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ABSTRACT

The prospects of expansionary monetary policies in the advanced countries for the foreseeable future have renewed the debate over policy options to cope with large capital inflows that are, at least partly, driven by low interest rates in the financial centers. Historically, capital flow bonanzas have often fueled sharp credit expansions in advanced and emerging market economies alike. Focusing primarily on emerging markets, we analyze the impact of exchange rate flexibility on credit markets during periods of large capital inflows. We show that credit grows more rapidly and its composition tilts to foreign currency in economies with less flexible exchange rate regimes, and that these results are not explained entirely by the fact that the latter attract more capital inflows than economies with more flexible regimes. Our findings thus suggest countries with less flexible exchange rate regimes may stand to benefit the most from regulatory policies that reduce banks' incentives to tap external markets and to lend/borrow in foreign currency; these policies include marginal reserve requirements on foreign lending, currency-dependent liquidity requirements, and higher capital requirement and/or dynamic provisioning on foreign exchange loans.

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1. Introduction

Capital inflows bonanzas have become more frequent after restrictions to international movements were relaxed worldwide over the last decades.[2] Capital flows to emerging economies can finance investment and foster economic growth, as well as increase welfare by facilitating consumption smoothing. However, inflows may also induce excessive monetary and credit expansions, build vulnerabilities associated with currency mismatches, and distort asset prices.[3] Large inflows tend to be associated with expansionary economic policies and behave procyclically.[4] These linkages between surges in capital inflows and financial excess are not limited to emerging markets, as the recent wave of crises in advanced economies attest.[5]

The prospects of expansionary monetary policies in advanced countries have renewed the debate over policy options to cope with large capital inflows in emerging economies. As in the past, spillovers from low international interest rates will likely have a significant impact in emerging economies. These spillovers may be stronger this time around, for two reasons. First, as advanced economies struggle with a massive public and private debt overhang, expansionary monetary policies may be in place for a longer period of time than in past “normal” business cycles (a ‘push factor’).[6] Second, emerging markets have been conspicuously resilient during the financial crisis, increasing investors’ appetite for the asset class (possibly a ‘pull factor’—although the relative attractiveness of emerging markets may also stem from another push factor owing to the higher perceived risk of advanced

[2] See, for example, Reinhart and Reinhart (2008), and references therein.
[3] See Magud et al (2011) describing the four fears to capital inflows.
[4] Kaminsky et al (2004).
[5] See Reinhart and Rogoff (2009).
[6] For the importance of ‘push factors’ during capital inflows booms, see Calvo et al (1995).

economies, unprecedented since World War II).[7] The debate over the right policy mix to cope with capital flows has been and continues to be extensive. However, it has overlooked some dimensions of the role played by the exchange rate regime, an issue we take up in this paper.

We show that during capital inflow bonanzas, credit grows more rapidly and its composition tilts to foreign currency in economies with relatively inflexible exchange rate regimes. Studies on economic performance under different exchange regimes have tended to focus on growth, inflation, fiscal policies, and current account adjustments, but have been relatively silent on the evolution of domestic credit. In a recent paper, Mendoza and Terrones (2008) show that capital inflows increase before the peak in credit booms, and that these latter have a higher frequency under less flexible exchange rate regimes. We discuss and document why and how this relationship between capital inflows, domestic credit, and exchange rate regimes works through banking intermediation. The main analysis is based on a panel of 25 emerging markets in Asia, Europe, and Latin America. We identify periods of capital inflows booms and document that episodes of relatively inflexible exchange rate regimes are positively associated with the ratio of private credit to GDP. We also show that the share of foreign currency credit is positively associated with less flexible exchange regimes. The share of foreign currency credit also increases with larger capital inflows and interest rate differentials.

These developments in credit could potentially be exclusively explained if countries with more rigid exchange rate arrangements tend to record larger capital inflows. However,

[7] Capital flow reversals were mild compared to previous inflows, and relatively short-lived.

by analyzing the relationship of the ratio of capital flows to GDP and the exchange rate regime, we do not find compelling evidence that this is the case.

The rest of the paper is organized as follows. The next section discusses the conceptual links between exchange rate regimes and credit growth patterns while revisiting the existing literature. Section III describes the data. Section IV presents the methodology for defining capital inflows booms and for panel estimations. Section V shows the basic results, as well as robustness checks encompassed in alternative estimations. Section VI gives a snapshot of credit and exchange rate flexibility in advanced economies Section VII discusses results, policy implications and directions for future research.

II. Exchange Rate Arrangements and Credit: Basic Concepts

The collapse of several pegged exchange rate regimes during the 1990s led to the perception that these arrangements were more prone to currency and financial crises after sharp credit expansions.[8] In this context, in a study of the occurrence of twin crises, Kaminsky and Reinhart (1999) show banking crises and currency crises in close succession. Overall, evidence on the link between crises and alternative exchange rate regimes is not clear-cut, but the literature suggests that the exchange regime may have an impact on developments in financial markets and asset prices, through several channels.[9]

The basic textbook prediction tells us that in an economy with a pure floating exchange rate regime capital inflows would appreciate the domestic currency with no further effect on monetary aggregates. With a fixed exchange rate, however, the central bank would

[8] See, for example, Ghosh et al (2003) and Ghosh et al (2010).
[9] For a discussion on the probability of crises and the severity of their macroeconomic impact under alternative exchange regimes, see Ghosh et al (2003), Bubula and Otker-Robe (2003), and references therein.

be forced to intervene, accumulating international reserves so as to maintain the peg. Part or all of this reserve accumulation can be (in principle) offset through sterilization, a contraction in domestic credit effected through open market sales of domestic bonds. In practice, sterilization is usually partial, as it is costly (risk premiums on domestic bonds may be large in emerging economies) and foreign exchange intervention is associated with expanding the monetary base. Consequently, economies with less flexible exchange rate regimes are more likely to experience credit expansions in the presence of large capital inflows, the main channel being bank intermediation of these flows.

Montiel and Reinhart (2001) describe another channel through which exchange regimes may affect financial markets. They argue that by extending implicit improperly priced guarantees, fixed exchange regimes may contribute to stronger credit growth than flexible ones, especially in the context of large capital inflows. Hence, deposit guarantees and a peg are perceived as a guarantee to foreign currency claims, increasing the scope for banks' expansion through external funds, which can potentially feed into domestic credit (i.e., an increase in the banking system's leverage ratio). In a different context, Backé and Wójcik (2007) develop a simple framework with an increasing trend in productivity growth in an emerging economy that pegs its domestic currency to a developed economy with constant productivity growth.[10] The peg gives place to lower interest rates and higher domestic credit compared to the equilibrium with a flexible regime.

A credible fixed exchange rate regime may also place incentives for taking on debt in foreign currency. To begin with, the increase in banks' leverage—loan to deposit ratios—that

[10] This is particularly relevant in Emerging Europe.

large capital inflows usually bring about can place incentives to lend directly in foreign currency, as this would allow banks to avoid currency mismatches in their balance sheets. As for debtors, in credible pegs, a small differential between interest rates in domestic and foreign currency may create incentives to borrow in the latter, as they would deflate a lower interest rate by expected domestic inflation or wage growth.[11] These incentives have typically played a critical role during inflation stabilization programs, especially when they were coupled with policies allowing liability dollarization. Cavallo and Cottani (1997), for example, analyze the Argentinean experience with the currency board where the peg, as a nominal anchor, played a fundamental role in the dollarization of the financial system.[12]

Our preceding discussion highlights that the flexibility of the exchange rate regime should be an important element in conceiving the policy mix to cope with large capital inflows and domestic credit expansions.[13] The potential impact of the exchange regime on both the amount and composition of private credit highlights the importance of macro-prudential regulations like marginal reserve requirements on foreign lending, currency-dependent liquidity requirements, debt-to-income and loan-to-value ratios, and higher capital requirement and/or dynamic provisioning on foreign exchange (FX) loans.

[11] See, for example, Rosenberg and Tirpák (2008), and the underlying theoretical model on the determinants of credit dollarization developed by Jeanne (2003).
[12] While policies allowing liability dollarization created challenges, the authors highlight that they were critical to extending the maturity of financial assets, thus reducing the risks associated with short-term debt overhangs.
[13] See, for example, Ostry et al (2010) for a recent debate on these issues. For a discussion on the effects exchange rate flexibility on domestic demand see International Monetary Fund (2010).

III. Data and Coverage

We use annual data for five Asian economies (Indonesia, Korea, Malaysia, Philippines, and Thailand), 13 emerging European countries (Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovak Republic, Serbia, and Turkey), and seven Latin American countries (Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Uruguay). The series span different periods, chosen using the criterion defined below for identifying capital inflows booms. For Latin America we use data for the period 1993-2002; for Asia, 1990-1997; and for Emerging Europe, 1999-2008.

As for macroeconomic variables, time series were obtained from the International Monetary Fund's *International Financial Statistics* and *World Economic Outlook* databases, numerous IMF's Staff Reports for the countries in our sample, national central banks, Saint Louise Federal Reserve Bank's FRED database, Haver Analytics databases, and Eurostat. These series are real GDP, external debt, exports and imports of goods and services, the external capital and financial account balance, interest rates, domestic credit to the private sector, consumer price indices, broad money, the real effective exchange rate, and domestic credit in foreign currency. For the international interest rate, we used the U.S. 2-year Treasury bonds, as well as Fed funds rate and the European Central Bank policy rate, with similar results in all specifications.

For the exchange rate regime, we used the Reinhart and Rogoff *de-facto* exchange rate regime (COARSE) classification.[14] In the latter, regimes are classified as described in

[14] See Reinhart and Rogoff (2004), and the subsequent update from Ilzetski, Reinhart and Rogoff (2010). Updates for Emerging Europe in 2008 were based on changes in exchange rate regimes as described in the Fund's AREAER.

Figure 1 below, with an increase in the index pointing to more flexible exchange rate regimes. We have also considered Reinhart and Rogoff's fine classification, and the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), which for the more recent period yield similar results. Given the time-varying nature of exchange rate regimes, using *de-facto* arrangements have the advantage of drawing a distinction between what countries declare as their official *de jure* regime and their actual practices, which may even capture to a certain degree the endogeneity of policies, shocks, and markets reactions.[15]

Figure 1. Exchange Rate Regimes - Coarse Classification

1 No separate legal tender
1 Pre announced peg or currency board arrangement
1 Pre announced horizontal band that is narrower than or equal to +/-2%
1 De facto peg
2 Pre announced crawling peg
2 Pre announced crawling band that is narrower than or equal to +/-2%
2 De factor crawling peg
2 De facto crawling band that is narrower than or equal to +/-2%
3 Pre announced crawling band that is wider than or equal to +/-2%
3 De facto crawling band that is narrower than or equal to +/-5%
3 Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)
3 Managed floating
4 Freely floating
5 Freely falling
6 Dual market in which parallel market data is missing.

The variable labeled financial deepness is based on measures of financial development pioneered by Beck, Demirgüç-Kunt and Levine (2000), which was updated since this work began in the early 2000s.[16] The index reflects the sum of stock market

[15] Notice that our empirical methodology is based on ex-post information, i.e., is backward-looking. An alternative approach could be to conduct event studies to capture market reactions on an ex-ante basis. Event studies could focus on authorities' announcements (signals), and analyze how forward-looking agents react to these announcements.

[16] We are grateful to Sergio Schmukler for kindly sharing with us the updated Beck et al (2009) database.

capitalization, deposits, and private and public bond market capitalization, all in terms of GDP. Financial integration is the index for financial openness developed by Chinn and Ito.[17] This index measures the scope of capital controls based on the information from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER).

IV. Methodology

We pursue three different tasks in this section. First, we identify capital inflows booms in the countries included in the dataset. Second, we define the three dependent variables in the exercise and explore the relationship between the exchange rate regimes, capital flows, and the amount and composition of domestic credit to the private sector through cross-plot analysis. Finally, we describe the econometric methodology used in the paper to test the impact of the exchange regimes on credit and capital flows.

1. Identifying Capital Inflows Booms

The countries in the sample have not necessarily experienced capital inflows booms simultaneously. Asian and Latin American countries received large capital inflows during the 1990s and the early 2000s, while Emerging Europe recorded large capital inflows in the 2000s. Furthermore, although Latin America and Asia received large inflows during the same decade, the specific years differ. Therefore, our first task is to identify periods of large capital inflows systematically before pooling the data.

Definition 1. *We define a capital flow boom as:*

[17] See Chinn and Ito (2008).

(i) *a period in which trend capital inflows monotonically increase with a structural trend change; or*

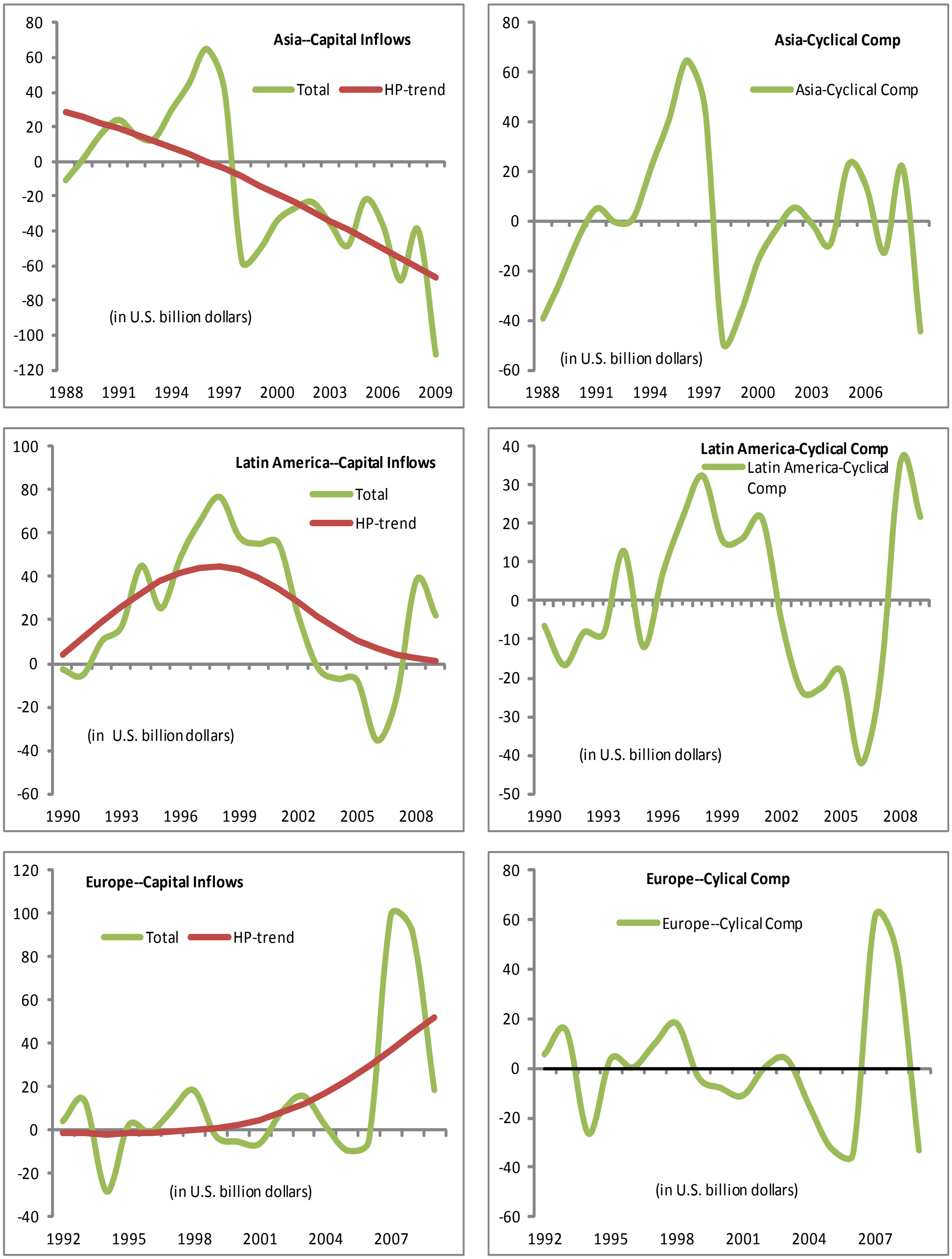
(ii) *a period* t: $[t \in \daleth | \daleth = t_1, t_2, \ldots, T]$ *in which inflows exceeds their long-term trend, i.e.* $CF_{t,i} > \overline{CF_{t,i}}$, *where* $CF_{t,i}$.*refers to capital inflows in region* i *during period* t. *A bar over a variable represents its long-term value.*

First, we compute regional cyclical components of capital flows.[18] For each region—i: $[i \in I | I = 1, 2, 3]$—we compute the total volume of capital inflows by adding the dollar-value of capital inflows of each country c_n^i: $\left[c_n^i \in C^i \middle| C^i = c_1^i, c_2^i, \ldots, c_{Ni}^i\right]$ for the $n = 1, 2, \ldots, Ni$ countries, as $CF_t^i = \sum_{c_1^i=1}^{c_{Ni}^i} CF_{t,c_n^i}^i$, obtaining total regional capital flows in each year *t*. These series are then de-trended using the standard Hodrick-Prescott filter. As we are using annual data, we set $\lambda = 100$. The cyclical components are computed by subtracting the HP-trended value from total capital inflows in each period *t*.

Figure 2 below depicts trend and observed total component in their left panels and the cyclical component in the right panels. In the early 1990s, Latin America and Asia received large capital inflows, which reversed during the early 2000s for Latin America, and during the late 1990s for Asia. Capital inflows in Emerging Europe were virtually zero before the late 1990s, and picked up with prospects for European Union access in the early 2000s.

[18] We conduct this exercise regionally due to heterogeneity among regions.

Figure 2. Defining Regional Capital Flow Cycles



Following **Definition 1**, we identify capital inflows booms as follows:

- For Emerging Europe, we define a capital inflows boom between 1999 and 2008. Trend capital inflows were virtually zero before the late 1990s, and switched to an increasing positive value in 1999. While the trend remains positive in 2009, we exclude this year from the sample as the region as a whole experienced a sharp reversal in capital flows.

- For Latin America and Asia, the periods are defined as 1993-2002 and 1990-1997 respectively. For these two regions—and especially in Asia—observations over the entire sample period seem to be mean-reverting—with capital inflows during the 1990s and outflows thereafter. As such, periods of large capital inflows are better defined by identifying periods in which inflows are above their long-term trend.

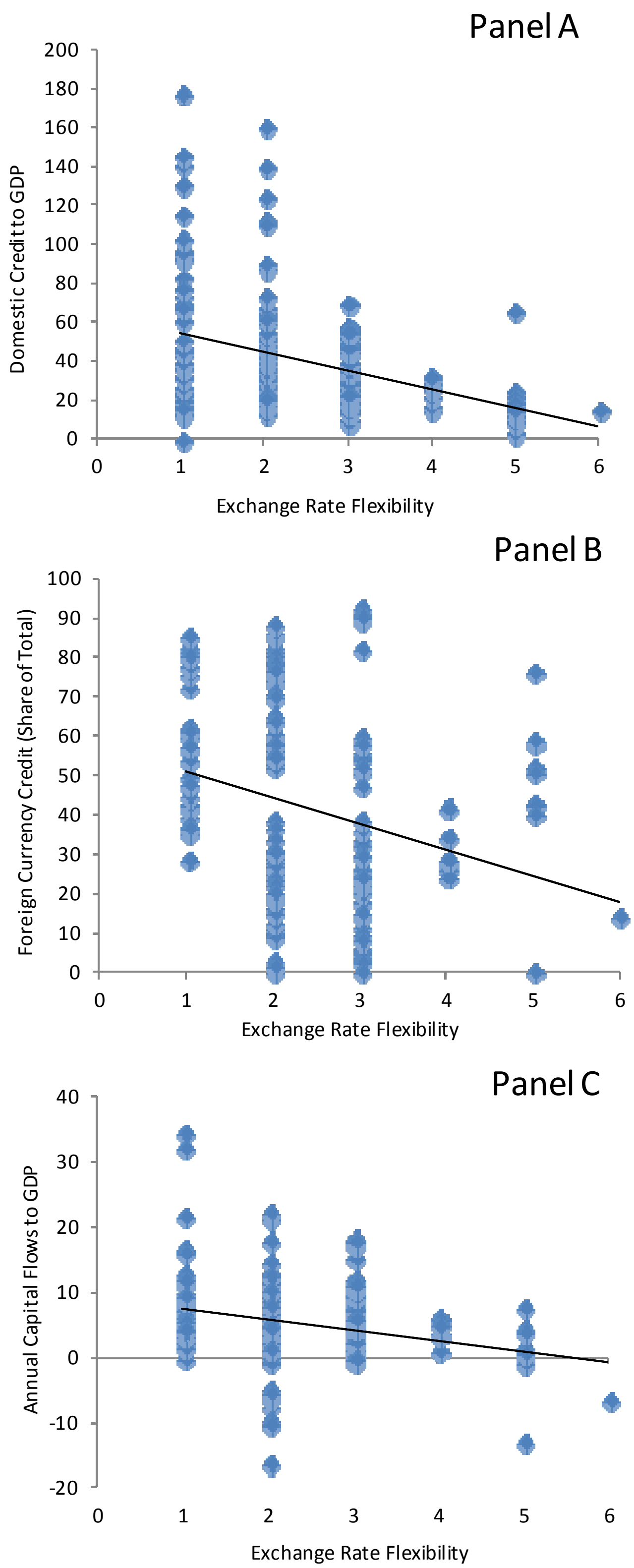
After identifying regional capital inflows bonanzas, we build a panel of 25 cross-sections, with 10 observations per cross-section in Latin American and Europe, and 8 observations in Asia. Note that this method for identifying regional bonanza episodes accords well with the country-by-country approach developed in Reinhart and Reinhart (2008), as, for example, Asian capital flow bonanzas in that study are bunched in the 1990-1996 period. The maximum sample size is 240 annual observations.

2. The indicators

The three variables we study are defined as follows. The domestic credit variable is the ratio of banking system credit to the private sector to gross domestic product at current prices. The second variable—foreign currency credit—is defined as the ratio of credit to the private sector in foreign currency to total credit to the private sector. The capital flows variable is defined as the ratio of capital flows to the gross domestic product at current prices, both in US dollars. The association between domestic credit, capital inflows and the exchange rate regime can be promptly illustrated through cross-plot charts:

- Figure 3, panel (a) suggests that credit to the private sector is higher in economies with less flexible exchange regimes.
- Figure 3, panel (b) shows that there seems to be a significant relationship between the share of credit in foreign currency and exchange rate regimes, with a higher share in economies with less flexible regimes.
- Figure 3, panel (c) shows that capital flows are higher in economies with less flexible exchange rate regimes. The scatter, though, suggests that this relationship may be associated with a few outliers in very inflexible regimes (classifications #1 and #2).

Figure 3. Exchange Rate Flexibility, Credit, and Capital Flows



3. Econometric Methodology

There are a number of empirical studies analyzing macroeconomic performance under alternative exchange rate regimes. This literature concentrates on the study of the behavior of growth, interest rates, fiscal policy, inflation, and the external accounts. Using panel regressions, they analyze the role played by the exchange rate regime by using variables classifying exchange rate regimes on either *'de jure'* or *'de facto'* basis.

To study the impact of alternative exchange regimes on capital inflows and domestic credit, we use the same broad approach as in the recent literature.[19] We extend the analysis by controlling for the degree of domestic financial development and the financial integration with international capital markets. We also control for macroeconomic factors that are important in the evolution of capital flows and domestic credit, like the international interest rate and interest rate differentials.

The explanatory variables can be grouped in four different categories: (i) a variable capturing the flexibility of the exchange rate regime (already described in more detail in Section II), (ii) macroeconomic factors, (iii) financial sector variables, and (iv) country and time dummies.

The second category involves macroeconomic variables. Real GDP reflects the level of gross domestic product at constant prices, and intends to capture how the level of economic development affects in time the amount of capital flows. Real GDP growth captures whether higher economic growth attracts more capital inflows. The ratio of external

[19] See, for example, Ghosh et al (2003) and Ghosh et al (2010).

debt to GDP and the ratio of exports and imports to GDP capture how the level of indebtedness and trade openness affect the amount of capital flows. The annual rate of inflation controls for the effect of inflation on the amount and composition of domestic credit. The ratio of broad money to GDP controls for factors that affect disposable funding for credit in the domestic financial system. The ratio of foreign currency deposit to total deposits measures the impact of domestic foreign currency financing on foreign currency lending. Finally, the real exchange rate level controls for the incentives that it may place on the decision to shift towards foreign currency lending. All these variables are standard in the literature.

The variables in the third category control for the impact of financial sector developments. Interest rate differentials capture incentives for borrowers to demand credit in foreign currency. Capital inflows capture the impact of foreign funding in the volume and composition of domestic credit.

As a last category, we include country dummies and time dummies to control for aggregate time shocks, i.e. international developments. Specifications including country and time dummies help us assess whether results are driven by cross-country or cross-time variation, which may have different implications in terms of policy.

We estimate panel regressions for every dependent variable. The basic regression uses annual data for the pooled sample panel under ordinary least squares. The estimated equations are:

$$Y_{i,t} = \eta + \beta' X_{i,t} + \gamma' M_{i,t} + \theta' F_{i,t} + \omega_{i,t} , \qquad (1)$$

such that $i = 1,...,N$, and $t = 1,...,T$. We assume that the error term $\omega_{i,t}$ can be characterized by independently distributed random variables with mean zero and variance $\sigma^2_{i,t}$. $Y_{i,t}$ represents the four dependent variables defined above. The sub-indexes *i* and *t* stand for country and time respectively. $X_{i,t}$ stands for the variable capturing exchange rate flexibility. $M_{i,t}$ denotes variables controlling for macroeconomic effects. $F_{i,t}$ captures the impact of financial sector variables.

As a first alternative, we report within (or fixed effects) and time effects estimates. These models are estimated as:

$$Y_{i,t} = \phi' f_{i/t} + \beta' X_{i,t} + \gamma' M_{i,t} + \theta' F_{c,t} + \varepsilon_{i,t}, \quad (2)$$

such that $f_{i/t}$ are country and time specific effect, respectively. We assume that the error term $\varepsilon_{i,t}$, can be characterized by independently distributed random variables with mean zero and variance $\sigma^2_{i,t}$. Finally, for robustness, through generalized least squares we estimate the panel allowing for heteroskedasticity and autocorrelation of the residuals.

The above estimations assume exogeneity of the explanatory variables. However, to control for potential endogeneity biases and to check the robustness of the results, we also estimate instrumental variable models of equation (1), as the last alternative specification.

V. Main Findings

Following the evidence in Figure 3, we explore three main issues both in the basic pooled estimates as well as in alternative ones. We first analyze the impact of exchange rate flexibility on domestic credit to the private sector. Second, we study how the composition of domestic credit is affected by flexibility. Finally, we assess whether the volume of capital flows is also affected by the exchange rate policy.

1. Domestic Credit

The estimates reported in Table 1 show that exchange rate flexibility has an impact on domestic credit levels, confirming the findings described in Figure 3. The pooled estimate suggests that the exchange rate regime variable is statistically significant (at the 1 percent level) and has a negative sign, implying that less flexible regimes are associated with higher credit to the private sector.[20] The point estimates suggest that the impact of exchange rate flexibility is economically relevant. A 1-point increase in the exchange rate classification index (a 17 percent increase) increases the ratio of domestic credit to GDP by about 4¼ percentage points (a 10 percent increase in the average credit to GDP ratio in the sample, which stands at 40 percent).

Alternative estimates suggest that results are robust. Fixed (cross country and time) effects specifications, as well as Generalized Least Squares (GLS) and instrumental variables estimations suggest that the variable exchange rate regime has a negative and statistically significant coefficient (in all cases, at the one percent level), suggesting that this relationship is explained both by cross-country and cross-time effects. Point estimates suggest that elasticities are similar to the ones obtained in the pooled estimates.

As for the impact of other variables on domestic credit, Table 1 suggests that larger capital inflows and a larger depositor base (captured by the ratio of broad money to GDP)

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[20] A higher value in the exchange rate regime variable is associated with more flexible regimes.

also have a positive impact on domestic credit.[21] These coefficients are statistically significant across specifications.

In summary, these results suggest that large capital inflows (i.e., banking system external funding) and less flexible exchange rate regimes tend to exacerbate domestic credit cycles. The fact that the exchange rate regime is statistically significant despite controlling for capital inflows suggests that the impact of exchange rate flexibility is likely working through a transmission channel that goes beyond the monetary expansion associated with capital inflows. A larger share of capital inflows could be intermediated through the banking system or the credit multiplier might be larger in economies with less flexible exchange regimes. This would be consistent with Montiel and Reinhart's (2001) intuition, i.e. that a peg may be perceived as a guarantee on foreign currency claims, increasing the scope for banks to expand credit through external funding.

[21] Regressions were also run using banking system leverage (i.e., loan to deposit ratios) instead of capital inflows. Results are in line with the ones reported in this section, and are available upon request.

Table 1. The Exchange Rate Regime and Domestic Credit

Dependent Variable: Domestic Credit/GDP

	OLS			GLS		IV
	(1)	(2)	(3)	(4)	(5)	(6) 1/
C	13.53 ***	-5.86	15.38 ***	9.32 ***	12.82 ***	14.51 ***
Capital Inflows	1.04 ***	0.94 ***	0.93 ***	0.55 ***	1.04 ***	1.24 ***
Exchange Rate Regime	-4.26 ***	-5.19 ***	-4.59 ***	-2.59 ***	-3.68 ***	-4.39 ***
Inflation (-1)	-0.01	0.00	0.00	-0.01 *	-0.01	-0.02 **
Broad Money/GDP	0.71 ***	1.16 ***	0.70 ***	0.75 ***	0.69 ***	0.73 ***
Dummy Crisis	26.81 *	31.12 ***	26.68 *	18.85 **	26.73 **	17.16
Fixed Effects	No	Yes	No	No	No	No
Time Effects	No	No	Yes	No	No	No
Cross-Section Weights	No	No	No	Yes	No	No
Period Weights	No	No	No	No	Yes	No
Observations	202	202	202	202	202	202
Adjusted R-squared	0.57	0.88	0.57	0.64	0.58	0.59
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

1/ Instruments are lagged independent variables for capital inflows and broad money.

2. Credit Composition

Table 2 suggests that credit composition is affected by exchange rate flexibility, also confirming the findings described in Figure 3. The pooled estimate suggests that the exchange rate regime variable is statistically significant (at the 1 percent level) and has a negative sign, implying that less flexible regimes are associated with a higher share of credit in foreign currency. The point estimates suggest that the impact of exchange rate flexibility is economically relevant. A 1-point increase in the exchange rate classification index increases the share of credit in foreign currency by about 14 percentage points (a 35 percent increase in the average share of foreign currency lending in the sample, which stands at 41 percent).

Table 2. The Exchange Rate Regime and Credit Composition

Dependent Variable: Domestic Credit in Foreign Currency/Total Domestic Credit

	OLS			GLS		IV
	(1)	(2)	(3)	(4)	(5)	(6) 1/
C	60.02 ***	38.42 ***	60.69 ***	49.75 ***	59.40 ***	55.36 ***
Capital Inflows	0.55 *	0.42 ***	0.54 *	0.93 ***	0.62 **	0.72 **
Exchange Rate Regime	-14.14 ***	-4.17 **	-14.48 ***	-11.14 ***	-14.04 ***	-12.44 ***
Domestic deposit in FC/Tot Deposits	0.27 ***	0.35 ***	0.27 ***	0.33 ***	0.27 ***	0.32 ***
Inflation (-1)	0.11	0.18 ***	0.13	0.09	0.11	-0.04
Interest Rate Differential	0.75 ***	0.06	0.75 ***	0.45 ***	0.76 ***	0.64 ***
Dummy Crisis	16.13	-5.51	15.56	21.13 ***	16.18	3.23
Fixed Effects	No	Yes	No	No	No	No
Time Effects	No	No	Yes	No	No	No
Cross-Section Weights	No	No	No	Yes	No	No
Period Weights	No	No	No	No	Yes	No
Observations	150	150	150	150	150	158
Adjusted R-squared	0.31	0.94	0.27	0.77	0.31	0.30
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

1/ Instruments are lagged independent variables for the capital inflows, domestic deposits in foreign currency (share of total deposits), and the interest rate differential.

Alternative estimates suggest that results are again robust. Fixed-effects, GLS, and instrumental variables estimations suggest that the exchange rate regime has a negative and statistically significant coefficient (in most cases, at the one percent level).

As for other variables, Table 2 suggests that capital inflows and a larger share of deposits in foreign currency are associated with a higher share of foreign currency credit. Both variables capture the incentives described above. Larger capital inflows (i.e., an increase in foreign funding) and deposit in foreign currency allow banks to expand credit portfolios, but they try to avoid a currency mismatch in their balance sheets by lending in foreign currency. As for borrowers, a higher interest rate differential between domestic and foreign currency financing places incentives to contract credit in foreign currency, which is reflected by the positive and statistically significant coefficient for this variable.

As a robustness test, we use banking leverage ratios instead of capital inflows as an explanatory variable for the share of domestic credit in foreign currency.[22] Leverage ratios capture the increase in banking system external funding sources associated with large capital inflows. Table 3 shows that the results are consistent with the regressions in Table 2: a higher share of domestic credit in foreign currency over the total is associated with less flexible exchange regimes and higher leverage ratios. Moreover, we also explore the

[22] Leverage is defined as the loan-to-deposit ratio, and it proxies the expansion of the credit portfolio beyond the deposit base in the domestic financial system.

Table 3. The Exchange Rate Regime and Credit Composition: Transmission

Dependent Variable: Domestic Credit in Foreign Currency/Total Domestic Credit

	OLS			GLS		IV
	(1)	(2)	(3)	(4)	(5)	(6) 1/
C	48.26 ***	32.29 ***	49.32 ***	48.25 ***	47.59 ***	48.70 ***
Leverage	0.23 ***	0.07	0.22 **	0.23 ***	0.23 ***	0.22 **
Exchange Rate Regime	-8.70 **	-6.23 ***	-9.18 **	-11.13 ***	-8.39 **	-8.97 **
Leverage*Exchange Rate Regime	-0.09 **	0.05 *	-0.08 **	-0.06 ***	-0.09 **	-0.08 **
Domestic deposit in FC/Tot Deposits	0.302268 ***	0.40 ***	0.30 ***	0.39 ***	0.30 ***	0.31 ***
Inflation (-1)	0.06767	0.17 ***	0.11	-0.06	0.06	0.06
Interest Rate Differential	0.69 ***	0.16	0.70 ***	0.67 ***	0.70 ***	0.71 ***
Dummy Crisis	-6.57	-0.29	-6.51	8.20	-7.83	-26.04
Fixed Effects	No	Yes	No	No	No	No
Time Effects	No	No	Yes	No	No	No
Cross-Section Weights	No	No	No	Yes	No	No
Period Weights	No	No	No	No	Yes	No
Observations	150	150	150	150	150	158
Adjusted R-squared	0.32	0.95	0.28	0.80	0.32	0.32
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

1/ Instruments are lagged independent variables for the leverage, domestic deposits in foreign currency (share of total deposits), and the interest rate differential.

interaction between leverage and exchange rate flexibility, which shows that the positive relation between leverage and credit in foreign currency is stronger in countries with less flexible exchange rate regimes. This interaction variable has the opposite sign than the leverage variable—reducing its elasticity by more than a third in the pool estimate. In other words, less flexible exchange regimes exacerbate this interaction, i.e. the incentives for banks to hedge against currency risk seem to be stronger in economies with less flexible exchange rate regimes.

3. Capital Flows

Is it the case that the relationship between domestic credit and the exchange rate regime is largely explained by differences in the amount of capital inflows received by economies with different degrees of exchange rate flexibility?

In principle, fixed exchange rate regimes may attract larger volumes of capital inflows compared to flexible ones. By reducing nominal exchange rate volatility—compared to flexible regimes—pegs can reduce transaction costs, encouraging cross-border investment.[23] On shorter horizons, nominal exchange rate stability can place strong incentives for foreign investors to take advantage of even small interest rate differentials through carry trade.[24] Another reason why a fixed exchange rate regime may attract more capital is associated with a policy tool ubiquitous in pegs to prevent inflation and lower real interest rates in the presence of large capital inflows: sterilized intervention. Sterilized intervention would introduce a wedge in domestic interest rates and likely magnify the volumes of capital inflows.[25]

However, the estimates reported in Table 4 suggest that exchange rate flexibility does not have an impact on the volume of capital flows going to emerging economies. Alternative estimations, including fixed effects, GLS controlling for heteroskedasticity and autocorrelation in error terms, and instrumental variables do not change the picture. Capital inflows are larger in more open economies, economies that are more integrated to

[23] For an analysis on nominal exchange rate volatility, see Ghosh et al (2003) and references therein.
[24] On carry trade, see for example Plantin and Shin (2011) and Brunnermeier et al (2009).
[25] On sterilization, see for example Calvo (1991), Fernández Arias and Montiel (1996), Montiel and Reinhart (2001), and Reinhart and Reinhart (2008).

international financial markets, and economies with a larger stock of external debt.[26] While the first explanatory variable may be capturing the fact that capital flows are oftentimes associated to trade flows, the last two variables suggests that more open financial accounts and previous access to financial flows (captured by the external debt stock) may have facilitated new foreign investments in emerging economies.

We have not been able to identify a variable capturing ‘push factors’, but regional factors may be playing a role. In Latin America, the 1990s were characterized by stabilization programs aiming at reducing inflation, reforming policy frameworks, and embarking in ambitious supply-side structural reforms that likely attracted new foreign investment. In Emerging Europe, the prospects (and eventually, the realization) of access to the European Union likely attracted significant amounts of new foreign investment. In this context, even if there was an impact associated with exchange rate flexibility, it may have been marginal compared to other pull factors.

[26] We lag these explanatory variables in the different specifications to avoid endogeneity biases.

Table 4. The Exchange Rate Regime and Capital Flows

Dependent Variable: Capital Flows/GDP

	OLS			GLS		IV
	(1)	(2)	(3)	(4)	(5)	(6) 1/
C	-1.10	-7.72 ***	-2.58	0.31	1.08	-0.90
Exchange Rate Regime	0.27	-0.10	0.34	0.06	-0.08	0.02
Financial Deepness (-1)	-0.01	0.16 ***	-0.05 *	-0.01	0.00	-0.03
Financial Integration (-1)	0.92 ***	1.21 ***	0.57 *	0.46 ***	0.70 ***	0.73 ***
Trade Openness (-1)	0.04 ***	0.09 ***	0.05 ***	0.03 ***	0.04 ***	0.05 ***
Real GDP	0.00	0.00	0.00	0.00 ***	0.00	0.00
Output Growth	-0.08	0.09	0.03	0.06	-0.10	-0.03
External Debt/GDP (-1)	0.05 ***	0.02	0.04 ***	0.04 ***	0.04 ***	0.06 ***
International Interest Rate	0.00	0.18	0.39	0.02	-0.11	0.08
Dummy Crisis	-11.33 **	-7.58 *	-11.19 **	-9.41 ***	-10.85	-9.41 *
Fixed Effects	No	Yes	No	No	No	No
Time Effects	No	No	Yes	No	No	No
Cross-Section Weights	No	No	No	Yes	No	No
Period Weights	No	No	No	No	Yes	No
Observations	202	202	202	202	202	189
Adjusted R-squared	0.30	0.70	0.32	0.53	0.25	0.32
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

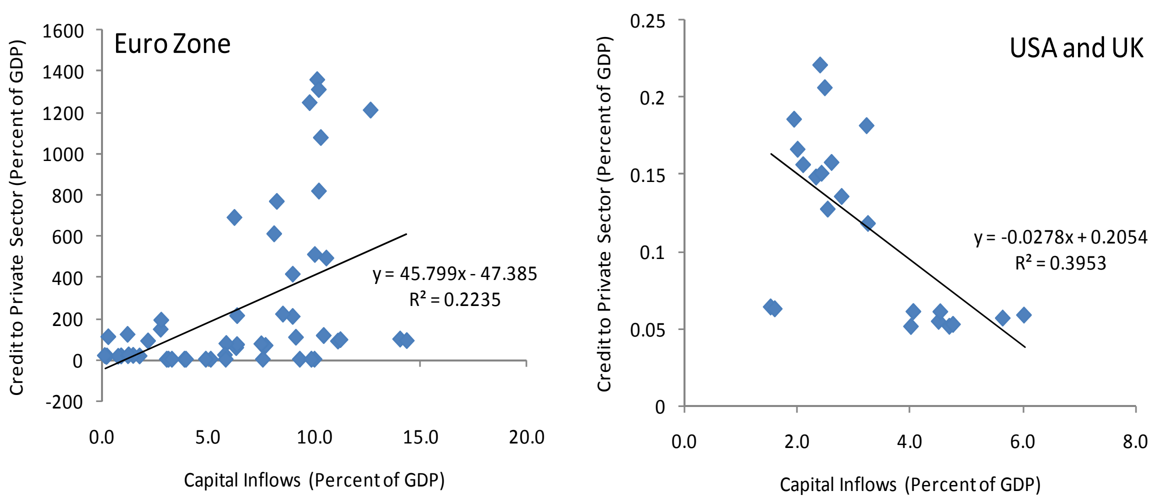
1/ Instruments are lagged independent variables for real GDP, output growth, and the exchange regime.

VI. A Digression: Parallels with Advanced Economies

While our analysis focuses on emerging markets, a snapshot of the advanced economies suggests that exchange rate flexibility may also play a role on credit expansions. Figure 4 below suggests that capital inflows may have also been associated with credit expansions in the euro zone since the mid-1990s. Also, albeit with less significant capital inflows (in terms of GDP), countries with more flexible exchange regimes (UK and US) do not show a positive association between capital inflows and domestic credit expansions. Of course, an important caveat to these differences in the correlations shown in Figure 4 is that in the UK and the US (which are less bank dependent) much of the increased leverage in the decade prior to the crisis was not in the form of domestic bank credit but through securitized debt. Whether a broader definition of "credit" blurs these differences between the euro zone and the others remains to be seen.

Reinhart and Rogoff (2009) and Obstfeld and Gourinchas (2011) suggest that the impact of the recent financial crisis in advanced economies is similar to the one experienced by emerging markets in the past, and that credit expansions have been a critical element in these crises. While very preliminary, the evidence presented here suggests the impact of exchange rate flexibility and capital inflows on domestic credit may be relevant for advanced economies as well, and that this is an issue worth exploring.

Figure 4. Domestic Credit and Capital Inflows: Selected Advanced Economies



VII. Policy Implications and Further Issues

This paper contributes to the current debate on policies to manage large capital inflows in emerging economies. This debate focuses on policies that help contain domestic demand—critical to prevent exchange rate overshooting—and avoid boom-bust credit cycles and their consequences on asset prices—critical to avoid a hard-landing in case of capital flows reversals. Our work suggests that exchange rate flexibility may be instrumental in curving the effects of capital inflows on domestic credit. From a policy perspective, it suggests that relatively inflexible exchange rate regimes may need to be 'counteracted' by carefully designed macro-prudential policies.

With the main findings from our empirical exercise summarized in Table 5, we discuss in this section the kind of regulatory measures that could be used 'counteractively', as macro-prudential policy tools comprise a wide scope of instruments.

Table 5. Summary of main results.

	Domestic Credit	Share of FX Credit	Capital inflows
Exchange rate regime 1/	(-)	(-)	
Capital inflows	(+)	(+)	
Broad money	(+)		
Share of domestic deposits in FX		(+)	
Interest rate diffferential		(+)	
Leverage		(+)	
Leverage*exchange rate regime		(-)	
Financial integration			(+)
Trade openness			(+)
External debt			(+)

1/ This variable decreases as the exchange rate regime becomes more rigid.

Our findings suggest that the most relevant tools to counteract lack of exchange rate flexibility (apart from the obvious implication of allowing for greater exchange rate flexibility) should target banks' external funding and incentives to lend/borrow in foreign currency. Such measures include:

- Currency-dependent liquidity requirements—maybe even combining them with marginal reserve requirements on external wholesale financing. Both contain credit and reduce incentives to borrow in foreign currency by reducing the interest rate differential between loans in domestic and foreign currency. Increasing reserve requirements across the board or imposing limits on external borrowing by the banking sector may of course also reduce domestic credit growth.

- Increasing capital requirement for FX loans and/or introducing dynamic provisioning on FX loans (i.e. provisions increase as the share of FX loan over the total increases). These would place incentives for banks to internalize the higher credit risk associated with potential borrowers' currency mismatches. They would also facilitate the building of buffers to cope with capital flows reversals.

- Tightening debt-to-income and loan-to-value ratios (conditional on the debts' currency denomination) would also contribute to contain domestic credit directly, and might be more effective than traditional monetary tightening—i.e. increasing domestic interest rates.

On the other hand, the fact that we do ,not find convincing evidence that the exchange regime has an impact on the amount of capital inflows—i.e. the former affects credit through 'transmission channels' rather than a 'volume effect'—suggests that less flexible exchange regimes do not necessarily call for broader forms of capital controls.

Our findings also suggest that lack of exchange rate flexibility may make the economy more vulnerable to reversals in capital flows, as credit expansions are more significant in economies with less flexible exchange regimes.[27] Capital flow reversals could potentially trigger a credit bust and asset price deflation, with significant consequences in macroeconomic conditions. While the empirical evidence in this paper focuses on periods of large capital inflows, exploring the dynamics in credit markets during capital inflows reversals and their possible differences across exchange rate regime is no doubt needed to reach a fuller evaluation of the relative merits of some of the policies sketched here.

[27] See Eyzaguirre et al (2011) for a recent debate on capital flows reversals.

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