EUROPEAN CENTRAL BANK

EUROSYSTEM

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

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Outline

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- Related literature
- The role of the banking sector
- 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 cyclicality** 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

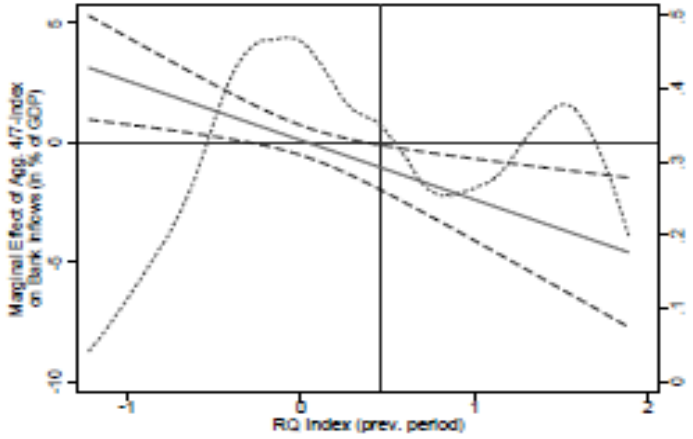
LHS: Bank Inflows (in % of GDP)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$DMPP_{i,t}$	-0.292	0.100	4.262*	-6.571***	0.211	3.164**	7.695***	-2.833	2.339
	(0.413)	(0.749)	(0.069)	(0.005)	(0.930)	(0.035)	(0.004)	(0.149)	(0.297)
$DMPP_{i,t}$ x RQ $Index_{i,t-1}$		-2.483***	-2.656***					-1.641***	-1.949**
		(0.004)	(0.001)					(0.006)	(0.024)
$DMPP_{i,t}$ x $Cost\text{-}to\text{-}Income_{i,t-1}$				0.105***	0.076**			0.088***	0.066**
				(0.004)	(0.012)			(0.003)	(0.020)
$DMPP_{i,t}$t x $Credit\text{-}to\text{-}Dep._{i,t-1}$						-0.033**	-0.027**	-0.024*	-0.022*
						(0.033)	(0.038)	(0.090)	(0.098)
RQ $Index_{i,t-1}$	0.747	2.268***	2.049***	0.838*	0.843*	0.728*	0.656	1.814***	1.689**
	(0.120)	(0.003)	(0.008)	(0.060)	(0.097)	(0.062)	(0.139)	(0.005)	(0.022)
$Cost\text{-}to\text{-}Income_{i,t-1}$	-0.065***	-0.068***	-0.065***	-0.096***	-0.085***	-0.064***	-0.062***	-0.093***	-0.084***
	(0.004)	(0.003)	(0.002)	(0.001)	(0.001)	(0.003)	(0.003)	(0.001)	(0.001)
$Credit\text{-}to\text{-}Dep._{i,t-1}$	0.011*	0.010	0.012*	0.011*	0.013**	0.024**	0.023**	0.020*	0.020*
	(0.096)	(0.135)	(0.063)	(0.069)	(0.042)	(0.027)	(0.024)	(0.057)	(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

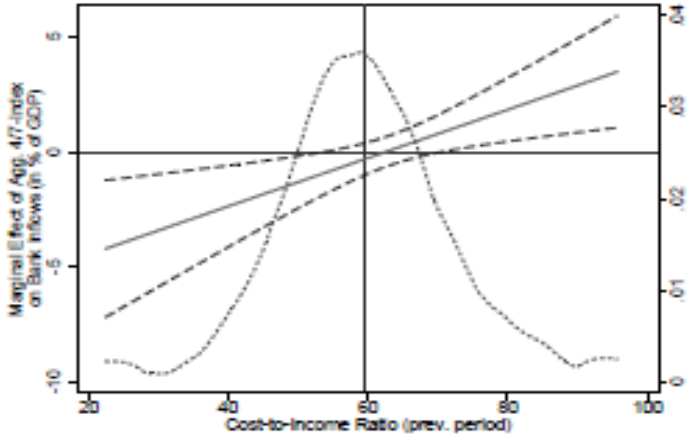
Additional results for Emerging v. Advanced economies

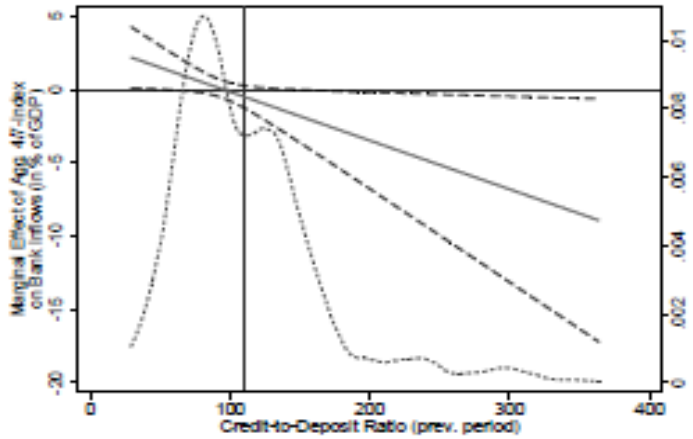
	All	*Emerging*			*Advanced*	
LHS: Bank Inflows (in % of GDP)	(1)	(2)	(3)	(4)	(5)	(6)
$DMPP_{i,t}$	-2.833	0.999	-1.369	-1.395	0.584	1.135
	(0.149)	(0.608)	(0.267)	(0.224)	(0.883)	(0.818)
$DMPP_{i,t}$ x RQ $Index_{i,t-1}$	-1.641***	-1.654*	-1.199**	-0.832**	-1.616	-0.044
	(0.006)	(0.084)	(0.049)	(0.030)	(0.443)	(0.979)
$DMPP_{i,t}$ x $Cost\text{-}to\text{-}Income_{i,t-1}$	0.088***	0.011	0.039*	0.037*	0.225***	0.172**
	(0.003)	(0.756)	(0.080)	(0.070)	(0.006)	(0.013)
$DMPP_{i,t}$ x $Credit\text{-}to\text{-}Dep._{i,t-1}$	-0.024*	-0.016**	-0.011	-0.012	-0.113***	-0.107***
	(0.090)	(0.032)	(0.137)	(0.137)	(0.001)	(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







Note: This figure presents the marginal effects of $MPP_{i,t}$ on Bank Inflows (in % of GDP), depending on the value of the Regulatory Quality (RQ) variable (left top panel), the Cost-to-Income Ratio (right top panel), and the Credit-to-Deposit Ratio (left bottom panel). The corresponding coefficients are taken from Specifications (2), (4), and (6) in Table 1. The marginal effects (left vertical axis) are bordered by two confidence bands at the 95% level. The dotted distribution line (right vertical axis) describes the sample distribution of the lagged and winsorized values of the three financial variables.

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	-4.406	-0.741	-10.168	-5.154*	-2.905	-0.721	8.813
	(0.149)	(0.223)	(0.842)	(0.233)	(0.077)	(0.168)	(0.550)	(0.188)
$DMPP_{i,t}$ x RQ $Index_{i,t-1}$	-1.641***	-1.811*	-1.670**	-0.077	1.772	-1.408**	-0.808	-2.836
	(0.006)	(0.056)	(0.049)	(0.942)	(0.144)	(0.019)	(0.147)	(0.314)
$DMPP_{i,t}$ x Cost-to-$Income_{i,t-1}$	0.088***	0.130***	0.057*	0.202	0.027	0.091***	0.036*	0.131*
	(0.003)	(0.009)	(0.100)	(0.203)	(0.486)	(0.004)	(0.091)	(0.089)
$DMPP_{i,t}$ x Credit-to-$Dep._{i,t-1}$	-0.024*	-0.039	-0.017	-0.011	0.005	-0.022	-0.015**	-0.121***
	(0.090)	(0.107)	(0.405)	(0.353)	(0.686)	(0.142)	(0.041)	(0.000)
$DMPPINT_{i,t}$						1.196	-0.260	-2.464
						(0.622)	(0.921)	(0.793)
$DMPPINT_{i,t}$ x INT RQ $Index_{i,t-1}$						-1.098**	-1.104*	21.876***
						(0.035)	(0.079)	(0.010)
$DMPPINT_{i,t}$ x INT Cost-to-$Income_{i,t-1}$						0.032	-0.015	-0.632***
						(0.472)	(0.588)	(0.002)
$DMPPINT_{i,t}$ x INT Credit-to-$Dep._{i,t-1}$						-0.034**	0.010	0.177***
						(0.045)	(0.524)	(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 manoeuver 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:

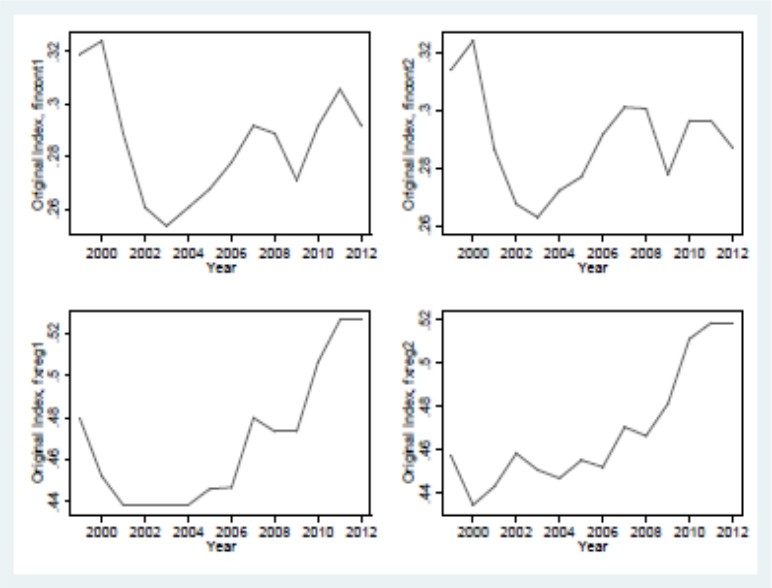
- Four dummy variables that identify the individual policy stance based on fincont1 and fxreg1
  - i.e., high (average >= 0.5) and a very high (average = 1)
- Four dummy variables that identify the strength of the aggregated policy stance of fincont1 and fxreg1
  - i.e., dummies with stepwise higher cut-offs (sum >= 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 >= 1, 2, 3, 4, 5, 6, =7)

Number of MPP Incidents

MPP index	Obs.	Mean	Std.	Min.	Max.
Original Indices					
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
Aggregated Indices					
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

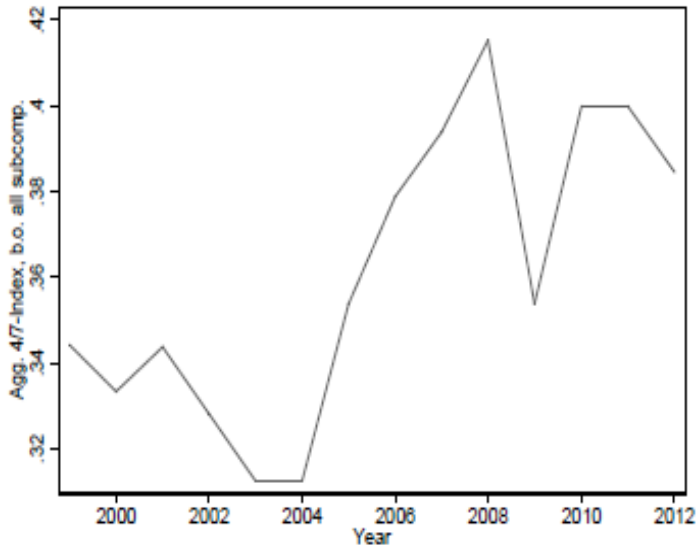
- The first set of indices displays the four original indices from the Qureshi (2012) paper
- The second set of indices shows the bottom, the median, and the top index aggregated over all seven subcomponents of the four original indices
  - The share of MPPs in place varies highly according to the definition
  - 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

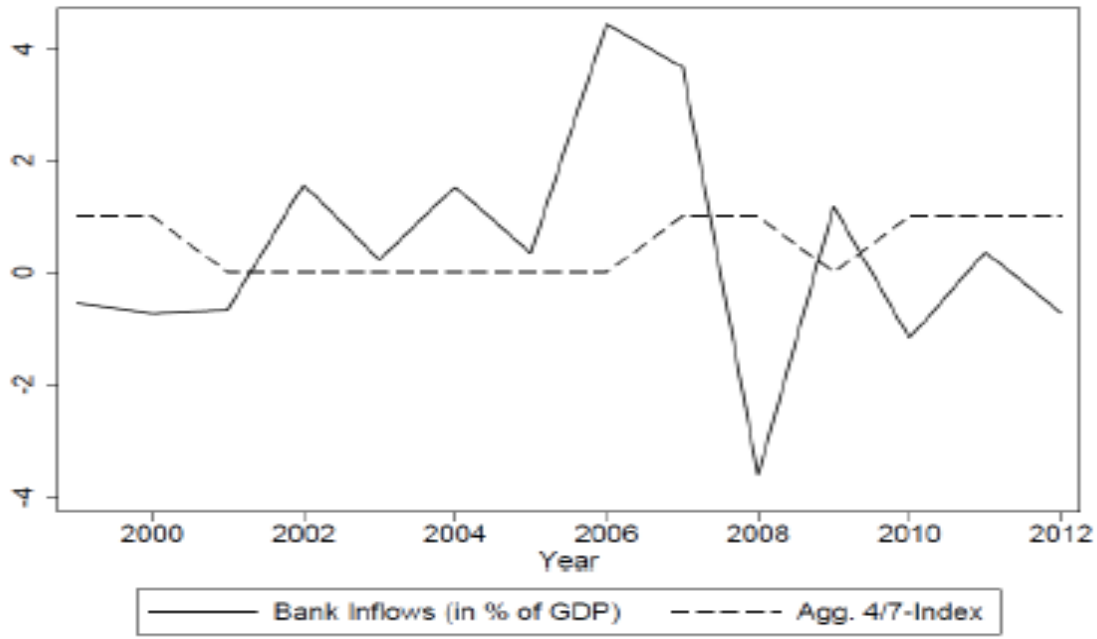


- All measures have (at least local) peaks in the global financial crisis, some of them peak additionally around 2000

- 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.**