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International Evidence on the Interaction between Cross-Border Capital Flows and Domestic Credit Growth

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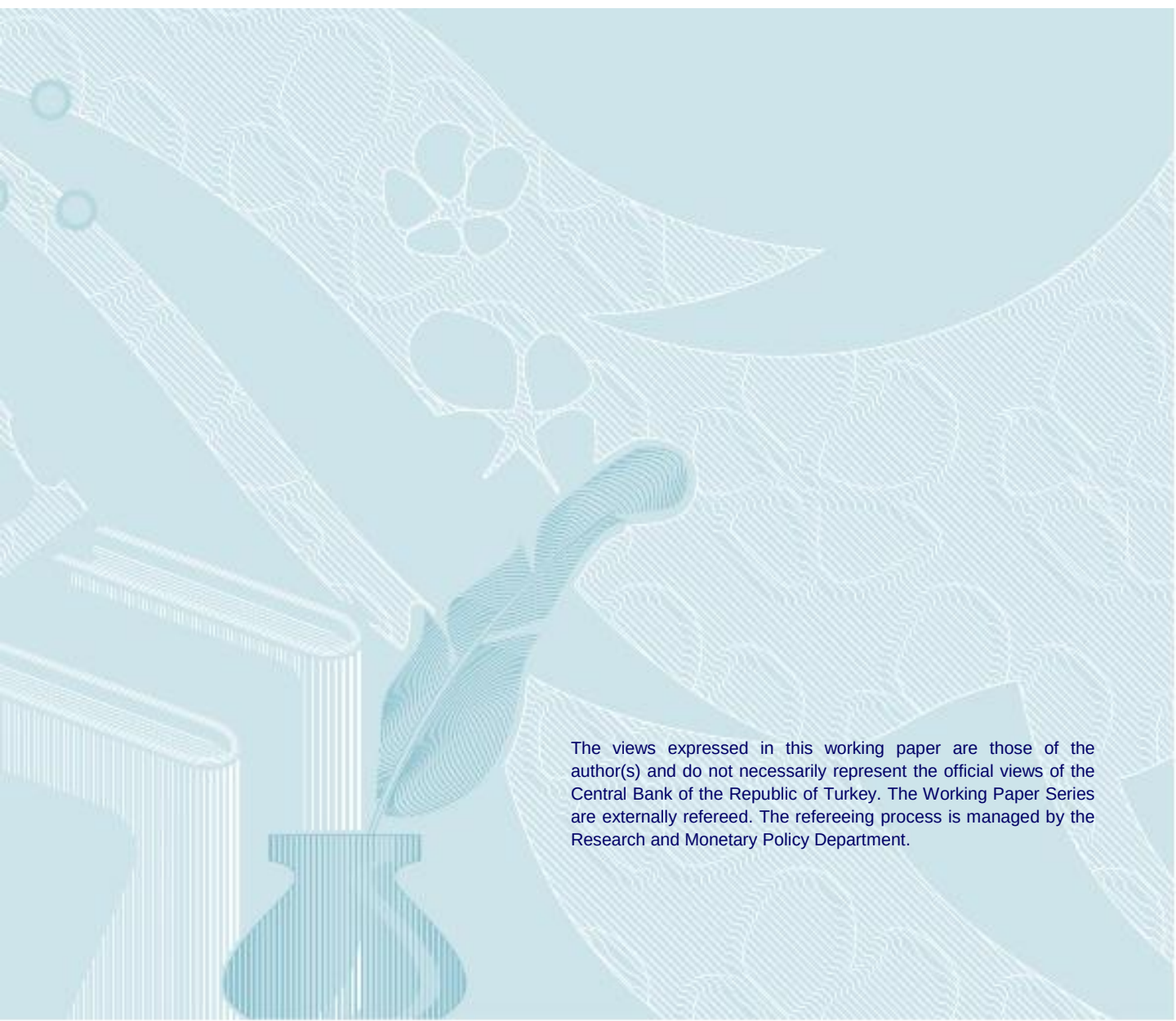

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International Evidence on the Interaction between Cross-Border Capital Flows and Domestic Credit Growth[1]

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Abstract

The extent of interaction between international capital flows and macro-financial stability is an important and unsettled topic of debate. We contribute to this discussion by providing empirical evidence on the relationship between capital flows and domestic credit growth using a large cross-country panel dataset which includes both developed and developing economies. In the benchmark regression, we use a fixed effect model, and find a statistically significant and positive co-movement between the two variables, which is consistent with common wisdom and recent theory a la Bruno and Shin (2014). This empirical regularity is more pronounced in upper-middle income countries in comparison with the lower-middle and high income countries. The main results are robust to other econometric specifications and a variety of alternative measures for credit growth and capital flows.

JEL Classifications: E51, F32, G15.
Keywords: Cross-border capital flows, domestic credit growth, macro-financial stability, cross-country evidence.

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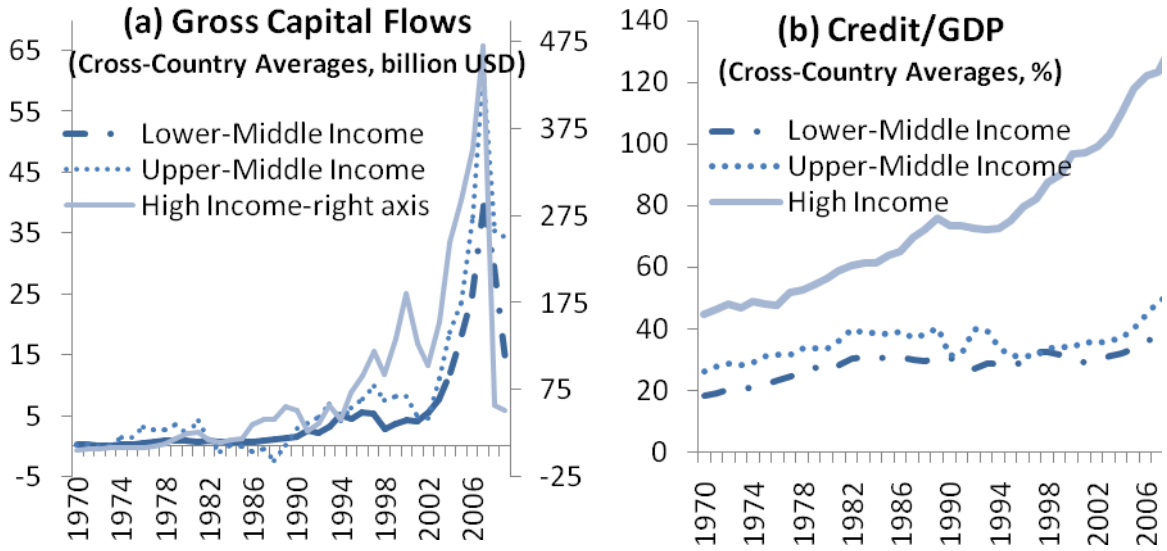
1. Introduction

> *"...one might compare capital account liberalization to putting a race car engine into an old car and setting off without checking the tires or training the driver. Perhaps with appropriate tires and training, the car might perform better; but without such equipment and training, it is almost inevitable that an accident will occur. One might actually have done far better with the older, more reliable engine: performance would have been slower, but there would have been less potential for an accident."* Stiglitz (2000).

International capital flows are in principle beneficial for countries, particularly for those with low saving rates; however they can also intensify macro-financial risks in recipient countries, as illustrated in recent turmoil in emerging countries. The fact that the size of capital flows has reached remarkable levels over the course of the last decade makes this concern all the more relevant for policymakers, especially in emerging economies (Figure 1, panel a)[4]. In particular, the extent of interaction between international capital flows and macro-financial stability is an important topic of debate which is still unsettled (Kose et al. 2009). Also, appropriate policies to benefit from greater financial integration while limiting the adverse effects have been some of the raised topics of discussion among others in both policy circles and academics.[5]

[4] See also Broner et al.(2013) and Kose et al. (2009).
[5] See IMF (2012) and CIEPR (2012) for detailed discussions.

Figure 1: International Capital Flows and Domestic Credit



Notes: Classification of countries with respect to income levels follows the definitions of World Bank. Data sources: IMF and World Bank.

In this regard, we study the interaction between international capital flows and domestic credit growth using a large cross-country panel dataset which includes both developed and developing economies. Our empirical results, based on panel data regressions, verify significant positive correlation between net capital inflows and domestic credit growth, and are robust to various econometric specifications. This is consistent with the findings in the recent empirical studies in the literature as well.[6] We also find that credit growth rate is positively correlated with real GDP growth, and negatively correlated with inflation and crisis periods, which are quite intuitive results. Moreover, the interaction between capital flows and credit growth is more pronounced in upper-middle income countries in comparison with high income and lower-middle income countries.

[6] See Rey (2013), and Lane and McQuade (2014) for complementary results.

In the literature, there has been a considerable attempt to shed light on the linkages between international capital flows and domestic macro-financial developments. Common wisdom and some theory predict benefits from financial integration because capital inflows can finance investment/saving gap, improve economic growth, and smooth inter-temporal consumption. However, they can also potentially lead to financial vulnerabilities through excessive debt expansion, currency mismatches, inflation, exchange rate appreciation, and asset price booms.[7]

Intuitively, credit growth is an important channel through which capital flows potentially accumulate macro-financial risks in domestic economies.[8,9] In particular, excessive credit expansions may lead to unsustainable debt levels for households and implausible leverage ratios for firms.[10] In this regard, we aim to investigate possible interaction between cross-border capital flows and credit growth in order to shed light on the role of capital inflows in accumulating aforementioned financial risks in domestic economies.[11]

The rest of the paper is organized as follows: we provide a literature review in Section 2, in Section 3 we present the data set, we discuss the results in Section 4, and we finally conclude in Section 5.

2. Related Literature

This paper adjoins a body of research on the macroeconomic and financial (in)stability implications of global financial integration (surge in international capital flows preceded by

[7] Section 2 provides a detailed review on the theoretical and empirical literatures on international capital flows.
[8] See Bruno and Shin (2014) for an example of mechanism through which domestic banking sector transmits financial risks from global liquidity.
[9] Jorda et al. (2011), Schularick and Taylor (2012), and Gourinchas and Obstfeld (2012) document that financial crises tend to be followed by credit booms.
[10] See Mian and Sufi (2010) and Mendoza and Terrones (2012) among others.
[11] Shin (2012) emphasizes the role of gross flows between Europe and U.S. in credit booms of the U.S. in mid-2000s.

liberalization of capital accounts).Despite presence of numerous papers attempting to understand the effects of financial integration on domestic economies, neither theoretical nor empirical literature is conclusive on the topic. On the theory side, most of the studies focus on the consumption, output, and risk sharing implications of financial integration. While standard business cycle models predict substantial welfare gains from financial integration through increased risk sharing and output growth, and decreased consumption volatility (Backus et al. 1992, Baxter and Crucini 1995, Sutherland 1996); others (Cole and Obstfeld 1991, Levchenko 2005, Gourinchias and Jeanne 2006, Evans and Hnatkovska 2007, Leblebicioglu 2009) demonstrate the opposite under alternative model environments. Cross-country empirical studies such as Razin and Rose (1994), Kose et al. (2007), and Levchenko et al. (2009) find either little or no benefit from financial integration in terms of consumption, output, and risk sharing; whereas Bekaert et al. (2005), Bekaert et al. (2007), and van Wincoop (1994), among others, provide evidence on the opposite.

Policy alternatives to manage capital flows – especially for emerging countries - have also been an important topic in the literature. For instance, Stiglitz (2000) summarizes the potential benefits of financial liberalization for domestic economies and classifies the conditions under which global financial integration would be beneficial for domestic economies. He concludes that full capital account liberalization might be harmful for countries, especially those with weak institutions for financial stability. In particular, he argues that countries tend to benefit from direct investments whereas they face macro-financial volatilities with fully liberalized short-term capital flows.[12]

[12] Calvo et al (1994), Eichengreen (2000), Kose et al. (2010), Akyüz (2004), and Boratav (2001) also surveyed the policy options on capital flow management.

A number of cross-country studies search for the effects of international capital flows on various macro-financial variables such as real exchange rate and asset prices. For instance, Aizenman and Jinjarak (2009), and Favilukis et al (2013) document significant positive correlation between capital inflows and house prices. Stulz (1999), and Levin and Zervos (1998), among others, document the interaction between capital flows and stock market prices. Kim and Yang (2009), and Calvo et al. (1994) provide evidence on the statistical relationship between capital flows and exchange rates. In this literature, there is a lack of theory and evidence on the interaction between capital flows and domestic credit growth except a few recent papers. In two recent papers, Bruno and Shin (2014) model the linkage between capital flows and lending behavior of banks and provide empirical evidence on the main mechanism of their model in which exchange rate appreciation preceded by capital inflows leads to higher leverage ratios for banks. Rey (2013), and Lane and McQuade (2014) document empirical relationship between capital flows and domestic credit focusing on various sets of countries. Our paper differs from those studies by providing evidence for a larger set of countries for a longer time span and disaggregates the results with respect to income level classifications. Hence, we aim to contribute filling this gap in the literature by providing complementary cross-country evidence.

3. Data

Sources and coverage of data

We use annual data for 101 countries including both developed and developing for the period between 1970 and 2009. The panel dataset is unbalanced due to time availability limits for several variables and countries. Most of the series are obtained from IMF's International Financial Statistics (IFS) and World Bank's World Development Indicators (WDI) databases. In addition we used series generated by Chinn and Ito (2006), Darvas (2012), and Broner et al

(2013) which will be explained later in this section. The macroeconomic variables used in our analysis include credit growth, net capital inflows, real GDP, real per capita GDP, real exchange rate, inflation, and capital account openness index. Below, we give a brief description for each variable.

Variable definitions

Here we shortly explain data sources and measurement units of each variable used in the empirical analysis. Table 1 reports the summary statistics of the variables covering complete set of countries and the entire range of time.

Credit growth: In the benchmark specification, we use "bank claims on other sectors" (IFS database) divided by consumer price index to measure real private credit growth following other studies in the literature.[13]We alternatively use private credit to GDP ratio (WDI database) as a robustness check as in Lane and McQuade (2014), Djankov et al. (2007) and Furceri et al. (2011).

Table 1: Summary Statistics.

Variable	Units	Obs	Mean	Std.
Credit/GDP	percent	3572	51.34	43.12
Net Flows/GDP	percent	2997	0.64	10.68
Inflation	percent	3433	36.03	312.47
Capital Openness	index	3597	0.28	1.59
Change in REER	percent	3810	-0.10	20.90
Per Capita	1000*USD	3010	13.19	10.70
Real GDP	percent	3557	3.50	5.85

Note: The means and standard deviations are calculated for the entire set of countries and the full range of available time period (1970-2009). REER: Real Effective Exchange Rate.

[13] Calderon and Kubota (2012), and Guo and Stepanyan (2011).

Net capital flows: We obtain net capital inflows and net capital outflows from IFS database measured in current US dollars, and calculate net capital flows by subtracting the former from latter. The net flows are normalized by GDP series in current US dollars which are gathered from WDI database. As an alternative specification, we use net capital flows divided by trend GDP.[14]

Real effective exchange rate: We obtain real effective exchange rate series from Darvas (2012) because they provide longer series in comparison with other standard alternative, WDI database.[15]

Inflation: We obtained inflation series which measures percentage change in consumer prices from WDI database.

Capital openness index: We use the Chinn-Ito index to measure capital openness which is based on Chinn and Ito (2006) and updated occasionally. The currently available dataset covers the full sample period used in this paper.[16]

Real GDP and per capita real GDP: Both series are measured in constant local currency prices and obtained from WDI database.

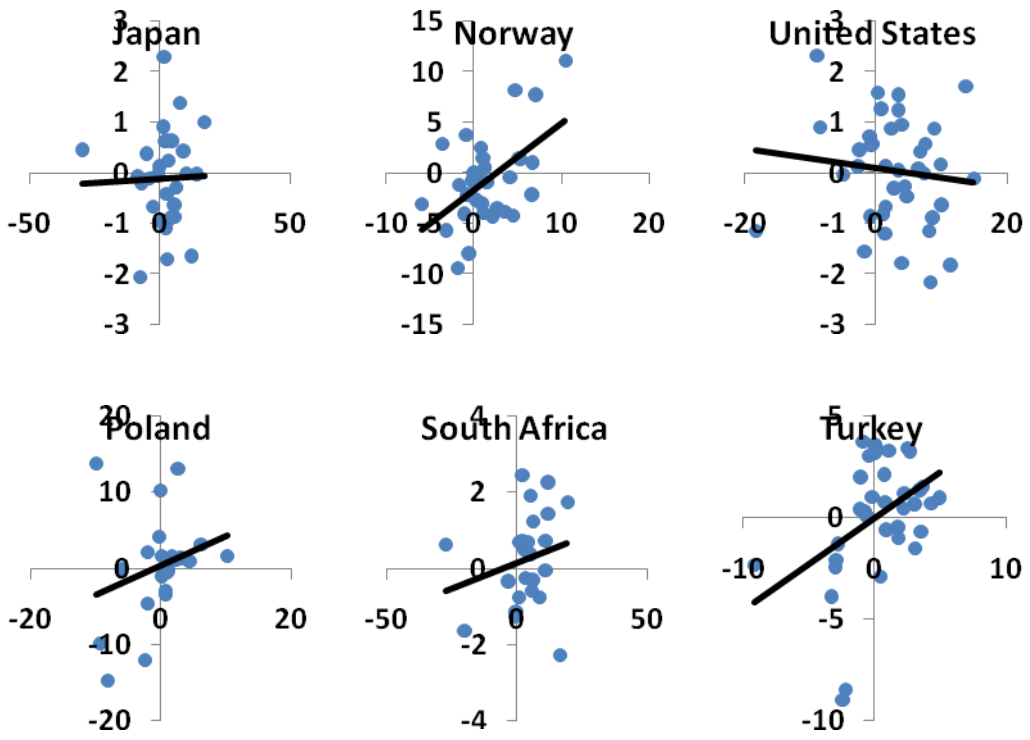
Crisis indicators: We obtain crisis identifiers from Broner et al. (2013) which merges indicators from various sources.

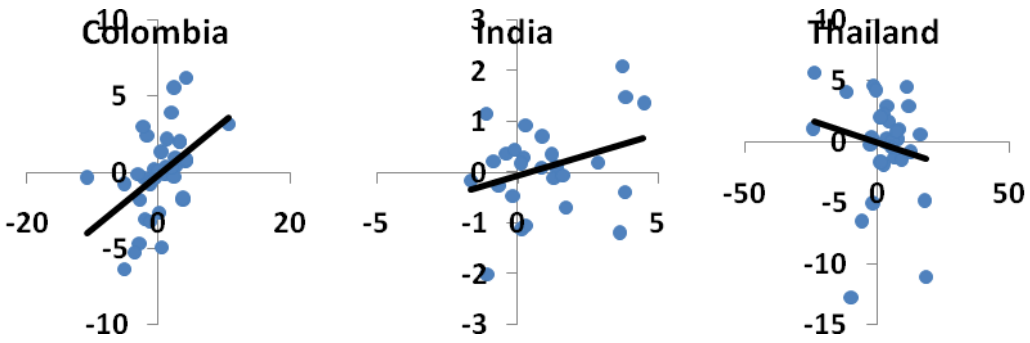
Country classifications: We classified high, upper-middle, and lower-middle income countries using World Bank definitions.[17]

[14] We obtained this series from Broner et al.(2013) in which they estimate trend GDP using HP-filter.
[15] http://www.bruegel.org/datasets/real-effective-exchange-rates-for-178-countries-a-new-database
[16] http://web.pdx.edu/~ito/Chinn-Ito_website.htm
[17] http://data.worldbank.org/about/country-classifications

Shown in panels of Figure 2 are scatter plots of credit/GDP on the horizontal axis and net capital flows/GDP on the vertical axis. The top panel illustrates the scatter plots for selected high income countries (Japan, Norway, United States) whereas the middle and bottom panels reports those for upper-middle (Poland, South Africa, Turkey) and lower-middle income countries (Colombia, India, Thailand), respectively. In a nutshell, the relationship between credit growth and capital flows seems to be more regular in the selected upper-middle income countries, which will also be confirmed in a more formal empirical analysis in Section 4.

Figure 2: International Capital Flows and Domestic Credit Growth for Selected Countries.





Notes: Credit to GDP ratio on the horizontal axis and net capital flows to GDP ratio on the vertical axis. Both series are measured in percentage units.

4. Regression Analysis

We use panel data methods to evaluate the empirical relationship between credit growth and net capital flows. In the benchmark specification, we use a fixed effect model; and then provide a robustness check using Arellano-Bond model with system GMM and difference GMM estimations. In particular we estimate the following equation:

$$CR_{it} - CR_{it-1} = a + (NCF_{it} - NCF_{it-1})\beta + (X_{it} - X_{it-1})\delta + D_{yr}\theta + D_{cr}\lambda + \mu_i + \varepsilon_{it} \quad (1),$$

where CR and NCF represent the level of domestic credit provided to private sector measured in natural logarithm, and net capital flows to GDP ratio, respectively. X denotes a set of time-varying explanatory variables including domestic price level, real effective exchange rate, capital account openness indicator, real GDP, real per capita GDP.[18] D_{yr} and D_{cr} represent a set of year and crisis dummy variables, respectively.

As denoted in equation (1), the fixed effect model is estimated with growth rates: that is we take the first difference of NCF and CR which are already measured in percentage units, and take the first difference of logarithms of the rest, except dummy variables and capital account openness

[18] See Section 3 for data sources and variable definitions.

indices. This index contains negative numbers; therefore we took first difference instead of log difference to keep the number of observations.

Estimated coefficients of the benchmark model are reported in Table 2. Separate columns report estimates for cases where we include various set of independent variables in the regression. We are, in particular, interested in the estimated coefficient of β which reveals the interaction between credit growth and net capital flows. In line with the previous results in the literature, the correlation between the two is always positive and statistically significant. This is also robust to various choices of control variables in the equation (Table 2, Columns 1 to 6). The correlation between the two variables is .36 when we control only GDP growth, and gets as large as .43 when we control for complete set of explanatory variables.

Table 2: Regression Results.

VARIABLES	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Change in Net	0.43***	0.39***	0.37***	0.35***	0.37***	0.37***
Flows/GDP	[0.084]	[0.081]	[0.068]	[0.064]	[0.062]	[0.062]
Real GDP Growth	0.62	0.99***	1.16***	1.14***	1.16***	1.18***
	[0.514]	[0.176]	[0.188]	[0.188]	[0.178]	[0.180]
Inflation	-0.01**	-0.01**	-0.00	-0.00	-0.00	
	[0.004]	[0.004]	[0.003]	[0.003]	[0.003]	
Crisis	-0.04*	-0.03*	-0.05**	-0.04		
	[0.021]	[0.020]	[0.024]	[0.024]		
% Change in	-0.12	-0.10	-0.11			
	[0.077]	[0.077]	[0.073]			
Change in Capital	0.01	0.01				
Openness Index	[0.008]	[0.008]				
% Change in Per	0.46					
Capita Income	[0.446]					
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,187	2,268	2,436	2,436	2,466	2,466
R-squared	0.16	0.15	0.14	0.13	0.13	0.13
Number of	98	100	101	101	101	101

Notes: REER abbreviates Real Effective Exchange Rate.

According to the estimates, credit growth rate is positively correlated with real GDP growth, and negatively correlated with inflation and crisis periods. These coefficients are also statistically significant. This result is quite intuitive from both supply and demand perspectives

As the economic conditions improve, credit demand would increase via improved balance sheets of firms and households who tend to consume and invest more. On the other hand, an increase in inflation is supposed to discourage both lenders and borrowers, because it increases uncertainty and complicates making healthy decisions for both lenders and borrowers. Moreover, per capita income growth and capital account openness index are positively and real exchange rate is negatively correlated with credit growth rates with statistically insignificant coefficients.

Disaggregation of the countries with respect to per capita income levels reveals some interesting results. Following World Bank, we categorize countries as high, upper-middle, and lower-middle income economies, and run specific regressions for each set of countries. The results are reported in Table 3. The positive correlation between credit growth and net capital inflows is valid for all three sets of countries, and more pronounced in upper-middle income countries in comparison with the lower-middle income and high income countries (Table 3, columns 1 to 3).In particular, estimated coefficient for upper-middle income countries is .75 whereas it is .38 and .32 for high income and lower-middle income countries, respectively. In addition, inflation is negatively, and GDP growth, per capita income growth, and real effective exchange rate growth are positively correlated with credit growth in all three groups of countries. The statistical significance of the estimated coefficients varies with the type of country groups. Most of the results stay very similar when we use trend GDP levels as an alternative to the current GDP series to normalize the capital flows (Table 3, rows 4, 5, 6).

Table 3: Country-wise disaggregation with respect to income levels.

VARIABLES	(1) High	(2) Upper-middle	(3) Lower-Middle	(4) High	(5) Upper-middle	(6) Lower-Middle
Change in Net Flows/GDP	0.36***	0.74***	0.31***			
	[0.118]	[0.231]	[0.084]			
Change in Net Flows/Trend GDP				0.28**	0.78***	0.32***
				[0.130]	[0.233]	[0.093]
% Change in REER	0.02	-0.32**	-0.08	0.02	-0.16	-0.08
	[0.072]	[0.152]	[0.085]	[0.072]	[0.103]	[0.087]
Inflation	-0.05*	-0.02	-0.01***	-0.05*	-0.02	-0.01***
	[0.025]	[0.021]	[0.001]	[0.025]	[0.021]	[0.001]
Change in Capital Openness	0.01	0.03***	-0.02	0.01	0.02**	-0.02
	[0.011]	[0.010]	[0.015]	[0.012]	[0.010]	[0.015]
Real GDP Growth	0.54	1.21	0.12	0.59	1.24	0.11
	[0.600]	[1.977]	[0.224]	[0.601]	[2.003]	[0.220]
% Change in Per Capita Income	0.30	0.12	0.68***	0.27	0.05	0.68***
	[0.599]	[1.809]	[0.136]	[0.605]	[1.826]	[0.137]
Crisis	-0.03	-0.02	-0.05*	-0.03	-0.00	-0.05*
	[0.017]	[0.052]	[0.024]	[0.017]	[0.054]	[0.024]
Observations	864	478	834	864	481	834
R-squared	0.18	0.29	0.19	0.18	0.28	0.19
Number of countries	36	24	37	36	24	37
Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1						

Notes: Country classifications follow World Bank definitions.

We use interaction variables to see whether the coefficient estimates in Table 2 differ among country groups (classified in terms of per capita income level). In particular, we pool all the countries back, and interact each of the right hand side variables in equation (1) with income level dummy variables. This exercise also allows us to formally test the significance of country-

wise (High, upper-middle, lower-middle) coefficient heterogeneity in net capital flow variable (Table 3, rows 1, 2).

The coefficient estimates for the interaction variables along with the previously included variables are presented in Table 4. The column on the left presents the estimated coefficients for the variables in the benchmark model along with their interactions with country dummies. The column on the right shows the results when we alter the denominator of the capital flows with trend GDP instead of current GDP. The variables HID and LMID represent high income and lower-middle income dummies, respectively. The estimated coefficients for their interaction with the other variables reveal the difference between the corresponding country group and the upper-middle income country group in the interacted variable's estimated coefficient. For instance, the estimated coefficient for the variable "Change in Net Flows/GDP*LMID" is negative and significant. That means the size of the correlation between the credit growth and domestic credit growth is significantly larger for the upper-middle income countries compared with the lower-middle income countries. The estimated coefficients for the other interaction variables are interpreted in a similar manner.

The bold cells in Table 4 show the statistically significant coefficient estimates. According to at least one of the two model specifications (Table 4, right and left columns), correlation between capital inflows and credit growth is significantly larger in upper-middle income countries compared with both lower-middle and high income countries (Table 4, rows 2, 3). Also, correlation between real effective exchange rate and credit growth is found to be significantly smaller in upper-middle income countries than that in high income countries. The other coefficient estimates are also mostly consistent with the estimates from country-wise disaggregated equations (Table 3) in terms of both sign and statistical significance.

Table 4: Country group dummy variables (with respect to income levels) interacted with other explanatory variables.

(1) % Change in Credit	VARIABLES	(2) % Change in Credit
0.71* **	Change in Net Flows/GDP	-
[0.212]		
-0.38	Change in Net Flows/GDP*HID	-
[0.234]		
-0.39*	Change in Net Flows/GDP*LMID	-
[0.230]		
-	Change in Net Flows/Trend GDP	**0.77*** **
		[0.218]
-	Change in Net Flows/Trend GDP*HID	**-0.52****
		[0.245]
-	Change in Net Flows/Trend GDP*LMID	**-0.45***
		[0.236]
-0.25*	% Change in REER	-0.15
[0.127]		[0.090]
0.00*	% Change in REER*HID	0.00
[0.001]		[0.001]
0.00	% Change in REER*LMID	0.00
[0.001]		[0.001]
-0.02	Inflation	-0.02
[0.022]		[0.022]
-0.03	Inflation*HID	-0.03
[0.038]		[0.038]
0.01	Inflation*LMID	0.01
[0.022]		[0.022]
0.03**	Change in Capital Openness	**0.02****
[0.011]		[0.010]
-0.02	Change in Capital Openness*HID	-0.01
[0.017]		[0.016]
-0.03	Change in Capital Openness*LMID	-0.03
[0.021]		[0.021]
1.22	Real GDP Growth	1.24
[1.820]		[1.851]
-0.83	Real GDP Growth*HID	-0.81
[1.922]		[1.950]
-1.00	Real GDP Growth*LMID	-1.04
[1.814]		[1.847]
0.09	% Change in Per Capita Income	0.02
[1.623]		[1.648]
0.39	% Change in Per Capita Income*HID	0.41
[1.736]		[1.760]
0.62	% Change in Per Capita Income*LMID	0.70
[1.592]		[1.622]
-0.01	Crisis	-0.00
[0.052]		[0.053]
-0.02	Crisis*HID	-0.02
[0.055]		[0.055]
-0.04	Crisis*LMID	-0.04
[0.056]		[0.056]
2,176	Observations	2,179
0.17	R-squared	0.17
97	Number of countries	97
Robust standard errors in brackets, *** p<0.01, ** p<0.05, * p<0.1		

Notes: HID and LMID indicate High Income Dummy and Lower-middle Income Dummy, respectively. Country classifications follow World Bank definitions.

Robustness Checks

We provide some robustness checks in this section. We alternate the credit growth and capital flow measures as a first robustness check. In particular, we use "credit to GDP ratio" instead of "level of credit" itself to measure domestic credit. Also, we use "level of net capital flow" and "its ratio to trend level of GDP" instead of "its ratio to current GDP" as alternative specifications.[19] Columns (1) to (4) of Table 5 present the estimation results with the aforementioned alternative variables. The results show that the positive correlation between capital flows and credit growth is robust to alternative measurements of the two variables. The fact that the size of the estimated coefficients differ from each other is a natural consequence of the varying scales of alternative measures.

In addition, we alternate the econometric specification, and use a dynamic panel method a la Arellano and Bond (1991) which is especially useful in cases where number of cross sections (n) is relatively larger compared to number of time periods.[20] This method allows us to incorporate the dynamic nature of credits. In particular, we use the lagged value of the credits as an independent variable on the right hand side which leads to inconsistency in fixed effect regression but not in Arellano-Bond model. In particular we estimate equation (1) with a lagged value of the dependent variable on the right hand side.

We estimate the Arellano-Bond model with system GMM and difference GMM. We treat real GDP growth, inflation, and per capita income growth as potentially endogenous variables, and use them as endogenous instrumental variables. In addition, we used the rest of the independent

[19] We obtain the series for "net capital inflows to trend GDP ratio" from Broner et al.(2013) in which trends are calculated using Hodrick-Prescott filter.

[20] See Roodman(2009) for a detailed explanation of conditions where Arellano-Bond method provides consistent estimates. We have 101 countries and 39 years in our dataset, therefore we think Arellano-Bond method is a suitable alternative model specification for our dataset.

variables, except dummies, as exogenous instruments. Shown in the last two columns of Table 5 are the results of the corresponding estimations. They indicate that the positive relationship between capital flows and credit growth is robust to alternative econometric specifications. The scales of the estimated coefficients are again different from the benchmark model as a natural result of different scales of alternative measures.

Table 5: Robustness checks.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	**% Change in Credit FE**	**% Change in Credit FE**	**Change in Credit/GDP FE**	**Change in Credit/GDP FE**	**Ln(Credit) Difference GMM**	**Ln(Credit) System GMM**
Change in Net Flows/GDP	0.43*** [0.085]	-	0.10** [0.053]	-	-	-
Change in Net Flows/GDP_{trend}	-	0.42*** [0.088]	-	0.11** [0.051]	-	-
First lag of Credit	-	-	-	-	0.96*** [0.014]	1.00*** [0.001]
Net Flows/GDP	-	-	-	-	0.35*** [0.096]	0.32*** [0.071]
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Crisis Dummy	Yes	Yes	Yes	Yes	Yes	Yes
X	No	No	No	No	No	Yes
% Change in X	Yes	Yes	Yes	Yes	Yes	No
Observations	2,176	2,179	2,299	2,302	2,136	2,244
R-squared (overall)	0.16	0.16	0.05	0.05	-	-
Number of countries	98	98	99	99	97	99

Robust standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1.

Notes: X represents the explanatory variables presented in equation (1). GDP_{trend} is the trend component of GDP which is calculated using Hodrick-Prescott filter.

5. Conclusions

While capital flows supposedly provide significant benefits to countries, especially to those with saving-investment gaps, they also pose some macro-financial risks to domestic economies. For instance, capital flow volatility may lead to financial instability concerns through channels such as excessive credit fluctuations and exchange rate volatility (Bruno and Shin 2014). The transmission of the 2008-2009 crisis from the U.S. housing market to the rest of the world is a recent major example to realized risks of global financial integration and capital flows. The period after the crisis in which we experienced a surge on international capital flows lead to a growing empirical literature on the topic.

We aim to contribute to this empirical literature. In particular, we use a large cross-country dataset including both developed and developing countries, and show that there is statistically significant correlation between net capital flows and domestic credit growth. While this relationship is stronger in upper-middle income countries compared to lower-middle and high income countries, the relationship between real effective exchange rate and domestic credit growth is found to be less pronounced in upper-middle countries in comparison with high income countries. We also find that credit growth rate is positively correlated with real GDP growth, and negatively correlated with inflation and crisis periods. These results reveal not only the significant interaction between capital flows and domestic macro-financial variables but also that it is not uniform across countries, because the estimated coefficients vary with respect to per capita income levels of countries.

Interaction between international capital flows and macro-financial stability is a topic which is still far from being settled. There are lots of remaining questions to be answered beyond the interaction between capital flows and credit growth on this issue. For instance, the linkage

between capital flows and balance sheets of banks, firms, and households are important research topics which might shed light on the channels through which capital flows affect macro-financial stability. The role of external (im)balances on the posture of these channels is another important question which can help assessing country-specific risks against capital flow volatilities. Consequently, understanding the linkages between the capital flows and domestic macro-financial developments will certainly provide benefits to policymakers in designing the macroprudential policies.

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Appendix

Set of countries included in the analysis:

Albania	Republic of Congo	Hungary	Mauritius	Saudi Arabia
Algeria	Costa Rica	Iceland	Mexico	Singapore
Angola	Croatia	India	Moldova	Slovak Republic
Argentina	Czech Republic	Indonesia	Mongolia	Slovenia
Armenia	Denmark	Iran	Morocco	South Africa
Australia	Dominican Republic	Ireland	Namibia	Spain
Austria	Ecuador	Israel	Netherlands	Sri Lanka
Azerbaijan	Egypt	Italy	New Zealand	Swaziland
Bahamas	El Salvador	Jamaica	Nicaragua	Sweden
Barbados	Equatorial Guinea	Japan	Norway	Switzerland
Belarus	Estonia	Jordan	Oman	Syrian Arab Republic
Bolivia	Finland	Kazakhstan	Pakistan	Thailand
Bosnia and Herzegovina	France	Rep. of Korea,	Panama	Trinidad and Tobago
Botswana	Gabon	Kuwait	Paraguay	Tunisia
Brazil	Georgia	Latvia	Peru	Turkey
Bulgaria	Germany	Libya	Philippines	Ukraine
Canada	Greece	Lithuania	Poland	United Kingdom
Chile	Guatemala	Macedonia	Portugal	United States
China	Honduras	Malaysia	Romania	Uruguay
Colombia	Hong Kong	Malta	Russian Federation	Venezuela
				Vietnam

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