Capital Flows, Macroprudential Policies and Capital Controls

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Understanding the determinants and patterns of international capital flows is of crucial importance for the design of policies that enhance macroeconomic stability. Traditionally, capital flows have been very volatile in developing economies, with large inflows in times of economic booms, and large, sudden capital flow reversals in times of economic turmoil. This volatile behavior has prompted policymakers in these economies to impose controls, on either inflows or outflows, in an attempt to reduce the volatility of capital flows, thus decreasing the probability of a crisis generated by large flow reversals. More recently, as a result of the buildup of global systemic risks prompted by capital flows and the subsequent rapid and widespread transmission of a shock originated in a single economy (the U.S.) that characterized the last global financial crisis, capital flows, capital controls and, more prominently, macroprudential policies in developed economies have become a subject of great interest in the profession[1]. It is only natural, then, that these are topics that have been thoroughly researched by the economic profession in the last decades. Yet, many questions about the extent of the effects of policy measures such as capital controls and macroprudential policies remain without a definite answer.

We would like to thank Catalina Larraín for her excellent research assistance. We are grateful to José De Gregorio and Nicolás Magud, as well as the participants at the XXI Annual Conference of the Central Bank of Chile, for their fruitful comments and discussions. All errors are our own.

1. While macroprudential measures are typically designed to impact domestic credit and risk-taking by financial institutions, arguably they should also impact capital flows, though in a more indirect manner.

Monetary Policy and Financial Stability: Transmission Mechanisms and Policy Implications edited by Álvaro Aguirre, Markus Brunnermeier, and Diego Saravia, Santiago, Chile.

In this paper we seek to understand how macroprudential policies and capital controls affect capital inflows, and what the main economic mechanisms driving the results are. To this end, we consider a panel of 39 countries over the 2004–2013 period, 21 of which are developed economies and 18 are developing ones. We derive results on the impact of these two types of economic policies, namely macroprudential policies and capital controls, on capital inflows for both types of economies.

Our main result is that macroprudential policies, especially those targeted at financial institutions, positively affect capital flows in developing economies, while their impact is negative in developed economies. This result appears to be quite robust to different econometric specifications and the inclusion of controls to account for possible reverse causality.

Following Bruno and Shin (2017), we argue that this outcome is broadly consistent with the hypothesis of carry-trade opportunities present in developing economies, which are intensified when macroprudential policies limit the ability of domestic financial institutions to provide credit to firms. Non-financial firms with access to international markets see an opportunity to obtain profits from interest rate differentials by bringing in external funds and acting as financial intermediaries in the domestic market[2].

While we do not explore the carry-trade mechanism explicitly[3], we base our interpretation of the results on two findings. First, domestic credit is negatively influenced by macroprudential policies in developing economies, but not in developed ones. Second, in developing countries with more developed financial systems, the effect of macroprudential policies on capital inflows is larger. This brings support to the idea that relatively small domestic firms see their funding needs curtailed by such policies.

2. De Gregorio and others (2017) argue that firms in emerging markets exploit interest rate differentials to accumulate international debt in order to increase their investments. While we do not explore this channel explicitly, we consider our findings and our hypothesis to be consistent with this evidence.

3. The reason for this is twofold: First, in order to test whether capital flows respond to interest rate differentials, we would need to take into account the interest rates at which firms take loans. These rates are different to the monetary policy rate in the economy and present quite a substantial degree of variance, so they are usually not necessarily well represented by the mean rate in the system. Second, even if we had a good measure of interest rate differentials, the presence of segmented markets in developing economies, by which some firms have ample access to domestic and international financial markets while others do not, makes it hard to test this channel by using a common equilibrium market price. Consequently, we consider this to be beyond the scope of the paper.

In terms of capital controls, we find that they exert a negative effect on capital inflows in developing economies, as it is expected from these types of measures. We also find that capital controls impact negatively on the volatility of equity inflows in these economies. This is an important result from the point of view of policy design, as the main goal of capital controls in developing economies is precisely the reduction of capital flow volatility.

This paper is organized as follows: section 1 reviews the related literature. Section 2 describes the data we use to perform our empirical analysis, and section 3 discusses our main empirical strategy. Our results are presented in section 4. Finally, section 5 concludes.

1. Related literature

After the global financial crisis of 2008–2009, there has been a renewed interest on the design and efficacy of macroprudential policies. Special attention has been given to their ability to promote financial stability[4] and their interaction with monetary policy as a stabilization tool.[5] In the recent past, there has been increasing interest in analyzing how macroprudential policies affect capital flows. A notable example is Bruno and others (2017).[6] In this paper, the authors identify the effects of domestic macroprudential policies and capital control measures on banking and bond inflows for a group of 12 Asia-Pacific economies over 2004–2013. Our analysis is related to theirs, but we focus on a larger group of 39 countries and we specifically investigate the effect of macroprudential policies on inflows associated to carry-trade operations.

Capital controls have received wide attention from the profession since the 1990s, praised and demonized at different points in time. While most papers in the early empirical literature on capital controls and financial liberalization focused on their effects on macroeconomic performance[7], the recent literature has focused on using rich datasets (cross-country or microdata within a country) to study the effectiveness of capital controls on net and gross measures of capital

4. See, among others, Galati and Moessner (2013), Claessens (2014), Cerutti and others (2015) and references therein.

5. See Smets (2014), Rubio and Carrasco-Gallego (2014), Angelini and others (2014), Bailliu and others (2015), and Mishkin (2011), among many others.

6. See also Ostry and others (2012), Unsal (2013), and Beirne and Friedrich (2017).

7. See Forbes (2007) for an excellent survey on the older literature on capital controls, financial liberalization and economic growth.

flows, oftentimes distinguishing by types of flows (mainly banking, bonds, and equity). Some examples in this literature are Magud and others (2011), Warnock (2012), Ahmed and Zlate (2014), Forbes and others (2015), and Forbes and others (2016). Results in this literature are usually conflicting—while some find that capital controls are associated with more stable capital flows (mainly through lower capital inflows), others find that these measures fail to accomplish their desired goals. We contribute to this literature in showing that some types of capital controls, specifically those targeted at equity flows, are associated with a lower volatility of equity inflows. Moreover, our results suggest that capital controls that affect bond inflows may have the desired effect, at least for non-developed countries.

Our work is also related to a newer strand of literature studying the patterns and determinants of international corporate debt issuance in emerging economies. In a nutshell, flows to emerging economies have shifted from being mainly used to finance public debt to finance corporate debt and, among the latter, from bank loans to bond issuance. The stylized facts associated to these changes are thoroughly documented in Turner (2014), Avdjiev and others (2014), Bruno and Shin (2017), and Caballero and others (2016a). The natural question that arises then is why we observe this new pattern of capital flows. There are two competing explanations for this phenomenon[8]: The first is that financially constrained firms in emerging markets have taken advantage of the relative abundance of global liquidity in the recent years to accumulate large stocks of funds, in anticipation of times in which market incompleteness would prevent them from covering their financial needs. This is dubbed as the *precautionary motive*. The second explanation posits that non-financial firms with access to international markets in these economies have undertaken a role of financial intermediation that heavily regulated banks cannot fulfill, thus taking advantage of macroeconomic conditions such as low international interest rates and local currency appreciation. This is the *carry-trade explanation* and is the one that seems to be supported in the data: Bruno and Shin (2017) use firm-level data on international bond issuance and other financial information and find that firms issuing U.S. dollar-denominated bonds use their proceeds to add to their cash holdings. This behavior is more prevalent in emerging markets and when carry-trade conditions are more favorable.

8. Other alternative explanations are the retreat of international banks from economies with weaker fundamentals and the presence of foreign firms in the U.S. market.

They interpret these findings as evidence supporting the carry-trade explanation. Caballero and others (2016b) link this result to the degree of financial openness of emerging markets. In particular, they find that carry-trade activities are prevalent in economies in which capital controls are tighter. We contribute to this ongoing debate by showing that, in emerging economies, domestic financial regulation also plays a prominent role in determining bond inflows. We argue that this is additional proof that such flows respond to carry-trade motives since macroprudential policies targeted at financial institutions provide a widened market in which non-financial firms can act as intermediaries, thus taking advantage of carry-trade opportunities.

2. Data

Following much of the recent empirical literature on capital flows, we use quarterly data on gross capital inflows on bonds and equity obtained from the Balance of Payments Statistics Database of the IMF.[9] We compute gross flows as the difference of two consecutive periods in the stock of liabilities reported in the international investment position of the country. Our preferred measure for the empirical analysis that follows is the gross flow scaled by the stock in $t - 1$, i.e., the growth rate.

Our measure of macroprudential policies is obtained from Cerutti and others (2015). They document the use of macroprudential policies for 119 countries on a yearly basis over the 2000–2013 period. They construct 12 measures of macroprudential policies and assign to each one of them a value of 1 if the country had that policy in place in that year, and 0 otherwise. They synthesize the information by means of three main indices of macroprudential policies, depending on which economic agents these policies are targeted at: borrowers, financial institutions, or all (which is the sum of the previous two). Macroprudential policies targeted at borrowers include loan-to-value ratio caps and debt-to-income ratio limits, while those targeted at financial institutions include loan-loss provisions, countercyclical capital buffers, limits on leverage ratios, capital surcharges on systemically important financial institutions (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.

9. See Gourinchas and Rey (2013) for a discussion.

We use measures of capital controls from Fernandez and others (2016), who document annual indicators of controls on inflows and outflows for ten categories of assets, for 100 countries, for the period 1995–2013, based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). As with macroprudential indices, here variables are assigned a value of 1 if there was a policy in place in that country and year, and 0 otherwise. For portfolio inflows, they group measures into those that affect assets purchased locally by non-residents and those that affect instruments sold or issued abroad by residents. Similarly, for outflows, they group measures into those that affect instruments sold or issued locally by non-residents and those that impact instruments purchased abroad by residents.

The rest of the variables we use are mainly macroeconomic controls obtained from the World Development Indicators of the World Bank, the St. Louis Fed, and Datastream. Appendix A contains a more detailed description of all variables and data sources used.

2.1 Summary Statistics

Table 1 shows summary statistics for the variables of interest used in the empirical estimations. Our sample consists of 39 countries—21 developed countries and 18 developing countries. In the latter group, there are six emerging countries according to the IMF classification.[10] We use an unbalanced panel of quarterly data from 2004 to 2013, requiring at least 12 observations for each country. On average, there are around 32 observations per country, which gives us a panel with 1239 observations, almost 60% of which correspond to developed countries.

The second panel of table 1 shows statistics related to the main dependent variable—capital inflows. On average, these are close to 1.9% of the stock of international assets, while their standard deviation is 6.7%. Capital inflows are larger and more volatile in developing countries than in developed ones, with an average size and a standard deviation of 2.3% and 7.1%, respectively, as compared with 1.5% and 6.4% shown by developed countries.

Almost all the countries in our sample have had some type of macroprudential policy in place during the period considered (i.e.

10. See table 11 in the appendix for the list of countries.

the macroprudential index, or MPI, has a positive value). The only countries without these types of policies in the sample period are the U.K. and Slovenia. The third panel of table 1 shows statistics for the two types of macroprudential policies we use in our estimations. Most of these policies are imposed on financial institutions, with 34 countries having a positive value in the corresponding index at some point. Countries with positive values in the index for borrowers are half this number. More important for the results are the number of countries that introduce or eliminate some measures during the years of our sample. These are 9 and 17 countries for borrowers and financial institutions, respectively. In terms of countries' classification these indicators are evenly spread between developed and developing countries.

Table 1. Summary Statistics

	All	*Developed*	*Developing*
Countries	39	21	18
Observations	1,239	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

Source: Author's elaboration.

The last panel of table 1 shows the same information but for capital controls. These policies are scarcer in the sample, with only 13 countries showing positive values for the indicators, eight of them using both types of controls, to residents and non-residents. Unlike the MPI, capital controls are significantly more common in developing countries. Indeed, these are so infrequently applied in developed countries that we are unable to identify their effects in this group when using our preferred specification, which needs not only variation in capital controls but also that they remain in place for more than one year. This we do not observe in the group of developed countries in our sample.

3. Econometric Specification

Our baseline specification takes the following form

$$f_{i,t} = \alpha_i + \eta_t + \beta X_{i,t} + \gamma_b \text{MPI}^b_{i,t} + \gamma_{f_i} \text{MPI}^{f_i}_{i,t} + \theta_{nr} \text{CC}^{nr}_{i,t} + \theta_r \text{CC}^r_{i,t} + \in_{i,t} \quad (1)$$

where f is the capital inflow variable, i and t denote country and period, respectively, and parameters α_i and η_t capture country-fixed and time-fixed effects, respectively. The vector X includes controls that are commonly used in the literature: total external debt to GDP, the fraction of external debt that is short-term, and the stock of reserves as a fraction of total external debt. The coefficients of interest are γ_b and γ_{fi} in the case of MPI for borrowers and financial institutions, and θ_{nr} and θ_r in the case of capital controls imposed on non-residents and residents, respectively. The residual is $\in_{i,t} \sim N(0, \sigma^2)$.

The specification above does not control for endogeneity problems related to reverse causality from capital inflows to policy measures. Although solving this problem and identifying a pure causal effect from policies to capital flows is out of the scope of this paper, we do try to minimize this issue. We do this by controlling for dummy variables that indicate country-year pairs when the value of each policy indicator changes. Following this approach, we control for the contemporaneous correlation between flows and the policy indicators, which we claim should be more contaminated by reverse causality.

This can be illustrated when considering capital controls to non-residents in developing countries. In figure 1 we plot the average path of capital inflows, without controlling for any other factor, in developing countries around the imposition of the capital control, defined as time 0 in the x-axis. Capital inflows rise significantly in the year the control is

imposed, probably because policy reacts to the larger inflow. But in the year after the policy change, capital flows drop significantly, below the level observed before the control is imposed. This is explained more likely because of causality from policy to inflows, which is the relationship we are interested in capturing. Therefore, as we clean our estimations from the effects happening at time 0, our coefficients will be capturing this causality better than when not controlling for them. Indeed, as it is shown below, when not controlling for the change in capital controls, the coefficient θ_{nr}, which captures the relationship in figure 1, is positive and significant, while it becomes negative and significant when doing so.

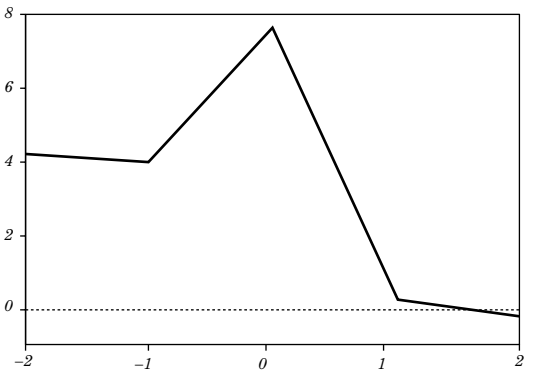
Hence we add dummies to equation (1) to obtain our preferred specification:

$$f_{i,t} = \alpha_i + \eta_t + \beta X_{i,t} + \gamma_b \mathrm{MPI}^b_{i,t} + \gamma_{f_i} \mathrm{MPI}^{f_i}_{i,t} + \theta_{nr} \mathrm{CC}^{nr}_{i,t} + \theta_r \mathrm{CC}^r_{i,t} \quad (2)$$
$$+\hat{\gamma}_b d\mathrm{MPI}^b_{i,t} + \hat{\gamma}_{f_i} d\mathrm{MPI}^{f_i}_{i,t} + \hat{\theta}_{nr} d\mathrm{CC}^{nr}_{i,t} + \hat{\theta}_r d\mathrm{CC}^r_{i,t} + \in_{i,t}$$

where a *d* before the policy variable denotes a dummy that takes a value of 1 every year there is a change in the corresponding policy variable, and where γ_b, γ_{fi}, θ_{nr} and θ_r remain as the coefficients of interest.

We estimate this regression for the whole sample and use dummy variables to measure heterogeneous coefficients in developed and developing countries, and for different time-periods. We also vary the dependent variable keeping the explanatory variables unmodified.

Figure 1. Capital Flows in Developing Countries Around the Time of Implementation of Capital Controls



Source: Author's elaboration.

4. Results

Table 2 shows the results of our benchmark specifications. For all four columns, the dependent variable is quarterly bond inflows. All columns include an index of macroprudential policies targeted at borrowers and at financial institutions (*MPI borrower* and *MPI fin inst*, respectively), and an index of capital controls specifically targeted at restricting inflows, both for instruments purchased locally by non-residents (*Capital Controls non-residents* (*plbn*)) and for instruments sold internationally by residents (*Capital Controls residents* (*siar*)). Finally, all columns include controls for macroeconomic conditions, country fixed effects to control for unobservables at the country level, and quarterly time effects to control for global macroeconomic confounding factors.

Columns 1–3 of table 2 contain our baseline results. Macroprudential policies targeted at borrowers seem to exert a positive effect on bond inflows for the whole sample (column 1). When we split the sample into developed and developing economies, this effect is only present in developed economies. Moreover, macroprudential policies targeted at financial institutions have the opposite effect in these economies—they deter capital inflows (column 2). For developing economies, only macroprudential policies targeted at financial institutions have positive statistically significant effects. This last result brings support to the hypothesis that there are carry-trade opportunities in emerging economies that drive, at least partially, capital flows towards these economies—if macroprudential policies affect the lending activities of domestic financial institutions, alternative non-financial agents will find it profitable to bring in external capital to lend domestically. Developed economies are less prone to carry-trade operations (Bruno and Shin, 2017). Indeed, our results suggest that macroprudential policies targeted at financial institutions deter capital inflows in these economies, probably because less funds from international markets are channeled through financial institutions to domestic ones, while those targeted at borrowers promote them. This result is in line with the idea that firms that cannot finance themselves domestically will resort to international markets. Finally, capital controls to bonds purchased by non-residents appear with positive sign in column 2, which is contrary to the expected direct effect of this type of policies on capital inflows. We believe this positive coefficient might be the result of the problem of reverse causality that our analysis faces—greater capital inflows induce policymakers to implement capital controls, and not the other way round. Notice that this problem is much more likely to be present in the case of direct measures to control capital flows,

rather than in that macroprudential measures aimed at enhancing domestic financial stability.

Columns 4–6 of table 2 include, in addition to all controls present in columns 1–3, the change in the *MPI* and *Capital Control* indices to control for the contemporaneous correlation between flows and policy indicators. As explained in the previous section, it is an attempt, though imperfect, to control for the reverse causality problem inherently present in this analysis. We can observe that the main results previously discussed survive—MPI measures targeted at financial institutions stimulate capital inflows in developing countries, while they deter them in developed ones. Moreover, now MPI measures targeted at borrowers appear to exert a negative effect on capital inflows in the former economies. This is probably due to a signaling effect of macroprudential policies—if the regulating authority imposes limits on borrowers because it perceives that credit is higher than desired, then foreign investors will be more reluctant to bring in capital in fear of financial distress that could negatively impact profitability. This also brings support to the hypothesis that firms in need of financing may resort to alternative sources, thus creating opportunities for carry-trade by non-financial firms.

Table 2. Capital Inflows, Macroprudential Policies and Capital Controls

	Baseline			*Controlling for year of implementation*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.0093*	0.013*	−0.011	0.0085	0.013	−0.020*
	(1.72)	(1.92)	(1.19)	(1.37)	(1.63)	(1.88)
MPI fin. inst.	−0.0060	−0.013***	0.020**	−0.0031	−0.011**	0.031***
	(1.54)	(3.13)	(2.57)	(0.71)	(2.33)	(3.42)
Capital controls non-residents (plbn)	0.013	0.068***	−0.0044	−0.012		−0.028*
	(1.24)	(2.99)	(0.35)	(0.86)		(1.86)
Capital controls residents (siar)	−0.023	0.021	−0.032	−0.034		−0.038
	(1.29)	(0.68)	(1.44)	(1.50)		(1.42)
R^2	0.33	0.34		0.34	0.35	
Observations	1,190	1,190		1,190	1,190	

Source: Author's elaboration.

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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 3. Bonds and Total Inflows

	Bonds			*Total (Bonds + Equity)*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.0085	0.013	−0.020*	0.011	0.028	−0.044*
	(1.37)	(1.63)	(1.88)	(0.86)	(1.63)	(1.94)
MPI fin. inst.	−0.0031	−0.011**	0.031***	0.0032	−0.0032	0.049***
	(0.71)	(2.33)	(3.42)	(0.35)	(0.31)	(2.64)
Capital controls non-residents (plbn)	−0.012		−0.028*	−0.063**		−0.090***
	(0.86)		(1.86)	(2.04)		(2.67)
Capital controls residents (siar)	−0.034		−0.038	0.15**		0.16*
	(1.50)		(1.42)	(2.10)		(1.87)
R^2	0.34	0.35		0.62	0.62	
Observations	1,190	1,190		1,051	1,051	

Source: Author's elaboration.
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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 4. Bonds Inflows and Domestic Credit

	Capital Inflows (Bonds)			*Domestic Credit*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.0085	0.013	−0.020*	−0.059**	−0.097	0.0088
	(1.37)	(1.63)	(1.88)	(1.98)	(1.60)	(0.22)
MPI fin. inst.	−0.0031	−0.011**	0.031***	−0.045**	−0.030	−0.11***
	(0.71)	(2.33)	(3.42)	(2.57)	(1.51)	(3.38)
Capital controls non-residents (plbn)	−0.012		−0.028*	−0.016		−0.0068
	(0.86)		(1.86)	(0.32)		(0.14)
Capital controls residents (siar)	−0.034		−0.038	−0.13*		−0.16*
	(1.50)		(1.42)	(1.70)		(1.86)
R^2	0.34	0.35		0.54	0.55	
Observations	1,190	1,190		321	321	

Source: Author's elaboration.
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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Capital controls to bonds purchased locally by non-residents is now statistically significant and has the expected negative sign for developing economies. The variable drops from the regression for developed countries, though. This is due to the fact that only two countries in our sample of developed economies implemented this type of controls, and they did it for only one year. This reinforces the idea that the positive sign in column 2 was probably driven by reverse causality.

Table 3 shows the same analysis, but now considering inflows in bonds and equity. For comparison purposes, columns 1–3 replicate columns 4–6 in table 2, while columns 4–6 in table 3 show results when the dependent variable is total quarterly inflows instead of only bonds. All results described for bond inflows survive when considering inflows in bonds and equity. Now, capital controls to bonds and equity sold internationally by residents are also positive and statistically significant for all countries. Once again, this unexpected result might reflect reverse causality.

Table 5. Effects on 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)
MPI borrowers	−0.0072	−0.0066	−0.0046	−0.017	−0.0071	0.021
	(1.21)	(0.86)	(0.40)	(1.46)	(0.52)	(0.93)
MPI fin. inst.	−0.0003	0.0006	−0.0038	−0.0095	0.0084	−0.070***
	(0.066)	(0.13)	(0.43)	(1.17)	(1.01)	(4.22)
Capital controls non-residents (plbn)	−0.019		−0.019	0.0024		0.030
	(1.39)		(1.29)	(0.084)		(1.02)
Capital controls residents (siar)	−0.025		−0.020	−0.12*		−0.27***
	(0.87)		(0.50)	(1.74)		(2.95)
R^2	0.35	0.36		0.35	0.46	
Observations	251	251		226	226	

Source: Author's elaboration.

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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

In order to provide further evidence in favor of the idea that macroprudential policies targeted at financial institutions boost capital inflows by providing carry-trade opportunities to non-financial firms, we analyze how domestic credit reacts to these types of measures. Table 4 shows the results. Once again, columns 1–3 replicate columns 4–6 of table 2, while columns 4–6 show results for the case in which the dependent variable is domestic credit as a percentage of GDP.

From columns 5–6 in table 4, we see that domestic credit reacts exactly as it would be expected if the carry-trade motive is the one governing capital inflows. In particular, macroprudential policies on financial institutions negatively affect domestic credit in developing economies, while there is no effect on developed ones. Indeed, this is the desired effect of these types of measures. Financing needs of domestic agents create opportunities for carry-trade operations, which results in capital inflows increasing with the *MPI fin inst* index. Finally, note that *Capital Controls residents* have a negative effect on domestic credit for the whole sample, driven by the effect on developing economies. This could be due to an indirect effect of capital controls on the availability of domestic lending funds through a diminished supply of capital inflows. The coefficient of *Capital Controls residents* on capital inflows is insignificant, though. It could also be due to a signaling effect, as capital controls may signal less future liquidity in the system, which translates into less domestic credit, or to an endogeneity problem.

Finally, we explore the idea that macroprudential policies and capital controls may have served as a stabilization tool by exerting a negative effect on the volatility of capital flows. Table 5 shows the results of regressing the annual volatility of bond (columns 1–3) and equity inflows (columns 4–6) on our measures of macroprudential policies and capital controls.

While the volatility of bond inflows does not seem to react to macroprudential policies or capital control measures, the volatility of equity inflows is negatively affected by some of these measures, depending on the type of country analyzed. *Capital Controls residents*

seem to negatively affect the volatility in developing countries. This is an expected direct effect. In addition, the *MPI fin inst* negatively affects the volatility of equity inflows in these countries. By stabilizing domestic financial markets, macroprudential policies might also stabilize stock markets, especially so in economies where these are not strongly developed.

Table 6. Macroeconomic Conditions

	VIX (1)	*Ted Rate* (2)	*U.S. mpr r** (3)	*Local mpr r* (4)	*r–r** (5)	*GDP Gap* (6)	*GDP Growth* (7)
				Developed countries			
MPI borrowers	0.0006	0.022	0.0091	–0.013	–0.026**	–1.43**	–0.61*
	(0.55)	(0.74)	(0.97)	(1.06)	(2.24)	(2.04)	(1.65)
MPI fin. inst.	0.0001	0.0002	–0.0015	–0.0043	–0.0071*	–0.14	–0.0045
	(0.28)	(0.025)	(0.68)	(1.52)	(1.93)	(0.56)	(0.029)
				Developing countries			
MPI borrowers	0.0010	0.012	–0.0089*	0.0003	0.0081**	0.76**	0.29
	(1.42)	(0.89)	(1.90)	(0.10)	(2.20)	(2.37)	(1.26)
MPI fin. inst.	0.0005*	0.0052	–0.0010	–0.0013	0.0004	0.041	–0.014
	(1.89)	(0.92)	(0.47)	(0.76)	(0.20)	(0.31)	(0.16)
Capital controls non-residents (plbn)	0.0023*	0.0034	–0.014**	–0.0080	0.0038	0.69	–0.023
	(1.74)	(0.14)	(2.06)	(1.23)	(0.75)	(0.94)	(0.041)
Capital controls residents (siar)	0.0022*	0.018	–0.0099	–0.0033	0.0062	0.26	0.24
	(1.72)	(0.73)	(1.52)	(0.48)	(1.02)	(0.51)	(0.43)

Source: Author's elaboration.

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. t-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

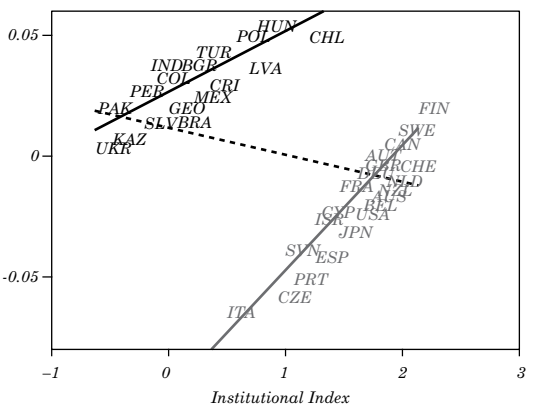
Table 7. Institutions and Financial Development

	All		*Developed*		*Developing*	
	Instit. (1)	*Fin. Dev. (2)*	*Instit. (3)*	*Fin. Dev. (4)*	*Instit. (5)*	*Fin. Dev. (6)*
MPI borrowers	0.0034	0.015	0.088**	0.052**	−0.091**	−0.18
	(0.35)	(1.38)	(2.33)	(2.23)	(2.24)	(1.09)
MPI fin. inst.	−0.011**	−0.022***	0.052***	0.0019	0.025	0.10**
	(2.30)	(2.79)	(3.38)	(0.11)	(1.23)	(2.04)
Capital Controls non-residents (plbn)	0.10***	0.27***			0.071*	0.37***
	(2.95)	(4.34)			(1.95)	(5.21)
Capital Controls residents (siar)	0.13**	0.37***			−0.078	0.45***
	(2.36)	(3.95)			(0.90)	(3.44)

Source: Author's elaboration.

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. Instit is the index of government effectiveness from the World Governance Indicators database, and Fin Dev is domestic credit provided by financial sector as a % of GDP. In each case we use the average from 2000 so these don't vary over time. 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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Figure 2. Institutions and the Effects of MPI to Financial Institutions on Capital Inflows



Source: Author's elaboration.

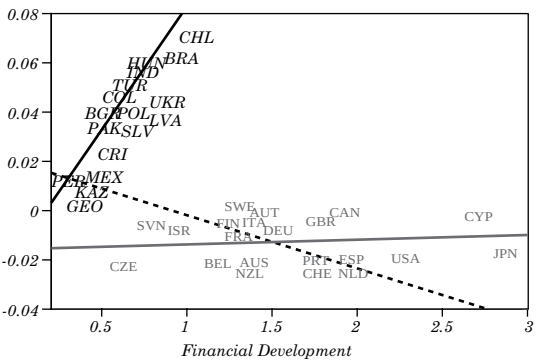
Note: Dash, grey and black lines are the conditional effects for all, developed, and developing countries, respectively, of MPI financial institutions on capital inflows. These are based on the results presented in table 7, in rows 3–4 and columns 1, 3, and 5.

4.1 Macroeconomic Conditions

In this section we explore the idea that certain macroeconomic conditions in the global or domestic economy may impact the effect that macroprudential or capital control measures have on capital inflows. To this end, we interact the indices of macroprudential policies and capital controls with different indicators of macroeconomic conditions, namely, the VIX index (a proxy for global uncertainty and market volatility), the TED spread (a proxy for global credit risk), the U.S. monetary policy rate to account for global liquidity availability, the local monetary policy rate, the spread between the latter two, a measure of output gap in the domestic economy computed as the log difference between real GDP and a trend GDP measure (where the trend is computed from applying the HP filter to the series), and finally the growth rate of the domestic economy.

Table 6 shows the results for both the group of developed economies and the group of developing economies. For developed economies, only a handful of interactions with macroprudential policies are significant.[11]

Figure 3. Financial Development and the Effects of MPI to Financial Institutions on Capital Inflows



Source: Author's elaboration.
Note: Dash, grey and black lines are the conditional effects for all, developed, and developing countries, respectively, of MPI financial institutions on capital inflows. These are based on the results presented in table 7, in rows 3–4 and columns 2, 4, and 6.

11. Notice that results for capital control measures are not reported because, as before, developed countries that implemented capital control measures did so for only one year.

In particular, a contractive monetary policy stance with respect to the U.S. reinforces the contractionary effect of macroprudential regulations, both for borrowers and for financial institutions, on capital inflows. This result is in line with Bruno and others (2017), who find that macroprudential policies are more successful when they are implemented in periods of monetary policy tightening. In line with this result, macroprudential policies targeted at borrowers are also more successful in deterring capital inflows when the economy is experiencing an expansion, either measured by a positive output gap or by GDP growth, which are times in which the monetary policy is expected to be tightened. Finally, global factors do not seem to play a role.

Today, in developing economies, global economic conditions do play a role in shaping the efficacy of macroprudential policies and capital controls. An uncertain economic environment, represented by a larger value of the VIX index, lowers the influence of macroprudential policies and capital controls in deterring capital inflows. On the other hand, a higher monetary policy rate in the U.S., which signals more stringent global liquidity conditions, aids macroprudential measures targeted at borrowers and capital controls on non-residents in discouraging capital inflows. Contrary to developed economies, now a higher spread between the domestic and the U.S. monetary policy rate impacts positively on the effect of macroprudential policies (targeted at borrowers) on capital inflows. A positive output gap exerts a similar effect. In these economies, an economic boom increases financing needs of local firms. Macroprudential regulations targeted at borrowers restrict the ability of firms to satisfy these needs domestically and may prompt them to look for funds in the international markets, thus fostering capital inflows. This explains the positive sign.

4.2 Institutions and Financial Development

Since macroprudential regulations seem to have distinctive effects on capital inflows depending on whether a country is developed or not, in this section we test the hypothesis that institutional and financial development may also play a role in shaping the effect of these measures. In the same spirit as the previous section, we interact our indices of macroprudential regulations and capital control measures with two variables of interest: *Instit*, an index of government effectiveness from the World Governance Indicators database, which is a proxy of institutional quality, and *Fin Dev*, which is the ratio of domestic credit provided by the financial sector to GDP. In each case, we use the variables' values of 2000, so they do not change over time.

Table 8. Sub-Samples: 2007

	2004–2006			*2007–2013*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.0084	0.074***	−0.060***	0.0079	0.0064	−0.022*
	(0.63)	(3.20)	(3.06)	(1.26)	(0.73)	(1.88)
MPI fin. inst.	−0.0080	−0.019***	0.044***	−0.0017	−0.014***	0.030***
	(1.39)	(2.85)	(3.17)	(0.37)	(2.67)	(3.15)
Capital controls non-residents (plbn)	−0.017		−0.068*	−0.012		−0.033**
	(0.61)		(1.66)	(0.83)		(2.10)
Capital controls residents (siar)	−0.031	0.0012	0.020	−0.034		−0.029
	(0.95)	(0.058)	(0.39)	(1.43)		(1.01)
R^2	0.34	0.36				
Observations	1,190	1,190				

Source: Author's elaboration.
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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 9. Sub-Samples: 2008

	2004–2007			*2008–2013*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.014	0.072***	−0.031*	0.0081	0.0074	−0.018
	(1.21)	(3.36)	(1.78)	(1.29)	(0.83)	(1.56)
MPI fin. inst.	−0.0083	−0.017***	0.028**	−0.0014	−0.011**	0.026***
	(1.57)	(2.58)	(2.24)	(0.31)	(2.09)	(2.70)
Capital controls non-residents (plbn)	−0.037		−0.048	−0.0074		−0.025
	(1.63)		(1.63)	(0.49)		(1.56)
Capital controls residents (siar)	−0.023	0.019	−0.021	−0.032		−0.038
	(0.78)	(0.96)	(0.55)	(1.36)		(1.41)
R^2	0.34	0.36				
Observations	1,190	1,190				

Source: Author's elaboration.
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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

Table 7 shows the results, and figures 2 and 3 provide a graphical representation of the effects of macroprudential policies targeted at financial institutions on capital inflows conditional on institutional index and financial development level, respectively. Figure 2 shows that the effect of these macroprudential policies becomes less negative, the higher the index of institutional quality of the developed country. For developing economies, the conditional effect is not statistically significant. This is probably due to the fact that countries with higher levels of institutional quality also have sounder financial systems in which macroprudential measures are less stringent. Conversely, figure 3 shows that the effect of macroprudential policies targeted at financial institutions becomes more positive the higher the level of financial development of the developing country. In this case, the effect is not significant for developed economies. This brings support to the idea that the channel through which macroprudential regulations affect capital inflows in developing economies has to do with carry-trade opportunities—countries in which the financial sector is more developed are more affected by these measures (either because they are more easily enforced or because of their wider coverage) and therefore present better opportunities for carry-trade operations. Notice that, when the effect of macroprudential policies conditional on institutional quality and financial development is estimated for all countries in the sample, it becomes more negative (or less positive) when either of these indicators increases. This because the interaction in this case is working as a proxy for the level of development of countries. Then, a country with higher institutional index/financial development is typically a more developed country, in which the effect of macroprudential policies targeted at financial institutions is negative. On the contrary, this effect is positive in less developed countries, which usually have a lower institutional index/financial development.

When considering macroprudential policies targeted at borrowers, the effects conditional on institutional quality and financial development are positive for developed economies and negative for developing ones. For the whole sample, capital controls, both to residents and non-residents, exert a more positive (or less negative) effect on capital inflows when the institutional quality and financial development of a given country is higher. Again, these indicators function as proxies for the level of development of a country. In developing economies, the effect of capital controls on inflows is less negative with higher financial development and institutional quality. Countries with sounder institutions and financial systems are likely to be less prone to volatile capital inflows seeking very short-term profitabilities, which are the targets of capital control measures.

Table 10. Robustness, Annual vs. Quarterly MPI indices

	Baseline			*Quarterly MPI*		
	Eq. 1	*Eq. 2*		*Eq. 3*	*Eq. 4*	
	All (1)	*Devd.* (2)	*Dving.* (3)	*All* (4)	*Devd.* (5)	*Dving.* (6)
MPI borrowers	0.0085	0.013	−0.020*	−0.0058	0.0021	−0.020**
	(1.37)	(1.63)	(1.88)	(1.28)	(0.39)	(2.36)
MPI fin. inst.	−0.0031	−0.011**	0.031***	0.0080	−0.041***	0.012**
	(0.71)	(2.33)	(3.42)	(1.55)	(3.08)	(2.35)
Capital Controls non-residents (plbn)	−0.012		−0.028*	0.0059		0.0052
	(0.86)		(1.86)	(0.39)		(0.34)
Capital Controls residents (siar)	−0.034		−0.038			
	(1.50)		(1.42)			
R^2	0.34	0.35		0.40	0.41	
Observations	1,190	1,190		1,035	1,035	

Source: Author's elaboration.
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. *t*-values are reported below the coefficients. * means significant at 10%, ** significant at 5%, and *** significant at 1%.

4.3 Robustness Analysis

In this section we perform some robustness checks in order to test the stability of our results.

First, we divide the sample period into two subsamples to check whether there was a change in the way macroprudential and capital control measures affected capital inflows previous to the global financial crisis of 2008. Table 8 shows results for the case in which we divide the sample into years 2004–2006 and 2007–2013, while table 9 shows the same for the case in which we split the sample into years 2004–2007 and 2008–2013. As it is clear from the tables, our main results survive and are present in both sample sub-periods. The effect of macroprudential policies on the incentives to do carry trade and, through this channel, on capital inflows does not seem to have changed significantly before and after the global financial crisis.

Second, we use measures of macroprudential policies at quarterly frequency, instead of annual frequency. These measures are constructed in Cerutti and others (2017). Table 10 shows that our main results, namely that macroprudential policies targeted at financial institutions impact positively bond inflows in developing economies and negatively

in developed ones, are robust to considering quarterly indices of macroprudential policies.

5. Conclusions

In this paper we have studied the effects of macroprudential policies and capital control measures on capital inflows in both developed and developing economies. Our main result is that macroprudential policies 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. When considering total inflows (equity and bonds), the positive sign for developing economies survives, though, for developed ones, the coefficient is negative but not statistically significant. Splitting the sample in different time periods pre- and post- global financial crisis yields the same results.

We argue throughout the paper that this result is a reflection of carry-trade opportunities present in developing economies, which are intensified when macroprudential policies limit the ability of domestic financial institutions to provide credit to firms. Large, non-financial firms see an opportunity to obtain profits by exploiting interest rate differentials and bring in external funds that they use to lend to local firms that do not have access to international capital markets. Two elements support our hypothesis: domestic credit is negatively influenced by macroprudential policies in developing economies (but not in developed ones) and the degree of financial development of the country reinforces the positive effect of such policies on capital inflows. These findings point to the fact that these economies see their domestic credit provision significantly affected by macroprudential regulations. Alternative hypotheses, such as precautionary savings by credit-constrained firms, do not seem to be supported by our data, as the stance of the economic cycle does not seem to exert any effect on our results.[12]

12. The carry-trade hypothesis is very well explained in Bruno and Shin (2017). They find support for it when using firm-level data for a group of developed and emerging economies. We see our analysis as complementary to theirs.

APPENDIX

A. Data

A.1 Balance of Payment Statistics Database (IMF)

We obtain from here the capital flow variables. This database contains the financial account quarterly per country, classified by functional category, by type of financial instrument (equity, debt, and others), and presents the data separately by financial assets (net acquisition of assets) and liabilities (net incurrence of liabilities). Also, this database contains data of International Investment Position (IIP) that consist in stock of assets and liabilities at the end of each quarter. We compute gross flows as the difference of two consecutive periods in the stock of liabilities reported in the international investment position of the country. Our preferred measure for the empirical analysis that follows is the gross flow scaled by the stock in t–1, i.e., the growth rate. We drop those countries that have less than 12 observations in the sample. Also, we winsorize the sample at the 95 percentile.

A.2 Macroprudential Policies database

We use the macroprudential policy database from Cerutti and others (2015). This database documents the use of macroprudential policies for 119 countries over the 2000–2013 period on a yearly basis. The authors construct 12 measures of macroprudential policies, presented as dummy variables that take the value of 1 if the country had that policy in place in that year, and 0 otherwise. They summarize the information through three main indices of macroprudential policies, depending on which economic agents these policies are targeted at: borrowers, financial institutions, or all (which is the sum of the previous two).

A.3 Capital Controls database

We use measures of capital controls from Fernandez and others (2016). This database documents separate annual indicators of controls on inflows and controls on outflows for ten categories of assets for 100 countries, in the period 1995–2013, based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

As in the case of macroprudential indices, variables in this case are assigned a value of 1 if there was a policy in place in that country and year, and 0 otherwise. For portfolio inflows, they group measures into those that affect assets purchased locally by non-residents, and those that affect instruments sold or issued abroad by residents. Similarly, for outflows, they group measures according to whether they affect instruments sold or issued locally by non-residents, and those that impact instruments purchased abroad by residents. These indices are available for bonds and equity separately.

A.4 World Development Indicators (World Bank)

Data from the World Development Indicators (WDI, World Bank). It provides information at the country-year level. The data is in yearly frequency.

- We use the following variables for our analysis:
- GDP per capita, PPP
- GDP constant
- GDP current
- GDP per capita
- External debt stocks, total
- External debt stocks, short-term
- Total reserves
- Bank capital to assets ratio
- Bank liquid reserves to bank assets ratio
- Bank nonperforming loans to total gross loans
- Domestic credit provided by financial sector
- Domestic credit to private sector
- Market capitalization of listed domestic companies
- Stocks traded, total value
- Stocks traded, turnover ratio of domestic shares

A.5 Datastream

From here we obtain the Monetary Policy Rate (monthly) per country.

A.6 Fred - St. Louis FED

We use the following variables:

- TED Spread: the difference between the interest rates on interbank loans and on short-term U.S. government debt ("T-bills") (value at the end of each month)
- VIX Index: S&P 500 CBOE Volatility Index (value at the end of each month)
- Federal Funds Effective Rate (monthly): Monetary Policy rate from the U.S.

A.7 NBER

We use the crisis dummy from the NBER Dating Committee that takes the value of 1 if the quarter t had a crisis (according to the NBER Dating Committee), and 0 otherwise.

A.8 Institutional quality

1. Freedom House database: We use the Political Rights and Civil Liberties indices. Both of them go from 1 to 7, with 1 representing the highest degree of freedom, and 7, the lowest. Then, we compute the freedom house index, that is the mean between these others two indices.
2. Polity IV database: We use the Polity Index that goes from -10 to 10, from democracy to autocracy, and the Executive Constraints variable that explicitly measures how constrained the executive is in making arbitrary decisions.
3. World Governance Indicators database (World Bank): We use the Voice Accountability, Political Stability, Government Effectiveness, Regulatory Quality, Rule of Law and, Control of Corruption variables. They all go from -2.5 (weak) to 2.5 (strong) governance performance.

A.9 Countries in the sample

Developed Countries			*Developing Countries*		
France	Japan	Sweden	Hungary	Pakistan	Poland
Switzerland	Canada	Spain	Brazil	Kazakhstan	India
Austria	U.S.	U.K.	Colombia	Mexico	Ukraine
Israel	Belgium	Finland	Latvia	Costa Rica	Turkey
New Zealand	Germany	Australia	Bangladesh	Chile	
Italy	Cyprus	Slovenia	Peru	El Salvador	
Czech Republic	Portugal	Netherlands	Bulgaria	Georgia	

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