Volatile Capital Flows and Economic Growth: The Role of Macro-prudential Regulation

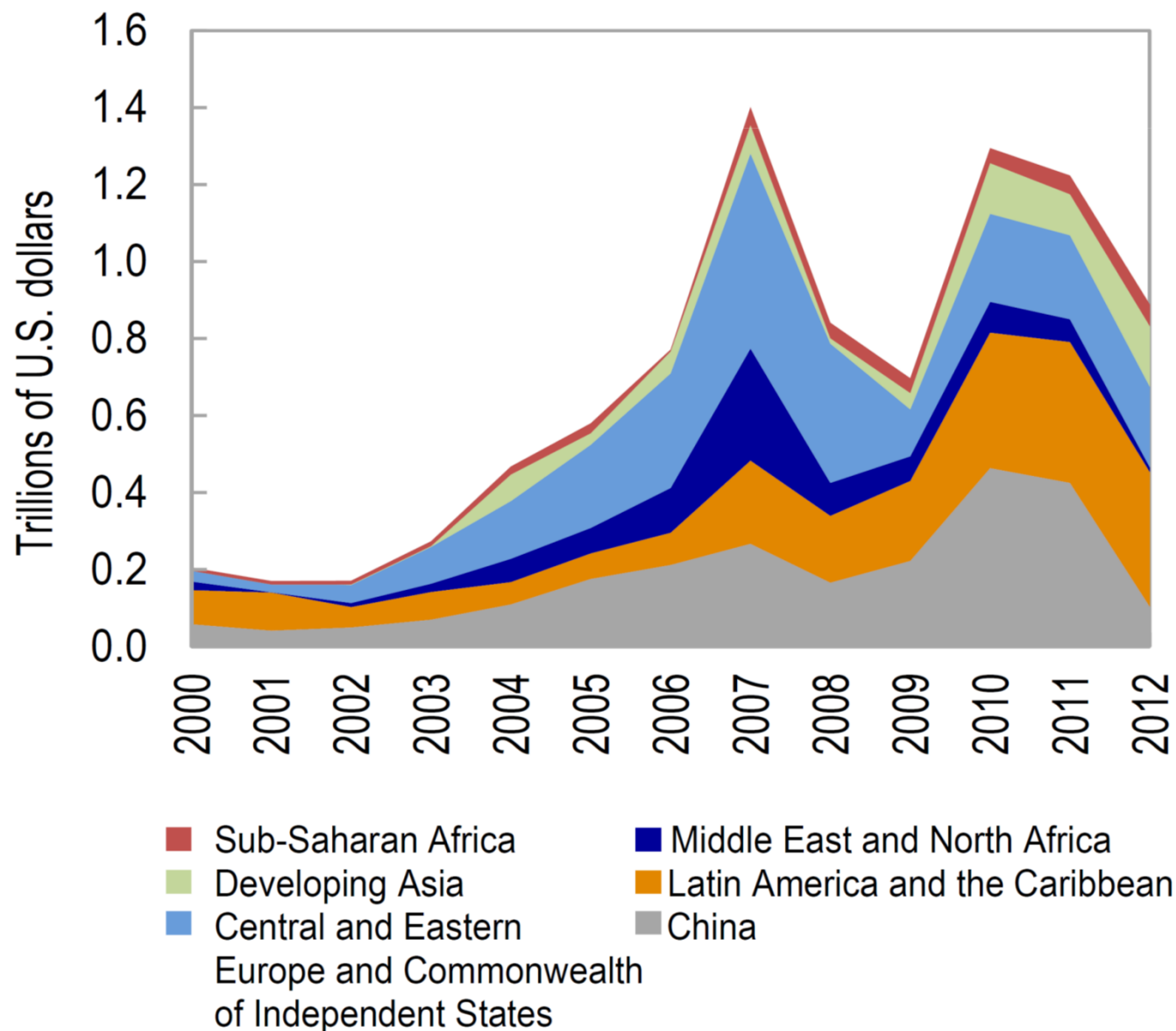## Kyriakos C. Neanidis

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- Laying the ground

- Main thesis

- Results

- Contributions to the literature

- Model and data

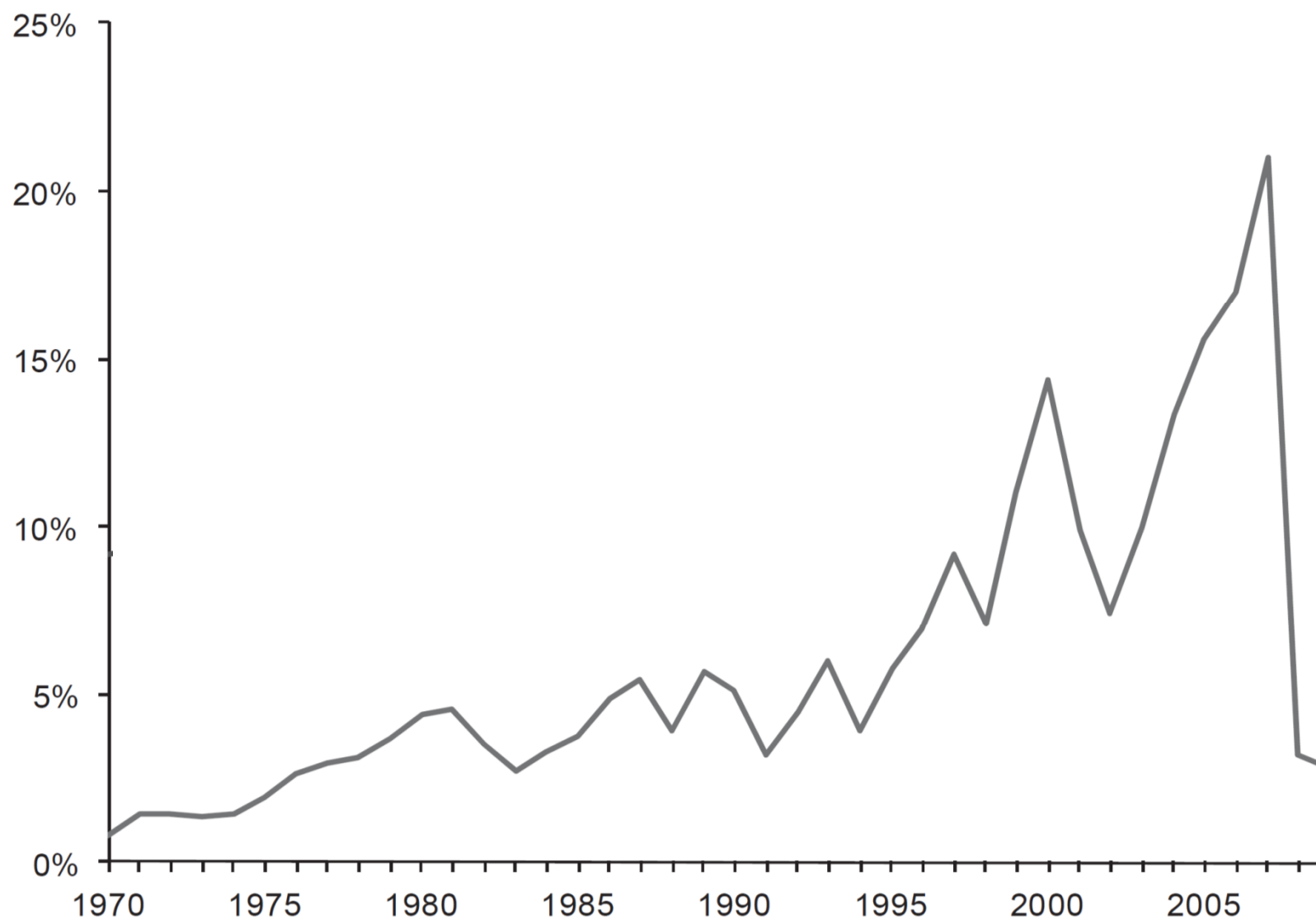- Findings

- Final remarks

Laying the Ground

Fact 1: Capital flows are volatile

Figure 3.1. Selected Regions: Capital Inflows, 2000–12

Legend:
- Sub-Saharan Africa
- Developing Asia
- Central and Eastern Europe and Commonwealth of Independent States
- Middle East and North Africa
- Latin America and the Caribbean
- China

Source: *Regional Economic Outlook, IMF (2013)*

Global capital flows (% of world GDP)

Figure 3.10 Capital flows volatility by decade and by region
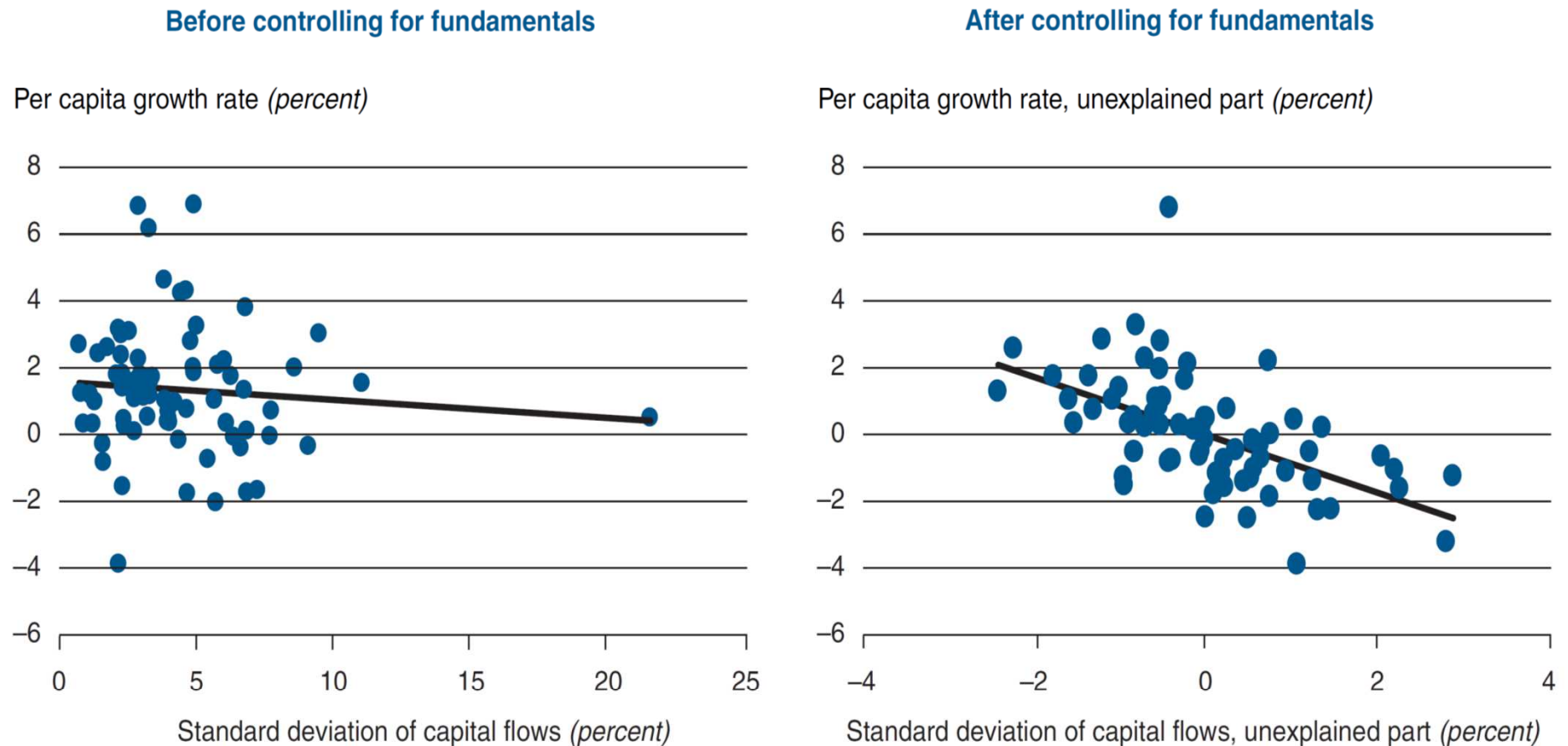
Standard deviation of capital flows *(percent of GDP)*
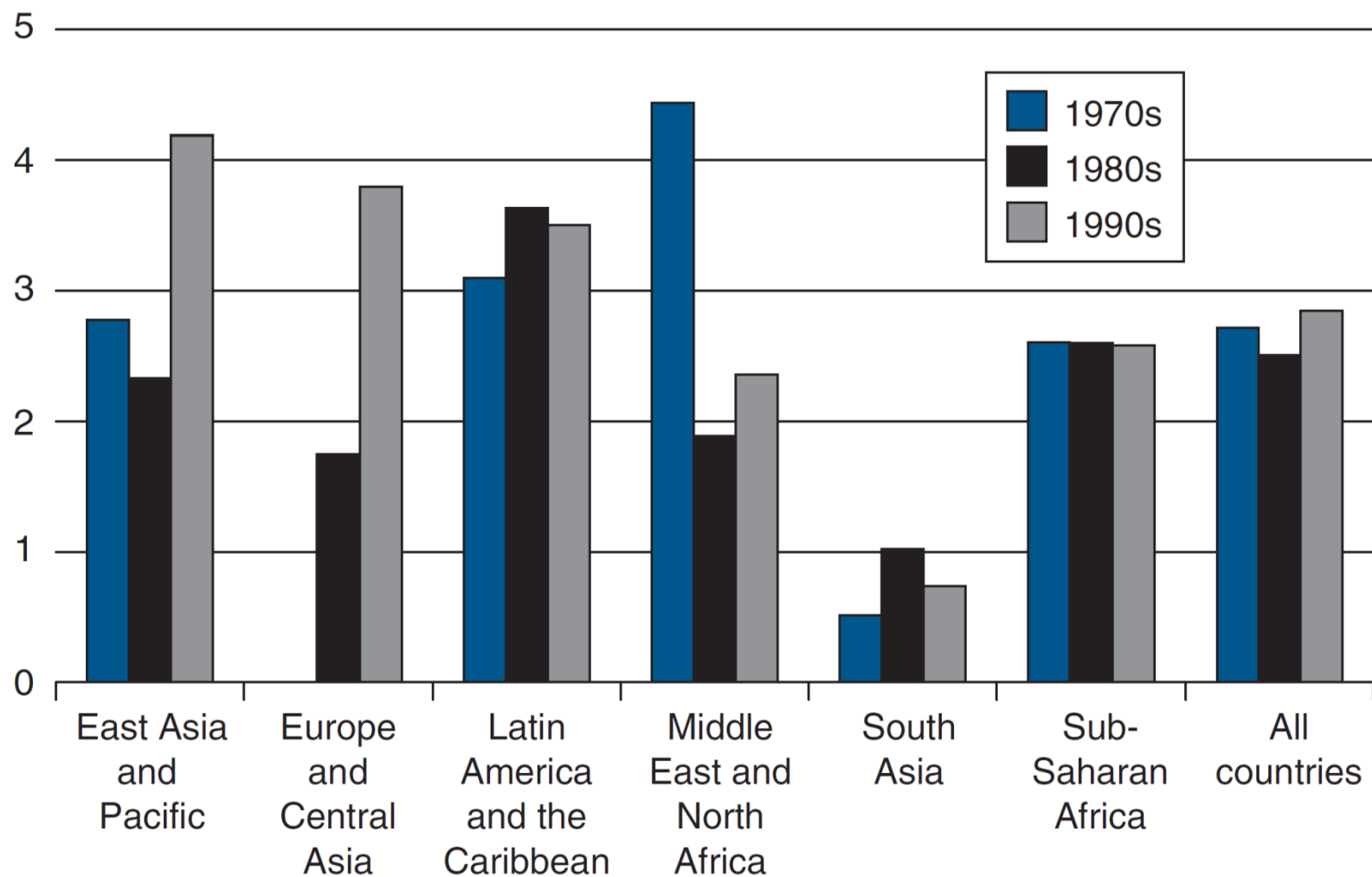
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1).

Fact 2: Volatile capital flows reduce economic growth

- The inherent volatility of capital flows, as manifested most severely in "sudden stops", "hot money" and capital flight, leads to adverse growth effects (Milesi-Ferretti and Tille, 2011; UNDP, 2011).

- Lensink and Morrissey (2006): FDI positively affects growth by decreasing the costs of R&D through stimulating innovation. If FDI inflows are uncertain, costs of R&D are uncertain, which negatively affects incentives to innovate.

Figure 3.8 Correlations and partial correlations between per capita average growth rates and private capital flows volatility, 1970–98

Before controlling for fundamentals

Per capita growth rate *(percent)*

Standard deviation of capital flows *(percent)*

After controlling for fundamentals

Per capita growth rate, unexplained part *(percent)*

Standard deviation of capital flows, unexplained part *(percent)*

Note: The partial correlation between the growth rate and capital flows volatility is the correlation between the residual growth rate and residual volatility in capital flows, after controlling for various fundamentals (see annex 3.1 for details). This residual variation in the growth rate and capital flows volatility is termed "unexplained part."
Source: World Bank, *Global Development Finance: Country Tables* and sources cited therein, various years (see annex 3.1 for details).

Objective of Macro-prudential regulation (MPR) policies:

- Strengthen bank-level, or micro-prudential, regulation.

- Contain (the buildup of) systemic risks and achieve greater financial stability.

- Improve the banking sector's ability to absorb shocks arising from financial and economic stress, whatever the source, thus reducing the risk of spillover from the financial sector to the real economy.

Fact 1: Capital flows are volatile

Fact 2: Volatile capital flows reduce economic growth

Objective of Macro-prudential regulation (MPR) policies: Contain (the buildup of) systemic risks and achieve greater financial stability

Combining the above, a natural question arises:

Do MPR policies attenuate the negative growth effect of volatile capital flows and in that way reduce the adverse consequences of financial volatility for the real economy?

Main Thesis

- In this paper, we move away from the implications of MPR for short-term economic stability…

- …and set the emphasis on the long-term effects of financial regulation for financial volatility and on the way this feeds into economic growth.

- Claim: The effectiveness of MPR rules cannot be fully assessed by limiting the analysis in the short-term objective of financial and economic stability, but also take into account the broad objective of economic growth (BIS, 2012).

- Investigate the links between financial volatility and economic growth, and study whether MPR rules help mitigate the adverse effects of financial volatility on growth.

- We set an econometric specification that allows assessing the specific channel of interest: the role of financial regulation on the way financial volatility impacts upon the economic growth process.

Results

- We find strong evidence that

1. Volatile capital flows retard economic growth, while

2. …MPR reduces the negative impact of financial volatility.

- These findings are mainly restricted in the sample of middle-income countries,…

- …while countries that are relatively open, with deep financial systems and exposed to macroeconomic volatility experience lower marginal benefits.

- This means that MPR policies are effective in limiting financial system vulnerabilities, especially for countries exposed to large and volatile movements in financial flows.

- This justifies efforts for international cooperation and coordination in setting MPR rules and standards as a way of combating and minimizing financial volatility and its consequences (Brunnermeier et al., 2012; IMF, 2013).

Contributions to the Literature

- Our study contributes to two strands of the literature.

1. We add to the existing evidence on the importance of volatile international capital flows for economic growth
    - Much of the empirical literature concerned with the effect of financial flows on growth has focused on levels.

    - Our work acts complementary to these studies, by focusing on the effect of volatile capital flows and offers a new mechanism that limits the distortionary impact of this volatility: macro-prudential regulation.

2. Our study contributes to a broader literature that investigates the effectiveness of MPR rules.

- Several studies have analyzed the effects of regulation policies in the credit and housing markets…

- …providing evidence that macro-prudential policy can contribute to reducing systemic risk and financial instability.

- The distinctive characteristic of our analysis is the focus on long-run economic growth that captures the interaction between financial volatility and prudential rules. Doing so, allows us to draw conclusions about the broader success of MPR policy in reducing systemic risk by dampening the volatility of flows.

Model and Data

- The objective is to examine a specific channel through which MPR policies may be beneficial for economic growth: by reducing the negative effects of volatile capital flows.

- We employ an empirical specification that allows focusing on this channel.

$$g_{i,t} = \alpha + \beta_1 F_{i,t} + \beta_2 VolF_{i,t} + \beta_3 MPR_{i,t} + \gamma (MPR \times VolF)_{i,t} + \delta X_{i,t} + \mu_i + u_t + \varepsilon_{i,t}$$

- $\beta_2 < 0$ and $\gamma > 0$: support the role of financial regulation in mitigating the adverse growth effect of capital flows volatility.

- We use two panel estimation techniques

- OLS

- System GMM
  - corrects for the biases introduced by endogeneity problems with a rich set of endogenous instruments, both in their levels and first-differences
  - addresses potential biases induced by country specific effects

- **Difficulty of dynamic GMM: choice of # of lags of potentially endogenous variables.**
  - Use as instruments the second (or third) lag of the instrumented variables up to the nth lag ($n \geq 2$) so as to satisfy the restriction that the number of instruments does not exceed the number of countries in the regressions (Roodman, 2009).

- **Both GMM approaches are tested for the validity of the used instruments with**
  - Hansen's (1992) J test of over-identifying restrictions
  - Checks of all regressions for 2nd order degree of serial correlation of the error terms (Arellano and Bond 1991)

- Our dataset covers 78 countries over 1973-2013 and uses 3-year period averages.

- Country and period coverage are strictly dictated by the availability of data on MPR.

- We put together four different measures of total capital flows and eleven measures for its subcomponents.

1. Sum of FDI, Portfolio equity, Debt securities, net inflows (% of GDP)--WDI and IFS

2. Net capital account flows (-CA/GDP), (-1)*CA Balance (% of GDP)--Alfaro et al. (2014)

3. Sum of FDI, Portfolio equity, total debt from private sources flows (% of GDP)--Alfaro et al. (2014)

4. Sum of FDI, Portfolio equity, total debt from private sources flows (% of GDP)--Lane and Milesi-Ferretti (2007)

5. Total debt flows from private creditors (% of GDP)--Alfaro et al. (2014)

6. Net public debt flows (% of GDP)--Alfaro et al. (2014)

The standard deviation of the normalized flows is used as a measure of their volatility.

- Data on MPR policies have been produced in recent years by detailed surveys of bank regulation and supervision across the globe

  1. Abiad et al. (2008) put together an annual database of financial reforms for 91 countries over 1973-2005. Amongst seven dimensions of financial sector policy reforms, they have an indicator of prudential regulation and banking sector supervision.

  2. The IMF's Monetary and Capital Department produced a survey of Global Macroprudential Policy Instruments, covering 119 countries for the period 2000-2013. The data combine twelve different macro-prudential instruments to develop a macroprudential index.

3. The third source is Barth et al. (2013) which builds on four surveys (1999, 2003, 2007, 2011) sponsored by the World Bank and covers 180 countries from 1999 to 2011. Although the dataset provides a wealth of indexes, we chose three measures of bank regulatory and supervisory practices, all of them reflecting aggregated indexes: i) restrictions on banking activity, ii) entry requirements in the banking sector, and iii) an index of external governance.

Overall, the MPR data from the above three sources represent the most detailed and up-to-date data on macro-prudential policies employed by the largest possible set of countries.

- **Dependent variable**: growth rate of real per capita GDP in constant local currency.

- **Control variables in set *X*:**
  - logarithm of beginning-of-period real GDP per capita
  - initial secondary school enrollment rates
  - growth rate of the population
  - private investment to GDP
  - trade to GDP
  - government consumption expenditure to GDP
  - inflation
  - institutional quality of the government
  - private credit provided by deposit money banks and other financial institutions as a share of GDP

Findings

Main findings

- Total capital flows and FDI flows are not statistically significant whereas equity flows enhance growth and debt flows diminish growth.

- More variable capital flows reduce economic growth.

- Stricter banking supervision practices promote directly economic growth.

- MPR mitigates the negative growth effect induced by more volatile capital flows.

- The effects of the variables included in the set X are supportive of the typical findings in the literature.

Table 2
Benchmark Findings

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) GMM-SYS	(6) GMM-SYS	(7) GMM-SYS	(8) GMM-SYS
Dependent variable: Growth rate of GDP per capita (period: 1973-2005)								
Type of capital flows →	**Total flows**	**FDI flows**	**Equity flows**	**Debt flows**	**Total flows**	**FDI flows**	**Equity flows**	**Debt flows**
Capital flows	0.208***	0.205**	0.024*	-0.017	-0.008	-0.054	0.048***	-0.204***
	(0.077)	(0.081)	(0.015)	(0.055)	(0.039)	(0.043)	(0.001)	(0.006)
Volatility of capital flows	-0.379*	-0.403*	0.027	0.023	-2.10***	-1.53***	-0.301***	-0.499***
	(0.212)	(0.317)	(0.474)	(0.168)	(0.143)	(0.198)	(0.019)	(0.040)
Banking supervision	0.402***	0.401***	0.534***	0.622***	0.452***	0.490***	0.372***	0.024
	(0.146)	(0.147)	(0.147)	(0.175)	(0.097)	(0.153)	(0.018)	(0.018)
Vol. of capital flows * Banking supervision	0.105*	0.113*	0.035	0.007	0.862***	0.673***	0.147***	0.195***
	(0.065)	(0.066)	(0.157)	(0.094)	(0.041)	(0.057)	(0.006)	(0.018)

Initial GDP per capita (log)	-0.540***	-0.563***	-0.615***	-0.624***	-1.51***	-1.00 ***	-0.660***	0.984***
	(0.167)	(0.165)	(0.187)	(0.190)	(0.171)	(0.184)	(0.065)	(0.102)
Education	0.007	0.007	0.007	0.007	0.039***	0.029***	0.023***	0.042***
	(0.007)	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.001)	(0.001)
Population growth rate	-0.560***	-0.564***	-0.740***	-0.654***	-0.320***	-0.358***	-0.780***	-0.125***
	(0.174)	(0.175)	(0.180)	(0.177)	(0.119)	(0.119)	(0.027)	(0.031)
Investment	0.239***	0.239***	0.255***	0.257***	0.413***	0.411***	0.404***	0.249***
	(0.025)	(0.025)	(0.025)	(0.027)	(0.007)	(0.020)	(0.004)	(0.006)
Trade	0.002	0.002	0.004	0.011**	0.002	0.001	-0.013***	0.030***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.002)	(0.002)	(0.001)	(0.001)
Government consumption	-0.068**	-0.067**	-0.052*	-0.061**	-0.001	-0.084***	0.068***	-0.198***
	(0.027)	(0.027)	(0.028)	(0.028)	(0.013)	(0.020)	(0.004)	(0.007)
Inflation	-0.004***	-0.004***	-0.004***	-0.004***	-0.006***	-0.009***	-0.013***	-0.004***
	(0.0002)	(0.0002)	(0.0002)	(0.0009)	(0.001)	(0.001)	(0.001)	(0.001)
Institutions	1.79*	1.90**	1.51	1.64	4.89***	3.89***	-0.981***	-7.48***
	(0.950)	(0.960)	(1.02)	(1.11)	(0.600)	(0.575)	(0.147)	(0.411)
Private credit	-0.015***	-0.016***	-0.018***	-0.019***	-0.051***	-0.046***	-0.021***	-0.016***
	(0.004)	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)	(0.001)	(0.001)
Countries/Observations	78/554	78/542	79/500	71/445	78/554	78/542	77/500	71/445
R-square	0.345	0.346	0.354	0.342				
Number of instruments					73	73	73	63
Chi-square (p-value)					0.000	0.000	0.000	0.000
Hansen J-statistic (p-value)					0.828	0.826	0.751	0.566
AR(2) test (p-value)					0.457	0.193	0.191	0.968

Economic significance of the effect

- Use the coefficient estimates of total capital flows volatility and its interaction term in column (5) with data on their standard deviation described in Table 1.

- Multiply each coefficient with the sample standard deviation of the corresponding variable.

- Increasing the volatility of total capital flows by one standard deviation decreases the growth rate of GDP per capita by 3.108 percentage points (-2.10×1.48), while increasing the interaction term by one standard deviation increases growth by 1.288 percentage points (0.862×1.48×1.01).

- This means that MPR has the capacity to reduce substantially the negative impact of total capital flows volatility on growth.

Robustness of main findings

- Different measures of aggregated and disaggregated capital flows

- Alternative indicators of macro-prudential policy

- Income and regional characteristics of our country sample

- Additional interaction effects

Table 3
Alternative Types of Capital Flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Dependent variable: Growth rate of GDP per capita (period: 1980-2005)												
Type of capital flows →	Capital account flows	Capital account aid-adjusted	Total private flows (IFS)	FDI flows (IFS)	Equity flows (IFS)	Debt flows (IFS)	Total private flows (LM)	FDI flows (LM)	Equity flows (LM)	Debt flows (LM)	Private debt flows	Public debt flows
Capital flows	-0.022	-0.138***	-0.012	-0.077*	0.112***	-0.090***	0.099***	0.083***	0.020***	0.017**	0.121***	-0.032
	(0.040)	(0.021)	(0.023)	(0.045)	(0.005)	(0.020)	(0.012)	(0.019)	(0.004)	(0.008)	(0.046)	(0.023)
Volatility of capital flows	-1.96***	-0.595***	-0.633***	-0.988***	-1.26***	-0.422***	-0.350***	-0.328***	-0.194***	-0.074***	-0.687***	-0.083**
	(0.148)	(0.106)	(0.084)	(0.262)	(0.026)	(0.074)	(0.020)	(0.120)	(0.008)	(0.012)	(0.100)	(0.041)
Banking supervision	-0.871***	0.106	1.30***	-0.042	0.050**	0.308*	0.858***	0.604***	0.126***	0.459***	1.26***	0.761***
	(0.240)	(0.326)	(0.401)	(0.166)	(0.025)	(0.181)	(0.168)	(0.149)	(0.048)	(0.065)	(0.325)	(0.162)
Vol. of capital flows * Banking supervision	0.855***	0.146**	0.260***	0.371***	0.337***	0.150***	0.113***	0.116**	0.112***	0.013**	0.216***	0.063**
	(0.079)	(0.071)	(0.056)	(0.088)	(0.016)	(0.034)	(0.010)	(0.046)	(0.005)	(0.005)	(0.068)	(0.026)

Table 4
Alternative Indicators of Macro-Prudential Regulation

	Dependent variable: Growth rate of GDP per capita (period: 2000-2013)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Type of capital flows → Indicator of MPR ↓	Total Flows (WDI)	Total private flows (IFS)	FDI Flows (WDI)	Equity Flows (WDI)	Debt Flows (WDI)	FDI flows (IFS)	Equity flows (IFS)	Private debt flows
Macroprudential index	0.085***	0.061**	0.064***	0.172***	0.106***	0.083***	0.137***	0.086**
	(0.015)	(0.028)	(0.015)	(0.002)	(0.004)	(0.023)	(0.008)	(0.038)
Banking activity restrictions	0.049***	0.053***	0.064***	-0.004***	0.037***	0.122***	0.003**	-0.107***
	(0.009)	(0.008)	(0.011)	(0.001)	(0.001)	(0.022)	(0.001)	(0.014)
Banking entry requirements	0.042***	0.107***	0.030***	0.061***	0.047***	0.057***	0.100***	-0.075
	(0.007)	(0.034)	(0.009)	(0.003)	(0.002)	(0.020)	(0.010)	(0.047)
External governance index	0.085**	0.145***	0.022	-0.033	0.029***	0.159***	0.046***	0.265***
	(0.038)	(0.037)	(0.035)	(0.023)	(0.011)	(0.016)	(0.014)	(0.046)
Includes control variables in set X	YES	YES	YES	YES	YES	YES	YES	YES

Table 5
Sensitivity Tests I
Dependent variable: Growth rate of GDP per capita (period: 1973-2005 & 2000-2013)

	(1) Income Level	(2) SSA	(3) Francophone SSA	(4) WAEMU	(5) Coefficient of Variation	(6) Coefficient of Variation
Capital flows	0.332***	-0.027	-0.190***	-0.220***	0.138**	-0.138
	(0.065)	(0.33)	(0.065)	(0.065)	(0.056)	(0.106)
Volatility of capital flows		-0.556***	-0.529**	-0.501**	-0.485***	-0.244***
		(0.163)	(0.254)	(0.255)	(0.179)	(0.053)
Volatility of capital flows * High	-0.365					
	(0.254)					
Volatility of capital flows * Middle	-2.59***					
	(0.646)					
Volatility of capital flows * Low	-0.412					
	(2.97)					
Volatility of capital flows * Regional Dummy		-2.93***	-1.37*	-0.151		
		(0.484)	(0.857)	(2.26)		
Banking supervision	0.620**	0.689***	1.36***	1.39***	0.469**	0.853**
	(0.270)	(0.065)	(0.156)	(0.177)	(0.207)	(0.407)
Vol. of capital flows * Banking supervision		0.222***	0.285***	0.274***	0.265***	0.097*
		(0.052)	(0.091)	(0.099)	(0.099)	(0.057)
Vol. of capital flows * Banking supervision * High	0.085					
	(0.077)					
Vol. of capital flows * Banking supervision * Middle	1.06***					
	(0.313)					
Vol. of capital flows * Banking supervision * Low	-3.28					
	(2.45)					
Vol. of capital flows * Banking supervision * Regional Dummy		3.54***	1.40**	-0.874		
		(0.453)	(0.685)	(6.18)		
Includes control variables in set X	YES	YES	YES	YES	YES	YES

Table 6
Sensitivity Tests II

Dependent variable: Growth rate of GDP per capita

Type of capital flows →	(1) Total flows	(2) Total flows	(3) Total flows	(4) Total flows	(5) Total flows	(6) Total flows
Capital flows	0.154*	-0.026	0.122	-0.053	-0.054	-0.050
	(0.085)	(0.045)	(0.105)	(0.051)	(0.040)	(0.074)
Volatility of capital flows	-2.47***	-0.407*	-1.22**	-0.639***	-0.682***	-0.662**
	(0.602)	(0.247)	(0.491)	(0.229)	(0.248)	(0.294)
Banking supervision	-0.431	0.495***	-0.278	0.662***	0.365***	0.712***
	(0.443)	(0.141)	(0.607)	(0.174)	(0.140)	(0.163)
Vol. of capital flows * Banking supervision	1.38***	0.273*	0.863*	0.326***	0.827*	0.497***
	(0.261)	(0.169)	(0.480)	(0.100)	(0.431)	(0.131)
Vol. of capital flows * Banking supervision * Private credit	-0.005***					
	(0.002)					
Vol. of capital flows * Banking supervision * Education		-0.001				
		(0.001)				
Vol. of capital flows * Banking supervision * Institutions			-0.513			
			(0.397)			
Vol. of capital flows * Banking supervision * Trade				-0.001***		
				(0.0003)		
Vol. of capital flows * Banking supervision * Initial GDP pc					-0.054	
					(0.034)	
Vol. of capital flows * Banking supervision * Inflation						-0.106***
						(0.015)
Capital flows * Banking supervision						
Includes control variables in set X	YES	YES	YES	YES	YES	YES

Table 6
Sensitivity Tests II

Type of capital flows →	Dependent variable: Growth rate of GDP per capita (period: 1973-2005)			
	(7)	**(8)**	**(9)**	**(10)**
	Total flows	**FDI flows**	**Equity flows**	**Debt flows**
Capital flows	0.698***	0.570***	1.65***	0.346***
	(0.119)	(0.047)	(0.709)	(0.102)
Volatility of capital flows	-1.25***	-0.955***	-1.99***	-0.806***
	(0.207)	(0.122)	(0.907)	(0.173)
Banking supervision	0.815***	0.809***	0.441	0.757***
	(0.135)	(0.043)	(0.671)	(0.330)
Vol. of capital flows * Banking supervision	0.498***	0.432***	0.720**	0.282***
	(0.074)	(0.042)	(0.350)	(0.072)
Capital flows * Banking supervision	-0.306***	-0.226***	-0.620**	-0.146***
	(0.040)	(0.020)	(0.261)	(0.038)
Includes control variables in set *X*	*YES*	*YES*	*YES*	*YES*
Countries/Observations	78/554	78/542	79/539	71/445
Number of instruments	71	81	64	55
Chi-square (p-value)	0.000	0.000	0.000	0.000
Hansen J-statistic (p-value)	0.902	0.784	1	0.973
AR(2) test (p-value)	0.426	0.339	0.355	0.940

Final Remarks

- We find that macro-prudential policies mitigate the negative growth effects of unstable capital flows and, by so doing, are effective in limiting financial system vulnerabilities.

- This finding holds across a variety of types and measures of capital flows, as well as across different aggregate instruments of regulation.

- The adoption of MPR policies may also entail some costs

  - In as much as they reduce the pool of high-risk financial projects, they may affect economic activity and growth and limit efficient resource allocation.