

Capital Flows, Macro-Prudential Policies and Capital Controls

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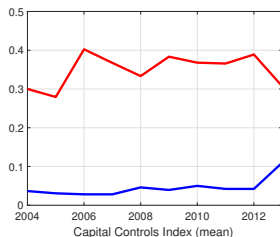
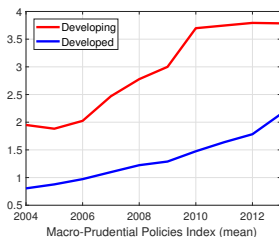
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Motivation

- Macro-Financial Stability and Capital Flows

- + Monetary Policy?

- + Additional Instruments: Macro-Pru Policies (MPP) and Capital Controls (CC)



- We empirically explore the relationship between MPP, CC and capital flows
- We exploit new data on MPP (by institution affected) and CC (by residents/non-residents)
- We partially address reverse causality problems

Main Results

- Effects of MPP differ between group of countries (developed vs. developing) and on the institutions affected (financial vs. borrower):
 - + MPP on **borrowers** affect **negatively** capital inflows in **developing** countries.
 - + MPP on **financial institutions** affect **negatively** capital inflows in **developed** countries, but **positively** in **developing** countries.
 - + The positive effect on developing countries does not lead to a rise in domestic credit, on the contrary **domestic credit drops with MPP**.
 - + Result is in line with the carry-trade hypothesis.
 - + The effect is contingent on institutions and financial development, but the group effect persists.
- Effects of CC are negative but weak, significant in some extensions (volatility, equity flows)

Related literature

- **CC and capital flows:** Magud et al. (2011), Warnock (2012), Ahmed and Zlate (2014), Forbes et al. (2015), Forbes et al. (2016)
- **MPP and capital flows:** Bruno et al. (2017), Ostry et al. (2012), Unsal (2013) and Beirne and Friedrich (2017)
- **International corporate debt issuance in emerging economies:** Turner (2014), Avdjiev et al. (2014), Bruno and Shin (2017) and Caballero et al. (2016a), Caballero et al. (2016b).

Data

- Capital flows
 - Quarterly data on gross capital inflows of bonds from the BPSD (IMF).
 - Gross flow scaled by the stock in $t - 1$
- MPP
 - Yearly index constructed by Cerutti et al. (2015).
 - 12 measures of MPP: 1 if the country had a policy in place, 0 otherwise.
 - Borrowers: loan-to-value ratio caps and debt-to-income ratio limits.
 - Financial institutions: loan-loss provisions, countercyclical capital buffers, limits on leverage ratios, capital surcharges on SIFIs, limits on interbank exposure, concentration limits, limits on foreign currency loans, countercyclical reserve requirements, limits on domestic currency loans and taxes on financial institutions.
- CC
 - Yearly index constructed by Fernandez et al. (2016).
 - 10 categories of assets, 1 if a policy in place, 0 otherwise.
 - Non-residents: affect assets purchased locally by them.
 - Residents: affect assets sold or issued abroad by them.

Summary Statistics (2004-2013)

	All	Developed	Developing
Countries	39	21	18
Observations	1239	728	511
Capital inflows			
Mean (%)	1.88	1.49	2.34
Standard Deviation (%)	6.70	6.39	7.06
MPI			
Countries with MPI borrower	17	7	10
Countries with change in MPI borrower	9	5	4
Countries with MPI fin inst	34	16	18
Countries with change in MPI fin inst	17	8	9
Capital Controls			
Countries with CC non-residents	9	2	7
Countries with change in CC non-residents	6	2	4
Countries with CC residents	12	3	9
Countries with change in CC residents	4	1	3

Econometric Specification

Our specification for quarterly bonds' capital inflows in time t and country i is

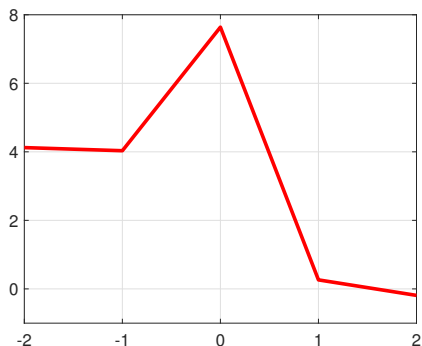
$$\begin{aligned} f_{i,t} = & \alpha_i + \eta_t + \beta X_{i,t} \\ & + \gamma_b \text{MPI}_{i,t}^b + \gamma_{fi} \text{MPI}_{i,t}^{fi} + \theta_{nr} \text{CC}_{i,t}^{nr} + \theta_r \text{CC}_{i,t}^r \\ & + \hat{\gamma}_b d\text{MPI}_{i,t}^b + \hat{\gamma}_{fi} d\text{MPI}_{i,t}^{fi} + \hat{\theta}_{nr} d\text{CC}_{i,t}^{nr} + \hat{\theta}_r d\text{CC}_{i,t}^r + \epsilon_{i,t} \end{aligned}$$

where,

- α_i is a country-fixed effect
- η_t is a quarter-fixed effect
- $X_{i,t}$ are country-specific controls: total and ST debt, and reserves
- $\text{MPI}_{i,t}^b$ is the MPI index for borrowers
- $\text{MPI}_{i,t}^{fi}$ is the MPI index for financial institutions
- $\text{CC}_{i,t}^{nr}$ is the CC index for non-residents
- $\text{CC}_{i,t}^r$ is the CC index for residents
- $dY_{i,t}$ is the *change* in the $Y = \{\text{MPI}^b, \text{MPI}^{fi}, \text{CC}^{nr}, \text{CC}^r\}$ index

Capital Controls and Inflows in Developing Countries

- Average bonds' capital inflows in developing countries around the year of imposition (time 0) of a capital control to non-residents.



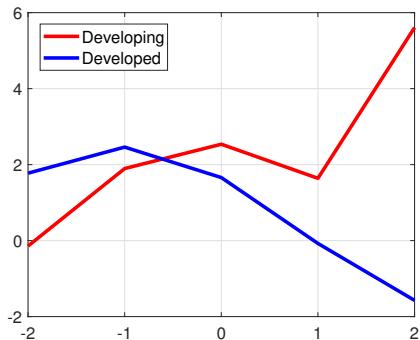
Baseline Estimations

	Not Controlling for year of implementation			Baseline		
	Eq.1	Eq.2		Eq.3	Eq.4	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.0093 (1.36)	0.013** (2.01)	-0.011 (1.04)	0.0085 (1.02)	0.013 (1.42)	-0.020* (1.72)
<i>MPI fin. inst.</i>	-0.0060 (1.19)	-0.013*** (2.78)	0.020** (2.35)	-0.0031 (0.51)	-0.011* (1.76)	0.031** (2.38)
<i>Capital Controls non-residents (plbn)</i>	0.013 (0.72)	0.068** (2.29)	-0.0044 (0.20)	-0.012 (0.44)		-0.028 (0.85)
<i>Capital Controls residents (siar)</i>	-0.023 (0.99)	0.021** (2.27)	-0.032 (0.97)	-0.034 (1.14)		-0.038 (1.23)
<i>R²</i>	0.33	0.34		0.34	0.35	
<i>Observations</i>	1190	1190		1190	1190	

Notes: The dependent variable is quarterly bond inflows. Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, fixed and quarterly time effects. Equations 3 and 4 additionally include the change in the MPI and capital controls variables to control for any effects during the year of implementation. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

MPI on Financial Institutions and Capital Inflows

- Average bonds' capital inflows around the year of imposition (time 0) of a MPI to financial institutions.



Effects on Domestic Credit

	<i>Capital Inflows (Bonds)</i>			<i>Domestic Credit</i>		
	<i>Eq.1</i>	<i>Eq.2</i>		<i>Eq.3</i>	<i>Eq.4</i>	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.0085 (1.02)	0.013 (1.42)	-0.020* (1.72)	-0.059 (1.60)	-0.097 (1.31)	0.0088 (0.26)
<i>MPI fin. inst.</i>	-0.0031 (0.51)	-0.011* (1.76)	0.031** (2.38)	-0.045* (1.82)	-0.030 (1.14)	-0.11** (2.13)
<i>Capital Controls non-residents (plbn)</i>	-0.012 (0.44)		-0.028 (0.85)	-0.016 (0.27)		-0.0068 (0.11)
<i>Capital Controls residents (siar)</i>	-0.034 (1.14)		-0.038 (1.23)	-0.13*** (2.89)		-0.16*** (2.76)
<i>R</i> ²	0.34	0.35		0.54	0.55	
<i>Observations</i>	1190	1190		321	321	

Notes: The dependent variables are quarterly bond inflows (equations 1 and 2) and annual domestic credit as a percentage of GDP (equations 3 and 4). Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

What Explains the Different Signs?

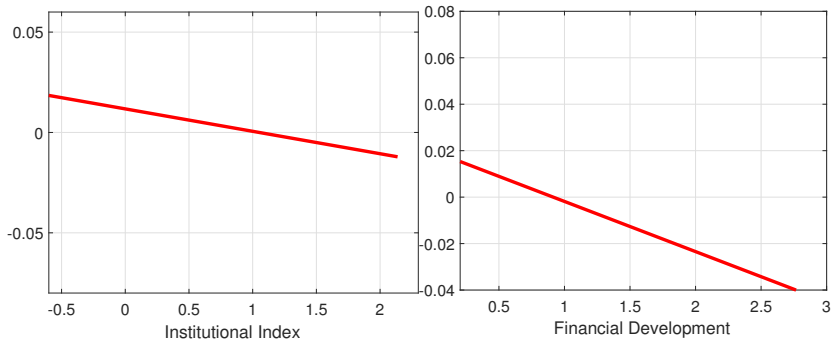
- Interactions: Institutions and Financial Development

	<i>All</i>		<i>Developed</i>		<i>Developing</i>	
	Instit (1)	Fin Dev (2)	Instit (3)	Fin Dev (4)	Instit (5)	Fin Dev (6)
<i>MPI borrowers</i>	0.0034 (0.25)	0.015 (1.60)	0.088*** (4.02)	0.052*** (3.01)	-0.091*** (5.04)	-0.18 (0.92)
<i>MPI fin. inst.</i>	-0.011* (1.69)	-0.022* (1.84)	0.052*** (2.98)	0.0019 (0.084)	0.025 (1.42)	0.10*** (3.09)
<i>Capital Controls non-residents (plbn)</i>	0.10* (1.69)	0.27*** (3.09)			0.071 (1.05)	0.37*** (5.83)
<i>Capital Controls residents (siar)</i>	0.13*** (3.26)	0.37*** (7.33)			-0.078 (0.97)	0.45*** (4.45)

Notes: The dependent variable is quarterly bond inflows. Results shown are the coefficients on interactions between the variables defined in the upper panel and the corresponding indicator defined in the first column. Each interaction is introduced one at a time in the baseline specification, with the same additional controls plus the interaction multiplied by the dummy variable indicating the time at which the policy changes. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Institutions and Financial Development

Conditional Effect of MPI to Financial Institutions

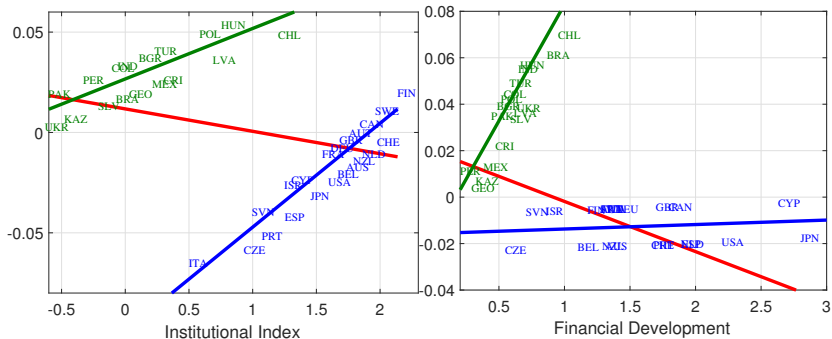


Note: red, blue and green lines are the conditional effects for all, developed and developing countries, respectively, of MPI financial institutions on capital inflows.

MPI to borrowers 

Institutions and Financial Development

Conditional Effect of MPI to Financial Institutions



Note: red, blue and green lines are the conditional effects for all, developed and developing countries, respectively, of MPI financial institutions on capital inflows.





MPI to borrowers 

Quarterly MPI Indexes

	Baseline			Quarterly MPI		
	Eq.1	Eq.2		Eq.3	Eq.4	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.0085 (1.02)	0.013 (1.42)	-0.020* (1.72)	-0.0058 (1.34)	0.0021 (0.56)	-0.020* (1.89)
<i>MPI fin. inst.</i>	-0.0031 (0.51)	-0.011* (1.76)	0.031** (2.38)	0.0080* (1.66)	-0.041*** (3.39)	0.012*** (2.92)
<i>Capital Controls non-residents (plbn)</i>	-0.012 (0.44)		-0.028 (0.85)	0.0059 (0.92)		0.0052 (0.91)
<i>Capital Controls residents (siar)</i>	-0.034 (1.14)		-0.038 (1.23)			
<i>R²</i>	0.34	0.35		0.40	0.41	
<i>Observations</i>	1190	1190		1035	1035	

Notes: The dependent variable is quarterly bond inflows from IMF. In the left panel MPI variables are at an annual frequency, and in the right panel they are at a quarterly frequency. Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Additional Results

- Total Flows: Bonds + Equity 
- Volatility 
- Macroeconomic Conditions 
- Sub-Samples: 2007 and 2008 

Conclusions

- In this paper we study the effects of MPP and CC measures on capital inflows in developed and developing economies.
- Our main result is that MPP targeted at financial institutions impact bond inflows negatively in developed economies and positively in developing ones.
- This result is quite robust and survives when we control for the year in which the policy is implemented, to (partially) account for reverse causality.
- We argue that this result is a reflection of carry-trade opportunities present in developing economies, that are intensified when MPP limit the ability of domestic financial institutions to provide credit to firms.
- Two elements support our hypothesis: domestic credit is negatively influenced by MPP in developing economies and the degree of financial development of the country reinforces the positive effect of such policies on capital inflows.

Appendix

Bonds vs. Total Inflows

	<i>Bonds</i>			<i>Total (Bonds + Equity)</i>		
	<i>Eq.1</i>	<i>Eq.2</i>		<i>Eq.3</i>	<i>Eq.4</i>	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.0085 (1.02)	0.013 (1.42)	-0.020* (1.72)	0.011 (0.72)	0.028** (1.98)	-0.044 (1.21)
<i>MPI fin. inst.</i>	-0.0031 (0.51)	-0.011* (1.76)	0.031** (2.38)	0.0032 (0.38)	-0.0032 (0.28)	0.049 (1.58)
<i>Capital Controls non-residents (plbn)</i>	-0.012 (0.44)		-0.028 (0.85)	-0.063*** (3.92)		-0.090*** (3.81)
<i>Capital Controls residents (siar)</i>	-0.034 (1.14)		-0.038 (1.23)	0.15*** (3.41)		0.16** (2.20)
<i>R²</i>	0.34	0.35		0.62	0.62	
<i>Observations</i>	1190	1190		1051	1051	

Notes: The dependent variables are quarterly bond inflows (equations 1 and 2) and total (bond plus equity) inflows (equations 3 and 4). Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Volatility

	Volatility, Bonds			Volatility, Equity		
	Eq.1	Eq.2		Eq.3	Eq.4	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	-0.0072 (1.36)	-0.0066 (0.82)	-0.0046 (0.37)	-0.017 (1.59)	-0.0071 (0.69)	0.021 (0.73)
<i>MPI fin. inst.</i>	-0.0003 (0.066)	0.0006 (0.14)	-0.0038 (0.27)	-0.0095 (0.87)	0.0084 (1.47)	-0.070*** (2.77)
<i>Capital Controls non-residents (plbn)</i>	-0.019* (1.91)		-0.019 (1.61)	0.0024 (0.073)		0.030 (0.68)
<i>Capital Controls residents (siar)</i>	-0.025 (1.38)		-0.020 (0.82)	-0.12*** (3.36)		-0.27*** (7.26)
<i>R²</i>	0.35	0.36		0.35	0.46	
<i>Observations</i>	251	251		226	226	

Notes: The dependent variables are the annual volatility of bond inflows (equations 1 and 2) and equity inflows (equations 3 and 4). Additional controls not shown are the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Macroeconomic Conditions

	VIX (1)	Ted Rate (2)	US mpr r* (3)	Local mpr r (4)	r-r* (5)	GDP gap (6)	GDP growth (7)
<i>Developed Countries</i>							
<i>MPI borrowers</i>	0.0006 (0.38)	0.022 (0.89)	0.0091** (2.15)	-0.013 (1.36)	-0.026*** (4.46)	-1.43*** (4.22)	-0.61*** (3.04)
<i>MPI fin. inst.</i>	0.0001 (0.20)	0.0002 (0.023)	-0.0015 (0.84)	-0.0043 (1.58)	-0.0071** (2.12)	-0.14 (0.51)	-0.0045 (0.025)
<i>Developing Countries</i>							
<i>MPI borrowers</i>	0.0010 (1.52)	0.012 (0.88)	-0.0089 (1.50)	0.0003 (0.072)	0.0081** (2.33)	0.76** (2.12)	0.29 (1.54)
<i>MPI fin. inst.</i>	0.0005** (2.02)	0.0052 (0.89)	-0.0010 (0.23)	-0.0013 (0.61)	0.0004 (0.14)	0.041 (0.33)	-0.014 (0.13)
<i>Capital Controls non-residents (plbn)</i>	0.0023** (2.21)	0.0034 (0.16)	-0.014* (1.65)	-0.0080** (2.19)	0.0038 (0.86)	0.69* (1.90)	-0.023 (0.036)
<i>Capital Controls residents (siar)</i>	0.0022** (2.13)	0.018 (1.13)	-0.0099 (1.16)	-0.0033 (0.49)	0.0062 (1.00)	0.26 (0.79)	0.24 (0.44)

Notes: The dependent variable is quarterly bond inflows. Results shown are the coefficients on interactions between the variables defined in the upper panel and the corresponding indicator defined in the first column. Each interaction is introduced one at a time in the baseline specification, with the same additional controls plus the interaction multiplied by the dummy variable indicating the time at which the policy changes. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Sub-Samples: 2007

	2004-2006			2007-2013		
	Eq.1	Eq.2		Eq.1	Eq.2	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.0084 (0.34)	0.074*** (6.68)	-0.060** (2.12)	0.0079 (1.12)	0.0064 (0.72)	-0.022* (1.78)
<i>MPI fin. inst.</i>	-0.0080 (1.19)	-0.019*** (2.79)	0.044*** (2.70)	-0.0017 (0.26)	-0.014** (2.06)	0.030** (2.34)
<i>Capital Controls non-residents (plbn)</i>	-0.017 (0.50)		-0.068 (0.91)	-0.012 (0.39)		-0.033 (0.84)
<i>Capital Controls residents (siar)</i>	-0.031 (0.65)	0.0012 (0.15)	0.020 (0.19)	-0.034 (0.93)		-0.029 (0.65)
<i>R²</i>	0.34	0.36				
<i>Observations</i>	1190	1190				

Notes: The dependent variable is quarterly bond inflows. Results shown are the coefficients on interactions between the explanatory variables and time dummies for the period before and after 2007. Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Sub-Samples: 2008

	2004-2007			2008-2013		
	Eq.1	Eq.2		Eq.1	Eq.2	
	All (1)	Devd (2)	Dving (3)	All (4)	Devd (5)	Dving (6)
<i>MPI borrowers</i>	0.014 (0.86)	0.072*** (7.51)	-0.031 (1.63)	0.0081 (1.17)	0.0074 (0.88)	-0.018* (1.70)
<i>MPI fin. inst.</i>	-0.0083 (1.30)	-0.017*** (2.72)	0.028* (1.87)	-0.0014 (0.23)	-0.011* (1.73)	0.026** (2.03)
<i>Capital Controls non-residents (plbn)</i>	-0.037 (0.78)		-0.048 (0.71)	-0.0074 (0.30)		-0.025 (0.75)
<i>Capital Controls residents (sjar)</i>	-0.023 (0.55)	0.019** (2.34)	-0.021 (0.33)	-0.032 (1.05)		-0.038 (1.19)
R^2	0.34	0.36				
<i>Observations</i>	1190	1190				

Notes: The dependent variable is quarterly bond inflows. Results shown are the coefficients on interactions between the explanatory variables and time dummies for the period before and after 2008. Additional controls not shown are external debt to GDP, short-term external debt as a fraction of total external debt, total reserves as a fraction of external debt, the change in the MPI and capital controls variables, fixed and quarterly time effects. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

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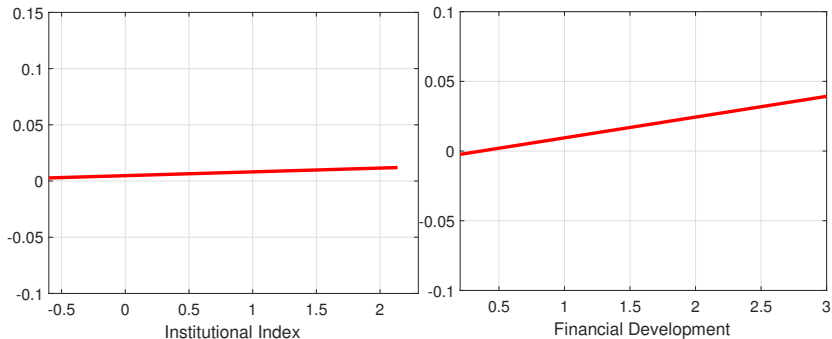
- Interactions: Institutions and Financial Development

	<i>All</i>		<i>Developed</i>		<i>Developing</i>	
	Instit (1)	Fin Dev (2)	Instit (3)	Fin Dev (4)	Instit (5)	Fin Dev (6)
<i>MPI borrowers</i>	0.0034 (0.25)	0.015 (1.60)	0.088*** (4.02)	0.052*** (3.01)	-0.091*** (5.04)	-0.18 (0.92)
<i>MPI fin. inst.</i>	-0.011* (1.69)	-0.022* (1.84)	0.052*** (2.98)	0.0019 (0.084)	0.025 (1.42)	0.10*** (3.09)
<i>Capital Controls non-residents (plbn)</i>	0.10* (1.69)	0.27*** (3.09)			0.071 (1.05)	0.37*** (5.83)
<i>Capital Controls residents (siar)</i>	0.13*** (3.26)	0.37*** (7.33)			-0.078 (0.97)	0.45*** (4.45)

Notes: The dependent variable is quarterly bond inflows. Results shown are the coefficients on interactions between the variables defined in the upper panel and the corresponding indicator defined in the first column. Each interaction is introduced one at a time in the baseline specification, with the same additional controls plus the interaction multiplied by the dummy variable indicating the time at which the policy changes. Below the OLS coefficients t-values are reported, which are based on standard errors clustered by country. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Institutions and Financial Development

Conditional Effect of MPI to Borrowers

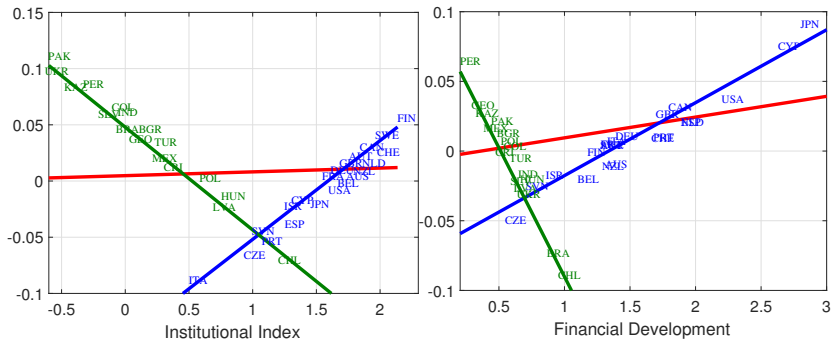


Note: red, blue and green lines are the conditional effects for all, developed and developing countries, respectively, of MPI financial institutions on capital inflows.

[▶ Back](#)

Institutions and Financial Development

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