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Capital Flows and Macroprudential Policies - A Multilateral Assessment of Effectiveness and Externalities

(joint with John Beirne, ECB)

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Motivation

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Outline and Contribution

- Goal of this paper: Examine the impact of Macroprudential Policies (MPPs) on international capital flows
  - We evaluate the effectiveness of MPPs *w.r.t.* to international bank capital flows by taking into account the state of the economy and the structure of the banking system
  - We add an international dimension to our analysis and assess the occurrence of capital flow spillovers *across* and *within* countries
  - We try to generalize the findings to a larger number of countries

- Background: Strong interest from policy institutions
  - Optimally managing capital inflows without discriminating foreigners
  - Gaining knowledge about side effects of domestically oriented MPPs
    - E.g., implementing policies effectively, designing international frameworks

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Related Literature

- IMF revised its view on the use of capital controls…
  - Ostry, Ghosh, Habermeier, Chamon, Qureshi, Reinhardt (IMF Staff Position Note, 2010)
- …and subsequently, initiated a large policy-oriented research program:
  - Focus on risk measurement, institutional frameworks for risk managing polcies, their effectiveness, and their multilateral consequences (anecdotal nature, no cross-country evidence)
- Literature on the effectiveness of MPPs:
  - MPPs are effective in reducing systemic risk; however, impact on capital flows is very limited
  - E.g., Lim, Columba, Costa, Kongsamut, Otani, Saiyid, Wezel, Wu (2011); Qureshi, Ostry, Ghosh, Chamon (JIE, 2012)
- Literature on international spillovers of MPPs:
  - Only very recently, papers provide actual empirical evidence of cross-country spillover effects
  - E.g., Giordani, Ruta, Weisfeld, Zhu (2014); Ghosh, Qureshi, Sugawara (2014); Pasricha, Falagiarda, Bijsterbosch, Aizenman (2015)

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Some Definitions

- Definition of the term "**Macroprudential Policy"** in the context of this paper – based on our reading of the literature and Borio (2003):
  - **Macroprudential Policy:** A policy that is targeted to all participants of the banking/financial system in order to reduce endogenous systemic risk (often only temporary)
  - **Microprudential Policy:** A policy that is targeted to an individual financial institution in order to reduce exogenous risks (usually of more permanent nature)
  - **Capital Control:** A policy that is applied by the residence principle and targeted to all non-residents of a country

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Macroprudential Policies

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Measurement of MPPs I: Qureshi/Ostry et al. (2012)

- 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:
  - **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

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Measurement of MPPs II: Lim et al. (2011)

- Source:
  - Based on anecdotal evidence/the MPP incidents listed in the appendix of Lim, Columba, Costa, Kongsamut, Otani, Saiyid, Wezel and Wu (2011)
- Description:
  - Dummy variables that take on the value of 1 on the introductory date of a MPP
- The MPP Indices 5-8:
  - **5. Foreign Exchange Restrictions (L_fxres)**
    - e.g. Caps on Foreign Currency Lending
  - **6. Credit Restrictions (L_credres)**
    - e.g. Ceilings on Credit or Credit Growth
  - **7. Capital Requirements (L_capreq)**
    - e.g. Countercyclical Capital Requirements
  - **8. Maturity Mismatch Restrictions (L_matres)**
    - e.g. Limits on Maturity Mismatches

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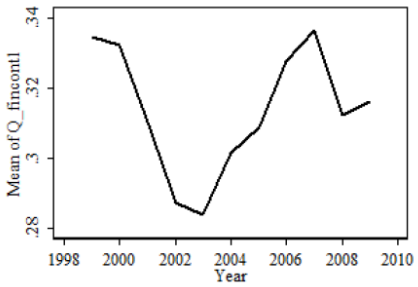
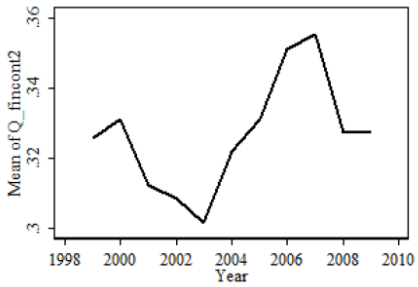
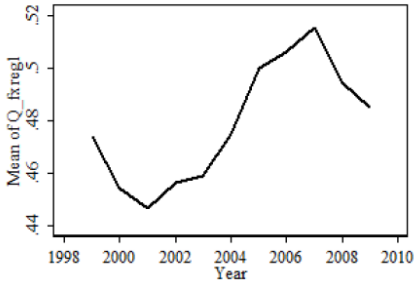
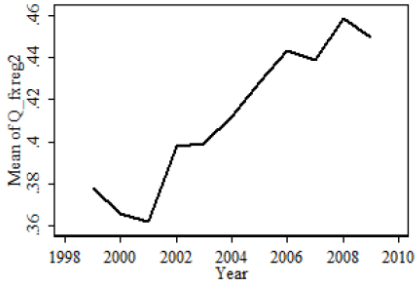
Development of MPPs over Time

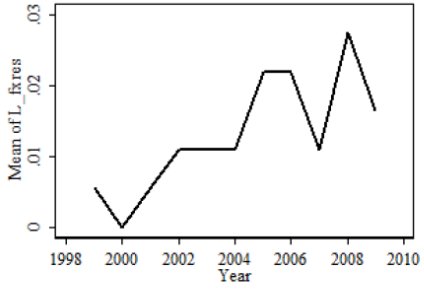


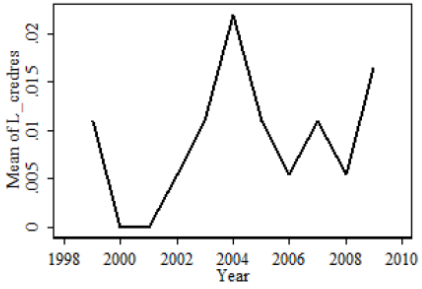


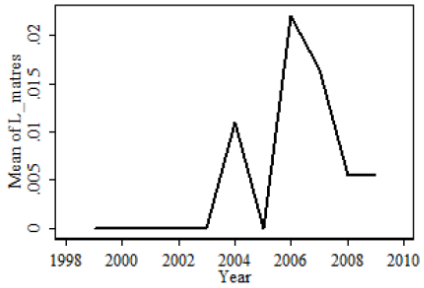


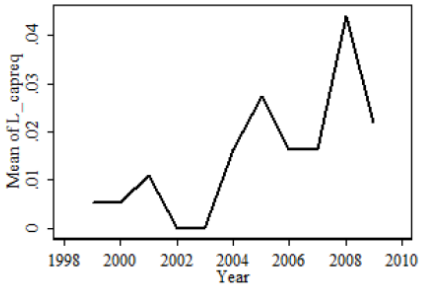


- Qureshi et al. (2012), left
- Lim et al. (2011), below









- Peaks are located around the year 2000 and the recent crisis

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Methodology and Data

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Measuring Geographical Spillovers

- We follow Forbes, Fratzscher, Kostka, Straub (2012): "Bubble thy neighbor: portfolio effects and externalities from capital controls"
  - Paper focuses on Brazil's tax on capital inflows from 2006 to 2011
  - Authors include a measure of the foreign policy stance in their specification ("international spillover term")

- We therefore construct two international MPP indices ($MPPINT_{i,t}$) based on the previously shown (domestic) MPP indices ($MPP_{i,t}$):
  - Version 1: Neighboring Country Version of $MPPINT_{i,t}$
    - GDP-weighted average of MPPs from immediate neighboring countries
    - Based on bilateral trade data from *CEPII*
  - Version 2: World Regions Version of $MPPINT_{i,t}$
    - GDP-weighted average of MPPs from all countries in a world region
    - Definition of 10 different world regions; largely based on continents, plus one residual category "Other Advanced Countries"

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Econometric Specification

- Baseline specification:

$$k_{i,t} = \alpha_i + \alpha_t + \beta X_{i,t-1} + \gamma MPP_{i,t} + \delta MPPINT_{i,t} + \lambda MPP_{i,t} \times X_{i,t-1} + \mu MPPINT_{i,t} \times X_{i,t-1} + \epsilon_{i,t}$$

- Total marginal effect for MPP:

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

- Total marginal effect for MPPINT:

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

$k_{i,t}$ = Bank Flows in % of GDP

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

$MPP_{i,t}$ = (Domestic) MPP Index

$MPPINT_{i,t}$ = International MPP Index

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Data

- Left-hand side variable: Bank Flows in % of GDP
  - Subcategory "Banks" in the category "Other Investment" on the liability side of the financial account of the Balance of Payments
- Macroeconomic controls (WEO database)
  - Real GDP growth rate
  - Inflation rate (highly correlated with interest and exchange rate)
  - Trade integration (imports + exports) in % of GDP
- Financial controls (FinStructure Database, World Bank)
  - Loans from non-resident banks in % of GDP → "International Exposure"
  - Return on assets in the banking system → "Profitability of the Banking System"
  - Private credit by banks in % of GDP → "Size of the Banking System"
- All variables are winsorized at the 1% level to reduce the impact of outliers

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Potential Channels

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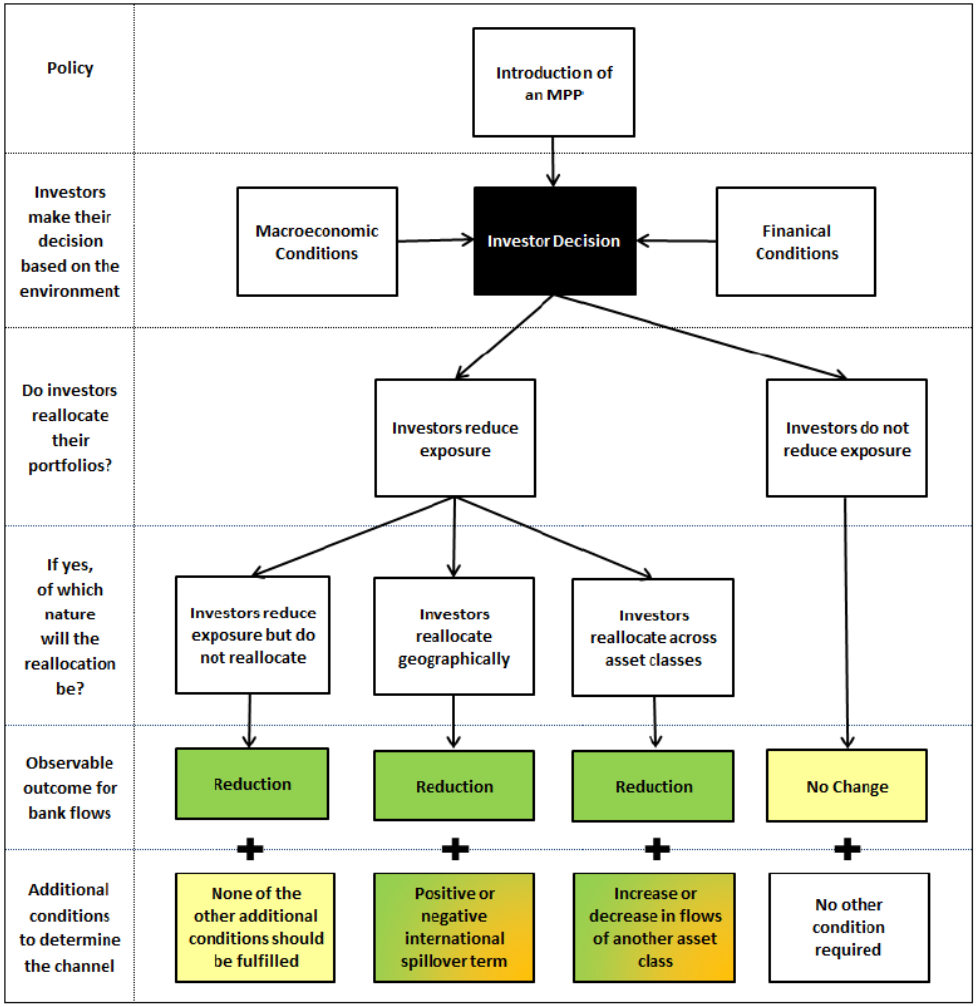
Identifying Potential Channels



- A framework to facilitate the interpretation of our empirical results:
  - e.g. what is the set of possible investor responses following the introduction of an MPP?
  - e.g. does an effective MPP necessarily lead to geographical spillovers?

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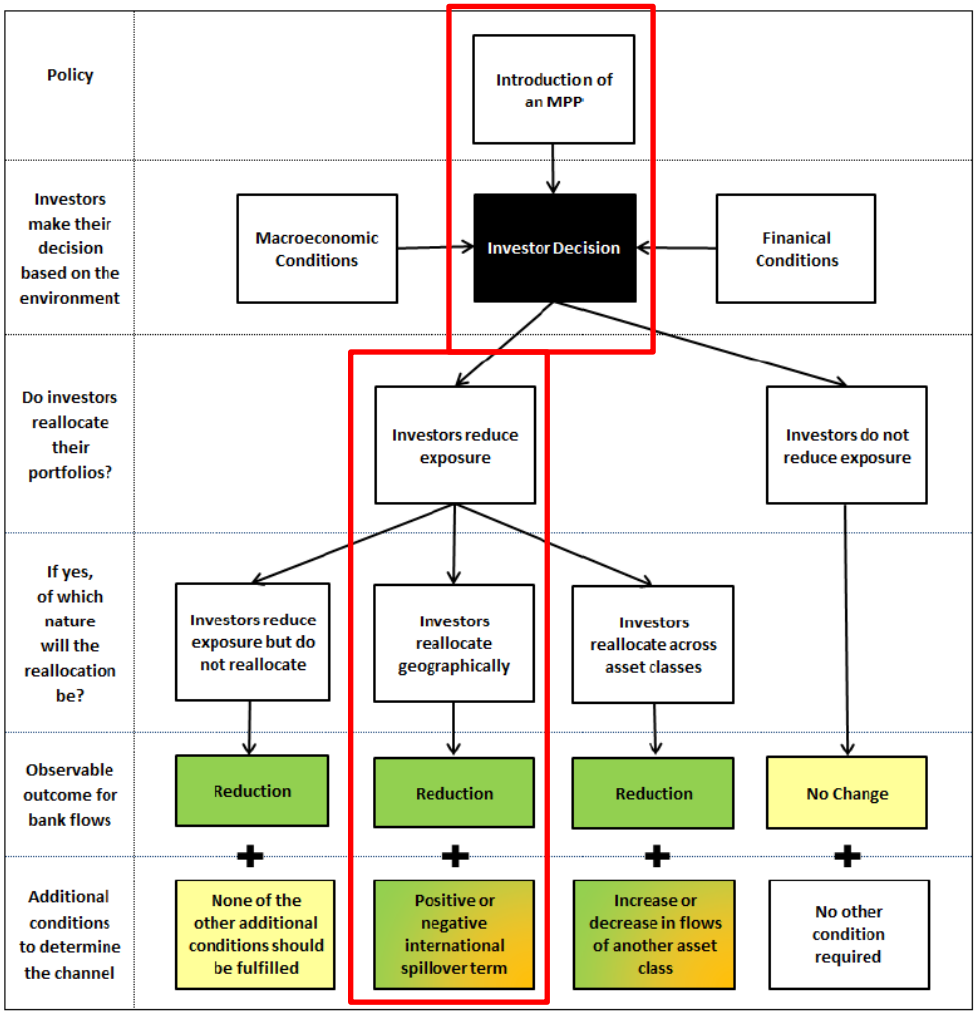
Identifying Potential Channels – An example



- Consider the introduction of an MPP:
  - If we observe a reduction in flows…
  - …and a positive coefficient on the spillover-term…
  - …this can indicate the presence of (negative) geo-graphical spillovers

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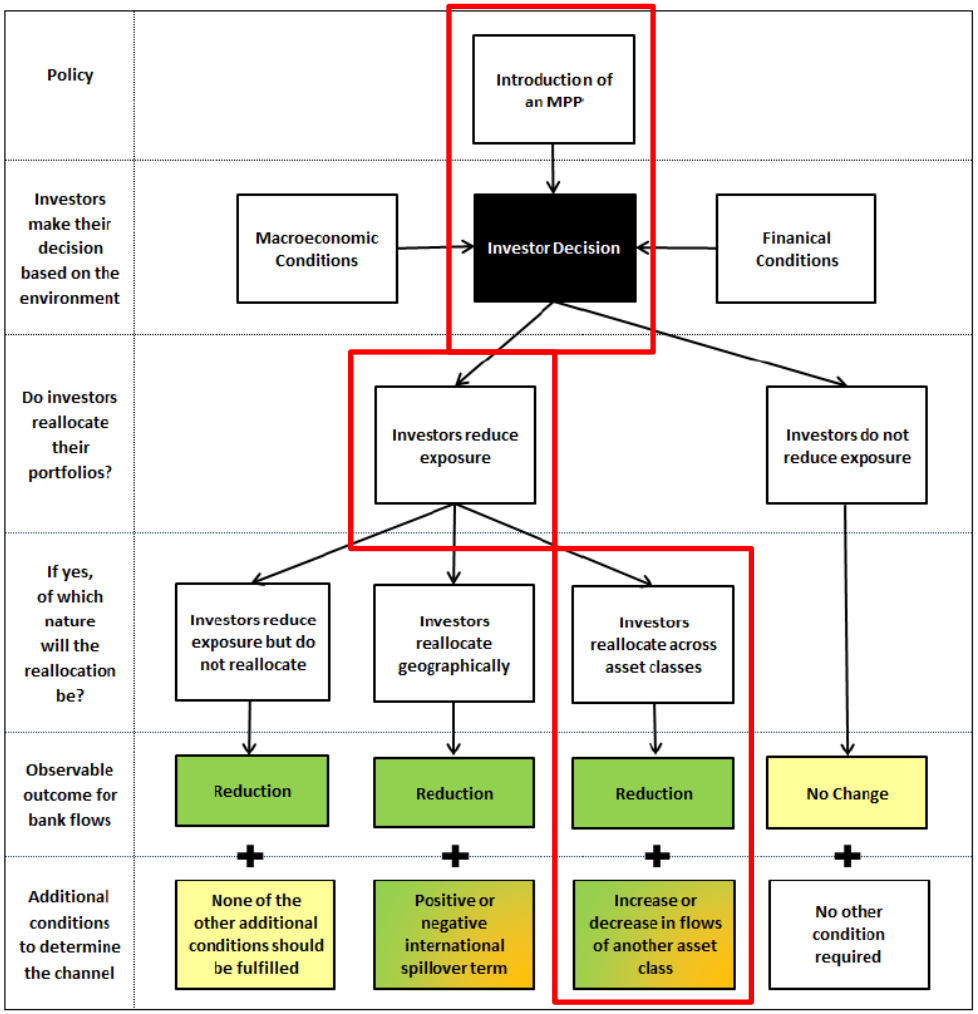
Identifying Potential Channels



- MPP is effective domestically and creates spillovers across asset classes (within a country)

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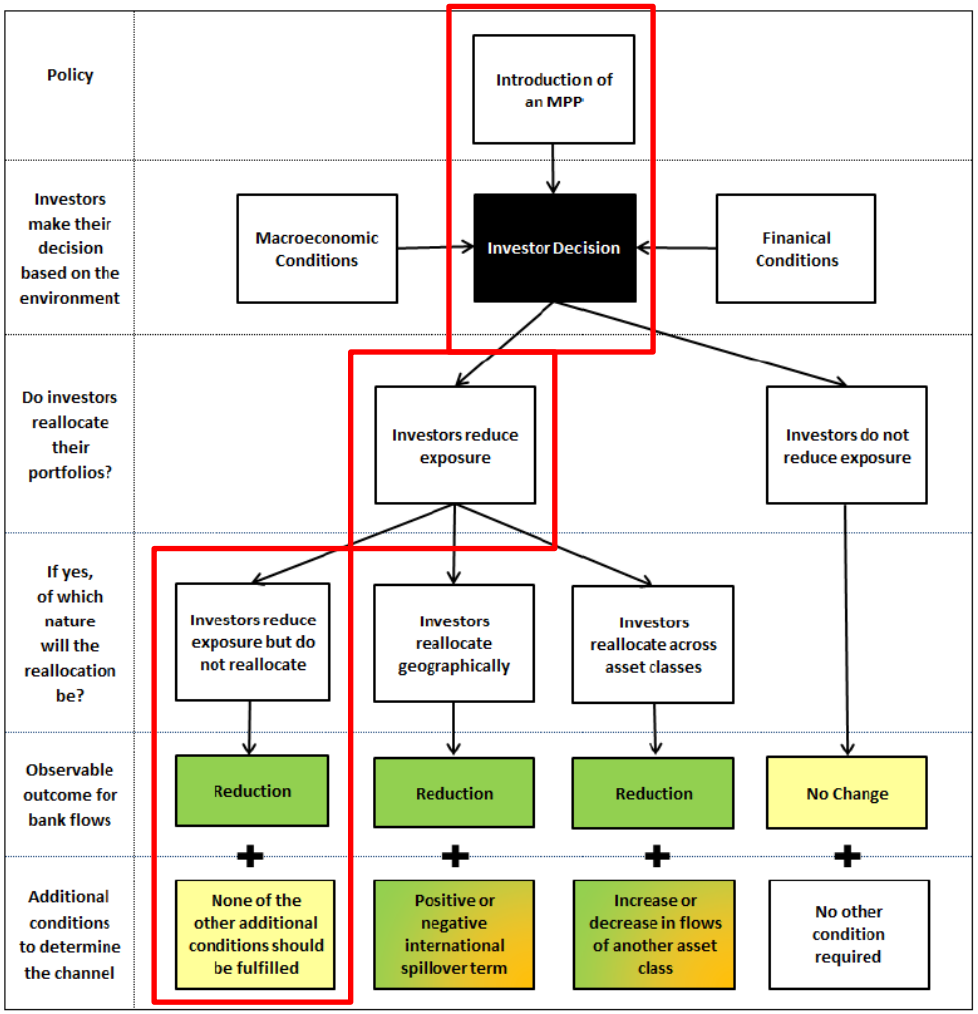
Identifying Potential Channels



- MPP is effective domestically and does not create any spillovers

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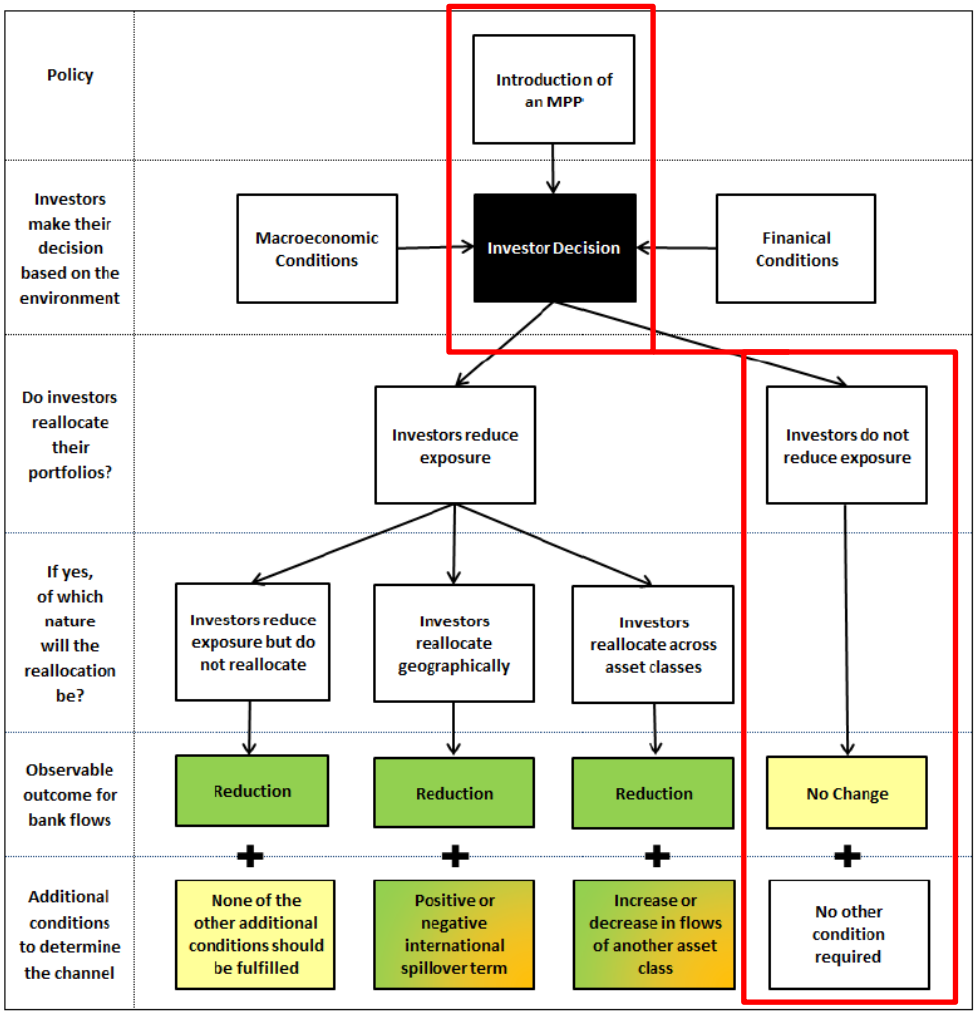
Identifying Potential Channels



- MPP is ineffective if it was targeting capital flows or does not affect capital flows otherwise

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Results

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Baseline Results – Neighboring Country Version I

Bank Flows	Q_fincont1	Q_fincont2	Q_fxreg1	Q_fxreg2	L_fxres	L_credres	L_matres	L_capreq
MPP	3.586	-6.373	0.113	-1.480	-1.833	0.118	4.420	-4.240
	(0.40)	(0.22)	(0.98)	(0.86)	(0.32)	(0.94)	(0.59)	(0.63)
MPPINT	-3.002	-5.653	-4.798	-8.979	-2.841	-7.679	11.980	3.353
	(0.57)	(0.25)	(0.31)	(0.21)	(0.48)	(0.42)	(0.43)	(0.33)
(1) NR-Loans	-0.089**	-0.105**	-0.108***	-0.162***	-0.046	-0.046	-0.048	-0.046
	(0.04)	(0.03)	(0.00)	(0.00)	(0.20)	(0.20)	(0.17)	(0.19)
(2) ROA	1.158*	1.410**	2.928***	3.423***	0.661**	0.623**	0.679**	0.600*
	(0.08)	(0.03)	(0.00)	(0.00)	(0.04)	(0.04)	(0.03)	(0.06)
(3) Privat Credit	0.019	0.030	0.006	0.037	-0.015	-0.014	-0.010	-0.015
	(0.71)	(0.58)	(0.91)	(0.47)	(0.77)	(0.79)	(0.85)	(0.78)
(4) Real Growth	0.439*	0.472*	0.518*	0.238	0.153	0.150	0.133	0.151
	(0.08)	(0.07)	(0.05)	(0.45)	(0.17)	(0.15)	(0.19)	(0.14)
(5) Inflation	0.089**	0.100**	0.127	0.206	0.034	0.033	0.030	0.034
	(0.02)	(0.01)	(0.15)	(0.12)	(0.21)	(0.21)	(0.22)	(0.19)
(6) Trade Integr.	-0.027	-0.077	-0.079	-0.093	-0.016	-0.015	-0.014	-0.015
	(0.70)	(0.18)	(0.17)	(0.27)	(0.73)	(0.73)	(0.75)	(0.74)

Level Terms

[For interaction terms, please see the next page]

Country-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1176	1175	1226	858	1291	1291	1291	1291
R-squared	0.16	0.19	0.21	0.26	0.12	0.12	0.13	0.13
Countries	134	134	134	117	139	139	139	139

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Baseline Results – Neighboring Country Version II

	Bank Flows		Q_fincont1	Q_fincont2	Q_fxreg1	Q_fxreg2	L_fxres	L_credres	L_matres	L_capreq
Inter-action Terms	(1) NR-Loans	x MPP	0.164***	0.191***	0.167**	0.212**	-0.146*	-0.055*	-0.078	-0.028
			(0.01)	(0.01)	(0.02)	(0.04)	(0.10)	(0.06)	(0.14)	(0.82)
	(2) ROA	x MPP	-0.169	-0.614	-1.429***	-1.903**	-3.302***	0.998	-0.147	4.094*
			(0.79)	(0.42)	(0.01)	(0.05)	(0.00)	(0.16)	(0.94)	(0.09)
	(3) Privat Credit	x MPP	-0.143**	-0.040	0.047	0.081	0.013	0.010	-0.013	0.036
			(0.04)	(0.51)	(0.39)	(0.34)	(0.68)	(0.63)	(0.83)	(0.26)
	(4) Real Growth	x MPP	-0.323	-0.350	-0.343	0.135	1.128**	-0.880**	-1.249***	-1.245***
			(0.25)	(0.20)	(0.17)	(0.68)	(0.04)	(0.01)	(0.00)	(0.01)
	(5) Inflation	x MPP	-0.057	-0.070	-0.060	-0.082	-0.035	0.119	0.286	0.451
			(0.34)	(0.41)	(0.23)	(0.64)	(0.57)	(0.17)	(0.18)	(0.34)
	(6) Trade Integr.	x MPP	-0.006	0.096	0.008	-0.005	0.049*	0.035	0.026	0.027
			(0.89)	(0.14)	(0.87)	(0.93)	(0.06)	(0.21)	(0.10)	(0.44)
	(1) NR-Loans	x MPPINT	-0.066	-0.112	-0.052	-0.063	-0.034***	-0.057*	0.101*	0.092***
			(0.36)	(0.13)	(0.19)	(0.35)	(0.00)	(0.07)	(0.08)	(0.00)
	(2) ROA	x MPPINT	-1.733*	-2.115*	-2.506**	-3.276**	-0.861*	-0.063	-2.272	0.489
			(0.09)	(0.06)	(0.02)	(0.01)	(0.08)	(0.97)	(0.16)	(0.48)
	(3) Privat Credit	x MPPINT	-0.001	0.008	0.026	0.077	0.009	0.376	-0.161**	-0.038
			(0.99)	(0.91)	(0.70)	(0.19)	(0.88)	(0.18)	(0.01)	(0.48)
	(4) Real Growth	x MPPINT	-0.501	-0.492	-0.331	-0.451	0.121	1.368	0.626	-0.288
			(0.16)	(0.20)	(0.27)	(0.24)	(0.74)	(0.35)	(0.44)	(0.38)
	(5) Inflation	x MPPINT	-0.035	-0.060	-0.074	-0.154*	-0.012	0.003	-2.376*	0.079
			(0.70)	(0.44)	(0.40)	(0.08)	(0.89)	(0.97)	(0.07)	(0.70)
	(6) Trade Integr.	x MPPINT	0.101	0.143**	0.114***	0.180**	0.036	-0.088	-0.021	-0.039
			(0.15)	(0.02)	(0.01)	(0.02)	(0.21)	(0.54)	(0.90)	(0.24)

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Baseline Results – Neighboring Country Version II

	Bank Flows	Q_fincont1	Q_fincont2	Q_fxreg1	Q_fxreg2	L_fxres	L_credres	L_matres	L_capreq
(1) NR-Loans	x MPP	0.164***	0.191***	0.167**	0.212**	-0.146*	-0.055*	-0.078	-0.028
		(0.01)	(0.01)	(0.02)	(0.04)	(0.10)	(0.06)	(0.14)	(0.82)
(2) ROA	x MPP	-0.169	-0.614	-1.429***	-1.903**	-3.302***	0.998	-0.147	4.094*
		(0.79)	(0.42)	(0.01)	(0.05)	(0.00)	(0.16)	(0.94)	(0.09)
(3) Privat Credit	x MPP	-0.143**	-0.040	0.047	0.081	0.013	0.010	-0.013	0.036
		(0.04)	(0.51)	(0.39)	(0.34)	(0.68)	(0.63)	(0.83)	(0.26)
(4) Real Growth	x MPP	-0.323	-0.350	-0.343	0.135	1.128**	-0.880**	-1.249***	-1.245***
		(0.25)	(0.20)	(0.17)	(0.68)	(0.04)	(0.01)	(0.00)	(0.01)
(5) Inflation	x MPP	-0.057	-0.070	-0.060	-0.082	-0.035	0.119	0.286	0.451
		(0.34)	(0.41)	(0.23)	(0.64)	(0.57)	(0.17)	(0.18)	(0.34)
(6) Trade Integr.	x MPP	-0.006	0.096	0.008	-0.005	0.049*	0.035	0.026	0.027
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		(0.36)	(0.13)	(0.19)	(0.35)	(0.00)	(0.07)	(0.08)	(0.00)
(2) ROA	x MPPINT	-1.733*	-2.115*	-2.506**	-3.276**	-0.861*	-0.063	-2.272	0.489
		(0.09)	(0.06)	(0.02)	(0.01)	(0.08)	(0.97)	(0.16)	(0.48)
(3) Privat Credit	x MPPINT	-0.001	0.008	0.026	0.077	0.009	0.376	-0.161**	-0.038
		(0.99)	(0.91)	(0.70)	(0.19)	(0.88)	(0.18)	(0.01)	(0.48)
(4) Real Growth	x MPPINT	-0.501	-0.492	-0.331	-0.451	0.121	1.368	0.626	-0.288
		(0.16)	(0.20)	(0.27)	(0.24)	(0.74)	(0.35)	(0.44)	(0.38)
(5) Inflation	x MPPINT	-0.035	-0.060	-0.074	-0.154*	-0.012	0.003	-2.376*	0.079
		(0.70)	(0.44)	(0.40)	(0.08)	(0.89)	(0.97)	(0.07)	(0.70)
(6) Trade Integr.	x MPPINT	0.101	0.143**	0.114***	0.180**	0.036	-0.088	-0.021	-0.039
		(0.15)	(0.02)	(0.01)	(0.02)	(0.21)	(0.54)	(0.90)	(0.24)

- A high share of non-resident bank loans reduces the effectiveness of MPPs

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Baseline Results – Neighboring Country Version II

	Bank Flows	Q_fincont1	Q_fincont2	Q_fxreg1	Q_fxreg2	L_fxres	L_credres	L_matres	L_capreq
(1) NR-Loans	x MPP	0.164***	0.191***	0.167**	0.212**	-0.146*	-0.055*	-0.078	-0.028
		(0.01)	(0.01)	(0.02)	(0.04)	(0.10)	(0.06)	(0.14)	(0.82)
(2) ROA	x MPP	-0.169	-0.614	-1.429***	-1.903**	-3.302***	0.998	-0.147	4.094*
		(0.79)	(0.42)	(0.01)	(0.05)	(0.00)	(0.16)	(0.94)	(0.09)
(3) Privat Credit	x MPP	-0.143**	-0.040	0.047	0.081	0.013	0.010	-0.013	0.036
		(0.04)	(0.51)	(0.39)	(0.34)	(0.68)	(0.63)	(0.83)	(0.26)
(4) Real Growth	x MPP	-0.323	-0.350	-0.343	0.135	1.128**	-0.880**	-1.249***	-1.245***
		(0.25)	(0.20)	(0.17)	(0.68)	(0.04)	(0.01)	(0.00)	(0.01)
(5) Inflation	x MPP	-0.057	-0.070	-0.060	-0.082	-0.035	0.119	0.286	0.451
		(0.34)	(0.41)	(0.23)	(0.64)	(0.57)	(0.17)	(0.18)	(0.34)
(6) Trade Integr.	x MPP	-0.006	0.096	0.008	-0.005	0.049*	0.035	0.026	0.027
		(0.89)	(0.14)	(0.87)	(0.93)	(0.06)	(0.21)	(0.10)	(0.44)
(1) NR-Loans	x MPPINT	-0.066	-0.112	-0.052	-0.063	-0.034***	-0.057*	0.101*	0.092***
		(0.36)	(0.13)	(0.19)	(0.35)	(0.00)	(0.07)	(0.08)	(0.00)
(2) ROA	x MPPINT	-1.733*	-2.115*	-2.506**	-3.276**	-0.861*	-0.063	-2.272	0.489
		(0.09)	(0.06)	(0.02)	(0.01)	(0.08)	(0.97)	(0.16)	(0.48)
(3) Privat Credit	x MPPINT	-0.001	0.008	0.026	0.077	0.009	0.376	-0.161**	-0.038
		(0.99)	(0.91)	(0.70)	(0.19)	(0.88)	(0.18)	(0.01)	(0.48)
(4) Real Growth	x MPPINT	-0.501	-0.492	-0.331	-0.451	0.121	1.368	0.626	-0.288
		(0.16)	(0.20)	(0.27)	(0.24)	(0.74)	(0.35)	(0.44)	(0.38)
(5) Inflation	x MPPINT	-0.035	-0.060	-0.074	-0.154*	-0.012	0.003	-2.376*	0.079
		(0.70)	(0.44)	(0.40)	(0.08)	(0.89)	(0.97)	(0.07)	(0.70)
(6) Trade Integr.	x MPPINT	0.101	0.143**	0.114***	0.180**	0.036	-0.088	-0.021	-0.039
		(0.15)	(0.02)	(0.01)	(0.02)	(0.21)	(0.54)	(0.90)	(0.24)

- A more profitable banking system increases the effectiveness of MPPs

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Baseline Results – Neighboring Country Version II

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(6) Trade Integr.	x MPPINT	0.101	0.143**	0.114***	0.180**	0.036	-0.088	-0.021	-0.039
		(0.15)	(0.02)	(0.01)	(0.02)	(0.21)	(0.54)	(0.90)	(0.24)

- A more profitable banking system reduces the probability of geographical spillovers

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		(0.15)	(0.02)	(0.01)	(0.02)	(0.21)	(0.54)	(0.90)	(0.24)

- A high degree of trade integration increases the probability of geographical spillovers

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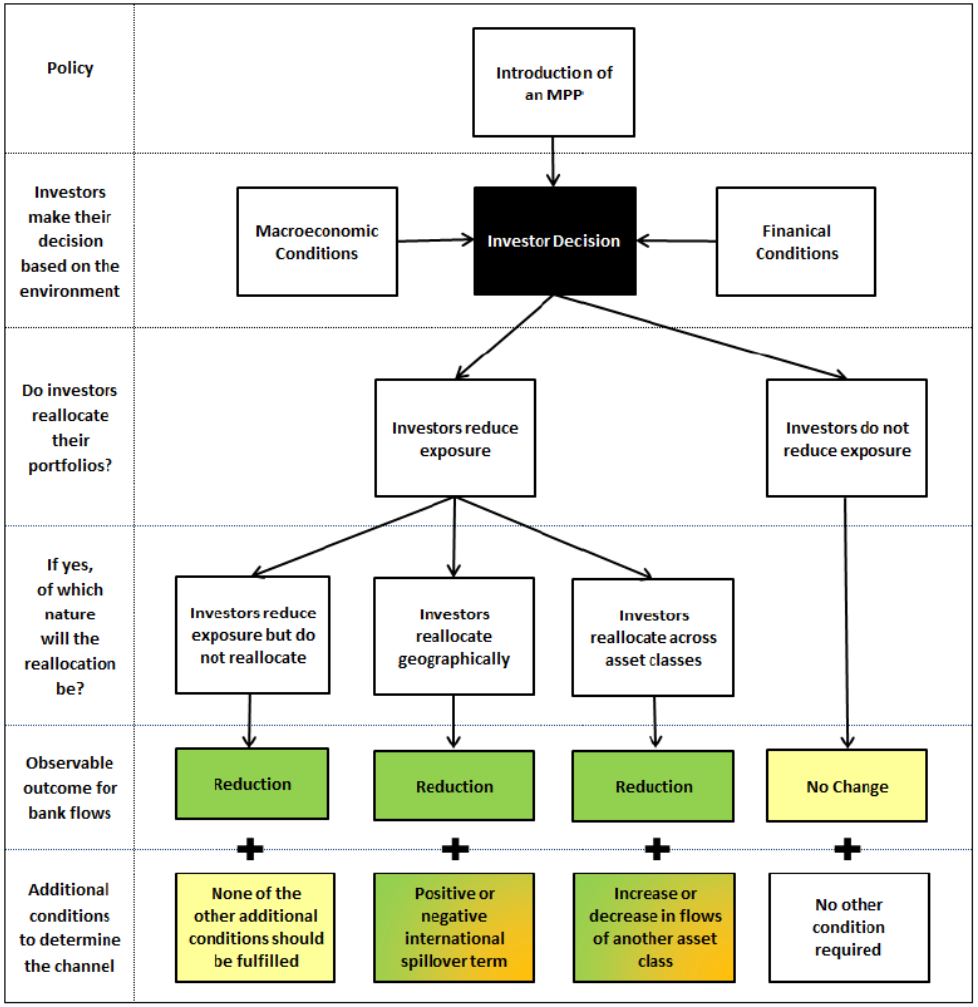
Recall the Investor Decision Framework



- To be able to assess potential channels, we have to examine the total marginal effects of both:
  - MPP and
  - MPPINT

  on bank flows

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Examining the Economic Relevance

- We evaluate the two total marginal effects at the 25th and the 75th percentile of the distribution of each control variable. This yields 64 (= 2^6) different hypothetical combinations.
- The table below shows the share of results that pass an F-test for significance of the total marginal effects (at the 90 %-level)

Policies:	Q_fincont1	Q_fincont2	Q_fxreg1	Q_fxreg2	L_fxres	L_credres	L_matres	L_capreq
Domestic Effect								
Reduction in Flows	23.4	12.5	1.6	0	12.5	9.4	6.3	9.4
No Effect	67.2	79.7	90.6	82.8	56.3	57.8	71.9	67.2
Increase in Flows	9.4	7.8	7.8	17.2	31.3	32.8	21.9	23.4
International Spillover Effect (Neighboring Country)								
Reduction in Flows	6.3	18.8	12.5	6.3	1.6	0	35.9	3.1
No Effect	93.8	78.1	76.6	65.6	98.4	100	64.1	95.3
Increase in Flows	0	3.1	10.9	28.1	0	0	0	1.6

- We observe a fair share of cases, in which MPPs have a reducing effect on bank flows
- Mostly, we do not observe such an effect: hence, financial and macroeconomic environments matter!
- There are some cases of geographical spillovers; however, their signs can go either way

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Robustness and Sensitivity

- Alternative measure of the international MPP index
  - The World Region Version of the international MPP index shows similar results for the domestic dimension of the MPP indices but more evidence of geographical spillovers:
    - A stronger cross-country reduction for the Qureshi et al. (2012) measures
    - A stronger cross-country increase for the Lim et al. (2011) measures
- When replacing bank flows with the variable “other/non-bank flows” we observe a positive reaction of capital flows to MPPs
  - This could indicate spillover effects across capital classes within countries
- Endogeneity concerns
  - MPPs are most likely implemented in times of high capital inflows
    - This can make the coefficient of MPPs on bank flows more positive
  - Results are only a lower bound
  - Specification with lagged MPPs

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Conclusion

- The structure of the financial system plays an important role for the effectiveness of MPPs with respect to int'l bank capital flows
  - Especially the profitability of the domestic banking system and international variables, such as loans from non-resident banks and trade integration, are important

- We also find a possibility for spillover effects
  - There is some evidence for spillovers across countries and across asset classes
  - The direction of geographical spillovers can go either way
  - However, an assessment of the economic relevance indicates that most likely only a limited number of countries will experience substantial geographical spillovers

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Thank you very much.