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The Foreign Liability Channel of Bank Capital Requirements

L. Falasconi, P. Herrero, C. Mendicino, D. Supera

Discussion

Stanislav Tvrz

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Overview

Area of interest

- Macroprudential measures, their macroeconomic consequences and monetary policy implications in a small open economy setting

Modelling approach

- Calibrated DSGE model of a SOE with financial intermediaries, bank default and foreign liability funding
- Steady-state, welfare and IRF analysis

Empirical case study

- Peruvian economy, July 2011 reform introducing compulsory capital buffers
- Verification of model-based results (DSGE) using panel data regression

Foreign Liability Channel of Bank Capital Requirements

Mechanism

1. Higher bank capital requirements make bank sector less risky (solvency risk), the probability of default gets smaller
2. Cost of foreign funding for banks (uninsured and therefore sensitive to the default probability) gets lower
3. The share of foreign liabilities used by domestic banks increases as they re-optimize their financing sources
4. Banking sector operating costs get lower but at the same time their exposure to foreign capital and exchange rate related shocks increases

   → a trade-off from the macroprudential point of view

Suggested remedy

- Foreign exchange (FX) interventions done by the central bank in order to stabilize the exchange rate in response to external shocks

Model overview – financial intermediaries (banks)

- Banks finance their investment in productive capital using: their own net worth, equity and domestic and foreign deposits subject to occasionally binding constraints:
  - Regulatory capital requirement $\theta q_{k,t} k^I_{t+1} \geq q_{d,t} d^I_{t+1} + q^*_{d,t}(\mathcal{C}_t) f_t d^{I,*}_{t+1} \rightarrow (1-\theta) q_k k^I \leq n + q_b b^I$
  - External borrowing constraint $\bar{d}^*_{t+1} \geq d^{I,*}_{t+1}$
  - Budget constraint $\underbrace{(1-\phi^0)n_t}_{\text{retained earnings}} + \underbrace{e_t - \Psi^{I,e}(e_t)}_{\text{equity issuance}} - \underbrace{\Psi^{I,\Theta}(d^I_{t+1}, d^{I,*}_{t+1})}_{\text{foreign deposit cost}} \geq \underbrace{q_{k,t}k^I_{t+1} + q_{b,t}b^I_{t+1} - q_{d,t}d^I_{t+1} - q^*_{d,t}(\mathcal{C}_t) f_{t+1} d^{I,*}_{t+1}}_{\text{net investment}}$
- Banks operate with limited liability and have an option of defaulting (dead-weight losses and deposit insurance costs)
- Deposits issued to the domestic households are fully insured (risk-free), while the debt to foreign investors isn't
- The cost of foreign funds as well as bank equity changes endogenously with the safety of the banking sector

Sources of risk

- Idiosyncratic shock to bank's profitability (leading to an ex-post heterogeneity)
- Aggregate mean-preserving shock to the standard deviation of the idiosyncratic shocks to bank profits (heightened volatility in bank profitability)
- Aggregate „sudden stops" shock in foreign funding availability for banks (occasionally binding limit to the overall volume of foreign currency denominated funds used by the banks)

Model overview – bankruptcy

- Banks default when hit by negative idiosyncratic profitability shock, which would lead to a negative net worth
- Assets of the bankrupt banks are then fully (domestic bonds and profits) or partially (capital investment) recovered (liquidated)

$$RV_t = (1-\mu)[r_{k,t} + q_{k,t}(1-\delta)]K_t^I + B_t^I + \epsilon_t^-$$

- Deposit insurance agency then takes over $1 - \Theta_t$ of the recovered assets, redeems deposits at par value (in full) and pays/collects the difference in a form of lump-sum taxes on households

$$T_t^{DI} = \left[D_t^I - (1-\Theta_t)RV_t\right]F_{\epsilon,t}$$

- A fraction of Θ_t of recovered assets is used to (partially) repay the (defaulted on) debt in foreign currency
- Foreign investors internalize the possibility of a default and thus their required interest rate on risky foreign debt satisfies following zero profit condition (implying a supply curve of foreign debt assets elastic w.r.t. bank's riskiness)

$$R^* = R_{d,t}^* \mathbb{E}_t \left\{ F_{\epsilon,t+1} \frac{\Theta_{t+1} RV_{t+1}}{f_{t+1} D_{t+1}} + (1 - F_{\epsilon,t+1}) \right\}$$

foreign discounting rate = required interest rate {default probability*haircut + (1 – default probability)}

- New banks enter the market with net-worth equal to that of the performing banks

Model overview – central bank

- If $\phi_{FX} > 0$, the central bank follows FX intervention rule and reacts to the depreciation of the real exchange rate by issuing local currency sterilization bonds, which are used to buy the foreign currency from the domestic banking system and deposited into official FX reserves (and vice versa)

$$log(B^{CB}_{t+1}) = log(\bar{B}^{CB}) - \phi_{FX} log\left(\frac{f_t}{\bar{f}}\right)$$

$$B^{CB}_{t+1} = f_t \mathcal{R}_{t+1}$$

- Sufficiently complex yet parsimonious DSGE model with well-developed financial sector
- Careful model calibration matching the moments in the Peruvian data (macroeconomic as well as financial)

Table 2: Moments Matched

Moment	Data	Model	Formula
Investment / GDP	0.22569	0.19621	$\frac{X}{GDP}$
HH Capital Share	0.11382	0.10829	$\frac{K^H}{K}$
Foreign Liability Share	0.10122	0.10615	$\frac{fD^*}{D+fD^*}$
Equity Issuance Ratio	0.0105	0.0093351	$4\frac{e}{N}$
Bank Default	0.010551	0.010637	$4F_\epsilon$
Export / GDP	0.21844	0.19523	$\frac{EX}{GDP}$
Reserves / GDP	0.2439	0.22386	$\frac{B}{GDP}$
Vol. Bank Default Rate	0.0098816	0.0098181	$std(4 \cdot F_\epsilon)$
AC(1) Bank Default Rate	0.89243	0.73431	$AC(4 \cdot F_\epsilon)$
Vol. Foreign Liability Share	0.010376	0.0033086	$std(\Theta)$
AC(1) Foreign Liability Share	0.79464	0.98474	$AC(\Theta)$
Vol. Investment / Vol. GDP	4.1948	4.3965	$\frac{std(I)}{std(GDP)}$

Steady-state and welfare analysis

- Highest welfare achieved for high enough value of capital requirements that minimizes the probability of banks' default but at the same time does not undermine their capacity of productive capital investment
  → trade-off between size and fragility of the financial sector
  (lower leverage of the banks ⇔ safer financial sector, but less investment in domestic real economy)

Figure 1: Comparative Statics wrt Capital Requirement Level

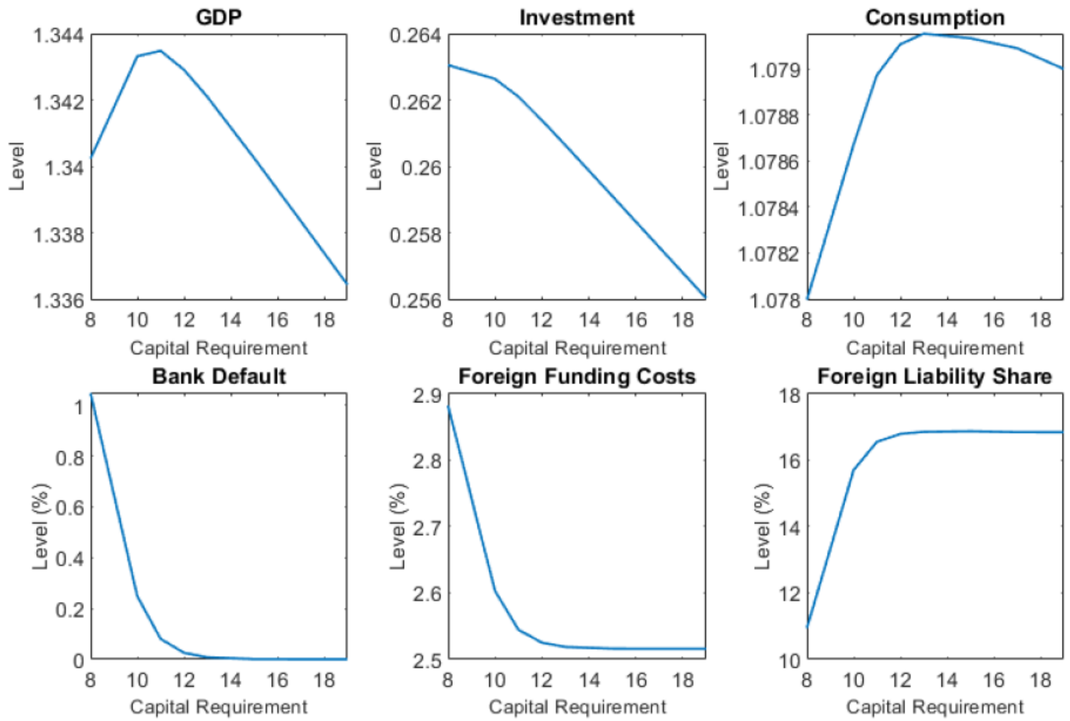
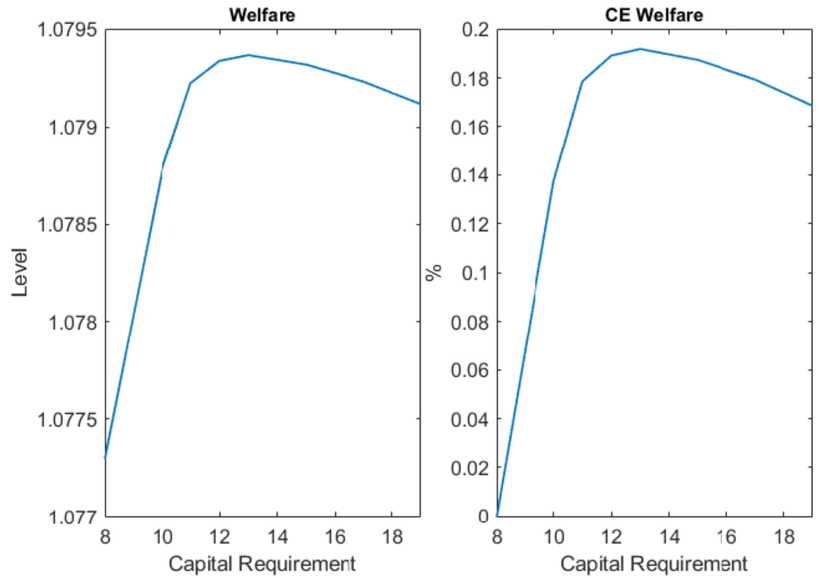


Figure 2: Welfare wrt Capital Requirement Level



Notes: This figure shows the implications of different values of the level of bank capital requirement θ on the mean of the ergodic distribution of selected variables of the baseline model. The variables plotted are long-run averages over a simulated series of 100,000 periods.

IRF analysis – domestic vs. foreign financial shock

Figure 3: Domestic Financial Shock

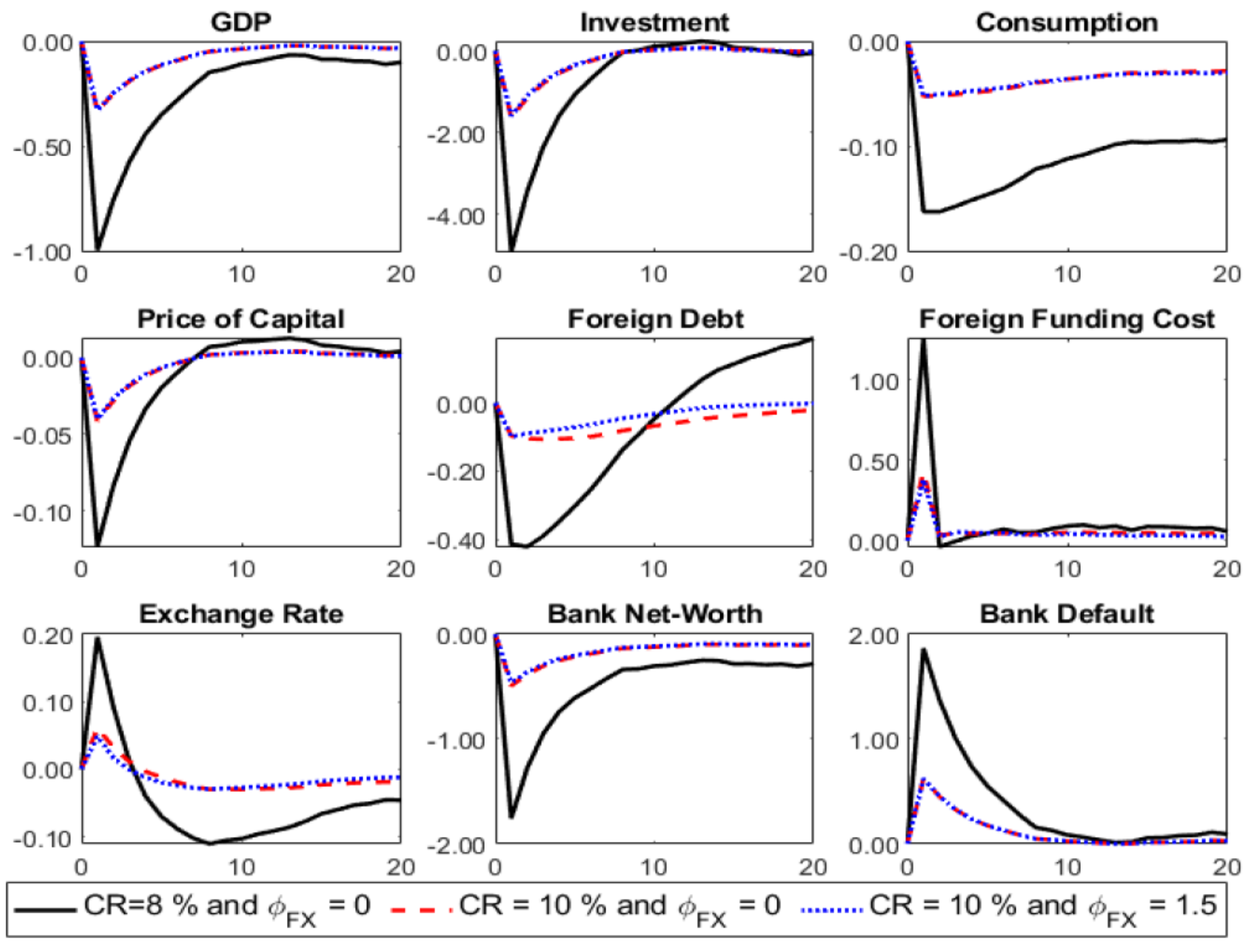
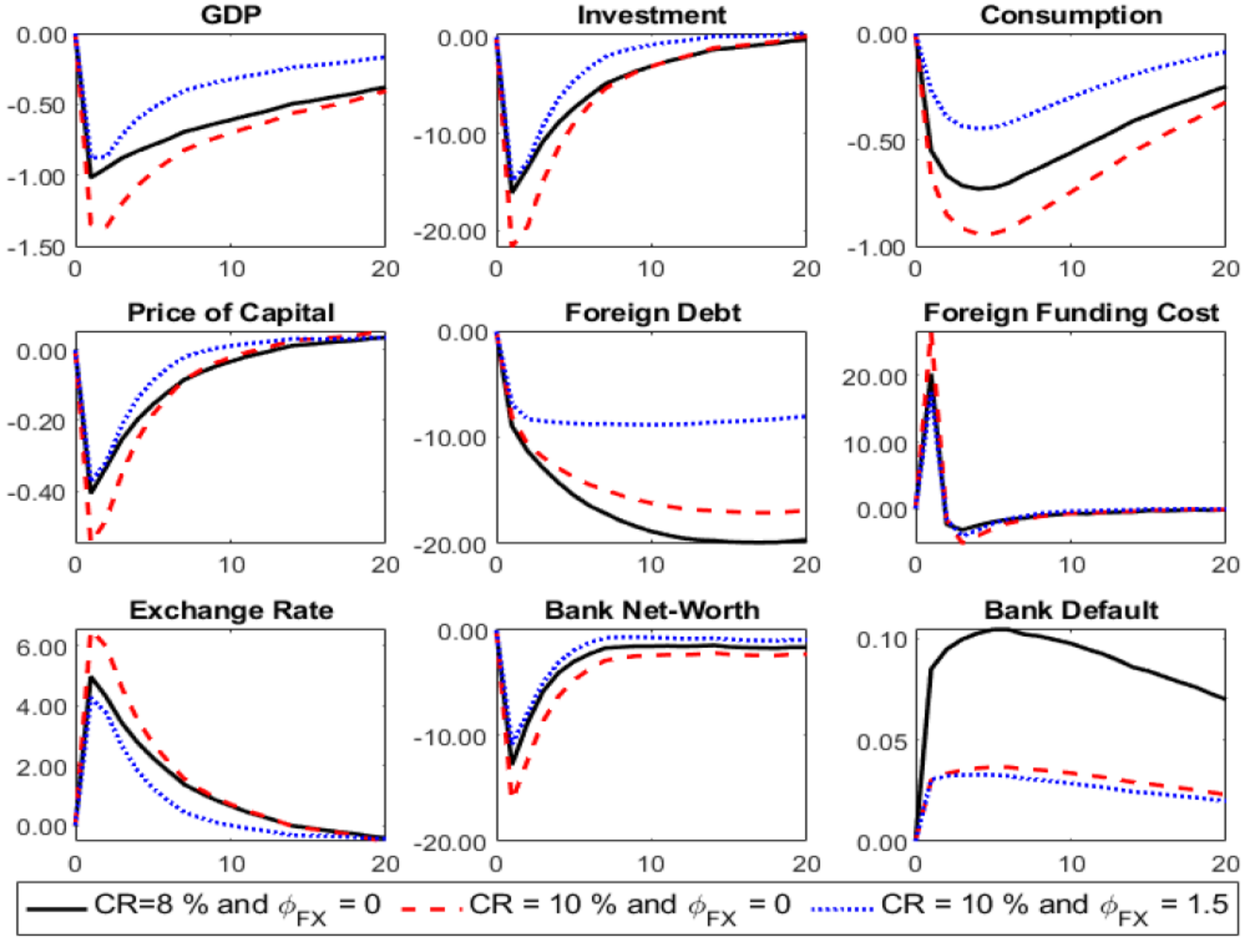


Figure 4: Foreign Financial Shock

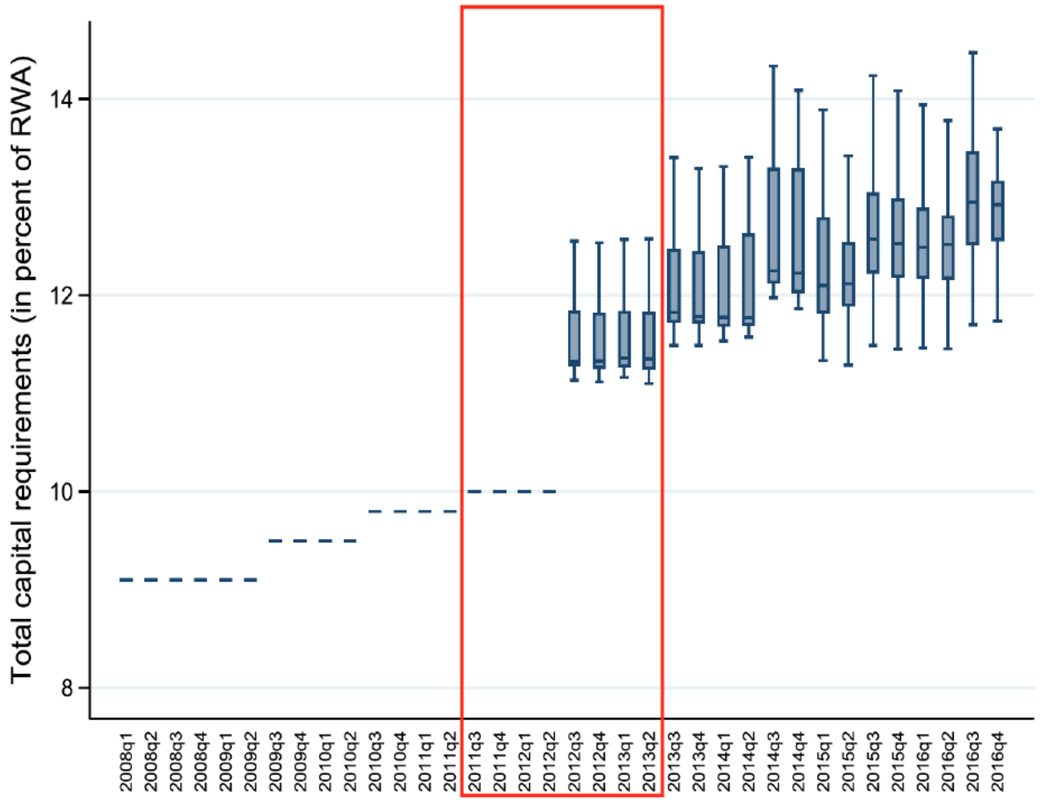


Suggestion

- Currently, the shocks are scaled to deliver a 1 % drop in GDP under the baseline calibration (CR=8% and no FX interventions), however the impact in the financial sector differs by order of magnitude. Maybe the scaling should be done in terms of banks net-worth? The comparison of macro effects could make more sense.

Case study: July 2011 capital requirements reform in Peru

Figure 5: Capital Requirement Increases in Peru



Notes: This figure presents the evolution of capital requirements across 16 commercial banks in Peru from 2008 until 2016. Up to the second quarter of 2012, capital requirements were uniform across banks. Starting from the third quarter of 2012, the box-whisker plot displays the capital requirement distribution among the banks. The box represents the interquantile range, the horizontal line is the median, and the whiskers are the 10th and the 90th percentiles of the distribution of bank capital requirements. Red box highlights the sample period used in the empirical analysis. Source: Fang et al. (2022).

Table 3: Capital Requirements and foreign liabilities: empirical analysis

	$log(ForeignDebt_{b,t})$			$\frac{ForeignDebt_{b,t}}{TotalLiabilities_{b,t}}$		
	(1)	(2)	(3)	(4)	(5)	(6)
$CapitalRequirement_{b,t-1}$	6.29***	6.88***	6.72***	0.697***	0.520***	0.756***
	(1.82)	(1.93)	(1.92)	(0.179)	(0.176)	(0.177)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Bank FE	Yes	No	Yes	Yes	No	Yes
Time FE	No	Yes	Yes	No	Yes	Yes
N	185	185	185	245	245	245
R^2	0.975	0.877	0.977	0.822	0.569	0.838

Notes: This table presents the coefficients from the regression analysis of the impact of capital requirements on foreign liabilities of banks. Columns (1) - (3) contain the estimates for the log amount of foreign debt as the outcome variable while columns (4) - (6) use the ratio of foreign debt to total liabilities as the dependent variable. Explanatory variable is the lagged level of capital requirement at the bank level. The controls are bank-level time-varying controls such as bank size, EBITA, liquidity position and risk-weighted assets. We saturate the model with bank fixed effects, and time fixed effects. The robust standard errors are given in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

- 1 percentage point increase in capital requirements is associated with a 6.7% increase in the absolute amount of foreign debt and an increase in share of foreign debt of 0.8 percentage points
- DSGE model's forecast implies an approximate 1 pp increase when capital requirements escalate from 10% to 11% (the pre-reform level of 2011 vs. the median post-reform level after the initial phase in 2012).

Questions & Comments

- The paper clearly illustrates the relationship between regulatory capital requirements and foreign capital exposure of the financial sector, both empirically using the Peruvian case study, and also using a DSGE model.
- At the same time the authors show that technically a FX interventions by the central bank should be able to mitigate the impact of increased external vulnerability (sudden stops risk) in the domestic real economy.
- While already quite impressive, the paper should be developed further to make the monetary policy implications more convincing.

- Is the FX intervention strategy suggested by the paper as a solution really the best one? What about the inflation targetting and potential conflicts with the standard Taylor rule?
- What about the limited FX reserves of the domestic central bank? The domestic central bank cannot prop-up the domestic currency (by selling foreign currency) indefinitely. Is such a strategy feasible without international cooperation, i.e. without some kind of a currency union?
- Wouldn't the open FX interventions strategy stimulate the foreign funds exposure further by taking the exchange rate fluctuations risk onto the central bank (moral hazard of banks & foreign investors)?
- Wouldn't it be sensible to require the domestic banks (instead of FX strategy) to limit the exposure to the foreign capital in the first place? The macroprudential authority could prescribe an upper limit of the share of foreign currency denominated liabilities and thus limit the exposure of domestic banks to foreign shocks (sudden stops). Or vice versa, a minimum share of domestic deposits could be prescribed.