



EUROPEAN CENTRAL BANK

EUROSYSTEM

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Macroprudential policies, capital flows and the structure of the banking sector

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Outline

- Motivation
- Related literature
- The role of the banking sector
- Measurement of macroprudential policies
- Data and methodology
- Results
- Conclusions and policy implications

Motivation

- Literature **lacks convincing evidence** that macroprudential policies (MPPs) and (other capital flow management measures (CFMs)) are effective in reducing foreign capital inflows.
- However, to date, no attempt has been made to examine the **role of the domestic banking sector** in driving the effectiveness of MPPs.
- We fill this gap in the literature by testing a number of banking sector channels through which MPPs can be effective, including via the **level of regulatory quality** and the **operational and intermediation efficiency of banks**.
- Where MPPs are effective, we also examine **spillover effects** to other asset classes and countries.

Preview of main findings

- Using a sample of up to 75 advanced and emerging economies over the period 1999-2012, our main findings are as follows:
 - A **higher level of regulatory quality and a higher credit-to-deposit ratio** increase MPP effectiveness, while a higher cost-to-income ratio has the opposite effect.
 - We find that under favourable financial conditions, **bank inflows in % of GDP are reduced by 3.44 percentage points** following the introduction of an MPP.
 - We find that the **structure of the domestic banking sector** underpins asset class spillovers from MPPs.
 - Geographical spillover effects are a function of banking sector conditions both at **home and abroad**.

Why look at the effect of MPPs on Capital Flows?

- Financial globalisation **synchronises capital flows** across countries and makes them more volatile:
 - “Old” literature on push factors (Reinhart, Calvo and Leiderman, 1993)
 - Literature on correlations in international finance (Ang and Bekaert, 2002)
 - Literature on episodes of strong capital inflows (Forbes and Warnock, 2012)
 - Hypothesis of a global financial cycle (Rey, 2013)
- Capital flows surges can pose **macroeconomic challenges and financial stability risks**:
 - e.g., credit booms/sudden stops, over-indebtedness, currency appreciation
- Strong interest in understanding the **effectiveness of capital controls/ macroprudential policies** as tools to mitigate such impacts
 - Optimally managing capital inflows without discriminating foreigners
 - Gaining knowledge about side effects of domestically oriented MPPs, e.g., implementing policies effectively, designing international frameworks

Recent focus on macroprudential policies to deal with large and volatile capital inflows

- EMEs have encountered difficulties in dealing with capital inflows, especially **short-term debt and banking flows**
 - these inflows can create credit booms, over-indebtedness, maturity and currency mismatches, over-valued exchange rates and sudden stops
- Policy challenges for EMEs using **traditional macroeconomic policies** to deal with large and volatile capital flows
 - e.g. allowing the exchange rate to appreciate reduces competitiveness; reducing interest rates can be inflationary/lead to overheating; tightening fiscal policy may harm economic growth (also may face political hurdles); accumulating reserves entails costs
- **Capital controls** have also been used as a policy tool
 - however, capital controls distinguish between residents and non-residents and may lead to a distortion of incentives
- More recently, **macroprudential policies** have been favoured by policymakers
 - these apply to the banking/financial system as a whole and do not discriminate between domestic and foreign investors

Related Literature: Macroprudential policy

- Literature on the effectiveness of MPPs
 - Habermeier et al. (2011), Lim et al. (2011), Qureshi et al. (2012) – MPPs are **effective in reducing systemic risk**; however, only very limited impact on capital flows is found.
 - Forbes, Fratzscher and Straub (2015) – MPPs can **reduce some measures of financial fragility** but do not impact on key targets (exchange rate, capital flows, interest rate differentials).
 - Bruno, Shim and Shin (2015) – some evidence that targeted MPPs are effective in **slowing down banking inflows and bond inflows for Asia-Pacific region**. See also Bruno and Shin (2014).
- Literature on international spillovers of MPPs
 - Only very recently, papers provide actual empirical evidence of **cross-country spillover effects**:
 - Giordani, Ruta, Weisfeld, Zhu (2014)
 - Ghosh, Qureshi, Sugawara (2014)
 - Pasricha, Falagiarda, Bijsterbosch, Aizenman (2015)

Related Literature: Capital Controls

Some (mixed) findings from the literature:

- Ahmed and Zlate (2013) – capital controls appear to have been effective in **reducing total portfolio inflows**.
- Cerutti, Claessens and Ratnovski (2014) – capital controls can be effective in **reducing the level and cyclical**ity of cross-border bank flows.
- Magud et al. (2011) – Survey of the literature on capital control effectiveness (influence on **composition** but not on the level of inflows).
- While capital controls can help to reduce capital inflows, the effects tend to be **short-lived** (e.g. Baba and Kokenyne, 2011).
- Binici et al. (2010) find that capital controls on equities and bonds are effective in reducing capital outflows but have **no effect on inflows**.
- Gochoco-Bautista et al (2012) – **no significant impact** on the level of net capital inflows.
- Forbes et al. (2011) – Use of an international spillover term; tax on foreign portfolio debt in Brazil leads to **negative externalities**.

The role of the banking sector – what are the channels through which MPPs can be effective?

- **Regulatory quality**

- Better institutions lead to a **more efficient use of foreign capital** (Abiad et al, 2009).
- quality of institutions is a key **driver of international bank loan flows** (e.g. Papaioannou, 2009)
 - MPPs are likely to be more effective where regulatory quality drives flows and there is a perception that the government is competent in implementing such policies.

- **Operational and intermediation efficiency of banks**

- International bank loan flows invariably channelled to and intermediated by the most **efficient domestic banks**.
- where financial intermediation breaks down, **agency problems between banks and their creditors** can lead to rising credit spreads, capital outflows and adverse effects on the real economy (Gertler and Kiyotaki (2010)).
 - MPP is more likely to be effective where banks have adequate domestic financial buffers in place against adverse shocks.

The role of the banking sector – what are the channels through which MPPs can be effective?

- **Banking concentration**

- **highly concentrated banking sector** conducive to financial stability given uncertainty about the costs of concentration as well as the perceived negative relation between competition and financial stability (e.g. Allen and Gale, 2004).
- but **may also increase financial fragility** as a more concentrated system may be more prone to engaging in risky practices, e.g. Boyd and De Nicolo (2005) and Caminal and Matutes (2002).

- **Share of foreign banks**

- Claessens and van Horen (2012) have noted that while foreign banks tend to have higher capital and liquidity, they are **not as profitable as domestic banks**.
- Unlikely to have a role to play in driving the effectiveness of MPPs given the **greater scope to circumvent restrictions** (e.g. Aiyar et al., 2014).

Data

- **Left-hand side variable:** Bank Flows in % of GDP
 - Taken from the Locational Statistics of the BIS, and following the approach of Bruno and Shin (2015)
- **Macroeconomic controls** (WEO database)
 - Real GDP growth rate
 - Inflation rate (highly correlated with interest and exchange rate)
 - PPP GDP per capita
 - Trade integration (imports + exports) in % of GDP
- **Financial controls** (World Bank Financial Development and Structure database; World Bank Worldwide Governance Indicators; Claessens and van Horen, 2014)
 - Index of regulatory quality
 - Cost-to-income ratio
 - Credit-to-deposit ratio
 - Banking concentration
 - Share of foreign banks
- All variables are winsorised at the 1% level to reduce the impact of outliers

Methodology

- Baseline specification:

$$k_{i,t} = \alpha + \alpha_t + \delta DMPP_{i,t} + \beta X_{i,t-1} + \lambda DMPP_{i,t} * X_{i,t-1} + \varepsilon_{i,t}$$

$k_{i,t}$ = international gross bank flows into country i in % of its GDP at time t

$DMPP_{i,t}$ = the direct effect of the MPP on bank inflows

$X_{i,t}$ = Vector of Macro and Financial Control Variables

- Total marginal effect for MPP:

$$\frac{\partial k_{i,t}}{\partial DMPP_{i,t}} = \delta + \lambda X_{i,t-1}$$

- For the spillover analysis, the baseline is altered as follows:
 - Asset class spillovers – we replace the LHS variable with alternative capital flow measures.
 - Geographical spillovers – we add a regressor to the baseline which is a GDP-weighted average MPP stance in countries nearby

Overview of main results

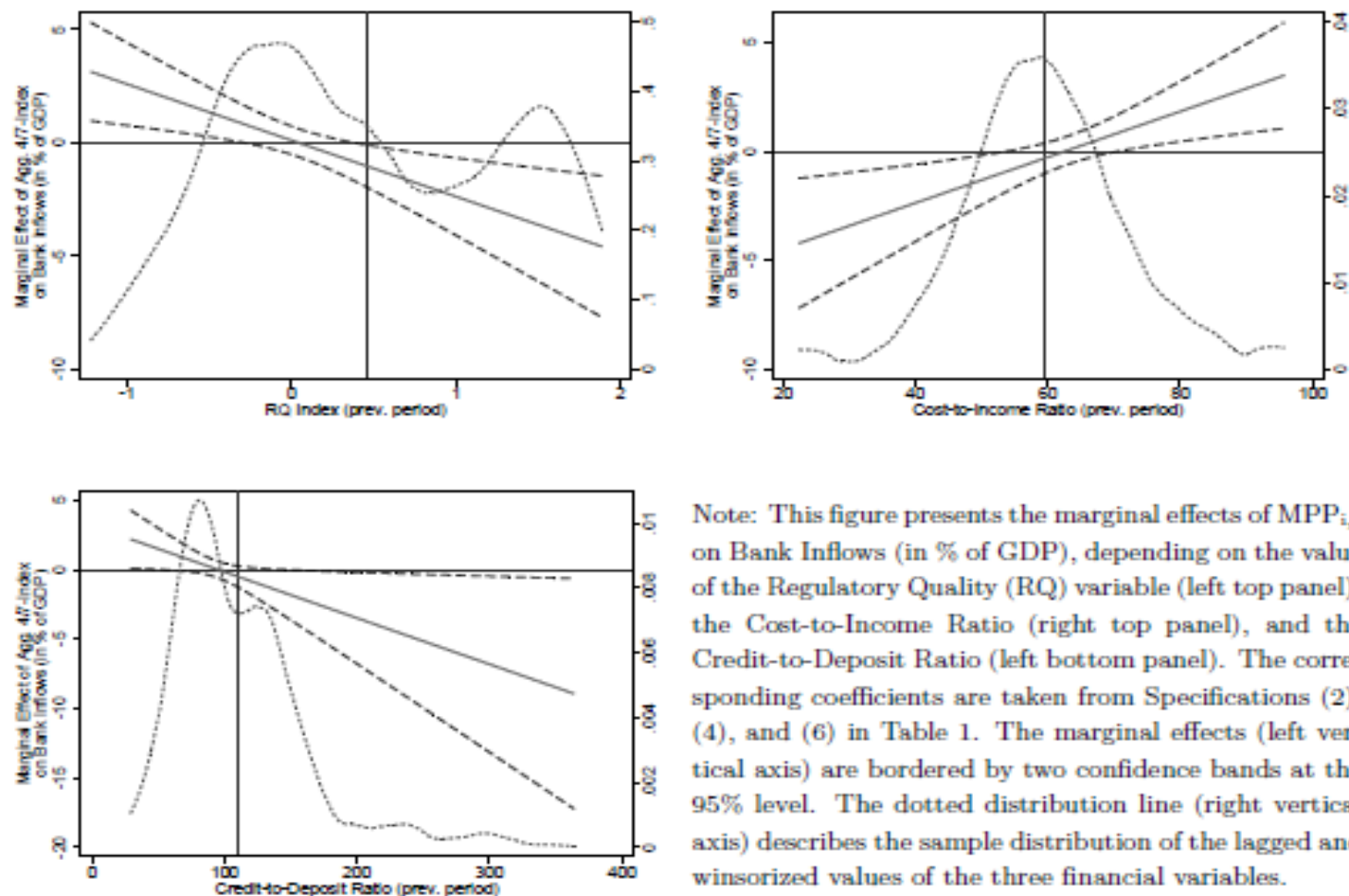
| LHS: Bank Inflows (in % of GDP) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| DMPP _{i,t} | -0.292 (0.413) | 0.100 (0.749) | 4.262* (0.069) | -6.571*** (0.005) | 0.211 (0.930) | 3.164** (0.035) | 7.695*** (0.004) | -2.833 (0.149) | 2.339 (0.297) |
| DMPP _{i,t} x RQ Index _{i,t-1} | | -2.483*** (0.004) | -2.656*** (0.001) | | | | | -1.641*** (0.006) | -1.949** (0.024) |
| DMPP _{i,t} x Cost-to-Income _{i,t-1} | | | | 0.105*** (0.004) | 0.076** (0.012) | | | 0.088*** (0.003) | 0.066** (0.020) |
| DMPP _{i,t} x Credit-to-Dep _{i,t-1} | | | | | | -0.033** (0.033) | -0.027** (0.038) | -0.024* (0.090) | -0.022* (0.098) |
| RQ Index _{i,t-1} | 0.747 (0.120) | 2.268*** (0.003) | 2.049*** (0.008) | 0.838* (0.060) | 0.843* (0.097) | 0.728* (0.062) | 0.656 (0.139) | 1.814*** (0.005) | 1.689** (0.022) |
| Cost-to-Income _{i,t-1} | -0.065*** (0.004) | -0.068*** (0.003) | -0.065*** (0.002) | -0.096*** (0.001) | -0.085*** (0.001) | -0.064*** (0.003) | -0.062*** (0.003) | -0.093*** (0.001) | -0.084*** (0.001) |
| Credit-to-Dep _{i,t-1} | 0.011* (0.096) | 0.010 (0.135) | 0.012* (0.063) | 0.011* (0.069) | 0.013** (0.042) | 0.024** (0.027) | 0.023** (0.024) | 0.020* (0.057) | 0.020* (0.053) |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro Variables Incl. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro Variables Inter. | No | No | Yes | No | Yes | No | Yes | No | Yes |
| Observations | 862 | 862 | 862 | 862 | 862 | 862 | 862 | 862 | 862 |
| R-squared | 0.26 | 0.27 | 0.29 | 0.27 | 0.29 | 0.28 | 0.30 | 0.29 | 0.31 |
| Countries | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 | 66 |

Additional results for Emerging v. Advanced economies

| | <i>All</i> | <i>Emerging</i> | | | <i>Advanced</i> | |
|---|----------------------|---------------------|---------------------|---------------------|----------------------|----------------------|
| LHS: Bank Inflows (in % of GDP) | (1) | (2) | (3) | (4) | (5) | (6) |
| DMPP _{i,t} | -2.833 (0.149) | 0.999 (0.608) | -1.369 (0.267) | -1.395 (0.224) | 0.584 (0.883) | 1.135 (0.818) |
| DMPP _{i,t} x RQ Index _{i,t-1} | -1.641*** (0.006) | -1.654* (0.084) | -1.199** (0.049) | -0.832** (0.030) | -1.616 (0.443) | -0.044 (0.979) |
| DMPP _{i,t} x Cost-to-Income _{i,t-1} | 0.088*** (0.003) | 0.011 (0.756) | 0.039* (0.080) | 0.037* (0.070) | 0.225*** (0.006) | 0.172** (0.013) |
| DMPP _{i,t} x Credit-to-Dep _{i,t-1} | -0.024* (0.090) | -0.016** (0.032) | -0.011 (0.137) | -0.012 (0.137) | -0.113*** (0.001) | -0.107*** (0.007) |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Macro Variables Included | Yes | Yes | Yes | Yes | Yes | Yes |
| Financial Variables Included | Yes | Yes | Yes | Yes | Yes | Yes |
| Observations | 862 | 571 | 571 | 571 | 291 | 291 |
| R-squared | 0.29 | 0.25 | 0.25 | 0.24 | 0.44 | 0.43 |
| Countries | 66 | 45 | 45 | 45 | 25 | 25 |

Note: For a description of the variables, see Table 1 . Specification (1) corresponds to the baseline specification (i.e., Specification (8) in Table 1) and is added for comparison. Specifications (2)-(4) estimate the baseline specification separately for emerging markets and Specifications (5)-(6) for advanced countries. The specifications within each country group differ because of alternative measures of DMPP_{i,t}. The included MPP definitions are in each case: Specification (2) = Agg. 3/7-Index; Specification (3) = Agg. 4/7-Index; Specification (4) = Agg. 5/7-Index; Specification (5) = Agg. 2/7-Index; Specification (6) = Agg. 3/7-Index. Since the average level of MPPs is lower in advanced countries than in emerging markets, we center the selection of our MPP definitions around a lower value in advanced countries.

Marginal effects of MPP depending on banking sector structure



Statistical and economic significance of results

| Distribution Measure | RQ Index | Cost-to-Inc. | Cre.-to-Dep. | All Three Jointly |
|--|----------|--------------|--------------|-------------------|
| Statistical Significance | | | | |
| Mean | | | | |
| Marg. Effect | -1.02 | -0.30 | -0.52 | -0.95 |
| P-value | 0.03 | 0.39 | 0.18 | 0.02 |
| Memo: Value of Fin. Var. | 0.45 | 59.63 | 110.93 | all three |
| Median | | | | |
| Marg. Effect | -0.69 | -0.38 | -0.15 | -0.53 |
| P-value | 0.08 | 0.29 | 0.63 | 0.09 |
| Memo: Value of Fin. Var. | 0.32 | 58.86 | 99.54 | all three |
| 25th/75th (in favor) | | | | |
| Marg. Effect | -2.93 | -1.11 | -1.29 | -3.44 |
| P-value | 0.01 | 0.03 | 0.06 | 0.00 |
| Memo: Value of Fin. Var. | 1.22 | 51.87 | 134.07 | all three |
| 10th/90th (in favor) | | | | |
| Marg. Effect | -3.92 | -1.81 | -2.28 | -5.39 |
| P-value | 0.00 | 0.01 | 0.04 | 0.00 |
| Memo: Value of Fin. Var. | 1.62 | 45.20 | 163.71 | all three |
| Economic Significance | | | | |
| Local Mean | | | | |
| Share of Marg. Eff. to LHS Mean [in %] | -87.65 | -65.92 | -68.73 | -57.74 |
| Memo: Decile of Fin. Var. | 8 | 3 | 8 | all three |
| Memo: Local Marg. Effect | -2.92 | -1.09 | -1.30 | -3.70 |
| Memo: Corresponding p-value | 0.01 | 0.03 | 0.06 | 0.001 |
| Memo: Local Mean of LHS Var. | 3.34 | 1.66 | 1.89 | 6.41 |

Spillovers across asset classes and countries

| LHS: Varies (see Note) | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|--|----------------------|---------------------|---------------------|--------------------|--------------------|---------------------|---------------------|----------------------|
| DMPP _{i,t} | -2.833 (0.149) | -4.406 (0.223) | -0.741 (0.842) | -10.168 (0.233) | -5.154* (0.077) | -2.905 (0.168) | -0.721 (0.550) | 8.813 (0.188) |
| DMPP _{i,t} x RQ Index _{i,t-1} | -1.641*** (0.006) | -1.811* (0.056) | -1.670** (0.049) | -0.077 (0.942) | 1.772 (0.144) | -1.408** (0.019) | -0.808 (0.147) | -2.836 (0.314) |
| DMPP _{i,t} x Cost-to-Income _{i,t-1} | 0.088*** (0.003) | 0.130*** (0.009) | 0.057* (0.100) | 0.202 (0.203) | 0.027 (0.486) | 0.091*** (0.004) | 0.036* (0.091) | 0.131* (0.089) |
| DMPP _{i,t} x Credit-to-Dep _{i,t-1} | -0.024* (0.090) | -0.039 (0.107) | -0.017 (0.405) | -0.011 (0.353) | 0.005 (0.686) | -0.022 (0.142) | -0.015** (0.041) | -0.121*** (0.000) |
| DMPPINT _{i,t} | | | | | | 1.196 (0.622) | -0.260 (0.921) | -2.464 (0.793) |
| DMPPINT _{i,t} x INT RQ Index _{i,t-1} | | | | | | -1.098** (0.035) | -1.104* (0.079) | 21.876*** (0.010) |
| DMPPINT _{i,t} x INT Cost-to-Income _{i,t-1} | | | | | | 0.032 (0.472) | -0.015 (0.588) | -0.632*** (0.002) |
| DMPPINT _{i,t} x INT Credit-to-Dep _{i,t-1} | | | | | | -0.034** (0.045) | 0.010 (0.524) | 0.177*** (0.005) |
| Time Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dom. Macro Var. Incl. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Dom. Fin. Var. Incl. | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Foreign Fin. Var. Incl. | No | No | No | No | No | Yes | Yes | Yes |
| Observations | 862 | 872 | 579 | 600 | 617 | 862 | 571 | 291 |
| R-squared | 0.29 | 0.29 | 0.25 | 0.27 | 0.41 | 0.30 | 0.27 | 0.45 |
| Countries | 66 | 67 | 45 | 46 | 47 | 66 | 45 | 25 |

Conclusion

- Literature does not provide **convincing evidence** that MPPs are effective in reducing capital inflows.
- We show that **the structure of the domestic financial system** plays an important role for the effectiveness of MPPs with respect to bank flows
 - Higher regulatory quality and a higher credit-to-deposit ratio increases MPP effectiveness, while a higher cost-to-income ratio has the opposite effect.
 - The introduction of an MPP leads to a reduction of bank flows as a % of GDP of around 3.5 percentage points.
- We also find evidence of **spillover effects** from MPPs
 - We find that the structure of the domestic banking sector underpins asset class spillovers from MPPs.
 - Geographical spillover effects are a function of banking sector conditions both at home and abroad.

Policy implications

- In turbulent times, when capital flows are volatile and countries want to rely on MPPs to tame such flows, it is important to maintain a **stable financial system with a high degree of regulatory quality and a profitable banking sector**.
- The assessment and categorisation of spillovers following the introduction of MPPs is a function of **domestic and international financial conditions** and therefore complex.
- As a result, while devising a multilateral macroprudential framework is fraught with difficulty, our results support the fostering of **well-regulated and healthy banking sectors** that allow sufficient room for manoeuvre when such policies should be used.

Reserve slides

Measurement of MPPs

- Source:
 - Replication of the MPP indices from Qureshi, Ostry, Ghosh and Chamon (JIE, 2012)
- Description:
 - MPP indices are based on the IMF's AREAER database; the authors focus on restrictions specifically to the financial sector (we obtain a hybrid measure between capital controls and MPPs in one case)
 - The measures are designed as an average over dummy variables that take on the value of 1 during the entire period when an MPP is in place
- The MPP Indices 1-4 (based on sums over dummy variables and enter linearly):
 - **1. & 2. Capital Controls to the Financial Sector (Q_fincont1, Q_fincont2)**
 - Version 1: Borrowing abroad + Differential treatment of deposit accounts held by non-residents
 - Version 2: Version 1 + Maintenance of accounts abroad
 - **3. & 4. FX-related Prudential Regulations (Q_fxreg1, Q_fxreg1)**
 - Version 1: Lending locally in foreign exchange + Differential treatment of deposit accounts in foreign exchange
 - Version 2: Version 1 + two additional restrictions

Measurement of MPPs

We compute three additional sets of indices:

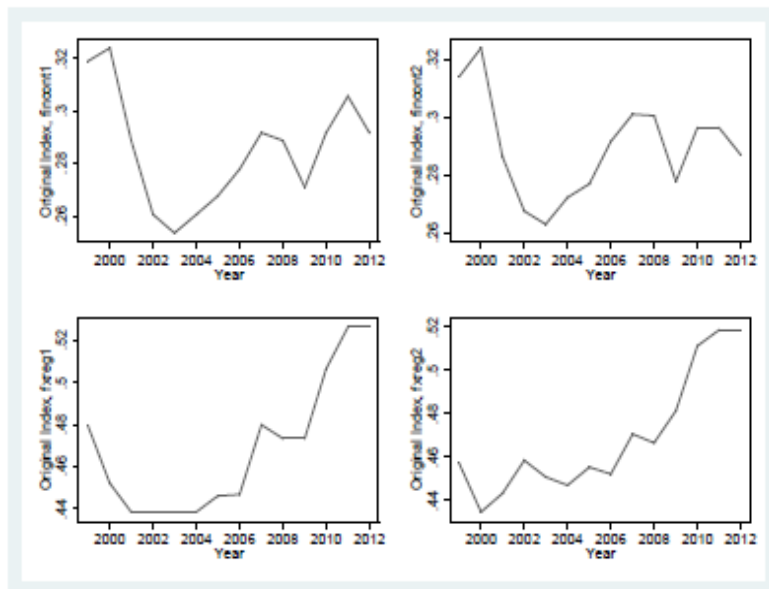
- Four dummy variables that identify the individual policy stance based on fincont1 and fxreg1
 - i.e., high (average ≥ 0.5) and a very high (average = 1)
- Four dummy variables that identify the strength of the aggregated policy stance of fincont1 and fxreg1
 - i.e., dummies with stepwise higher cut-offs (sum $\geq 1, 2, 3, =4$)
- Seven dummy variables that identify the strength of the aggregated policy stance of all seven subcomponents that underlie the construction of fincont1/2 and fxreg1/2
 - i.e., dummies with stepwise higher cut-offs (sum $\geq 1, 2, 3, 4, 5, 6, =7$)

Number of MPP Incidents

| MPP index | Obs. | Mean | Std. | Min. | Max. |
|---------------------------|-------------|-------------|-------------|-------------|-------------|
| <u>Original Indices</u> | | | | | |
| Original Index, fincont1 | 959 | 0.29 | 0.36 | 0 | 1 |
| Original Index, fincont2 | 959 | 0.29 | 0.34 | 0 | 1 |
| Original Index, fxreg1 | 994 | 0.48 | 0.43 | 0 | 1 |
| Original Index, fxreg2 | 916 | 0.48 | 0.36 | 0 | 1 |
| <u>Aggregated Indices</u> | | | | | |
| Agg. 1/7-index | 892 | 0.77 | 0.42 | 0 | 1 |
| Agg. 4/7-index | 892 | 0.38 | 0.48 | 0 | 1 |
| Agg. 7/7-index | 892 | 0.05 | 0.21 | 0 | 1 |

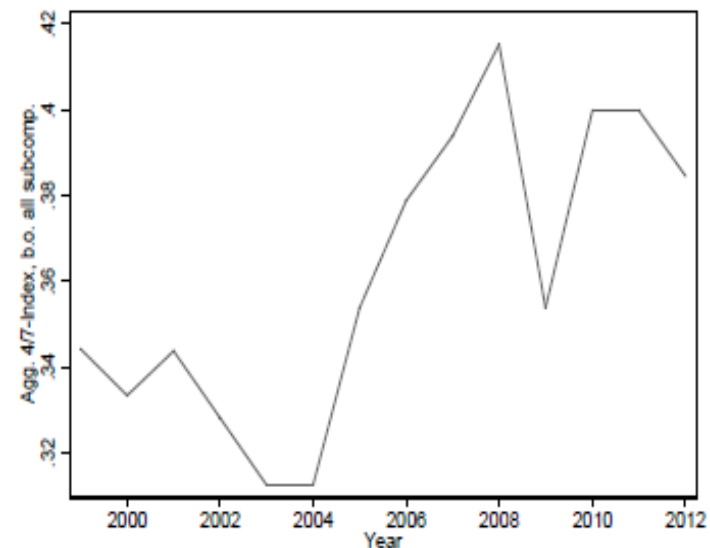
- The first set of indices displays the four original indices from the Qureshi (2012) paper
- The second set of indices shows the bottom, the median, and the top index aggregated over all seven subcomponents of the four original indices
 - The share of MPPs in place varies highly according to the definition
 - For most of the paper, we will select the median category (which has a similar average value as the original indices)

Development of MPPs over Time

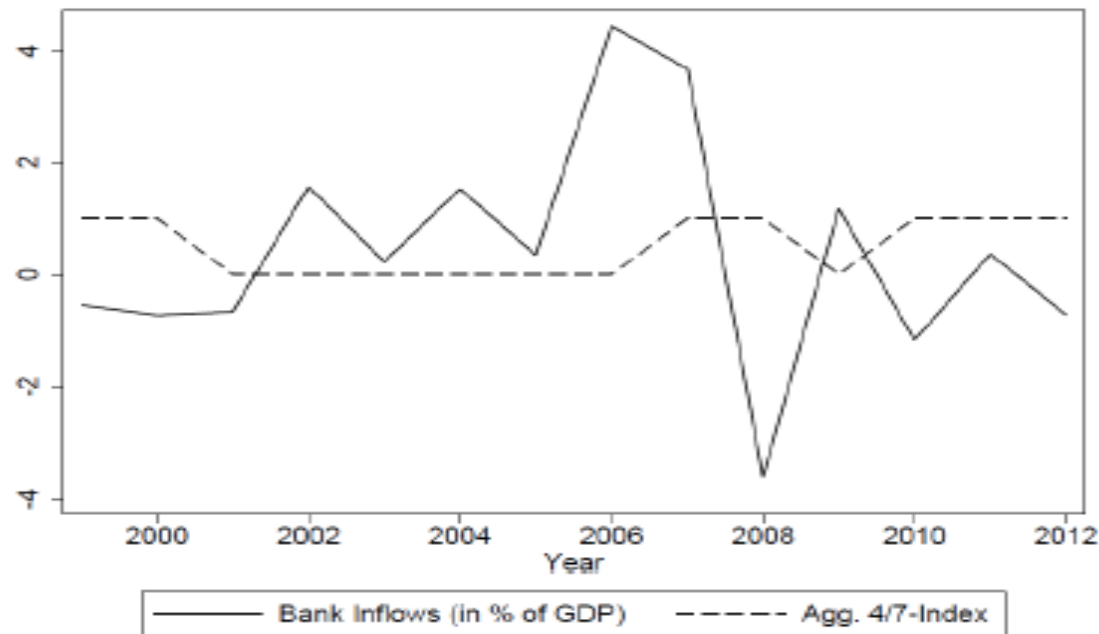


- All measures have (at least local) peaks in the global financial crisis, some of them peak additionally around 2000

- Qureshi et al. (2012), left
- Aggregated index, based on all subcategories in Qureshi et al. (2012), below



Our MPP measure and bank flows in South Korea



- From 1999 to 2012, there exists a **negative correlation** (-0.42).
- **QE led to a rise in capital inflows to South Korea** (like many other emerging economies) over the period 2008 to 2009 as investors searched for yield.
- In December 2009, South Korea introduced **MPPs aimed at the domestic banking sector to reduce systemic risk**.