

Capital Inflows, Exchange Rate Flexibility and Credit Booms

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Abstract

Historically, capital flow bonanzas have often fueled sharp credit expansions in advanced and emerging market economies alike. Focusing primarily on emerging markets, this paper analyzes the impact of exchange rate flexibility on credit markets during periods of large capital inflows. It is shown that bank credit is larger 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. The 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.

1. Introduction

Capital inflow bonanzas have become more frequent after restrictions to international movements were relaxed worldwide over the last decades.¹ 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.² Large inflows tend to be associated with expansionary economic policies and behave procyclically.³ 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.⁴

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”).⁵ Second, many 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

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another push factor owing to the higher perceived risk of many advanced economies, unprecedented since World War II).⁶ 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, domestic credit is larger and its composition tilts to foreign currency in economies with relatively inflexible exchange rate regimes.⁷ 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 inflow booms and document that episodes of relatively inflexible exchange rate regimes are positively associated with the ratio of private credit to gross domestic product (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, 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.

2. 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 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 affected 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 impro-

erly priced guarantees, fixed exchange regimes may contribute to stronger credit growth than flexible ones, especially in the context of large capital inflows. Deposit guarantees cum a peg are perceived as a guarantee to foreign currency claims, which is priced upon the reduced volatility of the exchange rate, thus giving place to moral hazard. This increases 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 (2008) 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. The peg gives place to lower interest rates and higher domestic credit compared with the equilibrium with a flexible regime. Bakker and Gulde (2010) notice that, as economic activity and inflation accelerate, credit booms in countries with fixed exchange rate regimes are difficult to contain—as increasing inflation lowers real interest rates, further fueling credit demand.

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 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.¹⁰ 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.¹¹

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.¹² 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.

3. 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 inflow 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 (IMF's) *International Financial Statistics* and *World Economic Outlook* databases, numerous IMF Staff Reports for the countries in our sample, national central banks, St Louis 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 US two-year Treasury bonds, as well as Fed funds rate and the European Central Bank policy rate, with similar results.

For the exchange rate regime, we used the Reinhart and Rogoff *de facto* exchange rate regime (COARSE) classification.¹³ 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.¹⁴

The variable labeled financial deepness is based on measures of financial development pioneered by Beck et al. (2000), which was updated since this work began in the early 2000s.¹⁵ The index reflects the sum of stock market 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.¹⁶ 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).

4. Methodology

We pursue three different tasks in this section. First, we identify capital inflow 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.

Identifying Capital Inflow Booms

The countries in the sample have not necessarily experienced capital inflow booms simultaneously. Asian and Latin American countries received large capital inflows during the 1990s and early 2000s, while Emerging Europe recorded large capital inflows in the 2000s. 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:*

- (i) *a period in which trend capital inflows monotonically increase with a structural trend change; or*
- (ii) *a period $t: [t \in \mathbb{T} \mid \mathbb{T} = t_1, t_2, \dots, T]$ in which inflows exceed 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. For each region, we compute the total volume of capital inflows by adding the dollar value of capital inflows of each country, obtaining total regional capital flows in each year t . These series are then de-trended using the standard Hodrick–Prescott filter.

Following Definition 1, we identify capital inflow booms. For Emerging Europe, we define a capital inflow 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 since 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.¹⁷

After identifying regional capital inflow bonanzas, we build a panel of 25 cross-sections, with ten observations per cross-section in Latin American and Europe, and eight 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.

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 illustrated through cross-plot charts. First, Figure 1, Panel A suggests that credit to the private sector is higher in economies with less flexible exchange regimes. Second, Figure 1, 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. Finally, Figure 1, Panel C shows that capital flows are higher in economies with less flexible regimes, although the scatter suggests that this relationship may be associated with a few outliers in inflexible regimes (numbers 1 and 2).

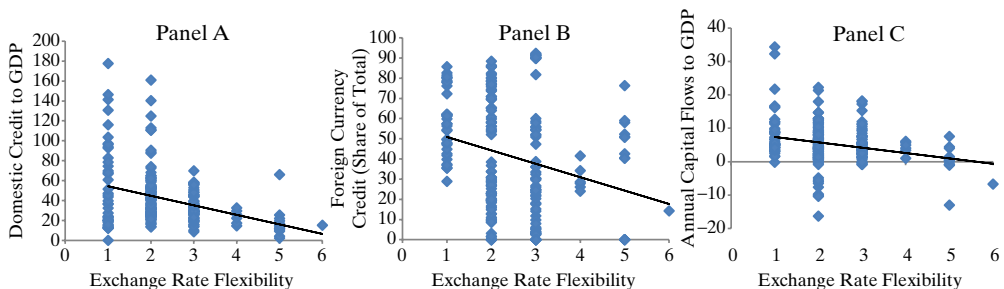


Figure 1. Exchange Rate Flexibility, Credit and Capital Flows

Econometric Methodology

Our empirical approach is similar to studies analyzing macroeconomic performance under alternative exchange rate regimes. Using panel regressions, this literature

concentrates on the study of growth, interest rates, fiscal policy, inflation and the external accounts.¹⁸ We focus on capital flows and domestic credit and extend the analysis by controlling for the degree of domestic financial development, financial integration with international markets, the international interest rate and interest rate differentials.

The explanatory variables can be grouped into four categories: (i) a variable capturing the flexibility of the exchange rate regime (see previous section), (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 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.

The basic regression is based on data for the pooled sample panel using OLS estimations, are reported in Table 1. For robustness, Tables 2–5 present several controls, including: (i) fixed and time effect estimates; (ii) generalized least squares allowing for heteroskedasticity and autocorrelation of the residuals, and (iii) instrumental variable estimations to control for potential endogeneity biases. Alternative estimates suggest that results are robust for the three main regressions reported in Table 1, and coefficients similar to the ones in pooled estimates.

5. Main Findings

Following the evidence in Figure 1, 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 currency 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.

Domestic Credit

The estimates reported in Table 1 show that exchange rate flexibility has an impact on domestic credit levels. The exchange rate regime variable is statistically significant (at the 1% level) and has a negative sign, implying that less flexible regimes are associated with higher credit to the private sector.¹⁹ The point estimates suggest that the

Table 1. Main Results

	<i>Credit/ GDP</i>	<i>FX Credit/ Total Credit</i>	<i>Capital Inflows/GDP</i>
C	13.53***	60.02***	-1.10
Capital inflows	1.04***	0.55*	
Exchange rate regime	-4.26***	-14.14***	0.27
Inflation (-1)	-0.01	0.11	
Broad money/GDP	0.71***		
Dummy crisis	26.81*	16.13	-11.33**
Domestic deposit in FC/Tot. deposits		0.27***	
Interest rate differential		0.75***	
Financial deepness (-1)			-0.01
Financial integration (-1)			0.92***
Trade openness (-1)			0.04***
Real GDP			0.00
Output growth			-0.08
External debt/GDP (-1)			0.05***
International interest rate			0.00
Observations	202	150	202
Adjusted R^2	0.57	0.31	0.30
Prob(F -statistic)	0.0000	0.0000	0.0000

Notes: FC = Foreign currency. ***, **, * Denote significance at the 1%, 5% and 10% levels, respectively.

impact of exchange rate flexibility is economically relevant. An increase in the exchange rate classification index, i.e., an increase in flexibility, results in a reduction in the credit to GDP ratio. 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) also have a positive impact on domestic credit.²⁰

In summary, these results suggest that large capital inflows (i.e. which include 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.

Credit Composition

Table 1 suggests that credit composition is affected by exchange rate flexibility. The pooled estimate suggests that the exchange rate regime variable is statistically significant (at the 1% 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.²¹

Table 2. The Exchange Rate Regime and Domestic Credit

	OLS			GLS			IV (7) ^a
	(1)	(2)	(3)	(4)	(5)	(6)	
C	13.53***	-5.86	15.38***	18.79**	9.32***	12.82***	10.42***
Capital inflows	1.04***	0.94***	0.93***	1.02***	0.55***	1.04***	1.41***
Exchange rate regime	-4.26***	-5.19***	-4.59***	-4.55***	-2.59***	-3.68***	-4.05***
Inflation (-1)	-0.01	0.00	0.00	0.01	-0.01*	-0.01	-0.01
Broad money/GDP	0.71***	1.16***	0.70***	0.61***	0.75***	0.69***	0.74***
Dummy crisis	26.81*	31.12***	26.68*	29.31***	18.85**	26.73**	29.18***
Fixed effects	No	Yes	No	Yes	No	No	No
Time effects	No	No	Yes	Yes	No	No	No
Cross-section weights	No	No	No	No	Yes	No	No
Period weights	No	No	No	No	No	Yes	No
Observations	202	202	202	202	202	202	177
Adjusted R ²	0.58	0.90	0.59	0.91	0.65	0.59	0.57
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-

Notes: Dependent Variable: Domestic Credit/GDP. ^a Instruments are lagged independent variables for capital inflows, inflation, and broad money, corrected for heteroskedasticity using weighting matrix. ***, **, * Denote significance at the 1%, 5% and 10% levels, respectively.

Table 3. The Exchange Rate Regime and Credit Composition

	OLS			GLS			IV (7) ^a
	(1)	(2)	(3)	(4)	(5)	(6)	
C	60.02***	38.42***	60.69***	37.74***	49.75***	59.40***	65.62***
Capital inflows	0.55*	0.42***	0.54*	0.30**	0.93***	0.62**	0.82**
Exchange rate regime	-14.14***	-4.17**	-14.48***	-3.88**	-11.14***	-14.04***	-17.09***
Domestic deposit in FC/Tot. deposits	0.27***	0.35***	0.27***	0.34***	0.33***	0.27***	0.21**
Inflation (-1)	0.11	0.18***	0.13	0.28***	0.09	0.11	0.08
Interest rate differential	0.75***	0.06	0.75***	0.08	0.45***	0.76***	1.13***
Dummy crisis	16.13	-5.51	15.56	-14.03	21.13***	16.18	17.21
Fixed effects	No	Yes	No	Yes	No	No	No
Time effects	No	No	Yes	Yes	No	No	No
Cross-section weights	No	No	No	No	Yes	No	No
Period weights	No	No	No	No	No	Yes	No
Observations	150	150	150	150	150	150	131
Adjusted R ²	0.33	0.94	0.34	0.95	0.78	0.34	0.32
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-

Notes: FC = Foreign currency. Dependent Variable: Domestic Credit in Foreign Currency/Total Domestic Credit. ^a Instruments are lagged independent variables (except for inflation and the dummy for crisis), corrected for heteroskedasticity using weighting matrix. ***, **, * Denote significance at the 1%, 5% and 10% levels, respectively.

Table 4. The Exchange Rate Regime and Credit Composition: Leverage

	OLS			GLS			IV (7) ^a
	(1)	(2)	(3)	(4)	(5)	(6)	
C	48.26***	32.29***	49.32***	30.16***	48.25***	47.59***	48.65***
Leverage	0.23***	0.07	0.22**	0.08	0.23**	0.23***	0.24***
Exchange rate regime	-8.70**	-6.23***	-9.18**	-5.33***	-11.13***	-8.39***	-8.39*
Leverage×Exchange rate regime	-0.09**	0.05*	-0.08**	0.04	-0.06***	-0.09***	-0.10**
Domestic deposit in FC/Tot. deposits	0.30***	0.40***	0.30***	0.39***	0.39***	0.30***	0.28***
Inflation (-1)	0.07	0.17***	0.11	0.21***	-0.06	0.06	-0.03
Interest rate differential	0.69***	0.16	0.70***	0.14	0.67***	0.70***	0.85***
Dummy crisis	-6.57	-0.29	-6.51	-5.25	8.20	-7.83	-14.28
Fixed effects	No	Yes	No	Yes	No	No	No
Time effects	No	No	Yes	Yes	No	No	No
Cross-section weights	No	No	No	No	Yes	No	No
Period weights	No	No	No	No	No	Yes	No
Observations	150	150	150	150	150	150	149
Adjusted R ²	0.35	0.96	0.35	0.96	0.81	0.35	0.35
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-

Notes: FC = Foreign currency. Dependent Variable: Domestic Credit in Foreign Currency/Total Domestic Credit. ^a Instruments are lagged independent variables (except for inflation and the dummy for crisis), corrected for heteroskedasticity using weighting matrix. ***, **, * Denote significance at the 1%, 5% and 10% levels, respectively.

Table 5. The Exchange Rate Regime and Capital Flows

	OLS			GLS			IV
	(1)	(2)	(3)	(4)	(5)	(6)	
C	-1.10	-7.72***	-2.58	-7.48**	0.31	1.08	-2.64
Exchange rate regime	0.27	-0.10	0.34	-0.06	0.06	-0.08	0.10
Financial deepness (-1)	-0.01	0.16***	-0.05*	0.13**	-0.01	0.00	-0.04
Financial integration (-1)	0.92***	1.21***	0.57*	1.10**	0.46***	0.70***	0.65**
Trade openness (-1)	0.04***	0.09***	0.05***	0.10***	0.03***	0.04***	0.06***
Real GDP	0.00	0.00	0.00	0.00	0.00***	0.00	0.00
Output growth	-0.08	0.09	0.03	0.06	0.06	-0.10	-0.09
External debt/GDP (-1)	0.05***	0.02	0.04***	0.01	0.04***	0.04***	0.06***
International interest rate	0.00	0.18	0.39	0.26	0.02	-0.11	0.47*
Dummy crisis	-11.33**	-7.58*	-11.19**	-8.26*	-9.41***	-10.85	-9.89***
Fixed effects	No	Yes	No	Yes	No	No	No
Time effects	No	No	Yes	Yes	No	No	No
Cross-section weights	No	No	No	No	Yes	No	No
Period weights	No	No	No	No	No	Yes	No
Observations	202	202	202	202	202	202	189
Adjusted R ²	0.33	0.74	0.38	0.75	0.55	0.29	0.37
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-

Notes: Dependent Variable: Capital Flows/GDP. ^a Instruments are lagged independent variables for real GDP, output growth, and the exchange regime, corrected for heteroskedasticity using weighting matrix. ***, **, * Denote significance at the 1%, 5% and 10% levels, respectively.

As for other variables, Table 1 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 deposits 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.²²

Capital Flows (Tables 2–5)

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 with flexible ones. By reducing nominal exchange rate volatility—compared with 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 sterilized intervention. The latter would introduce a wedge in domestic interest rates and likely magnify the volumes of capital inflows.²⁵

However, the evidence suggests that exchange rate flexibility does not have an impact on the volume of capital flows. Capital inflows are larger in more open economies, economies that are more integrated into international markets, and economies with a larger stock of external debt.²⁶ While the first explanatory variable may be capturing that capital flows are oftentimes associated with trade flows, the last two variables suggest that more open financial accounts and previous access to financial flows may have facilitated new foreign investments in emerging economies. We have not been able to identify a variable capturing “push factors” (like the international interest rate), but regional factors may also be playing a role, such as, for example, EU accession in Emerging Europe.

6. 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 flow reversals. Our work suggests that exchange rate flexibility may be instrumental in curbing the effects of capital inflows on domestic credit, and that relatively inflexible exchange rate regimes may need to be “counteracted” by carefully designed macro-prudential policies.

Our findings (Table 6) 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. Measures to curb banking sector credit could include:²⁷

Table 6. Summary of Main Results

	<i>Domestic credit</i>	<i>Share of FX credit</i>	<i>Capital inflows</i>
Exchange rate regime ^a	(-)	(-)	
Capital inflows	(+)	(+)	
Broad money	(+)		
Share of domestic deposits in FX		(+)	
Interest rate differential		(+)	
Leverage		(+)	
Leverage×Exchange rate regime		(-)	
Financial integration			(+)
Trade openness			(+)
External debt			(+)

Notes: FX = Foreign exchange. ^a This variable decreases as the exchange rate regime becomes more rigid.

- 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.
- Increased capital requirement for FX loans and/or 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 flow reversals.
- Tightened debt-to-income and loan-to-value ratios (conditional on the debts' currency denomination). This would also help contain domestic credit directly, and might be more effective than traditional monetary tightening.

In contrast, 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 to curb bank credit.

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.²⁸ 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 inflow reversals and their possible differences across exchange rate regimes is no doubt needed to reach a fuller evaluation of the relative merits of some of the policies sketched here.

Finally, while our analysis focuses on emerging markets, recent events in advanced economies suggest that lack of exchange rate flexibility may also have also played a role in credit expansions, in particular in Europe's periphery since the mid-1990s. Reinhart and Rogoff (2009) and Obstfeld and Gourinchas (2011) suggest that the

impact of the recent financial crisis in advanced economies is similar to that experienced by emerging markets in the past, and that credit expansions have been a critical element in these crises.

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Notes

1. See, for example, Reinhart and Reinhart (2008), and references therein.
2. See Magud et al. (2011) describing the four fears to capital inflows; Luca and Olivero (2012) look at the role of banking competition and liability dollarization during currency crises.
3. See Kaminsky et al. (2004).
4. See Reinhart and Rogoff (2009).
5. For the importance of "push factors" during capital inflow booms, see Calvo et al. (1995).
6. Especially in Latin America and Asia. Capital flow reversals were mild compared with previous inflows and relatively short-lived.
7. Throughout the paper, domestic credit refers to credit extended by the banking sector.
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 Ötoker-Robe (2003), and references therein.
10. See, for example, Rosenberg and Tirpák (2008), and the underlying theoretical model on the determinants of credit dollarization developed by Jeanne (2003).

11. 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. Also, Ize and Levy Yeyati (2003) argue that in the context of a portfolio model, by reducing exchange rate volatility, pegs may increase incentives for foreign currency lending.
12. See, for example, Ostry et al. (2011) for a recent debate on these issues. For a discussion on the effects exchange rate flexibility on domestic demand, see International Monetary Fund (2010).
13. See Reinhart and Rogoff (2004), and the subsequent update from Ilzetzki et al. (2010; unpublished manuscript). Updates for Emerging Europe in 2008 based on changes in regimes described in the Fund's AREAER.
14. 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 forward-looking agents' reactions.
15. We are grateful to Sergio Schmukler for kindly sharing with us the updated Beck et al. (2009) database.
16. See Chinn and Ito (2008).
17. See Magud et al. (2012) for details.
18. See, for example, Ghosh et al. (2003) and Ghosh et al. (2010).
19. A higher value in the exchange rate regime variable is associated with more flexible regimes.
20. 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.
21. Notice that the lag exchange rate regime variable, the IV estimation, addresses potential endogeneity problems associated with central banks keeping a less flexible exchange regime as a result of a high degree of dollarization.
22. We also use bank leverage ratios (defined as loan-to-deposit ratios to proxy the expansion of credit beyond the domestic deposit base) instead of capital inflows. Results are consistent with Table 1. Moreover, we also explore the 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 regimes.
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; unpublished manuscript) 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).
26. We lag these explanatory variables—and in particular the exchange rate regime—in the instrumental variable specification in Tables 2–5.
27. The relative effectiveness of these measures would depend on country or regional macro-economic factors. See Ashvin and Nabar (2011), Lim et al. (2011) and Terrier et al. (2011).
28. See Eyzaguirre et al. (2011) for a recent debate on capital flow reversals.