tr. liabilities ($\approx$ 55% US GDP, $\approx$ US banks holdings)
    - 30% depreciation ($\sim$ to Taper Tantrum): Loss of \$ 300bn. Who bears this risk?
    - EM particularly affected: Households in EM save partially in dollars

RESEARCH HAS IGNORED EFFECT OF CC ON DOLLAR DEBT



Constructed using data from Table A.1 from Mecagni et al.(IMF, 2015)

Figure: **% of Dollar Deposits in the Local Banking System (2007 - 2011)**

- **However, research has ignored the effect of CC on currency denomination of debt.**

THIS PAPER: NOVEL SIDE EFFECT OF CAPITAL CONTROLS

This Paper: Can CC reduce dollar liabilities and FX risk? Effects on risk distribution and employment?

	Contribution	Details
1	**Novel side effect of CC**	**CC make firms dollar liabilities worse (↑ FX risk) and increases bank's credit risk**
2	**New model to highlight a new mechanism**	w/o CC banks hedge FX risk w/ foreigners. w/ CC banks hedge by lending dollars to firms
3	**Natural experiment that shows new channel at work (Peru)**	Intensity of CC varied across banks. Carry trade inflows: using fwds (cpty: banks). CC limits on banks fwds. Some banks were above limit vs others below. DiD: lending in dollars/ soles of above vs below limit
4	**New confidential data on Peruvian banks' forwards and lending activities**	Trade level data on prop. trading of fwd and universe of bank-firm loans (if firm's total debt $>$ \$100,000) **Banks substitute 10-20% of lending in soles for dollars**
5	**Use monthly firm level data on employment to quantify the impact of the mechanism on employment**	**Importance: CC decreases employment by 6-11%**

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

Importance: CC worsen sensitivity to sudden stops. Eg. Post TT depreciation: Peru: 6-11% unemployment

OUTLINE

1. Effect of Capital Controls on Firms' Dollar Liabilities
   - Context
   - Mechanism & Theoretical Predictions
   - Empirical Strategy
   - Results at Bank Level and Validity
2. Total effect on currency composition of firm borrowing
3. Effect on Employment
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CONTEXT

- Inflows post 2011 financial crisis - Foreign investors:
  - Invested in EM assets to earn the interest rate differential with the low dollar rates
  - Wanted an asset in local currency and liability in dollars
  - Used FX forward contracts: bought local currency and sold dollars

- EM countries set limits to fwd positions of banks (CC) (eg. Colombia, Peru, Korea):
  1. Large share of dollar deposits
  2. Local firms have revenues in domestic currency

- However, banks only have indirect exposure to FX risk:
  3. Regulation forces banks to hedge FX risk (Canta et al. (2006) shows 40 EM that have this)

- Who gets FX risk if banks cannot hedge with forwards?
  - Possible Candidate: Firms/HH - Banks use short term deposits to lend long term (eg. firm loans, mortgages) (Begenau et al., 2015)

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

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Assumptions

- There are 3 assumptions for the theoretical argument:
  1. Households save partially in dollars
  2. Firms want to borrow in local currency
  3. Banks hedge exchange rate risk
- These hold broadly in emerging markets

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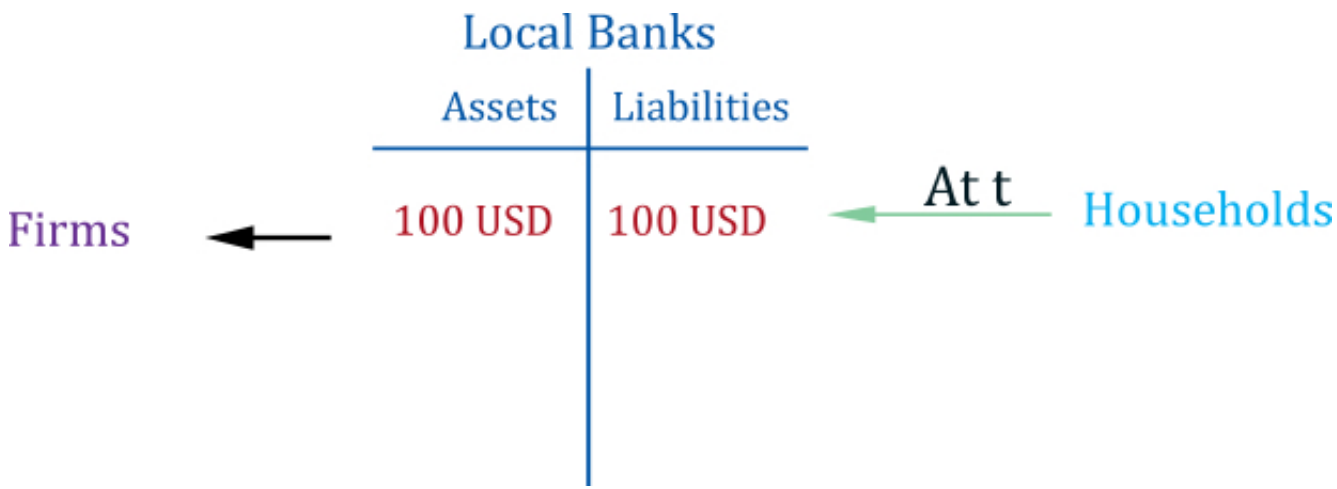
MECHANISM

1. **Lend in dollars (eg. closed economy)**
   - If the economy is closed: there are only households (HH), firms and local banks
   - If HH save 100 dollars and banks do not take FX risk: Banks lend 100 dollars to firms



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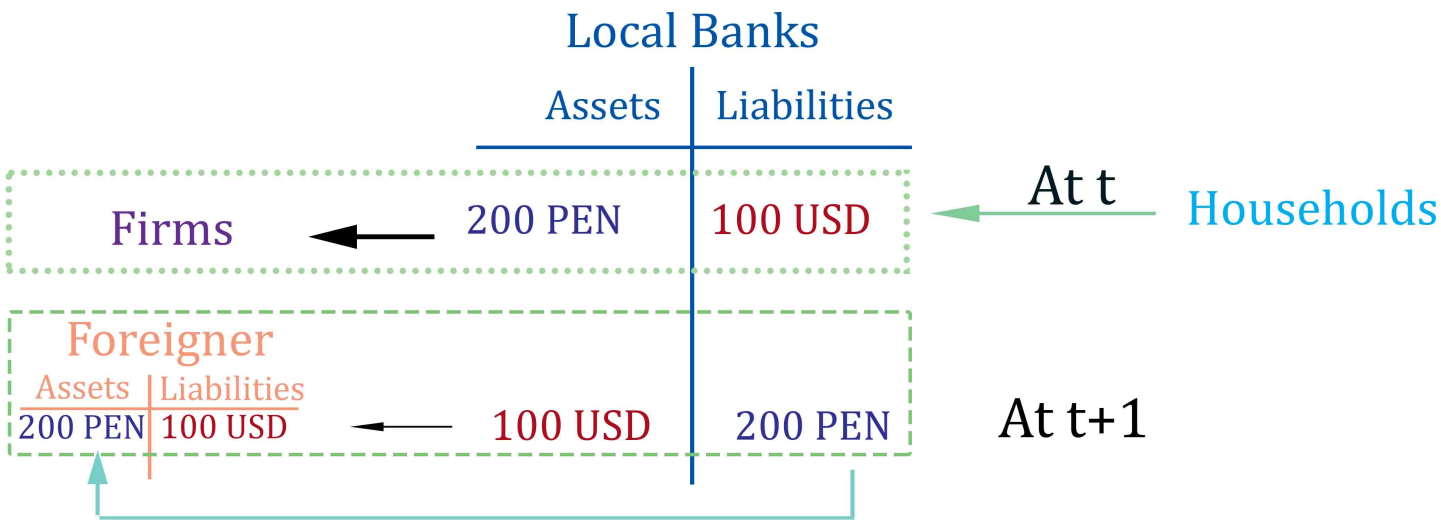
Mechanism

❷ Lend in soles (open economy)

- Open economy offers a 2nd alternative to get 100 USD assets
- Inflows: Foreigners use fwd contracts to get (buy) PEN assets and USD liabilities (sell USD)
- As forward liquidates at t + 1, banks have 100 USD deposits at t to lend
- Banks are hedged in USD, so deposits are lent in PEN to firms



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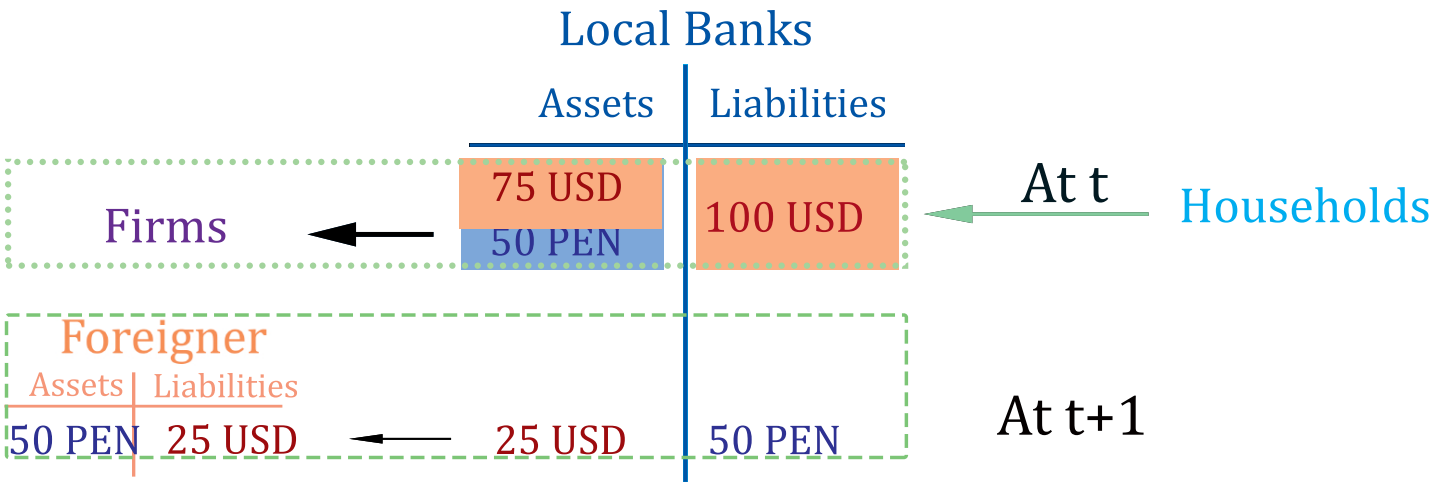
MECHANISM

❸ Introduction of capital controls (Peru: partially open economy)

- Consider CC limit forwards to 25 USD
- To hedge remaining 75 USD: banks lend 75 USD to firms
- Banks lend the 25 USD hedged with forwards in PEN
- Comparing CC to without CC: With CC banks lend more in USD and less in PEN



- **Theoretical predictions:** Banks lend (1) More in dollars (2) Less in local currency

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Ideal Experiment and Second Best Alternative

- **Ideally**, to estimate the impact that CC had on credit supply of countries that set CC:
  - Randomly assign CC across countries. However, not feasible.
- **Second best:** Randomly assign CC across banks *within* one country
  - Problem: firms can substitute loans from treated to non-treated banks. (Substitution Effect)
  - Estimation in two steps as results at the bank-firm level $\neq$ at firm level
    1. DiD across banks: How a treated bank changed lending w.r.t. non-treated
    2. At the firm level: If firms substitute, total effect is DiD 1st best + Substitution Effect
  - If subs. effect unwinds part of "DiD 1st best": Lower bound to effect of CC on firm outcomes
- **Peru's setting:** similar to second best - CC treatment intensity varied across banks

Contribution: CC induce banks to hedge FX by lending USD to firms, $\uparrow$ firms' FX risk and banks' credit risk

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Using Capital Controls in Peru as Natural Experiment

- CC treatment intensity varied across banks as fwd limits were a function of each bank's equity:

$$\text{Fwd Limit}_b = Max(40\% \times \text{Equity}_b, 400 \text{ million PEN})$$

- These were announced on Jan 24th 2011.
- However, came effective in April 2011.
- Therefore, the banks that were surpassing their limit, had until April to adjust their forward holdings.

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Split Banks into Above/Below Fwd Threshold

- **Main Treatment Variable:**
  - Banks treated as a function of their pre-existing fwd positions relative to the limit
    - Use the last reporting date (Jan 22nd) before announcement (Jan 24th) :

$$\frac{\text{Fwd Holdings}_{b,22Jan2011}}{\text{Fwd Limit}_b}, \text{ where: } CC_{b,22Jan11} = \begin{cases} 1, & \geq 100\% \\ 0, & < 100\% \end{cases}$$

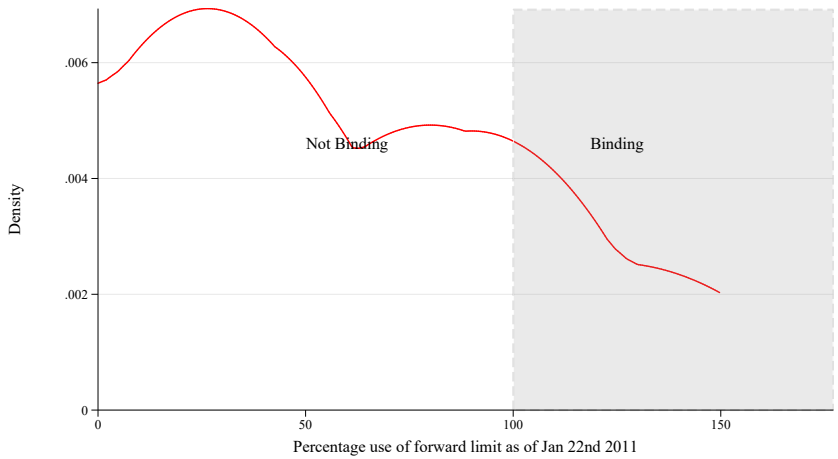

Figure: **Distribution of % of Fwd Limit Used on Jan 22nd 2011**

- **Main Outcome Variable:** % of firm borrowing that is in dollars (of firm f from bank b at time t)

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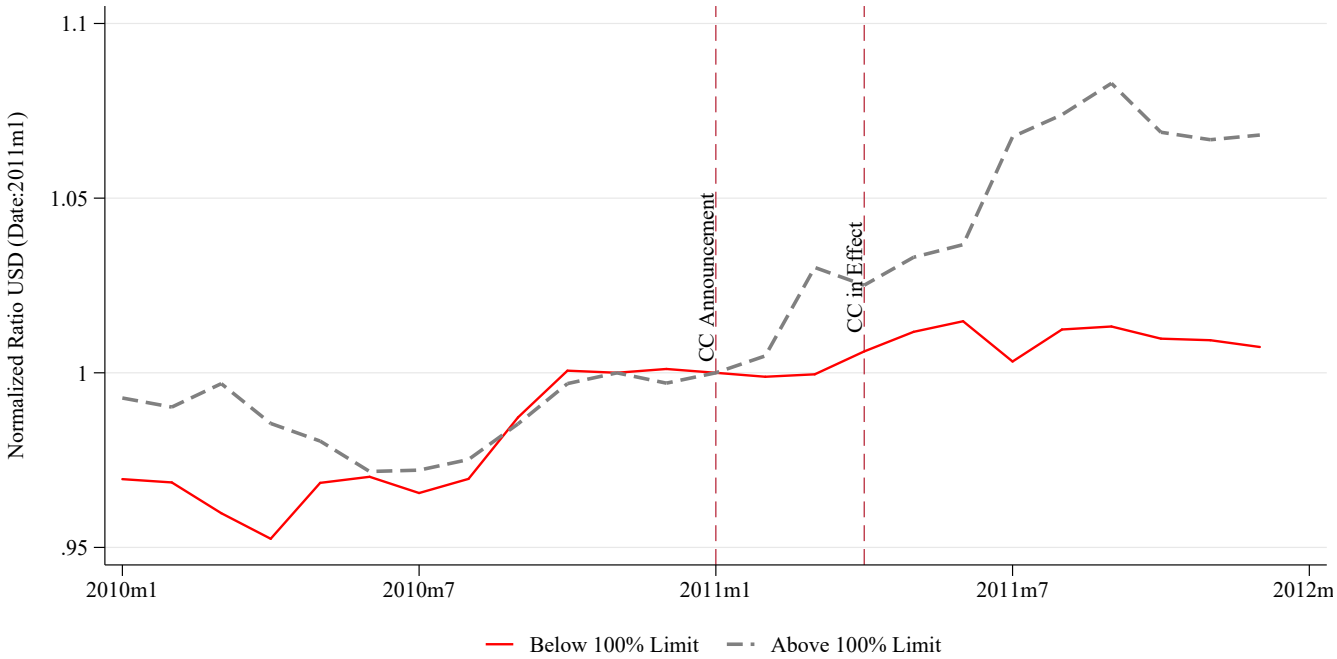
BANKS AFFECTED BY CC INCREASE THE % OF LENDING IN USD

Figure: **Percentage of local bank's lending in dollars for Treated and Non-Treated Banks**



- However, this plot does not disintangle credit supply from credit demand

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USE DID TO ISOLATE BANK LENDING CHANNEL

- DiD: Compare lending between banks that were exposed to the CC vs those that were not.

$$\left(\frac{\text{Loans in USD}}{\text{Total Loans}}\right)_{b,f,t} = \beta_0 + \beta_1 CC_b + \beta_2 \text{Post CC}_t + \beta_3 CC_b * \text{Post CC}_t + \text{Firm} * \text{Date FE}$$

$$+ \Gamma X_b + \Psi X_{b,f} + \upsilon_{b,f,t}$$

Firm* Date FE control for demand at each point in time

X_b and $X_{b,f}$ = bank and bank-firm relationship controls

- β_3: Additional share of USD lending by treated relative to non-treated banks in the year after CC vs. year before CC
- **2 Caveats:**
  - Validity after presenting results
  - For 2nd part: Interested in employment 2 years later - Long lasting effects?

$$\text{USD Ratio}_{bft} = \beta_0 + \beta_1 CC + \sum_{q=-11}^{q=-1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} + \sum_{q=12}^{q=1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} +$$

$$\Gamma X + Firm * DateFE + \upsilon_{bft}$$

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Data Obtained to Estimate Regressions

$$\frac{\text{USD Loans}}{\text{Total loans}}_{b,f,t} = \beta_0 + \beta_1 CC_b + \beta_2 \text{Post CC}_t + \beta_3 CC_b * \text{Post CC}_t + \text{Firm} * \text{Date FE}$$
$$+ \Gamma X_b + \Psi X_{b,f} + \upsilon_{b,f,t}$$

- **Credit Register (SBS):** Monthly balances of all commercial loans in USD and PEN for universe of Peruvian financial system. From Feb 2005-Oct 2015. Records firm size ($\geq$ Medium). Uses firm tax ID.
- **Fwd contracts (SBS):** All outstanding forward contracts. Recorded on a weekly basis. Last date before capital controls announcement: Jan 22nd 2011.
- **Bank controls (SBS):** Banks balance sheets and regulatory reports to SBS.
- **Employment (SUNAT):** Monthly employment data (permanent and outsourced workers) for all Peruvian firms. From Jan 2007-Dec 2015. Uses firm tax ID.
- **Exporter data (SUNAT):** All exports and imports made by Peruvian firms. From Jan 2007-Dec 2015. Uses firm tax ID. For pending analysis

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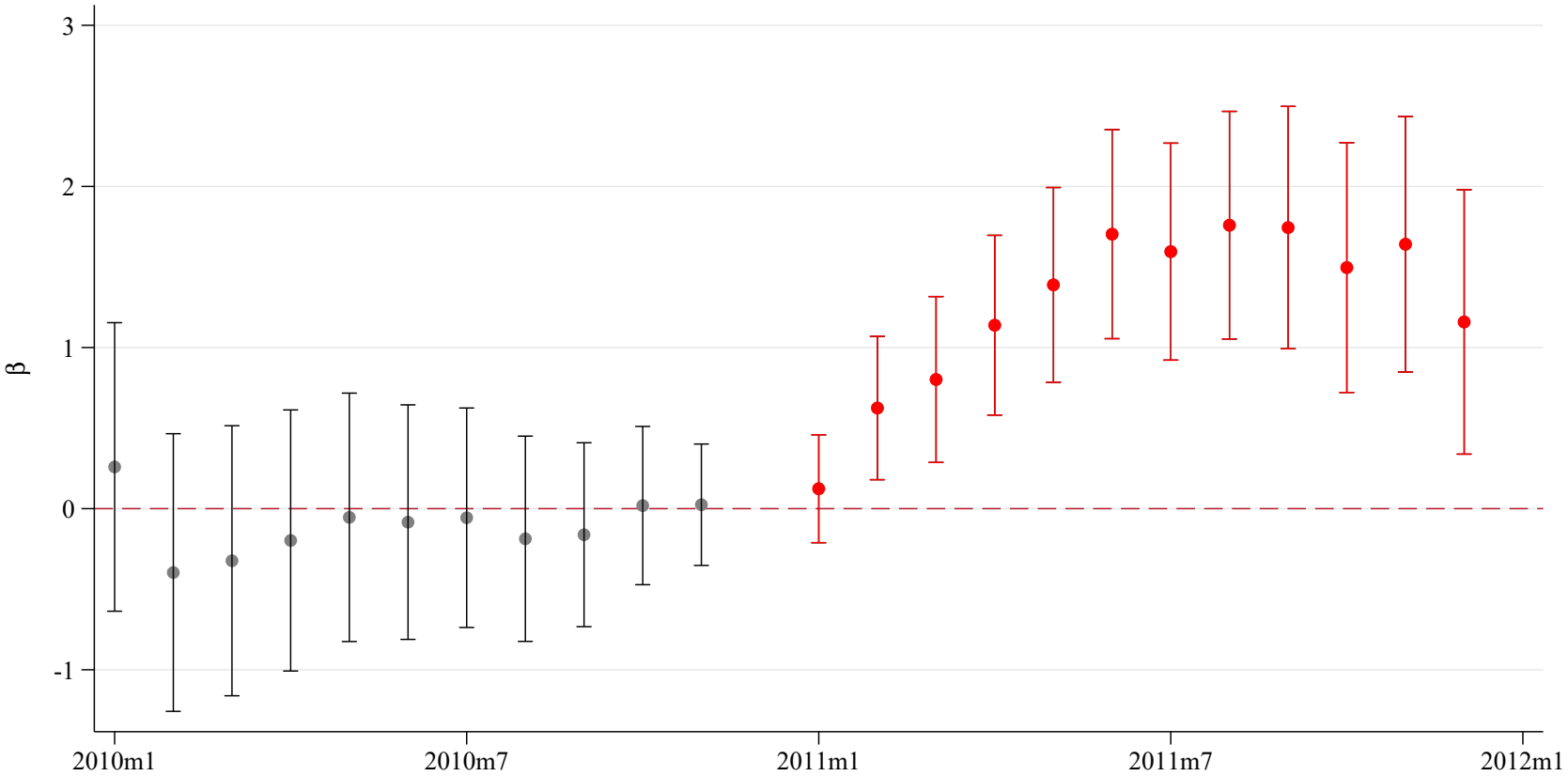
TREATED BANKS INCREASE % USD LENDING BY 100-150B.P.

$$\frac{\text{USD Loans}}{\text{Total Loans}}_{b,f,t} = \beta_0 + \beta_1 CC + \sum_{q=-11}^{q=-1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} + \sum_{q=12}^{q=1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} +$$

$$\Gamma X + Firm * DateFE + \upsilon_{bft}$$



A. Ratio USD (bp, FX:2005m2)

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

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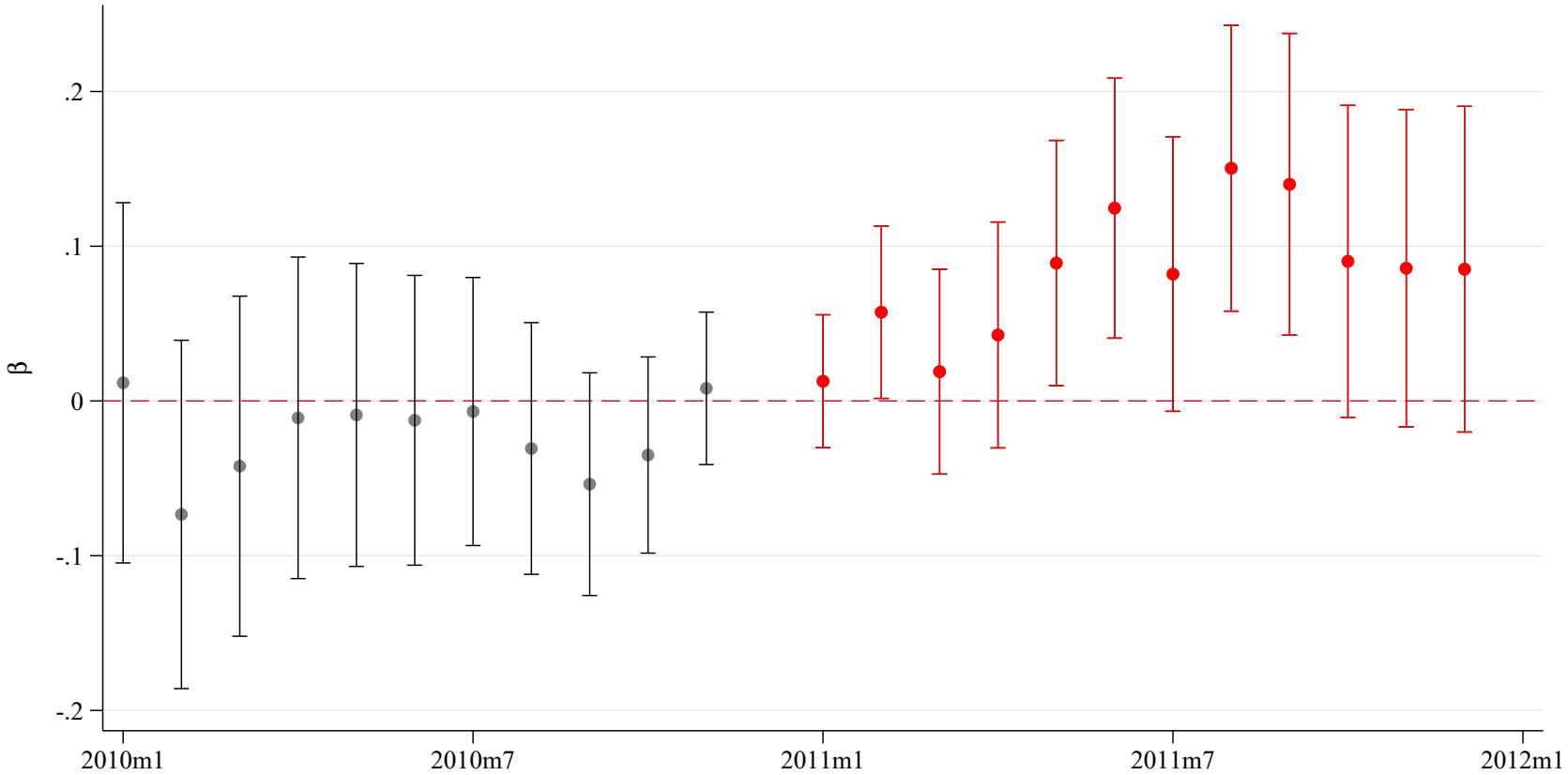
TREATED BANKS INCREASE USD LENDING BY 10-15%

$$\log(\text{USD Loans}+1)_{bft} = \beta_0 + \beta_1 CC_b + \sum_{q=-11}^{q=-1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} + \sum_{q=12}^{q=1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} + \Gamma X + Firm * DateFE + \upsilon_{bft}$$



B. Log(USD Credit + 1) (FX:2005m2)

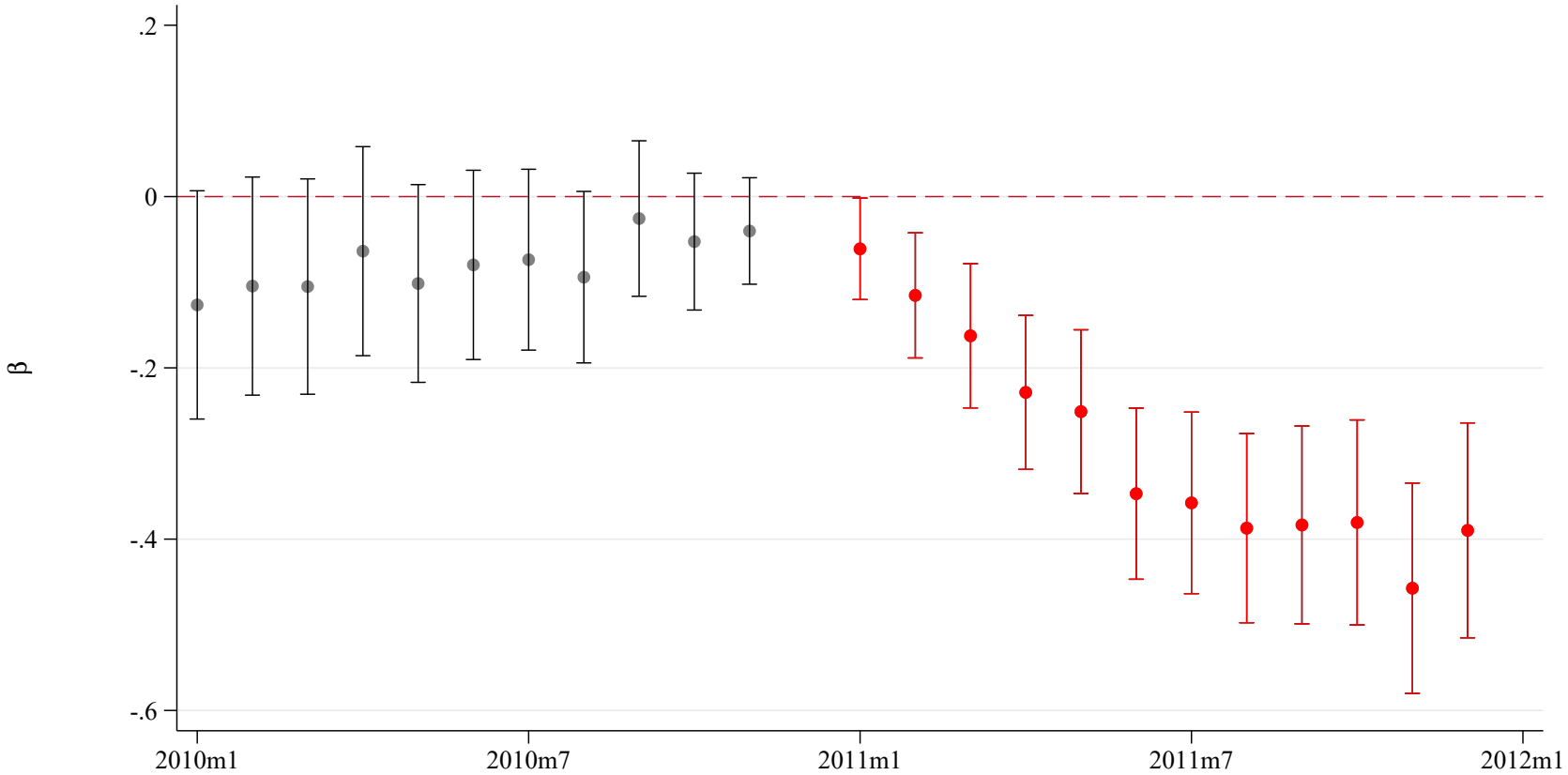
Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

Importance: CC worsen sensitivity to sudden stops. Eg. Post TT depreciation: Peru: 6-11% unemployment

TREATED BANKS DECREASE PEN LENDING BY 20-40%

$$\log(\text{PEN Loans+1})_{bft} = \beta_0 + \beta_1 CC + \sum_{q=-11}^{q=-1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} + \sum_{q=12}^{q=1} \beta_i CC * Post_{t=2011m1+q \text{ mo}} +$$

$$\Gamma X + Firm * DateFE + \upsilon_{bft}$$



C. Log(PEN Credit + 1)

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

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Robustness Checks

1. Anticipation of the regulation
   - If banks anticipate CC: Would ↓ fwd holdings before CC. This was not the case
2. Endogeneity of CC
   - CC were a reaction to inflows: Results are valid if this unobservable affected all banks
3. Endogenous matching between banks and firms
   - Corrected using firm-date FE as 70% of firms have multiple bank relationships
4. Control group is a valid counterfactual
   - Treated and Non-Treated banks have similar balance sheet characteristics
   - Previous plots show that the parallel trend assumption holds
     - To invalidate results: Need explanation for different bank lending *exactly at* CC
   - Fwd holdings are greatly explained by counterparty stickiness: 70% chance a counterparty trades fwds with the same bank as in the previous trade

▸ More Evidence

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

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BANK LENDING CHANNEL DOES NOT CONSIDER FIRM SUBSTITUTION ACROSS BANKS

- The previous section shows that treated banks substituted credit in soles for dollars
- As firms can substitute loans across banks, these results are only at the bank level.
- To study the total exposure to the FX at the firm level, I aggregate credit at the firm-month level.
- Compare firms based on % of each firm's debt that relies on a treated bank at CC announcement.
- I use 2 measures of firm exposure: (1)% credit that a firm has with treated banks, (2) Above/Below median exposure

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

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Firms do not use treated banks' USD lending to repay USD loans from non-treated banks

$$\frac{\text{USD Loans}}{\text{Total Loans}}_{f,t} = \alpha_0 + \alpha_1 \text{Exposed firm}_f + \alpha_2 \text{Exposed firm}_f \times \text{Post CC} +$$
$$+ \text{Firm Size} \times \text{Industry FE} \times \text{Date FE} + \upsilon_{f,t}$$

Table: Effect of Capital Controls on total Firm Borrowing

	Above / Below Median Exposure			Continuous Exposure		
	(1) $\frac{\text{USD Credit}}{\text{Total Credit}}$	(2) Log(USD+1)	(3) Log(PEN+1)	(4) $\frac{\text{USD Credit}}{\text{Total Credit}}$	(5) Log(USD+1)	(6) Log(PEN+1)
Post CC * Exposure	1.194*	17.56**	2.138	2.089**	29.60**	-2.183
	(2.02)	(2.53)	(0.25)	(2.33)	(2.72)	(-0.17)
Exposure	9.077***	-18.37**	-253.0***	15.81***	-83.68***	-526.5***
	(13.29)	(-2.43)	(-25.32)	(14.27)	(-6.57)	(-32.70)
Industry * Firm Size * Date FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	152401	152401	152401	152401	152401	152401
Adjusted R2	0.133	0.141	0.143	0.140	0.143	0.198
N Date Cluster	24	24	24	24	24	24
N Firm Cluster	10859	10859	10859	10859	10859	10859

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WHAT HAPPENS TO EMPLOYMENT AFTER A SUDDEN STOP?

- So far, firms 'overexposed' to USD in terms of liabilities
- What happens to the firm after a sudden stop?
  - Sudden stop: 30% soles depreciation following Fed's 'taper tantrum' in May 2013
- Need a measure of 'excess' firm borrowing in USD as a result of CC
- Forward limits had a long term effect (as we saw in event study) so split firms based on their exposure to treated banks as of the introduction of CC:
  - Treated Firm: $F_{f,22Jan11} = \begin{cases} 1, & \text{Borrowing} = 100\% \text{ from Treated Bank on Jan 2011} \\ 0, & \text{Borrowing} < 100\% \end{cases}$

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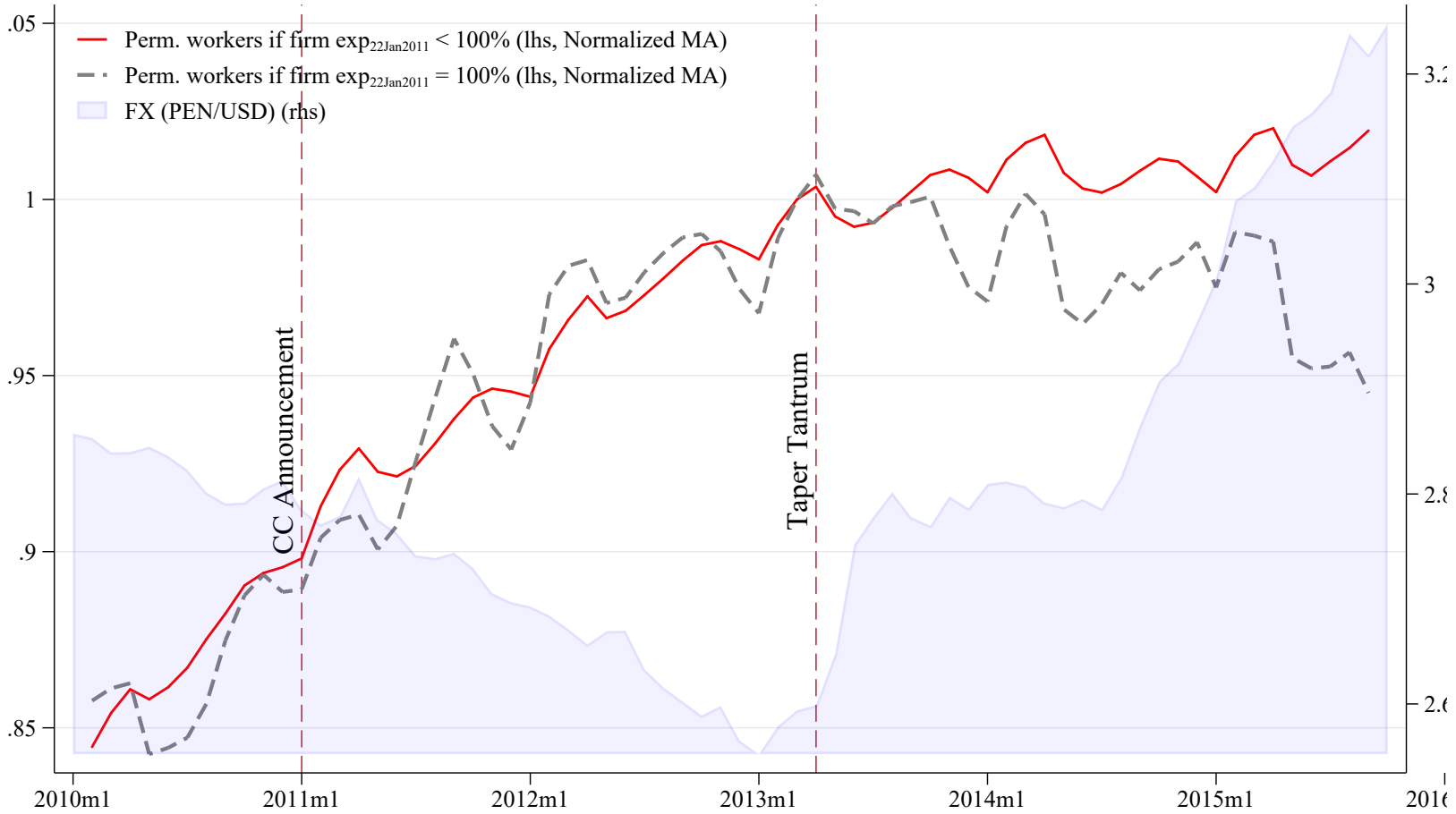
TREATED FIRMS REDUCE EMPLOYMENT AFTER SUDDEN STOP

Figure: **Currency depreciation and employment of firms affected and non-affected by CC**



- However, plot does not account for industry shocks

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USE DID TO ISOLATE EFFECT OF CC ON EMPLOYMENT

- Estimate DiD in firm employment

$$\log(\text{Emp.})_{f,t} = \theta_0 + \theta_1 \text{Firm Exposure}_f + \theta_2 \text{Firm Exposure}_f \times \text{Post TT}_t + \Gamma X_f^{bank} + \text{Industry * Firm Size * Date FE} + \zeta_{f,t}$$

- where:
  - Outcome variable is either: (1) Total workers (2) Workers with Permanent Contract (3) Outsourced Workers
  - Firm treatment dummy, Firm Exposure_f, takes value 1 if:
    - $F_{f,22Jan11} = 1$ when the firm was borrowing only from affected bank on Jan 2011
  - Post TT_t is a dummy that takes 1 after May 2013 (after Taper Tantrum)
  - Firm-level controls X_f^{bank} include (weighted) averages of bank-level measures of liquidity; deposits to assets; return to assets; bank size; also interaction between firm size and industry

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CC DECREASE TOTAL EMPLOYMENT BY 7% AFTER A SUDDEN STOP

$$\log(\text{Total Emp.})_{f,t} = \theta_0 + \theta_1 \text{Firm Exposure}_f + \theta_2 \text{Firm Exposure}_f \times \text{Post TT}_t + \Gamma X_f^{bank} + \text{Industry * Firm Size * Date FE} + \zeta_{f,t}$$

	Log(Total Workers)× 100			
Firm Exp * Post TT	-6.613***	-6.596***	-7.559*	-7.562*
	(-4.39)	(-4.40)	(-1.88)	(-1.87)
Firm Exp	-33.85*	-54.17**	-26.43**	-41.09***
	(-1.77)	(-2.62)	(-2.03)	(-2.94)
Post TT	15.27***	15.25***	0	0
	(9.54)	(9.49)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Firm Size * Industry * Date FE	No	No	Yes	Yes
N Firm Cluster	2797	2797	2694	2694
N Date Cluster	93	93	93	93

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Effect of CC on permanently employed workers is worse

$$\log(\text{Perm. Emp.})_{f,t} = \theta_0 + \theta_1 \text{Firm Exposure}_f + \theta_2 \text{Firm Exposure}_f \times \text{Post TT}_t + \Gamma X_f^{bank} + \text{Industry * Firm Size * Date FE} + \zeta_{f,t}$$

	Log(Permanent Workers)×100			
Firm Exp * Post TT	-11.00***	-10.99***	-11.36**	-11.35**
	(-4.66)	(-4.71)	(-2.29)	(-2.29)
Firm Exp	-31.62	-53.55**	-23.25*	-37.32**
	(-1.57)	(-2.43)	(-1.67)	(-2.49)
Post TT	25.68***	25.68***	0	0
	(11.61)	(11.57)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Firm Size * Industry * Date FE	No	No	Yes	Yes
N Firm Cluster	2797	2797	2694	2694
N Date Cluster	105	105	105	105

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Importance: CC worsen sensitivity to sudden stops. Eg. Post TT depreciation: Peru: 6-11% unemployment

TREATED FIRMS SUBSTITUTE PERMANENT FOR TEMPORARY WORKERS

$$\log(\text{Outsourced Emp.})_{f,t} = \theta_0 + \theta_1 \text{Firm Exposure}_f + \theta_2 \text{Firm Exposure}_f \times \text{Post TT}_t + \Gamma X_f^{bank} + \text{Industry * Firm Size * Date FE} + \zeta_{f,t}$$

	Log(Outsourced Workers)× 100			
Firm Exp * Post TT	5.767	5.802	8.380	8.543
	(0.82)	(0.82)	(1.20)	(1.22)
Firm Exp	-21.63	-28.54	-31.68***	-42.40***
	(-1.28)	(-1.61)	(-2.80)	(-3.38)
Post TT	-8.812***	-8.838***	0	0
	(-3.80)	(-3.81)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Firm Size * Industry * Date FE	No	No	Yes	Yes
N Firm Cluster	2778	2778	2674	2674
N Date Cluster	93	93	93	93

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

Importance: CC worsen sensitivity to sudden stops. Eg. Post TT depreciation: Peru: 6-11% unemployment

Outline

Contribution: CC induce banks to hedge FX by lending USD to firms, ↑ firms' FX risk and banks' credit risk

Importance: CC worsen sensitivity to sudden stops. Eg. Post TT depreciation: Peru: 6-11% unemployment

CONCLUSIONS

1. This paper shows a **new side effect of CC**
2. CC induce local banks to **substitute lending in local currency for lending in dollars**
3. This happens because **banks to shift FX risk away from foreign investors** and transfer it to firms
4. Using **novel and confidential data** I test these predictions
5. I take advantage of a **natural experiment** in Peru and find that CC:
   - $\uparrow$ **firms' FX exposure**
   - $\downarrow$ **employment by 6-10%** after a sudden stop

APPENDIX

RESULTS

$$\left(\frac{\text{Credit in dollars}}{\text{Total credit}}\right)_{b,f,t} = \beta_0 + \beta_1 CC_b + \beta_2 \text{Post CC}_t + \beta_3 CC_b * \text{Post CC}_t + \text{Firm} * \text{Date FE} + \Gamma X_b + \Psi X_{b,f} + \upsilon_{b,f,t}$$

Table: Effect of Capital Controls on Percentage of Credit in Dollars:

	$\frac{\text{USD Credit}}{\text{Total Credit}} \times 100$ [FX:2005m2]			
CC * Post CC	0.573	1.036***	1.488***	1.374***
	(1.56)	(3.14)	(3.92)	(3.83)
CC	8.373***	9.931***	6.002***	8.045***
	(18.15)	(11.43)	(13.38)	(11.80)
Post CC	-2.201***	0.206	0	0
	(-9.50)	(1.07)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Relationship Controls	No	Yes	No	Yes
Date * Firm FE	No	No	Yes	Yes
N Firm Cluster	19296	12414	12866	7314

RESULTS

$$\text{Log(USD Credit + 1)}_{b,f,t} = \beta_0 + \beta_1 CC_b + \beta_2 \text{Post CC}_t + \beta_3 CC_b * \text{Post CC}_t + \text{Firm} * \text{Date FE} + \Gamma X_b + \Psi X_{b,f} + \upsilon_{b,f,t}$$

Table: Effect of Capital Controls on USD Credit Supply:

	Log(USD Credit + 1)×100 [FX:2005m2]			
CC * Post CC	8.977*	8.642**	23.24***	9.694**
	(1.87)	(1.99)	(4.65)	(2.07)
CC	26.71***	21.50**	-24.99***	35.01***
	(4.48)	(2.00)	(-4.30)	(3.96)
Post CC	-24.54***	19.70***	0	0
	(-7.97)	(7.75)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Relationship Controls	No	Yes	No	Yes
Date * Firm FE	No	No	Yes	Yes
N Firm Cluster	19296	12414	12866	7314

RESULTS

$$\text{Log(PEN Credit + 1)}_{b,f,t} = \beta_0 + \beta_1 CC_b + \beta_2 \text{Post CC}_t + \beta_3 CC_b * \text{Post CC}_t + \text{Firm} * \text{Date FE} + \Gamma X_b + \Psi X_{b,f} + \upsilon_{b,f,t}$$

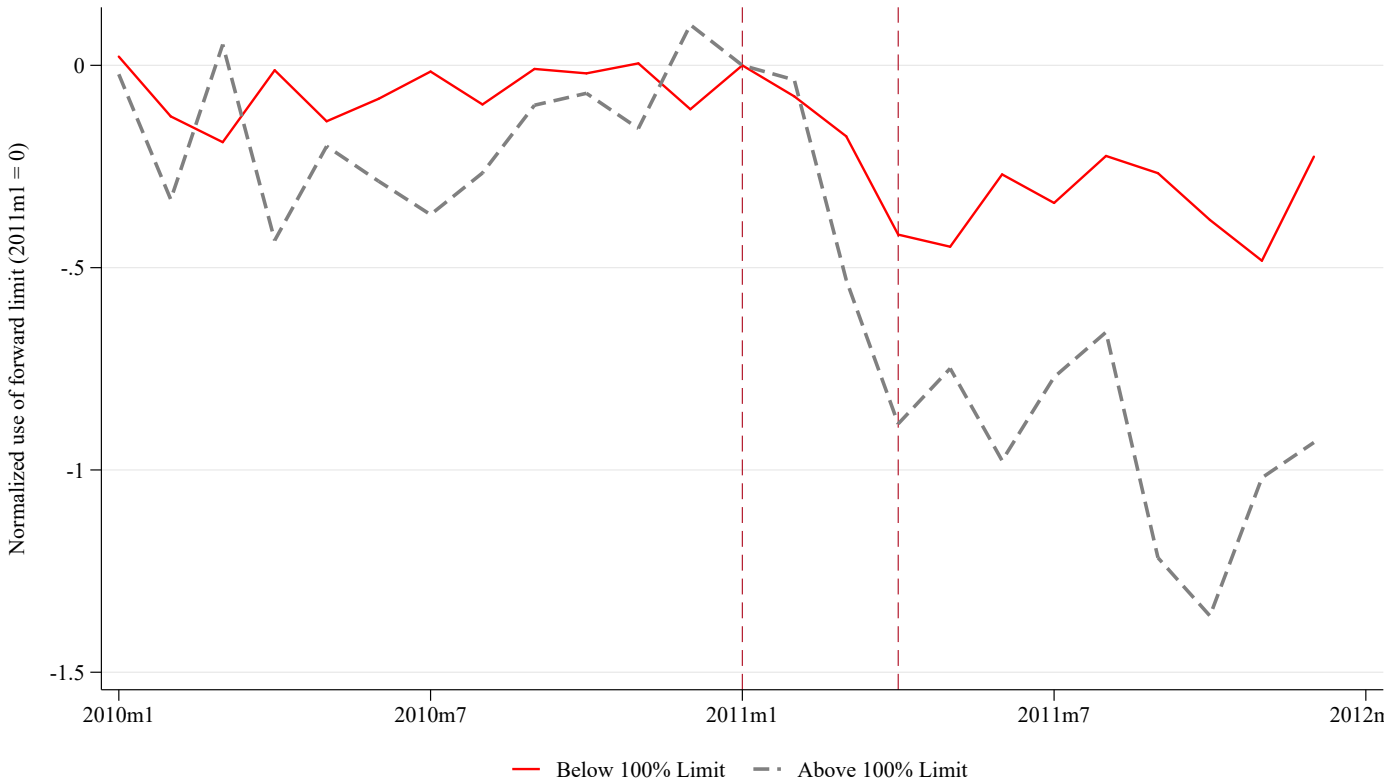
Table: Effect of Capital Controls on PEN Credit Supply:

	Log(PEN Credit + 1)×100			
CC * Post CC	-6.301	-16.40***	-12.07**	-22.03***
	(-1.32)	(-3.48)	(-2.36)	(-4.23)
CC	-212.8***	-235.1***	-218.0***	-202.9***
	(-34.13)	(-16.70)	(-34.21)	(-17.28)
Post CC	24.75***	19.03***	0	0
	(8.75)	(7.16)	(.)	(.)
Bank Controls	No	Yes	No	Yes
Relationship Controls	No	Yes	No	Yes
Date * Firm FE	No	No	Yes	Yes
N Firm Cluster	19296	12414	12866	7314

VALIDITY CONCERNS

1 Anticipation of the regulation

- Strategic behavior of banks if they expect CC: reduce fwd holdings
- Else could be subject to a fire sale
- However, banks were increasing their fwd holdings during the weeks before CC



VALIDITY CONCERNS

1. Anticipation of the regulation

2. Correlation between inflows and market conditions

   - Capital controls were a reaction to carry trade flows (therefore not exogenous)
   - Previous results could be caused by the economic conditions to which the government was reacting to and not CC.
   - As long as these market conditions affect all banks in the same way, $\widehat{\beta_3}$ will be unbiased.
   - To mitigate this concern, the pre/post CC regression is over a narrow window (January 2010 - December 2011).
   - I also have robustness checks over the adjustment period.

VALIDITY CONCERNS

1. Anticipation of the regulation

2. Correlation between inflows and market conditions

3. Correlation between bank and firm matching
   - Firm $\times$ Date (Month-Year) FE
     - Possible because 70% of firms have multiple bank relationships
   - Bank-firm relationship controls

VALIDITY CONCERNS

1. Anticipation of the regulation
2. Correlation between inflows and market conditions
3. Correlation between bank and firm matching
4. Control group is a valid counterfactual
    - Treated and Non-Treated banks have similar balance sheet characteristics

VALIDITY CONCERNS

❹ Control group is a valid counterfactual

	Control Group		Treated Banks	
	Mean	N	Mean	N
FX Forwards				
% Fwd Limit (All Banks)$_{22Jan2011}$	26.37	10.00	123.55	3.00
Credit				
Ch PEN Credit (%)	15.61	10.00	-8.00	3.00
Ch. USD Credit (%, FX: 2005m2)	10.04	8.00	14.66	3.00
Ch. Total Credit (%, FX: 2005m2)	16.99	10.00	9.30	3.00
Ch. USD Ratio (%)	0.35	8.00	4.08	3.00
Bank Controls				
ROA$_{2010m12}$ (%)	0.02	10.00	0.01	3.00
Total Assets$_{2010m12}$ (Billion PEN)	12.82	10.00	16.76	3.00
Liq. Ratio PEN$_{2010m12}$ (%)	40.27	10.00	48.46	3.00
Liq. Ratio USD$_{2010m12}$ (%)	44.45	10.00	46.93	3.00
PEN dep./Assets$_{2010m12}$ (%)	39.79	10.00	30.78	3.00
USD dep./Assets$_{2010m12}$ (%)	23.70	10.00	35.82	3.00

◂ Back to Parallel Trends

VALIDITY CONCERNS

1. Correlation between inflows and market conditions

2. Correlation between bank and firm matching

3. Anticipation of the regulation

4. Control group is a valid counterfactual
   - Treated and Non-Treated banks have similar balance sheet characteristics
   - Previous plots show that the parallel trend assumption holds
     - To invalidate results: need explanation for treated and non-treated banks to start diverging credit supply trends *exactly at* the imposition of CC
   - I study why banks could have different forward holdings
     - Found that is greatly explained by counterparty stickiness
     - 70% probability that a counterparty trades fwds with the same bank as in the previous trade

▸ More Evidence

WHY FORWARD HOLDINGS WERE DIFFERENT TO BEGIN WITH?

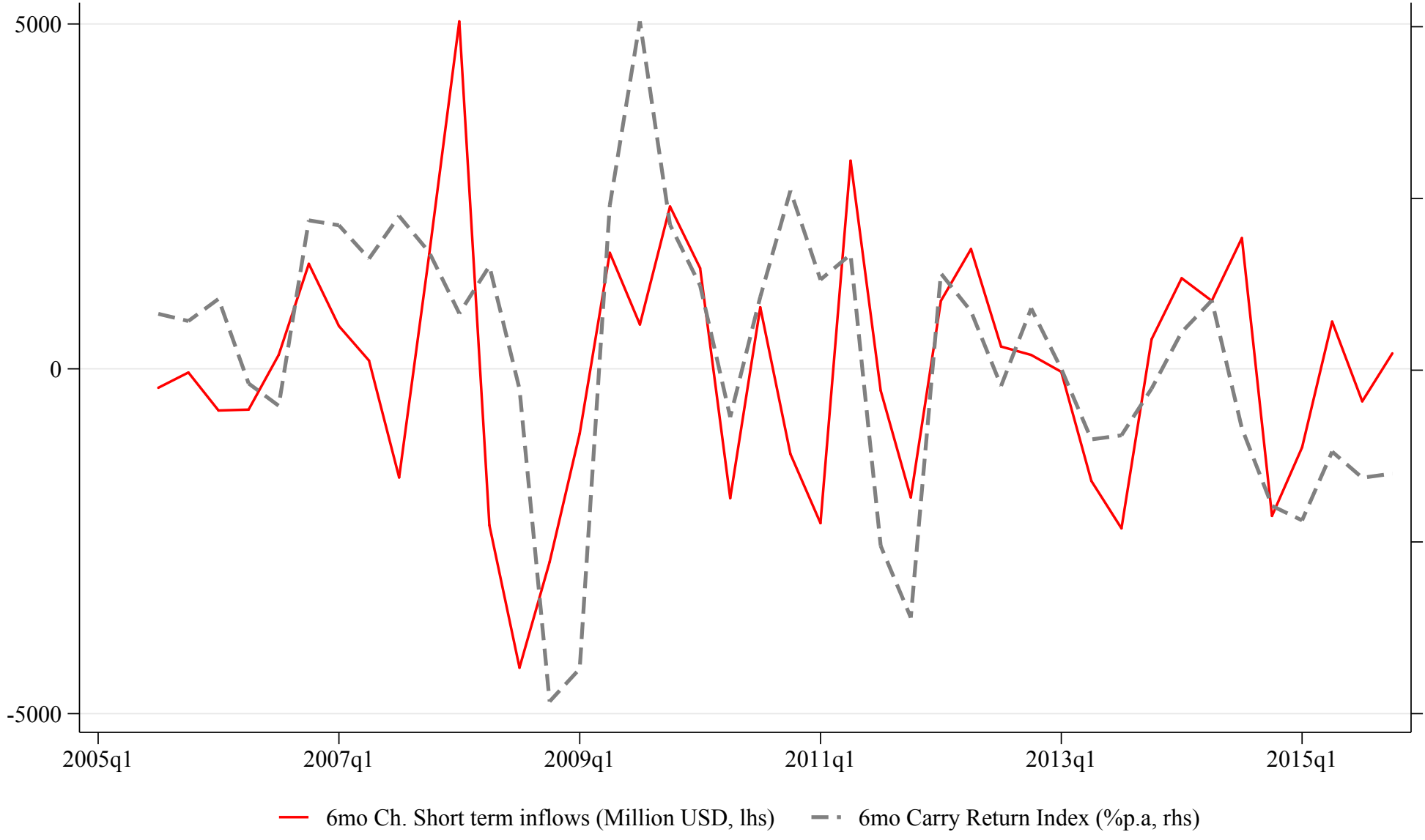
$$\text{Bank Traded}_{b,c,t} = \rho_0 + \rho_1 \text{Previous Bank Traded}_{b,c,t-1} + \text{Bank FE}_b \text{Bank FE} \times \text{Month FE}_{b,t} + \\ + \text{Bank FE} \times \text{Cpty Type FE}_{b,c} + \upsilon_{b,c,t}$$

Table: Probability of trading a forward contract with the same bank as was done in the previous trade

	Traded with Bank			
Previous bank traded	0.729***	0.655***	0.645***	0.620***
	(17.18)	(15.54)	(14.70)	(11.44)
Bank FE	No	Yes	Yes	Yes
Bank x Date(mo) FE	No	No	Yes	Yes
Bank x Cpty Type FE	No	No	No	Yes
Cluster	Date, Bank, Cpty	Date, Bank, Cpty	Date, Bank, Cpty	Date, Bank, Cpty
Bank Clusters	48	48	48	48
Cpty Clusters	876	876	876	876
Date Clusters	17	17	17	17
Observations	196098	196098	196098	196098
Adjusted R2	0.531	0.551	0.553	0.560

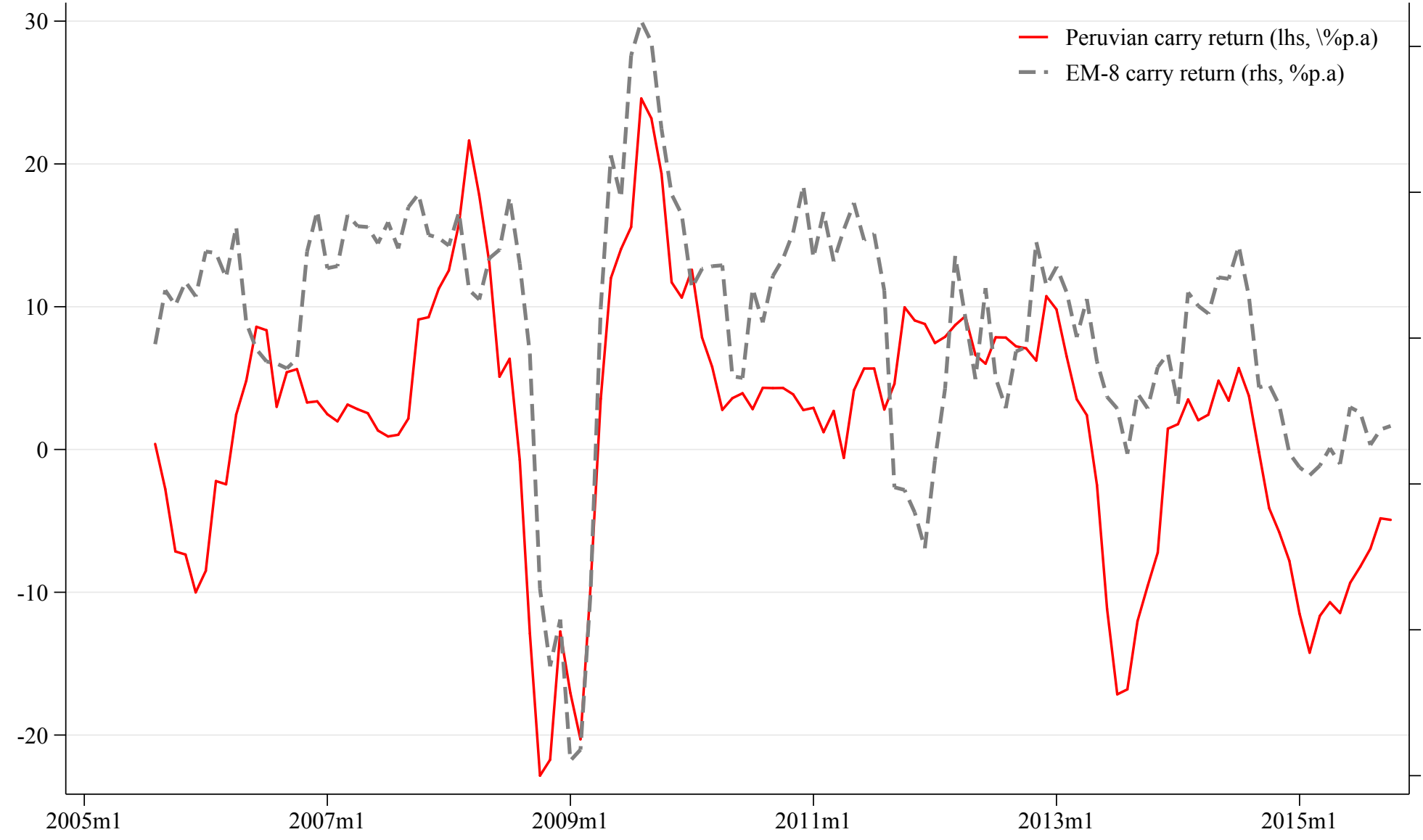
◂ Back to Validity

CORRELATION BETWEEN INFLOWS AND MARKET CONDITIONS



Back to Validity

CORRELATION BETWEEN INFLOWS AND MARKET CONDITIONS



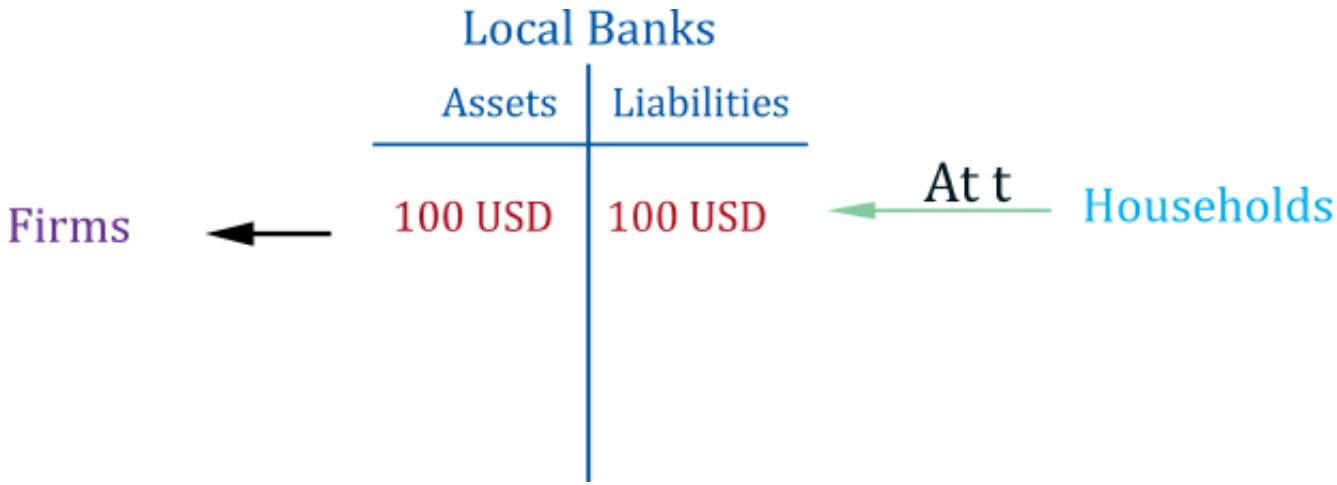
Back to Validity

Results Recap

- Capital controls have a causal effect on credit supply
- Banks more constrained by capital controls:
  - Increased credit supply of dollars
  - Decreased credit supply of soles
- This section explores why this happens
  - Assumes (1) HH save partially in dollars (2) Banks hedge dollar liabilities (3) CB intervenes in FX market
  - These assumptions hold in various EM.
- Mechanism found:
  - Two main ways to hedge local bank dollar liabilities: (1) Fwd (2) Lend in dollars
  - Without controls: Banks hedge dollar deposits using fwd contracts. This allows banks to lend in soles.
  - With controls: Banks hedge by lending dollars

MECHANISM

1. Lend in dollars (eg. closed economy)
   - If the economy is closed: there are only households (HH), firms and local banks
   - If HH save 100 dollars and banks do not take FX risk: Banks lend 100 dollars to firms



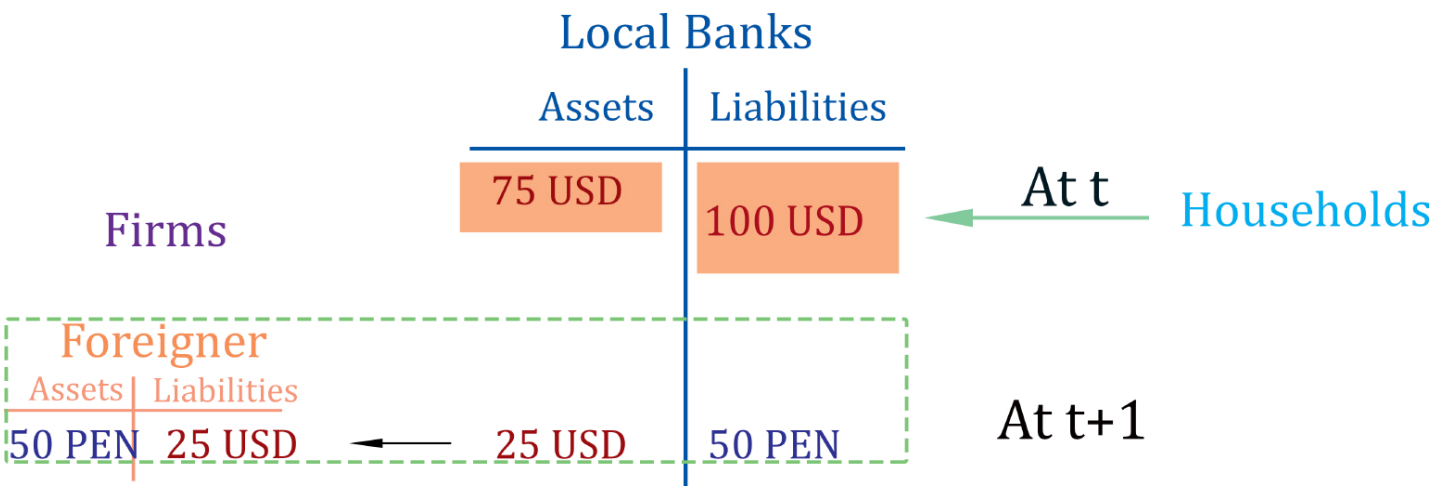
MECHANISM

2. Lend in soles (open economy)
   - Open economy offers a 2nd alternative to get 100 USD assets
   - Inflows: Foreigners use fwd contracts to get (buy) PEN assets and USD liabilities (sell USD)
   - As forward liquidates at t + 1, banks have 100 USD deposits at t to lend
   - Banks are hedged in USD, so deposits are lent in PEN to firms

Mechanism

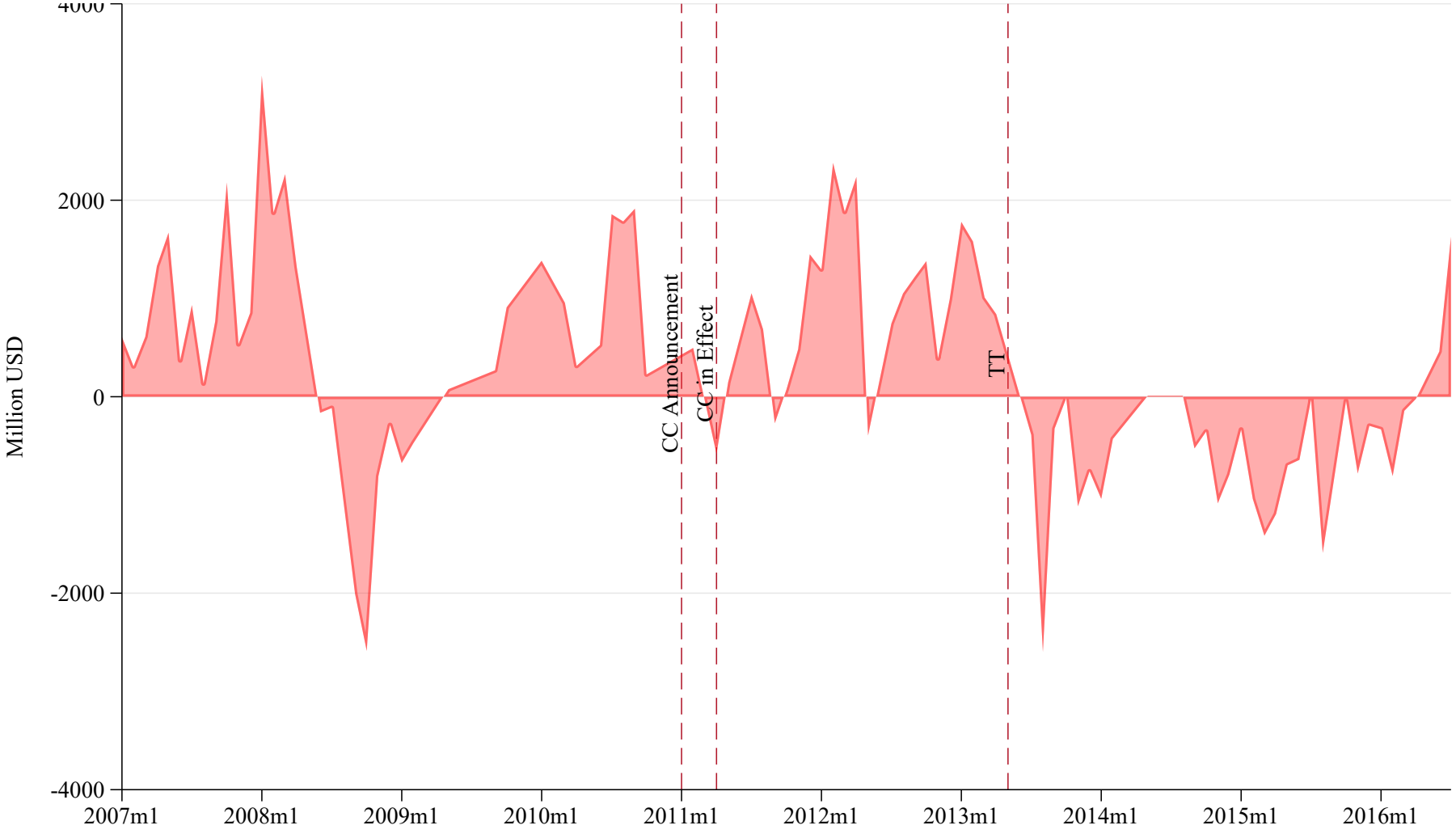
3. Introduction of capital controls (Peru: partially open economy)

   - Consider CC limit forwards to 25 USD
   - To hedge remaining 75 USD: banks lend 75 USD to firms
   - Banks lend the 25 USD hedged with forwards in PEN
   - Comparing CC to without CC: With CC banks lend more in USD and less in PEN



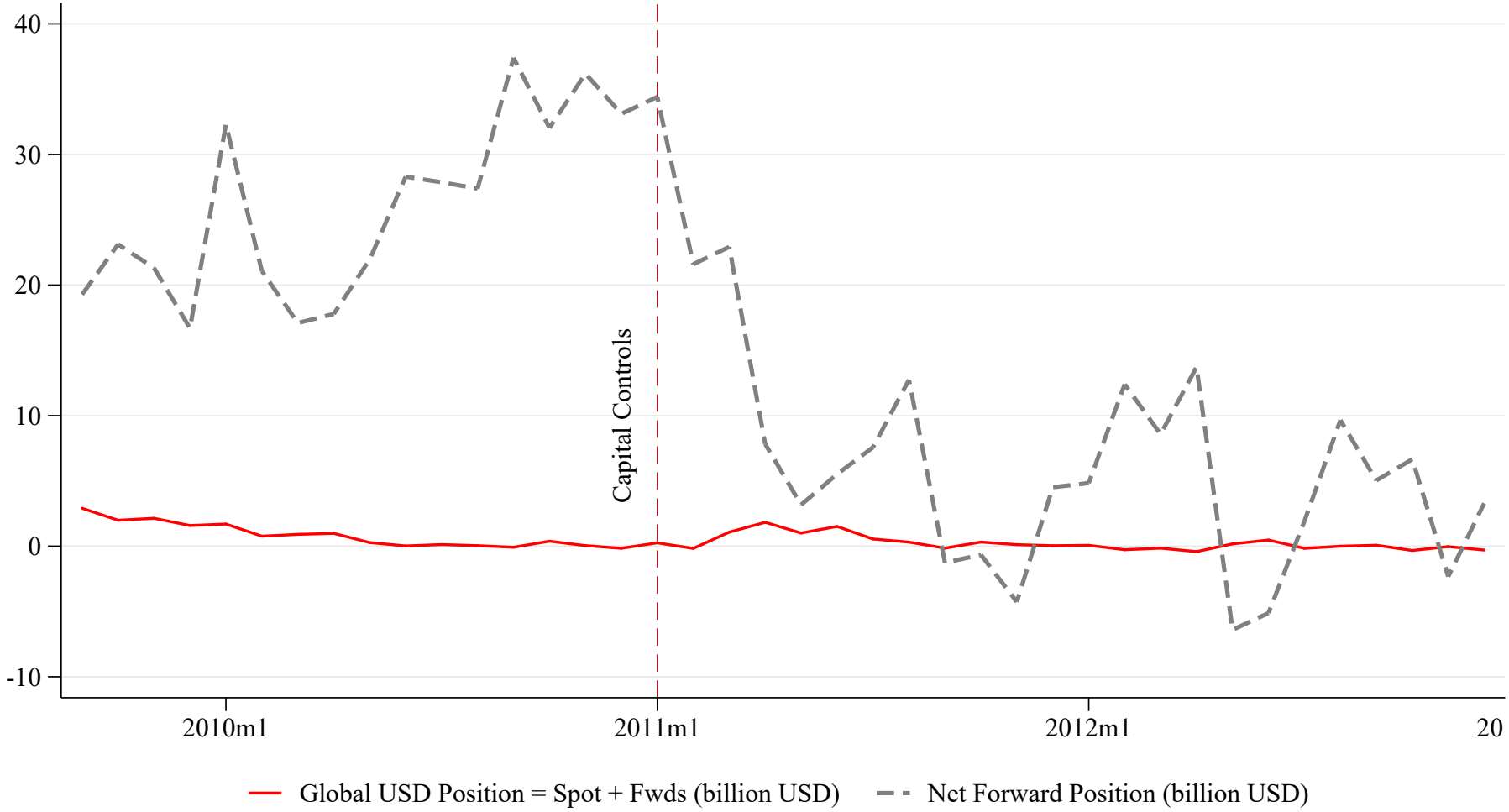
Central Bank Spot Intervention

Figure: **Central Bank's Net Monthly USD Spot Purchases**



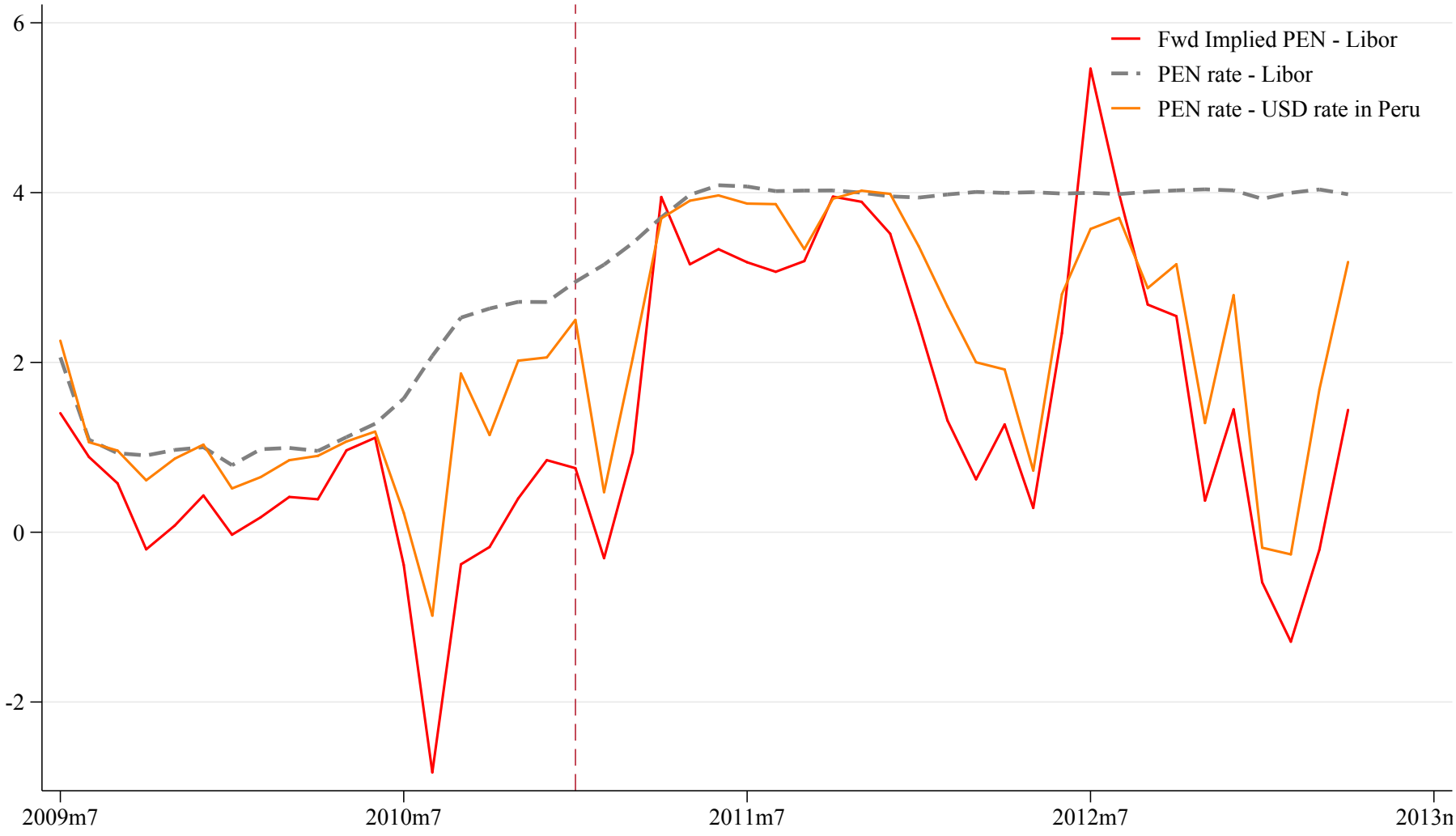
◂ Back to Mechanism

BANKS HEDGE USING FORWARD CONTRACTS



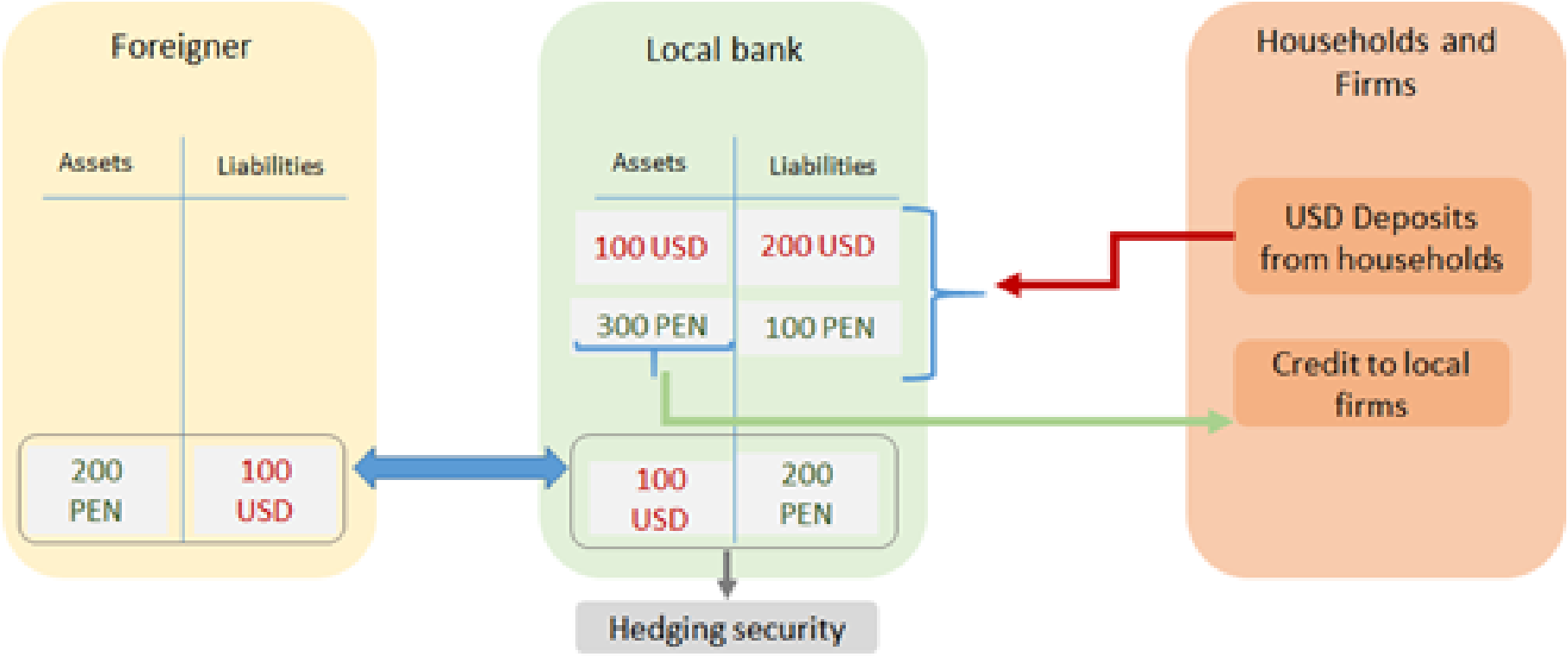
Global Forward Position data starts in Sep 2009

CHEAP FORWARD SECURITIES DURING INFLOWS



MECHANISM : LIQUIDITY AND FORWARDS

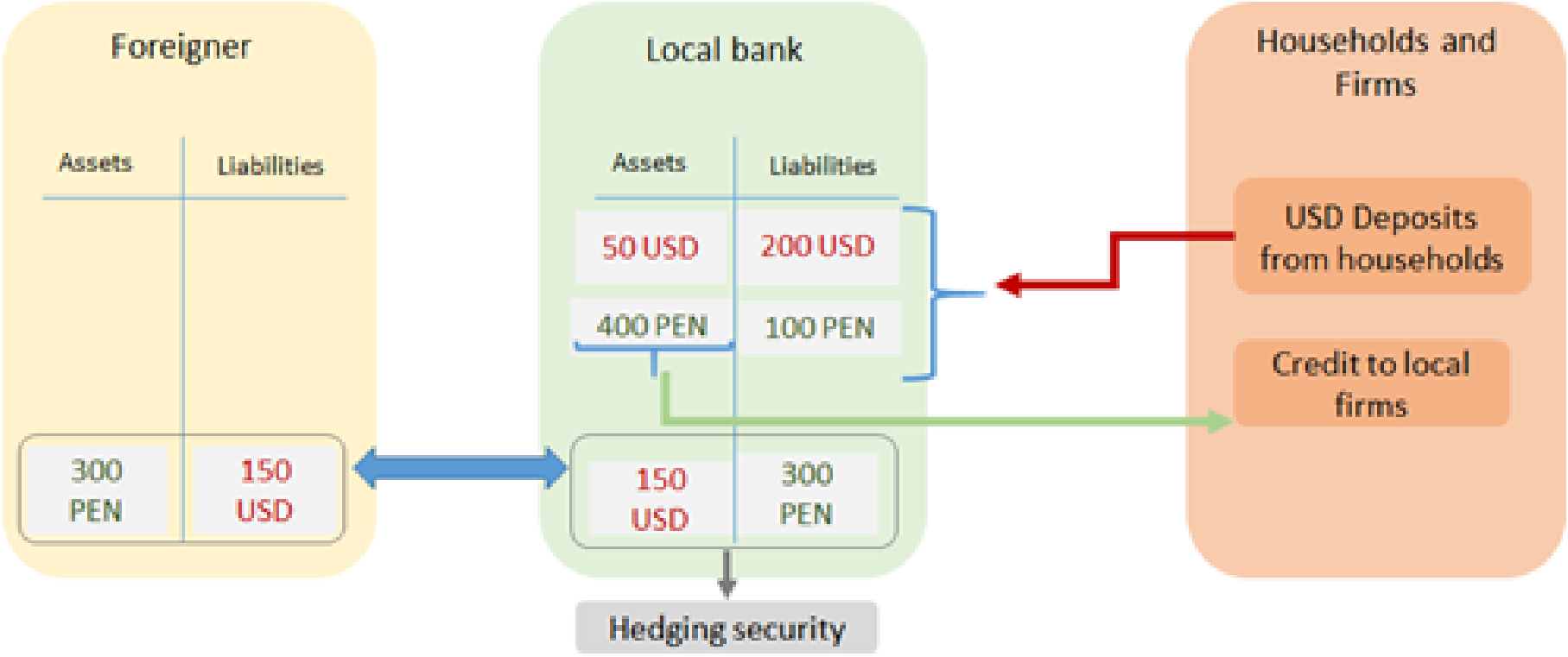
2. Lend in soles
   - Liquidity in soles increases and dollars decreases when buying forward contracts
   - If the bank hedges 100 dollars with forwards, lends 100 dollars and the remaining in soles. PEN Liq.Ratio =(300/100)= 3 and USD Liq. Ratio = (200/100) 0.5



◂ Back to Mechanism

MECHANISM : LIQUIDITY AND FORWARDS

2. Lend in soles
   - Liquidity in soles increases and dollars decreases when buying forward contracts
   - If the bank hedges 150 dollars with forwards, lends an additional 50 dollars in soles and only 50 in dollars. PEN Liq.Ratio increases to 4. USD Liq. ratio decreases to 0.25.

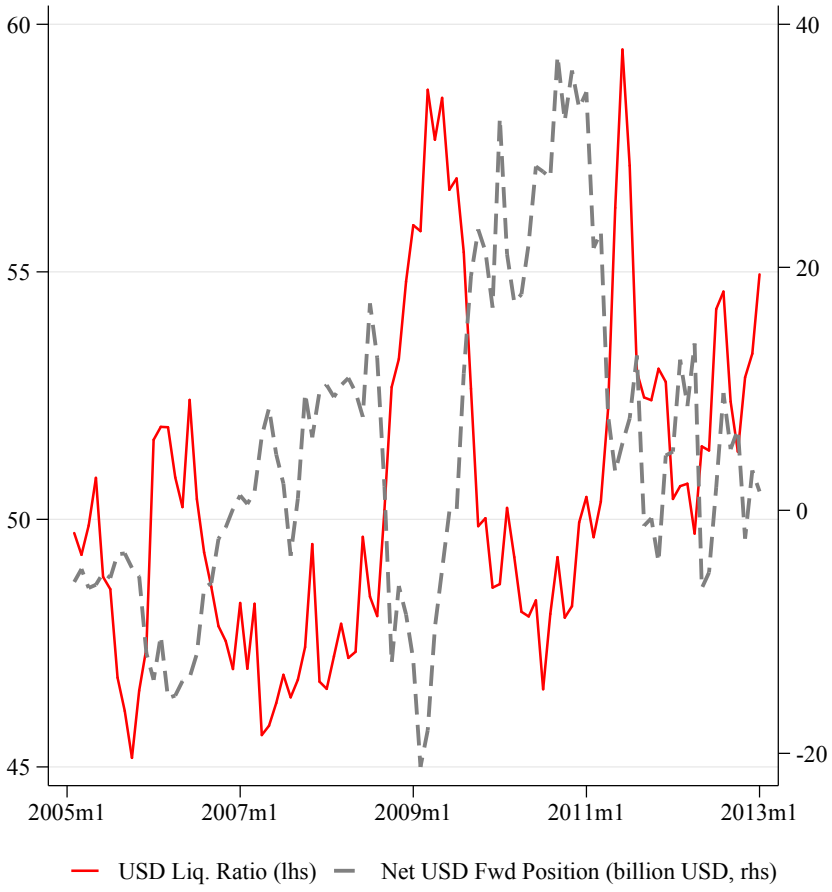


◂ Back to Mechanism

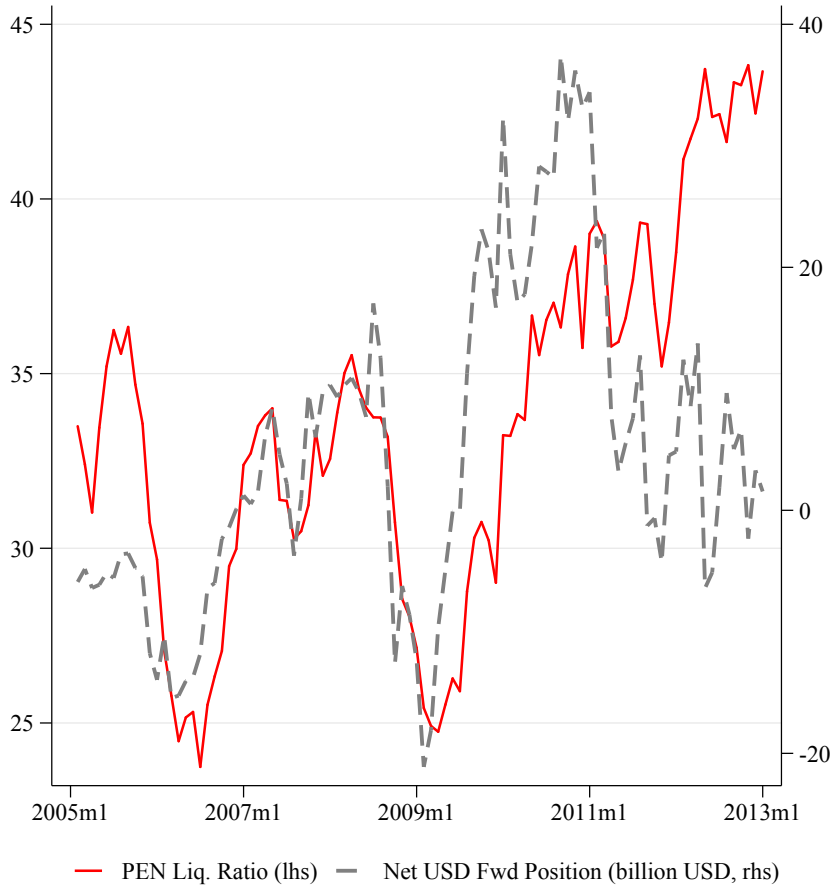
MECHANISM : LIQUIDITY AND FORWARDS

❷ Lend in soles

- Liquidity in soles increases and dollars decreases when buying forward contracts



A. USD Liq. Ratio and Net Long USD Fwd Holdings



B. PEN Liq. Ratio Net Long USD Fwd Holdings

◂ Back to Mechanism

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Canta, M., P. Collazos, and M. Shiva (2006). Límites a las posiciones de cambio como mecanismo de mitigación del riesgo cambiario . *SBS, Revista de Temas Financieros*, 119–136.