Exchange Rate Flexibility and Credit during Capital Inflow Reversals: Purgatory…not Paradise

Nicolas E. Magud and Esteban R. Vesperoni[1]

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Abstract

We document the behavior of macro and credit variables during episodes of capital inflows reversals in economies with different degrees of exchange rate flexibility. We find that exchange rate flexibility is associated with milder credit growth during the boom but, even though smaller than in more rigid regimes, it cannot completely shield the economy from a credit reversal. Furthermore, we observe what we dub as a recovery puzzle: credit growth in economies with more flexible exchange rate regimes remains tepid well after the capital flow reversal takes place. This results stress the complementarity of macro-prudential policies with the exchange rate regime. More flexible regimes could help smoothing the credit cycle through capital surcharges and dynamic provisioning that build buffers to counteract the credit recovery puzzle. In contrast, more rigid exchange rate regimes would benefit the most from measures to contain excessive credit growth during booms, such as reserve requirements, loan-to-income ratios, and debt-to-income and debt-service-to-income limits.

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[1] Author's E-Mail Address: nmagud@imf.org; evesperoni@imf.org. We thank comments and suggestions from Carlos de Barros, Cesar Calderon, Marcos Chamon, Fabio Comelli, Bob Flood, Gian-Maria Milesi Ferretti, Erlend Nier, Inci Otker-Robe, Carlos Vegh, and Alejandro Werner. We are also grateful for discussion at seminars at the IMF and LACEA 2013 (Mexico), as well as superb research assistance from Marie Kim, Inyoung Song, Anayo Ouseke, and Carlos Rondon. All remaining errors are ours. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

I. INTRODUCTION

Large capital inflows usually have an important impact on macroeconomic conditions—and in particular, on fluctuations in domestic credit. Capital inflows booms can finance investment and economic growth, and can also bolster the deepening of oftentimes shallow financial sectors. Banking sector credit usually expands and stimulates consumption. The volatility associated to these cycles, however, may pose significant macroeconomic challenges. Reversals in capital inflows could potentially result in credit busts and asset price deflation. Notably, the recent fluctuations in global risk aversion triggered by the Federal Reserve 'tapering' talk in 2013 are a reminder of the likelihood for reversals of large capital inflows. Consequently, these events strengthen the need for a proper debate about the policy framework and the corresponding policy mix needed to deal with large fluctuations in international capital flows. We tackle some of these issues here.

The impact of capital inflows bonanzas into the domestic credit cycle in emerging economies has prompted a renewed interest in academic and policy circles over recent years. This literature has shown that large capital inflows are associated with a deterioration in the current account, an appreciation of the real exchange rate, and oftentimes a rapid expansion in credit. The literature has also documented that large capital flows—especially those related to 'other non-portfolio investment' flows in the capital account—are good predictors of credit booms, and that these booms are more likely to end in credit crunches. More recently, Mendoza and Terrones (2008, 2012) and Magud et al (2014) looked at the role played by exchange rate flexibility in credit booms fueled by large capital inflows. The latter find that rapid expansions in domestic credit driven by large capital flows are particularly acute in less flexible exchange rate regimes; moreover, these regimes tilt the composition of domestic credit toward credit in foreign currency.

This paper contributes to the existing literature by looking at how economies with different degrees of exchange rate flexibility behave during capital inflows *reversals*. To this end, we construct a large data set comprising 179 countries for the period 1969–2012. Then, we use standard algorithms to identify reversal that are *conditional on following a bonanza in capital inflows*. This identification is the first contribution of the paper. In order to focus the analysis on (a more homogeneous group of) countries with relatively open capital accounts and access to international private capital flows, we then narrow our sample to emerging economies during the last 25 years, identifying about 130 reversal events. Second, we document stylized facts during +5/-5-year windows centered in the reversals, and focus on differences between economies with relatively fixed and flexible exchange rate regimes. Based on the events identified, we run panel regressions to assess the specific role played by the flexibility of the exchange rate during capital inflows booms and reversals, controlling for a number of macroeconomic factors. The findings are then used to discuss potential policies to mitigate the effects of credit fluctuations that are driven by capital flows cycles.

All in all, the buffering role played by exchange rate flexibility during credit cycles looks like a ticket to purgatory, but no entrance to paradise. In effect, our results suggest that exchange rate

flexibility helps containing banking credit growth compared to more rigid exchange rates during capital inflows booms. Yet, the fall in credit growth in economies with more flexible exchange regimes suggests that flexibility cannot fully shield the economy during the reversal, even though it is more modest than in fix regimes. Furthermore, we observe what we dub as a recovery puzzle: credit growth in more flexible exchange rate regimes remains tepid well after the capital flow reversal takes place.

Our findings suggest that flexible exchange rate regimes could be complemented by macro-prudential policies to smooth credit cycles—which could potentially raise systemic financial risks—during capital flow booms and reversals. Given the magnitude of capital flows during booms in emerging economies, curbing credit growth through macro-prudential may be challenging. However, these policies seem to be more effective in building buffers to help the economy avoid a crunch in banking sector credit when—for whatever reason—the credit cycle reverses after the boom. Exchange rate flexibility can keep credit growth relatively at bay during bonanzas, and it could be complemented by measures like capital surcharges or countercyclical provisions during the credit expansion phase. By building buffers, these macro-prudential instruments can help deal with the recovery puzzle experienced by flexible exchange rate regimes during reversals. On the other hand, measures aimed at containing excessive credit growth—such as debt-to-income, debt service-to-income, and loan-to-value ratios, or reserve requirements—seem to be very relevant in the context of less flexible exchange rate regimes, as credit tends to grow faster than in more flexible exchange rate arrangements.

The importance of understanding the dynamics of capital flows cycles and the optimal policies to deal with them could not be timelier. Expansionary monetary policies in advanced countries have had significant spillovers from low international interest rates in emerging economies. These spillovers have been strong this time around because advanced economies have maintained exceptionally expansionary monetary policies—including unconventional measures embedded in the multiple quantitative and credit easing initiatives—for a longer period of time than in past "normal" business cycles, as these are external financing cycles. And given that the withdrawal of these unconventional monetary policies has recently started—even if at a slow rate—, discussing the appropriate policy responses in emerging markets becomes critical.

The paper is organized as follows. The next section presents a short literature review of some recent contributions, while Section III presents a theoretical background. Section IV describes the construction of the data set, while Section V identifies the episodes of reversals in capital flows. Section VI presents the stylized facts, which are tested through panel estimations in Section VII. Against this backdrop, Section VIII discusses the policy implications and Section IX concludes.

II. Selected Literature Review

There is a growing literature focusing on the macroeconomic impact of capital inflows bonanzas in emerging economies, and in particular on the relationship between capital flows and credit booms. Cardarelli et al (2009), Elekdag and Wu (2011), and Forbes and Warnock (2012) document the

macroeconomic dynamics during capital flows surges. They notice the presence of real exchange rate appreciations and growth accelerations, which are forced into an abrupt reversal when capital inflows retrench. Mendoza and Terrones (2008, 2012) identify episodes of credit booms, and show that they are usually accompanied by large capital flows. In related work, Calderon and Kubota (2012) show that surges in capital inflows are good predictors of credit booms, particularly if driven by non-portfolio investment inflows, and that these credit booms are more likely to end in a crisis.

Some recent work has also focused on the role played by exchange rate flexibility in banking sector credit during capital inflow bonanzas. Magud et al (2014) document evidence from emerging economies in Asia, Latin America, and Emerging Europe since the early 1990s. They show that bank credit expanded more rapidly in more rigid exchange rate regimes, particularly foreign currency-denominated bank loans. Ghosh et al. (2014) find similar results and highlight the differences in how various degrees of exchange rate flexibility impact credit growth. They also show how the alternative degrees of exchange rate flexibility are more or less prone to different type of crises, noting that not only pure floating regimes, but also managed floats, reduce the likelihood of banking, financial, debt, and growth crises. IMF (2011) focuses on Asia and finds that credit booms that ended in crises tend to occur when large external financing is available, but also on the back of strong domestic factors, which appear to be stronger in that region. Exchange rate flexibility, though, mitigates the impact of external factors. Furceri et al. (2011) also find that in the presence of large capital inflows, the impact on credit expansions is less pronounced in countries with higher real exchange rate flexibility—measured as the standard deviation of the real exchange rate. Lane (2013) document boom-bust capital flows cycles in Europe.

The literature on capital inflow reversals is less extensive. Calvo et al. (2004, 2006) have documented the dynamics of sudden stops in capital inflows. In particular, they have focused on the role played by trade openness and balance sheet issues—i.e. liability dollarization—in the required adjustment in the real exchange rate, and in the macroeconomic impact of events in which capital flows suddenly dry out. Abiad et al. (2011), Calvo et al. (2006), and Elekdag and Wu (2011) also notice that economic recoveries preceded by both a credit booms and banking crises tend to be credit-less.

The literature on sudden stops, however, encompasses any sudden cut in external financing, regardless of having a boom in capital inflows as a pre-condition. This subtle difference is relevant, as our focus is on external financing *cycles*. By focusing on episodes of capital flows reversals that follow booms in capital flows, we can narrow the discussion of policy issues. This is important, as not every sudden stop episode is necessarily preceded by a boom in capital inflows. Furthermore, notice that the current environment is precisely that of a potential reversal of sustained capital inflows as the expansionary monetary policies that were deployed in advanced economies following the global crisis are now approaching its withdrawal stage.

III. THEORETICAL BACKGROUND

While capital flows cycles can have a significant impact on bank credit, the dynamics of domestic credit under different exchange rate regimes also depends on the response of key macroeconomic variables—and in particular consumption. Section IV will document key stylized facts around turning points during capital flows cycles. Before doing so, however, we look at what standard macroeconomic models would predict about it. Vegh (2013) shows that while the steady state after the economy is affected by a shock—e.g., to world interest rate or to consumption preferences—is the same regardless of the exchange rate regime, the dynamics during the transition are different. This difference is associated with the adjustment process in the real exchange rate, i.e. through inflation of non-tradable goods under pre-determined exchange rate regimes (i.e., rigid regimes), and through an instantaneous nominal depreciation in economies with flexible exchange rate regimes. The difference in the adjustment process has an impact on the dynamics of consumption, and hence of domestic credit.

Assume that preferences of the representative agent are a composite of the consumption of tradable and non-tradable goods, given by

$$\sum_{t=0}^{\infty} \beta^t \alpha_t u\left(c_t^T, c_t^N\right) \tag{1}$$

where the utility function u is strictly concave and well-behaved. The discount factor is given by β and α denotes a preference shock parameter. The consumer's flow budget constraint is given by

$$b_t + \frac{M_t}{E_t} = \left(1 + r_{t-1}\right) b_{t-1} + \frac{M_{t-1}}{E_t} + \tau_t + y_t^T + \frac{y_t^N}{e_t} - c_t^T - \frac{c_t^N}{e_t} \tag{2}$$

where b_t stands for holdings of net foreign assets by the private sector (in units of tradable goods). M_t denotes the stock of nominal money balances, E_t the nominal exchange rate (i.e., the number of domestic currency units needed to buy one unit of foreign currency, and assumed equal to the domestic price level to the extent that foreign prices are given and equal to one), r_{t-1} the international real interest rate, and τ_t lump-sum transfers from the government. y_t^T and y_t^N represent the flow of tradable and non-tradable goods output (where we assume that tradable output is a constant endowment), and $e_t = \left(E_t / P_t^N\right)$ is the relative price of tradable goods (i.e., the real exchange rate).

The consumer is under a cash-in-advance constraint, given by

$$M_{t-1} = E_t \left(c_t^T + \frac{c_t^N}{e_t} \right) \tag{3}$$

The supply side is given by Calvo's (1983) staggered prices model the for non-tradable sector, such that

$$\pi_{t+1} - \pi_t = \theta\left(y_f^N - c_t^N\right) \tag{4}$$

Where π_t stands for the rate of inflation between $t-1$ and t, θ is a positive parameter and y_f^N denotes the level of full employment real output of non-tradable goods.

Under standard optimality conditions, the dynamics of the adjustment in the relative consumption of tradable vs. non-tradable goods is given by:[2]

$$c_t^T = \frac{c_t^N}{e_t} \tag{5}$$

Now let's focus on the adjustment to a shock in world interest rate that triggers capital inflows into the economy. The lower price of current consumption increases the demand for tradable goods, worsening the trade balance. The shock also increases the demand for non-tradable goods. Given staggered prices, though, the price of non-tradable goods adjusts slowly, i.e. P_t^N cannot jump on impact.

In economies with a flexible exchange rate, the nominal exchange rate jumps instantaneously, adjusting the relative price of tradable consumption without much of an effect the consumption of non-tradable goods. In fact, in simulation exercises Vegh (2013) shows that on impact, the response in the consumption of tradable goods is of an order of magnitude larger than the consumption of non-tradable goods.

With pre-determined exchange rates, however, the nominal exchange rate cannot jump. Thus, the excess demand for non-tradable goods increases non-tradable inflation (a jump variable) given that the price level of non-tradable goods and the exchange rate cannot jump, increasing the supply of non-tradable goods above its full employment level. The smaller adjustment in the real exchange rate on impact results in higher consumption of non-tradable goods compared to the case of flexible exchange rates. Furthermore, the response of the consumption of non-tradable goods is of a similar order of magnitude as that of the consumption of tradable goods, and similar to the response of the consumption of tradable goods under a flexible exchange rate regime.

As aggregate consumption is a convex combination of consumption of tradable and non-tradable goods, the model suggests that although the dynamics of consumption are similar under either exchange rate regime, the magnitude is not. In particular, less flexible exchange rate regimes

[2] Vegh (2013) solves for the optimality conditions and analyzes different shocks, using both separable and non-separable utility functions. Without loss of generality, we focus here in the non-separable case.

amplify the response on consumption to an external shock. On impact, consumption grows faster in less flexible exchange rate regimes, with a sharper adjustment thereafter.[3] This is consistent with what we show below, as consumption appears to be more dependent on banking credit than investment (which can borrow also outside of the banking system). Thus, the model implies that, although the overall equilibrium after the economy adjusts to similar shocks is the same, the amplification in consumption dynamics in models of capital inflows is magnified in those economies with less flexible exchange rates.

IV. DATA DESCRIPTION

The data set is constructed based on series from IMF's World Economic Outlook (WEO) and the International Financial Statistics (IFS). The time span of the data is 1969–2012. The frequency is annual, and the coverage comprises 179 countries.

The macroeconomic variables include real GDP, the real effective exchange rate, private sector consumption, investment, government expenditures, net exports, and domestic saving. The demand components, as well as saving, are computed as a share of GDP. The real exchange rate and real GDP are indexes, which are made equal to one at the time capital inflows reverse, without loss of generality. We also include the rate of inflation, which is used to approximate real growth rates when needed.

The financial variables focus on banking credit and broad money. For robustness, we also computed the loan-to-deposit ratios (LTDs). When necessary, the variables are expressed in growth rates (in nominal and real terms, as appropriate).

The exchange rate regime follows Reinhart and Rogoff (2004) and Ilzetzki et al. (2012). This enables to base our estimation on *de facto* exchange rate regimes, as opposed to *de jure* arrangements. This classification defines "coarse" and "fine" *de facto* exchange rate regimes. Table 1 shows the different exchange rate regimes. The fine classification disaggregates these coarse measures in slimmer bands. We use both classifications, obtaining similar results. For expositional purposes, we focus here on the results from the coarse classification only, which works as a semi-continuous series. To avoid misinterpretation of the role played by the exchange rate regime, we eliminate those observations classified as "free falling" and "dual markets with missing parallel markets" (regimes 5 and 6, respectively). Using the latter regimes might distort the results, as they could be counted as flexible exchange rates when using the semi-continuous classification. For details see Ilzetzki et al (2012) and Magud et al. (2014).

[3] For an illustration, see figures 11 and 13 in Vegh (2013), chapter 4.

Table 1. Coarse Exchange Rate 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.

Source: Reinhart and Rogoff (2004).

V. IDENTIFYING CAPITAL FLOWS REVERSALS: METHODOLOGY

We define capital flows reversals as abrupt contractions in capital flows into a country, conditional on following a boom in capital inflows. Consequently, to identify these reversals, we first identify booms and then assess which of those ended with a substantial retrenchment of capital flows. We describe the methodology, and then present the salient features of the identified episodes.

A. Capital Inflows Booms

Capital inflows booms are defined according to alternative criteria, to increase the robustness of the identification process. The analysis of stylized facts and the panel regressions are conducted for these alternative identified samples. We use two approaches:

- *Distribution criteria*. In line with Reinhart and Reinhart (2008), for each country we identify capital inflows booms as those events that lie in the top 20th percentile of the distribution of the external financial account balance to GDP ratio. These are considered the country-specific episodes for which capital inflows are the largest. To avoid double-counting, if two or more consecutive years belong to the top quintile they are considered part of the same episode. Additionally, a minimum of two years in which the external financial account balance to GDP is not in the top 20th percentile is required for two events to be considered separate episodes.

- *Cyclical deviations criteria*. Mendoza and Terrones (2008, 2012) use an algorithm to identify credit booms. We follow their methodology to single out episodes of capital flows booms instead. Based on a Hodrick-Prescott filter, we compute the cyclical components of the external financial account balance (as a percentage of GDP). Against this backdrop, for an event to qualify as a capital inflows boom, the cyclical component of the financial account ratio has to be larger than or equal to a multiple *m* of the standard deviation of each

country's series. For robustness, this criterion uses various parameterizations, namely *m*= 1.0, 1.5, 1.75, and 2.0.

B. Capital Flows Reversals

For each approach, we label as episodes of capital inflows reversals those events for which we observe a drop of 10 percent on inflows. Robustness checks for alternative values produce similar results. The identification requirements give us a wealth of alternative specifications to identify periods of capital inflows booms, and the reversals that follow them. As shown below, the results are consistent across identifying approaches, making the results robust. Below we present the main characteristics of the identified capital flows episodes.

C. Identification Results: Some Descriptive Statistics

As the algorithms used to identify capital flows reversal vary by approach, the number of identified reversals differs. Table 2 shows the number of episodes identified for the full sample in each methodology.[4] The distribution criterion (RR henceforth) identifies over 700 events. In turn, using the cyclical deviations approach, the number of events decreases with the size of *m*. The larger *m* is, the more extreme the cyclical deviation value needs to achieve to be considered a boom in capital inflows. For this criterion (MT henceforth), the algorithm finds capital flow reversals ranging from close 550 events to just over 130 episodes. Table 2 also groups the reversal by the flexibility of its exchange rate regime. Defining as fixed exchange rate regimes those with coarse classifications 1 and 2 (see Table 1), and flex for classifications 3 and 4, we find that about 65 percent of the events are related to fixed exchange rate regimes in most cases.

Table 2. Capital Inflow Reversal Events

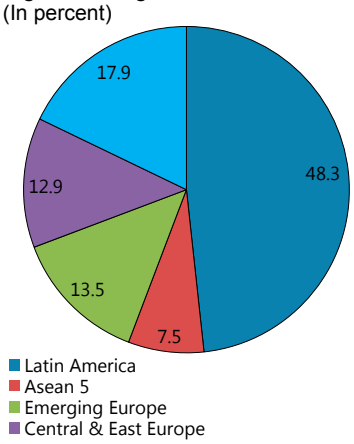
	RR	MT1	MT2	MT3	MT4
Events	701	544	285	203	132
of which: since 1990 (percent of total)	18.5	21.7	20.4	18.7	15.2
Fixed Regimes (percent events after 1990)	68.5	67.8	67.2	63.2	50
Flexible Regimes (percent of events after 1990)	31.5	32.2	32.8	36.8	50

Sources: authors' calculations

The regional distribution shows a bias toward Latin America (Figure 1). About 48 percent of the sample belongs to this region. Emerging Europe accounts for about 13 percent of the identified episodes, of a similar order of magnitude as events identified in Central and East Asia. A smaller share of the reversals episodes occurs in Asia.

[4] Appendix 1 to the Working Paper version of the paper contains a list of the reversal episodes using each methodology and threshold–including the year in which the reversal was triggered

Figure 1. Regional Distribution
(In percent)



We narrow the sample to analyze capital inflows reversals in emerging economies after the 1990s. Looking at the last 25 years allow us to focus on a period in which capital accounts in emerging economies became more open and received increasing private capital inflows. We eliminated developing and poor countries from the sample, as these countries present relatively close capital accounts and depend on official financing. Interestingly, the sample shows that between 20 to 25 percent of the identified capital inflow reversals took place after 1990.

VI. Event Analysis: Documenting Stylized Facts

We construct 11-year windows centered on reversals of capital inflows. The data is organized by event. For each episode, regardless of the actual year in which it took place, we label period *T* as the first year of the reversal. Hence, the data goes back to year *T-5* and forward to *T+5*. In this set up, we compute alternative "cross-section" statistical measures for each period in the interval (*T-5, T+5*). Of particular interest is the median, in each time period and for each series, as this measure is not influenced by outliers. The medians are then used to depict the dynamics of macroeconomic and financial variables.

A. The Macroeconomic Environment

Capital inflow reversals are characterized by a collapse in economic activity and sharp adjustments in the current account (Figure 2). Economic activity picks up and the current account deteriorates during the capital inflow boom—the median GDP growth is about 2 percentage points lower in the year of the reversal compared to the peak during the boom, and the current account adjust by between 2 and 3 percent of GDP. The slowdown in growth is particularly strong during the first couple of years of the reversal, to recover gradually—although not monotonically—thereafter. Concurrently, as capital flows reverse, the current account adjusts.

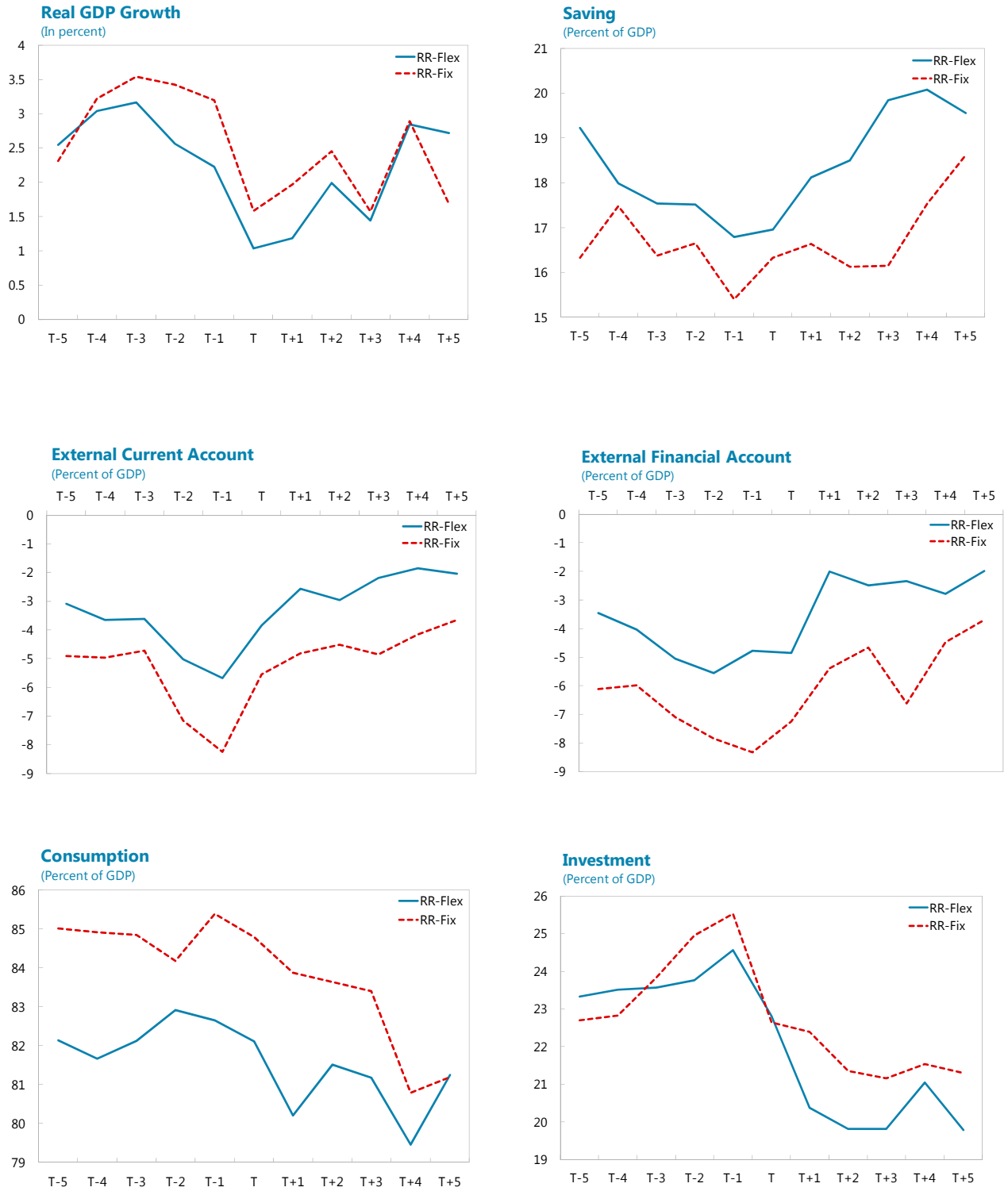
Investment falls strongly during reversals. At the peak of capital inflow booms, investment is about 4-5 percentage points of GDP higher than during the reversal year. Moreover, its recovery is particularly sluggish. Even five years following the reversal, investment is still lower in terms of GDP than in the year of the reversal. Private consumption remains fairly stable during the boom,

and even accelerates slightly prior to the reversal. As capital inflows retrench, however, consumption falls, consistent with the reduction in external financing. Additional issues—such as factors that might have an impact on banking sector credit, usually critical to the financing of consumption—could lie behind these dynamics.

We now focus on the differences between exchange rate regimes. We observe that investment dynamics are apparently not much affected by the exchange rate regime in a country during capital inflows reversals. Marginally, it appears that as the peak of the boom phase approaches, investment accelerates faster in more rigid exchange rate regimes. If anything, it might be signaling a potential misallocation of resources on the back of a misperceived sustainability of the cycle in the more rigid exchange rate arrangements.

The dynamics in economic activity and the current account do not differ markedly in countries with different exchange rate regimes. Yet, the external financing is larger in less flexible regimes. Domestic saving is larger in more flexible regimes throughout the boom and reversal, and accelerates faster after capital flows reverse. Measured as a share of GDP, consumption is significantly larger in less flexible exchange rate arrangements during capital inflow booms, and its adjustment during reversals substantially sharper, which is consistent with the behavior predicted in section III. In contrast, consumption is more stable in more flexible regimes and shows a much milder adjustment during reversals. As a result, consumption tends to converge under different degrees of exchange rate flexibility as the capital flow cycle fades out. As we will see below, consumption, typically financed through banking system credit, reflects the behavior of banking credit under different exchange rate regimes.

Figure 2. Macroeconomic Variables



Sources: authors' calculations

B. Banking Sector Credit

Real growth in banking credit to the private sector collapses during capital inflow reversals (Figure 3). As showed in Magud et al. (2014), banking credit accelerates during capital inflow booms, and the real growth rate of credit peaks a couple of years before capital flows reverse. During the reversal stage of the cycle, however, real credit growth markedly slows down. We also observe that after capital flows reversal episodes end, real credit growth stabilizes at a rate substantially lower than that of the boom phase.

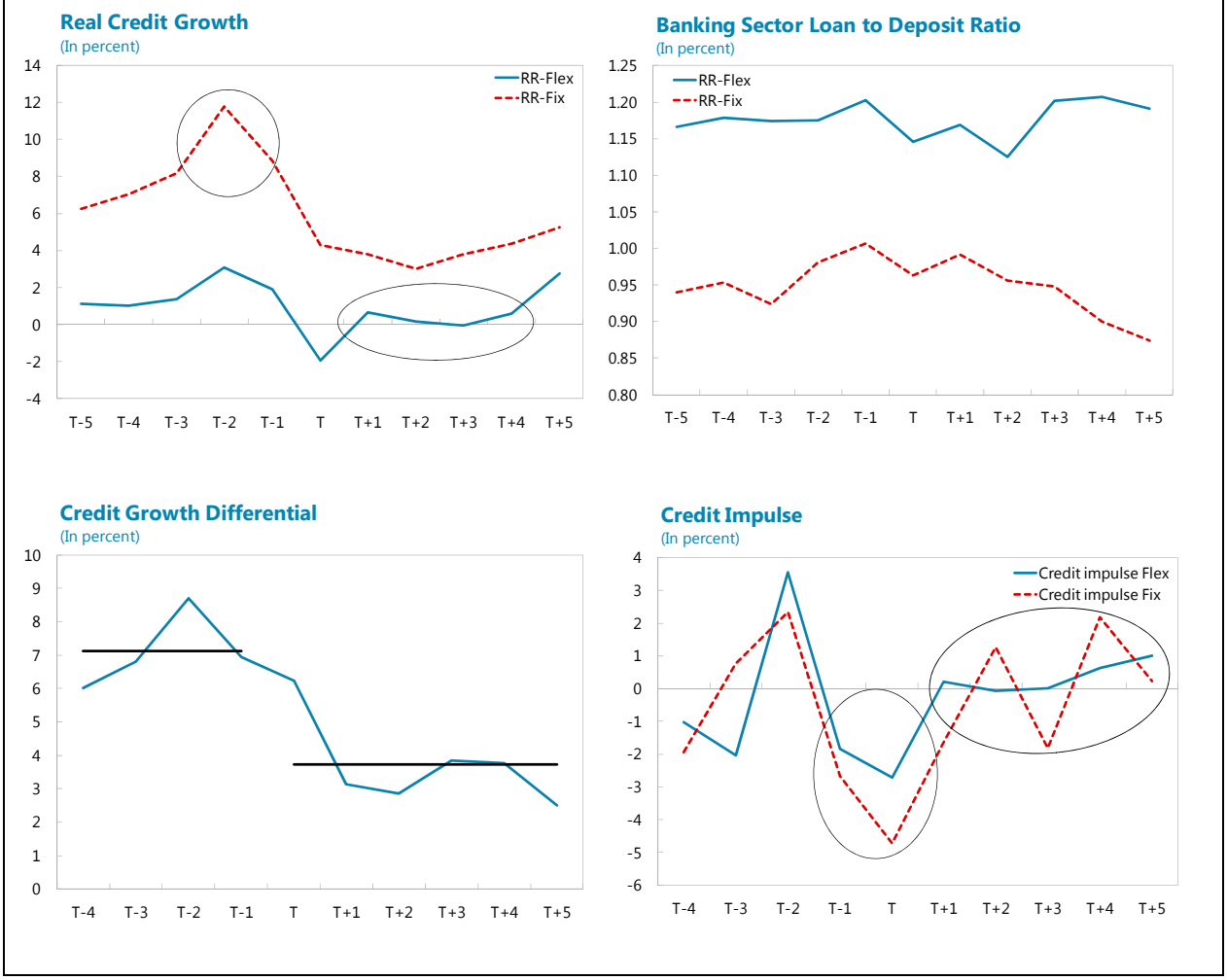
The dynamics of banking sector credit, however, show significant contrasts in economies with different exchange rate regimes. In particular:

- *Credit growth: consistently higher in fixed regimes, but less so during reversals.* Less flexible exchange rate regimes show consistently faster growth in domestic credit to the private sector during booms. The median of real growth in bank credit peaks at about 12 percent in fixed exchange rate regimes during capital inflow booms, while it does so at less than 3 percent for flexible regimes. The growth differential between regimes, however, falls significantly during reversals. Figure 3 shows that the average difference in median growth—i.e., credit growth in fixed regimes net of growth in flex regimes—falls from 9 percent during booms to 5 percent during reversals. Hence, even if partially, flexible exchange rate regimes show some more resilience during reversals as external financing dries up.

- *Containing credit growth during the boom is the key policy challenge for fixed regimes.* Credit growth in less flexible exchange rate regimes accelerates sharply during booms—its median doubles at the peak compared with the level five years before the reversal. In contrast, flexible regimes show a rather modest credit growth during capital inflow booms, with the median accelerating from slightly less than 2 percent during the initial stage of the boom to less than 3 percent at the peak. While differences in financial deepness makes it very complex to assess and compare credit growth among economies, double-digit credit growth in fixed exchange rate regimes economies strikes as too high in the context of 3-3½ percent average GDP growth during booms years.[5] Economies with flexible exchange rate regimes show real credit growth in line with the expansion in economic activity.

[5] We looked at potentially different dynamics around capital inflows reversals for economies with different degrees of financial deepness—characterized by the size of bank and bond market credit compared to GDP. Results were not conclusive. They suggest that while credit growth rates are somewhat—although not clearly—higher for shallower financial markets in fixed exchange rate economies, this is not the case for economies under a flexible regime.

Figure 3. Banking Sector Credit



Sources: authors' calculations

- *Supporting credit recovery seems to be a policy challenge for flexible regimes after reversals.* The fact that credit growth is more contained in economies with flexible exchange regimes during booms—and that loan-to-deposit ratios remain stable, see below—raises the question of whether the adjustment in credit growth during capital inflow reversals may be smoother. Furthermore, the slow recovery in credit growth for several years after the reversal—it is only towards the end of the capital flow cycle that credit growth rates significantly differ from zero—also raises questions. Why it is so difficult for banks to resume lending in a system that was characterized by a more contained pick-up in credit during the booms years? We dub this as the (credit) recovery puzzle.

- *Fixed regimes are exposed to sharp adjustments in non-deposit funding.* The LTDs can be considered as a proxy for banking sector external funding, as it reflects the share of total banking sector credit in excess of deposits. The sharp increase in LTDs in economies under fixed regimes suggests that capital inflows help finance the expansion of the lending

portfolio through leverage. However, banks are forced to retrench this financing once these flows disappear—in fact, LTDs fall below the level attained at the initial stages of the capital inflows cycle. In contrast, in more flexible exchange rate regimes, although higher throughout, this ratio is fairly stable over the capital flows cycle.

- *The credit impulse is more procyclical in economies under fixed exchange rate regimes.* Using the change in credit to GDP as a proxy for credit impulse—or a measure of acceleration—we observe that following a positive impulse during the boom phase, a strongly negative impulse is observed as capital flows reverse, in particular for fixed regimes. The credit impulse also looks more volatile after the reversal in these economies.

Higher order moments of the distribution of credit growth rates during reversals also suggest that credit in fixed regimes are more volatile over the whole cycle. The standard deviation of real credit growth in fixed regimes equals 2.7 for the whole period, while for flexible regimes reaches about only half of that, at 1.4. It is worth noticing, though, that while the standard deviation is higher in fixed regimes during booms, it is nonetheless lower than in flex regimes during the reversal—suggesting that the sharp adjustment at the reversal plays an important role in the assessment of volatility over the entire window. We also find that the distribution of real credit growth for economies with flexible exchange rate regimes exhibits negative skewness, while the one for less flexible regimes shows positive skewness. This suggests that economies under fixed regimes tend to concentrate a larger part of the distribution in observations with larger growth rates.

Table 3. Real Credit Growth

	Fixed	Flex
Std. dev full sample	2.7	1.4
Std. dev boom	2.1	0.8
Std. dev full reversal	0.8	1.5
Skewness	1.0	-0.5

Source: authors' calculations

While the results presented in this section are based on the RR identification process, they remain broadly similar under the MT identification process described above. Only small differences are found, and they only apply to the most stringent MT identification specifications—i.e. the ones using the highest deviation from the mean as the identification criteria. The latter shouldn't surprise, as the highest "*m*-values" are related to tail events. Yet, all the results, and consequently their dynamics and interpretation, remain unaltered.

VII. Regression Analysis

In this section, we focus on the dynamics of credit during capital inflow reversals in the context of different exchange rate regimes. The latter, based on the panel regressions presented below, will inform the policy discussion in the next section.

We model the following panel specification:

$$Y_{t,i} = \alpha X_{i,t} + \beta M_{t,i} + \gamma F_{t,i} + \delta R_i + \vartheta T_t + \varepsilon_{t,i} \qquad (1)$$

where sub-indices *t* and *i* stand for period and event respectively. $Y_{t,i}$ refers to the real growth rate of credit. $X_{i,t}$ denotes the main explanatory variable, the *de facto* exchange rate regime. As mentioned above, we use the coarse classification, which ranges from 1 to 4, as we leave out the free falling observations. Given this classification, the larger this variable is, the more flexible the exchange rate regime is—as a 4 refers to a free floating regime, while a 1 corresponds to pegs.

We introduce several controls. $M_{t,i}$ stands for the set of macroeconomic controls, which include real GDP growth and the real effective exchange rate. Other controls are aimed at correcting for financing conditions, namely $F_{t,i}$. These include financial deepness (proxied by the lagged ratio of banking credit to GDP), the real growth of broad money (M2), as well as the ratio of the balance of the (external) financial account to GDP, to control for external financing. Formally,

$$M_{t,i} = \begin{bmatrix} RGDPgrowth_{t,i} \\ REER_{t,i} \end{bmatrix}$$

$$F_{it,} = \begin{bmatrix} realBroadMongrowth_{t,i} \\ FinAccBal_{t,i} \\ Credit/GDP_{t-1,i} \end{bmatrix}$$

Equation (1) is the baseline regression model. Alternative specifications are added for robustness. We include dummy variables for each region, R_i, a sort of "fixed effect" control. We also test for the impact of "time effects" by adding a period dummy, T_t. We also run an instrumental variables specification in which the financial account balances and the real growth rate of broad money are instrumented by their one-period lags. The data set, based on the series used in the event analysis above, is a balanced panel. It is worth stressing that the series are not a country panel, but an episode-based panel including a total of 129 events with a maximum of 11 observations each. Countries in the sample could have experienced more than one episode of capital inflow reversals.

We also build a cross-section sample by computing the average of the series during the boom phase and the reversal stage of the capital flows cycles, respectively. Then, we compute the change in average real credit growth between the different stages. As we want to understand the factors behind the deceleration in credit during the reversal, and in particular the role played by the exchange rate regime, we run the following regression:

$$CredRev_i = \pi Z_i + \varphi W_i + \tau V_i + \omega_i \qquad (2)$$

where $CredRev_i$ stands for the change in average real credit growth between the boom and the reversal phases. Z_i stands for the exchange rate regime (again, based on the coarse classification, excluding free falling observations). The controls—W_i, V_i—stand for macroeconomic and financial variables respectively, and are given by the following vectors:

$$W_i = \begin{bmatrix} avgRGDP_i \\ avgREER_i \end{bmatrix}$$

$$V_i = \begin{bmatrix} avgFinAcc_i \\ avgRBrMongrowth_i \end{bmatrix}$$

The controls include the average growth rate of real GDP, and the average growth of the real effective exchange rate among the macroeconomic explanatory variables, and the average balance of the external financial account (as a percentage of GDP) and the average real growth rate of the growth of broad money as the financial variables. Variables in the right hand side of (2) are averages at the boom stage of the cycle, as we want to understand how much each of these boom-value levels conditions the change in real credit growth when capital flows reverse.

A. Results

The panel regressions suggest that credit growth is lower in economies with more flexible exchange rate regimes over the whole capital flow cycle. The coefficient for the exchange regime is negative and significant at the 1 percent level in every specification. Table 4, column 1 shows the baseline specification, which is corrected for heteroscedasticity. The baseline specification is checked for robustness by including regional and time dummies variables, as described above. Additionally, instrumental variable specifications are run by lagging broad money growth and the external financial account balance—not only in the baseline specification, but also when including regional and time period dummies.[6] The controls show the expected signs, with faster growth of broad money or a more appreciated real exchange rate more conducive to stronger credit growth. More buoyant economic activity is also associated with faster credit growth. Furthermore, a higher credit to GDP ratio in the previous period (a standard proxy for financial deepness) has a negative sign as a higher stock of credit results in lower growth of credit, all else equal.

The cross-section regression suggests that the banking credit *cycle* is less severe in economies with more flexible exchange rate regimes. This exercise regresses the *change* in average banking sector credit growth between the boom and reversal periods against the boom-average values of the same factors as in the panel regression. It shows that the fall in credit growth in more flexible exchange rate regimes during reversals is less acute than in economies with less flexible regimes. This is captured by the negative coefficient in the regression in column 7, thus stressing the importance of exchange rate flexibility to smooth *credit adjustment* when capital flows recede.[7]

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[6] Alternative specifications have been run by: (i) defining the exchange rate regime as a dummy variable adopting the value of 1 for classifications 1 and 2, and 0 for classifications 3 and 4; and (ii) by including one different dummy variable for each exchange rate classification. All the results are in line with Table 4. The IV procedure is similar to Magud et al. (2014). These results are based on the distribution criteria. Results remain broadly similar under the cyclical deviations criteria; see appendix.

[7] For robustness, we also run these specifications in sample that excludes the episodes in which the exchange rate regime changed when capital flows reversed. All the results hold (see the appendix).

Consistent with the evidence in Table 4, a recursive analysis of the coefficients suggests that the difference in credit growth rates between exchange rate regimes is less significant during capital inflow reversals. To check the stability of the coefficient for the exchange rate regime in the panel estimations in Table 4, we apply the procedure described in Anttila-Hughes and Hsiang (2010). We estimate recursively the coefficients using two-year windows—starting five years before the reversal—and assessing them through 95 percent confidence intervals.[8]

Figure 4 shows the results of the estimations, with two issues worth mentioning. On the one hand, the coefficient on the exchange rate regime is consistently negative and significant. On the other hand, the coefficient gradually becomes more negative during the capital inflow boom, reversing its dynamics at the time of reversal. In effect, the coefficient peaks at about -4¼ during the boom, jumping to about -2 after the reversal. These results suggest that exchange rate flexibility is a buffer against volatility in the credit cycle, although credit growth is still higher in less flexible exchange regimes during reversals. A change in the sign of this coefficient would have suggested that exchange rate flexibility is a much stronger buffer (paradise), but this is not being corroborated by the data (thus, just purgatory).

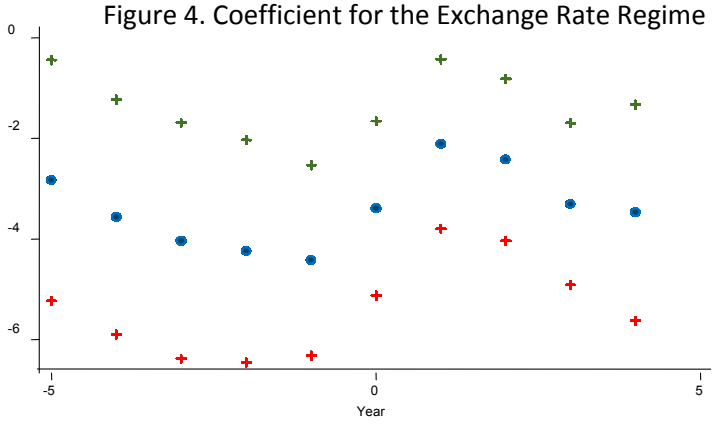
[8] That is, the first coefficient is the one associated with a regression of a panel including the fifth and fourth years before the capital inflow reversal. The second coefficient show results of a regression with the fourth and third years before the reversal. The remaining coefficients are estimated shifting the sample accordingly.

Table 4. Credit Growth and Exchange Rate Regime

R & R	Panel: credit growth						Cross-section
	Baseline	Regional	Time effect	IV baseline	IV regional	IV period	Reversal
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	cred_reversal
Financial account balance	0.000263*	0.000262*	0.000240*	8.85e-05	0.000206	0.000178	
	(0.000147)	(0.000145)	(0.000146)	(0.000181)	(0.000137)	(0.000137)	
Real GDP (RGDP) growth	1.763***	1.697***	1.712***	1.572***	1.734***	1.726***	
	(0.120)	(0.121)	(0.121)	(0.151)	(0.123)	(0.125)	
Broad money real growth	0.624***	0.605***	0.626***	1.428***	0.652***	0.665***	
	(0.0314)	(0.0318)	(0.0312)	(0.133)	(0.0327)	(0.0323)	
Real effective exchange rate (REER)	11.35***	12.98***	11.57***	9.152**	11.92***	10.50***	
	(3.450)	(3.445)	(3.430)	(4.251)	(3.734)	(3.736)	
Exchange rate regime	-3.155***	-3.740***	-3.197***	-2.645***	-3.836***	-3.080***	-2.093*
	(0.462)	(0.540)	(0.458)	(0.571)	(0.741)	(0.640)	(1.278)
Lagged credit/GDP 1/	-0.0532***	-0.0600***	-0.0506***	-0.0861***	-0.0879***	-0.0749***	
	(0.0109)	(0.0122)	(0.0108)	(0.0144)	(0.0150)	(0.0138)	
Latin America dummy		-9.214*			-11.14		
		(5.169)			(7.104)		
Emerging Europe dummy		-1.473			-2.368		
		(4.418)			(6.191)		
ASEAN 5 dummy		-2.966			-3.994		
		(5.302)			(7.284)		
Central & East Europe dummy		-4.677*			-6.113*		
		(2.793)			(3.632)		
Other advanced countries dummy		-7.149			-8.003		
		(5.223)			(7.180)		
Average RGDP growth during boom							1.377**
							(0.545)
Average finan. account bal boom							0.00546***
							(0.00122)
Average REER during boom							19.51
							(18.94)
Average real broad mon growth boom							0.551***
							(0.199)
Constant	-1.030	6.377	-0.426	4.000	10.63	2.010	-12.74
	(3.626)	(6.419)	(3.889)	(4.543)	(8.251)	(4.232)	(19.32)
Observations	1,148	1,148	1,148	1,141	1,141	1,141	124
R-squared				0.358	0.418	0.413	0.355
Number of countries	129	129	129	129	129	129	
Chi squared	749.2	793.3	783.3	361.7	796.9	800.0	
Log likelihood	-4636	-4622	-4625				-500.5

Source: authors' calculations.
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
1/ The lagged credit to GDP ratio is a proxi for financial deepness in banking credit.

Figure 4. Coefficient for the Exchange Rate Regime



B. Robustness

We assess whether the role of exchange rate flexibility is robust to alternative definitions of capital flows, in particular, we look at gross total capital flows and at non-FDI flows (namely, portfolio

flows and other investment flows), both in gross and net terms. We show that results in the previous section are robust to these alternative specifications.

Net Non-FDI flows, using total net flows as reversals' identifiers

The first robustness check uses capital flow reversals identified above and run the baseline specifications on portfolio and other capital flows. As some of the countries in the sample lack data on non-FDI capital flows, the number of reversal events falls to 84. Table 5 shows that coefficients are similar to the ones found in the baseline specification, and significant. Exchange rate flexibility is associated with slower real credit growth. These findings hold in all specifications, including time dummies, regional dummies, and estimations through instrumental variables. As in the baseline, higher GDP growth, broad money, and real exchange rate appreciation tend to be associated with faster credit growth. Deeper credit ratios points to lower credit growth, i.e. more developed credit markets expand at slower pace.

Table 5. Credit Growth and Exchange Rate Regime with net non-FDI flows
Original reversal episode selection criteria

	Net non-FDI					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth
Net non-FDI flows (percent of GDP)	0.0905	0.0167	0.0523	0.0270	0.0252	0.0265
	(0.0675)	(0.0688)	(0.0680)	(0.0781)	(0.0698)	(0.0695)
Real GDP growth	1.992***	2.014***	1.949***	1.886***	2.014***	1.955***
	(0.157)	(0.155)	(0.158)	(0.185)	(0.157)	(0.161)
Broad money real growth	0.377***	0.337***	0.379***	1.049***	0.360***	0.382***
	(0.0412)	(0.0416)	(0.0410)	(0.176)	(0.0456)	(0.0452)
Real effective exchange rate	10.76***	13.05***	11.35***	11.95***	14.18***	12.90***
	(3.720)	(3.727)	(3.692)	(4.256)	(4.066)	(4.080)
Exchange rate regime	-3.096***	-3.007***	-3.219***	-3.088***	-3.140***	-3.124***
	(0.581)	(0.619)	(0.577)	(0.664)	(0.811)	(0.780)
Credit to GDP (t-1)	-0.0384***	-0.0249*	-0.0339***	-0.0549***	-0.0526***	-0.0533***
	(0.0123)	(0.0141)	(0.0122)	(0.0148)	(0.0169)	(0.0154)
Latin America		-1.374			-2.911	
		(1.487)			(1.928)	
Emerging Europe		8.342***			8.158**	
		(2.690)			(3.392)	
ASEAN 5		3.476**			3.462	
		(1.738)			(2.261)	
Central East Europe		-4.088			-5.408	
		(2.649)			(3.355)	
Constant	-2.602	-7.075	-1.422	-1.438	-5.713	-1.830
	(4.043)	(4.481)	(4.301)	(4.658)	(5.070)	(4.787)
Observations	709	709	709	702	702	702
Number of events	84	84	84	84	84	84
chi2	345.4	387.3	370.6	249.3	138.9	135.4
ll	-2822	-2808	-2814			
r2_w				0.223	0.294	0.315
r2_b				0.383	0.555	0.444
r2_o				0.271	0.366	0.352

Standard errors in parentheses. Regressions (4)-(6) instrumented using lagged real GDP growth and lagged broad money real growth.
*** p<0.01, ** p<0.05, * p<0.1

Net non-FDI flows, using net non-FDI flows as reversals' identifiers

We also re-run the identification exercise above, but this time using the net non-FDI flows to find the capital flows reversal episodes. The number of events (and, in fact, countries) is more limited than in the baseline regressions, as the data set that we are using for non-FDI flows is smaller in scope than that for net total flows.[9] Table 6 shows that results are also consistent with the baseline specification.

Table 6. Credit Growth and Exchange Rate Regime with net non-FDI flows
Reversal episodes identified with net non-FDI flows

	Net non-FDI flows					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth
Net non-FDI flows (percent of GDP)	0.110	0.0133	0.0930	0.110	0.0575	0.0886
	(0.0793)	(0.0790)	(0.0793)	(0.0807)	(0.0809)	(0.0820)
Real GDP growth	1.551***	1.629***	1.473***	1.555***	1.596***	1.484***
	(0.158)	(0.152)	(0.160)	(0.155)	(0.153)	(0.159)
Broad money real growth	0.447***	0.383***	0.459***	0.448***	0.410***	0.454***
	(0.0493)	(0.0491)	(0.0492)	(0.0502)	(0.0502)	(0.0505)
Real effecttive exchange rate	12.63***	17.02***	13.34***	10.17**	13.99***	11.13***
	(3.798)	(3.749)	(3.764)	(4.232)	(4.110)	(4.253)
Exchange rate regime	-3.028***	-2.941***	-3.072***	-2.965***	-3.047***	-2.994***
	(0.609)	(0.643)	(0.601)	(0.895)	(0.846)	(0.886)
Credit to GDP (t-1)	-0.0185	-0.0128	-0.0140	-0.0480***	-0.0404**	-0.0416**
	(0.0130)	(0.0144)	(0.0130)	(0.0184)	(0.0183)	(0.0184)
Latin America		-3.411**			-4.523**	
		(1.574)			(2.113)	
Emerging Europe		6.599***			4.992	
		(2.426)			(3.286)	
ASEAN 5		5.494***			6.037**	
		(2.067)			(2.839)	
Central East Europe		-2.173			-1.961	
		(2.311)			(3.189)	
Constant	-4.483	-10.33**	-3.726	-0.457	-4.671	-0.279
	(4.226)	(4.645)	(4.409)	(4.895)	(5.309)	(5.125)
Observations	531	531	531	531	531	531
Number of events	70	70	70	70	70	70
chi2	264.2	330.9	289.5	116.2	148.3	275.8
ll	-2091	-2069	-2082			
r2_w				0.334	0.331	0.354
r2_b				0.244	0.493	0.293
r2_o				0.325	0.379	0.346

Standard errors in parentheses. Regressions (4)-(6) instrumented using lagged real GDP growth and lagged broad money real growth.
*** p<0.01, ** p<0.05, * p<0.1

Non-FDI gross inflows

Could the results be driven by the use of net flows instead of gross flows? To address this issue we use gross (non-FDI) capital flows to re-identify reversals in capital flows. Owing to data availability, the data set is also restricted in this extension—compared with the baseline data set. Yet, the findings are unaltered. Exchange rate flexibility brings a smaller rate of growth of credit in

[9] The data set corresponds to Adler and Sosa (2014). We thank Sebastian Sosa for sharing the data set with us.

real terms. All the other controls also remain in regards to sign, order of magnitude, and statistical significance. Table 7 presents these alternative regressions.

Table 7. Credit Growth and Exchange Rate Regime with gross non-FDI flows
Reversal episodes identified with gross non-FDI flows

	Gross non-FDI flows					
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth
Gross non-FDI flows (percent of GDP)	0.0487	0.0328	0.0395	0.0800*	0.0706	0.0650
	(0.0429)	(0.0422)	(0.0423)	(0.0439)	(0.0437)	(0.0439)
Real GDP growth	1.608***	1.652***	1.518***	1.418***	1.460***	1.360***
	(0.172)	(0.168)	(0.174)	(0.165)	(0.164)	(0.170)
Broad money real growth	0.486***	0.420***	0.501***	0.472***	0.446***	0.482***
	(0.0553)	(0.0556)	(0.0545)	(0.0533)	(0.0538)	(0.0534)
Real effecttive exchange rate	18.32***	20.71***	18.85***	21.14***	21.96***	21.97***
	(4.690)	(4.696)	(4.575)	(5.224)	(5.192)	(5.158)
Exchange rate regime	-3.090***	-3.056***	-3.309***	-3.368***	-3.497***	-3.547***
	(0.761)	(0.759)	(0.743)	(1.178)	(1.134)	(1.126)
Credit to GDP (t-1)	-0.0387**	-0.0360**	-0.0283*	-0.102***	-0.101***	-0.0811***
	(0.0157)	(0.0171)	(0.0156)	(0.0234)	(0.0243)	(0.0227)
Latin America		-3.070*			-5.782**	
		(1.731)			(2.745)	
Emerging Europe		4.398			1.396	
		(2.744)			(4.424)	
ASEAN 5		2.953			2.142	
		(2.447)			(4.009)	
Central East Europe		0.0103			0.878	
		(2.639)			(4.324)	
Constant	-9.782*	-13.04**	-9.330*	-8.212	-7.671	-8.888
	(5.090)	(5.544)	(5.139)	(6.008)	(6.577)	(6.045)
Observations	431	431	431	431	431	431
Number of events	59	59	59	59	59	59
chi2	248.5	289.6	288.9	266.7	159.7	292.7
ll	-1699	-1686	-1686			
r2_w				0.411	0.412	0.430
r2_b				0.232	0.358	0.355
r2_o				0.340	0.382	0.381

Standard errors in parentheses. Regressions (4)-(6) instrumented using lagged real GDP growth and lagged broad money real growth.
*** p<0.01, ** p<0.05, * p<0.1

The above results confirm that the baseline is robust to several alternative specifications. We have performed several other robustness checks, testing each specification and each reversal identifying alternative using as controls total gross flows, gross non-FDI flows, and net non-FDI flows, as well as the financial account balance. Results do not change in any of the specifications—and are available upon request.

VIII. POLICY IMPLICATIONS

In Magud et al (2014), we argued 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. The empirical evidence in those papers focused on periods of large capital inflows, and concluded that exchange rate flexibility could be instrumental in curving the effects of capital inflows on domestic credit. From a policy perspective, the paper suggested that relatively inflexible exchange rate regimes stood to benefit the most from regulatory policies to reduce banks' incentives to tap external markets and to lend/borrow in foreign currency. That paper acknowledged, though, that exploring the dynamics in credit markets during capital

inflows reversals and their possible differences across exchange rate regimes was needed to properly assess the policy options to smooth credit cycles associated with large capital inflows.

The analysis of capital inflow reversals suggests that economies with more flexible exchange rate regimes may also face a credit cycle during swings in capital flows. It is indeed the case that containing credit growth during capital inflow booms and coping with sharp adjustments in non-deposit funding—as evidenced by the cycle in loan-to-deposit ratios in those economies—constitutes a policy challenge in economies with fixed exchange rate regimes. However, the credit recovery puzzle in flexible regimes raises issues as well, as suggested by the dynamics of credit after reversals take place. In effect, the fact that credit growth accelerates less in economies with flexible exchange regimes during booms would suggest that the adjustment in credit growth during capital inflow reversals could be smoother. Furthermore, the slow recovery in credit growth for several years after the reversal also raises the question of why it is so difficult for the banking system to resume lending if credit acceleration during the booms years was less acute than in less flexible regimes.

The credit recovery puzzle in economies with flexible exchange rate regimes offers an interesting new perspective to the policy implications that one can draw just from looking at capital inflow bonanzas. The slow recovery in credit suggests that different macro-prudential policies may be most useful at different stages of the capital flow cycle. Concretely, the main policy implications from the paper could be summarized as follows:

- Macro-prudential policies would be particularly relevant to contain credit growth during the capital inflow bonanza in economies with fixed exchange rate regimes. As the key policy challenge in these regimes is associated to the excesses during the boom, macro-prudential measures to contain excessive credit growth—such as loan-to-value ratios (LTV), debt-to-income (DTI) and debt-service-to-income (DSTI) limits—would be most relevant in these cases. Given the observed increase in LTDs in these economies during the boom, currency-dependent reserve requirements that reduce the incentives for banks to tap international markets would also be instrumental in curbing credit growth.

- Macro-prudential policies that help creating buffers to support credit during the reversal of capital inflows may be very relevant in economies with more flexible exchange rate regimes. To the extent that measures like capital surcharges (CS) or countercyclical provisioning (CP) help banks build buffers during the capital inflows phase, they can be particularly useful in maintaining the supply of credit when the economy has to cope with the capital flow reversal.

IX. Concluding Remarks

The fluctuations in global risk aversion triggered by the Federal Reserve “tapering” talk in 2013 are a reminder that the potential for reversals in large capital inflows may have a significant impact on financial markets, including in the evolution of banking sector credit. This is particularly the case for emerging market economies.

We create a data set of capital flows reversals for 179 countries during 1960–2012 using standard algorithms to identify capital reversal events, conditional on following capital inflows bonanzas. Then we focus on countries with relatively open capital accounts during the last 25 years, and identify 129 reversal episodes and document the stylized facts for economies with relatively fixed and flex exchange rate regimes during 5-year windows before and after the events. We also run panel regressions to assess the role played by exchange rate flexibility during capital inflows booms, and particualrly during the reversals, controlling for a number of macroeconomic factors.

We find that exchange rate flexibility is associated with more contained banking credit growth during capital inflows booms. However, the fall in credit growth in economies with more flexible exchange regimes—albeit with a more modest drop than in fixed regimes—suggests that flexibility cannot fully shield the economy during the reversal. Furthermore, we observe what we dub as a recovery puzzle: credit growth in more flexible exchange rate regimes remains tepid well after the capital flow reversal takes place.[10] We also performed several robustness checks using gross total capital flows, gross non-FDI flows (i.e. portfolio plus other capital flows), and net non-FDI flows as controls. We also used them to identify the events of reversal in capital flows for each of the controls. All the results in the baseline specification remained unaltered.

From a policy perspective, our findings suggest that flexibility can be complemented by macro-prudential policies to manage capital flow cycles. It is often acknowledged that macro-prudential policies may find it challenging to control credit growth during booms; and that they seem to be more effective in building buffers to help the economy avoid a crunch in banking sector credit when—for whatever reason—the credit cycle reverses. Exchange rate flexibility can keep credit growth relatively at bay during bonanzas, and it could be complemented by measures like capital surcharges or countercyclical provisions during the credit expansion phase. These macro-prudential instruments, in turn, can help deal with the recovery puzzle experienced by flexible exchange rate regimes during reversals. More rigid exchange rate regimes are prone to faster credit growth during the boom phase of capital inflows. Hence, measures such as reserve requirements, loan-to-value ratios, and debt-to-income and debt-service-to-income limits would help mitigating an excessive expansion of credit before capital flows reverse.

Potential extensions to this initial evidence could look into the evolution of financial sector credit channeled outside the banking system. While the policy implications drawn from the evidence in this paper focus on bank credit cycles, it may well be the case that credit recoveries after capital flows reversal take place through other instruments. Further analysis could also look into the role of interconnectedness of the country's financial system with international markets and the structure of the financial system—e.g., the presence of foreign banks and the presence of public sector banks which can support credit growth despite of the capital inflow reversal.We leave this for future research.

[10] We leave for future research to explain why this puzzle takes place

Appendix

As a final robustness check, we re-run the econometric exercises in the baseline specification using (i) the episodes selected by the Mendoza and Terrones (2008, 2012) algorithm, and (ii) a restricted sample in which we exclude the episodes in which the exchange rate regime switched when capital flows reversed.. Table A.1 shows that the results hold throughout the specifications for the Mendoza and Terrones algorith. Only the statistical significance of the exchange rate regime in the cross-section specification diminishes to 15 percent, probably reflecting the lower number of observations. Table A.2 presents the restricted sample regression, where all the results in Table 4 above remain unaltered.

Table A.1. Robustness IV.

M & T	Panel: credit growth						Cross-section
	Baseline	**Regional**	**Time effect**	**IV baseline**	**IV regional**	**IV period**	**Reversal**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	real_credit_growth	cred_reversal
Financial account balance	0.000247	0.000243	0.000220	0.000160	0.000219	0.000189	
	(0.000200)	(0.000199)	(0.000199)	(0.000211)	(0.000196)	(0.000196)	
Real GDP (RGDP) growth	1.807***	1.806***	1.751***	1.804***	1.920***	1.874***	
	(0.146)	(0.146)	(0.147)	(0.163)	(0.156)	(0.158)	
Broad money real growth	0.488***	0.472***	0.491***	0.883***	0.445***	0.464***	
	(0.0377)	(0.0383)	(0.0374)	(0.139)	(0.0430)	(0.0424)	
Real effective exchange rate (REER)	5.864	6.540	6.054	4.529	7.961*	7.261	
	(4.118)	(4.159)	(4.087)	(4.715)	(4.669)	(4.641)	
Exchange rate regime	-4.549***	-5.027***	-4.602***	-4.308***	-5.225***	-4.790***	-2.261^
	(0.653)	(0.728)	(0.648)	(0.737)	(0.881)	(0.809)	(1.794)
Latin America dummy		-2.785**			-2.879*		
		(1.377)			(1.672)		
Emerging Europe dummy		4.549			6.665		
		(4.652)			(5.605)		
ASEAN 5 dummy		-0.762			-0.872		
		(2.170)			(2.636)		
Central & East Europe dummy		-2.236			-3.105		
		(4.587)			(5.534)		
Other advanced countries dummy		-1.652			-2.253		
		(1.810)			(2.191)		
Average RGDP growth during boom							1.934***
							(0.626)
Average finan. account bal boom							9.173
							(18.82)
Average REER during boom							0.00483***
							(0.00104)
							0.586***
							(0.211)
Constant	3.364	4.662	2.615	5.254	3.022	1.398	-4.710
	(4.268)	(4.425)	(4.670)	(4.904)	(5.015)	(5.220)	(19.44)
Observations	1,186	1,186	1,186	1,069	1,069	1,069	114
R-squared				0.224	0.258	0.263	0.364
Number of countries	118	118	118	118	118	118	
Chi squared	414.6	427.0	443.5	253.2	351.2	361.4	
Log likelihood	-5150	-5146	-5140				-471.3

Sources: authors' calculations.
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1, ^ p<0.15

Table A.2. Robustness V

R & R--restricted sample 1/	Panel: credit growth						Cross-section
	Baseline	**Regional**	**Time effect**	**IV baseline**	**IV regional**	**IV period**	**Reversal**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	real credit growth	real credit growth	real credit growth	real credit growth	real credit growth	real credit growth	cred reversal
Financial account balance	0.000243	0.000246*	0.000218	0.000134	0.000202	0.000170	
	(0.000149)	(0.000148)	(0.000149)	(0.000161)	(0.000137)	(0.000137)	
Real GDP (RGDP) growth	1.821***	1.754***	1.766***	1.854***	1.865***	1.855***	
	(0.123)	(0.124)	(0.124)	(0.137)	(0.129)	(0.130)	
Broad money real growth	0.570***	0.548***	0.572***	1.114***	0.632***	0.646***	
	(0.0317)	(0.0324)	(0.0315)	(0.126)	(0.0350)	(0.0344)	
Real effective exchange rate (REER)	12.40***	12.98***	12.71***	12.44***	11.76***	10.99***	
	(3.492)	(3.471)	(3.476)	(4.036)	(3.954)	(3.975)	
Exchange rate regime	-3.286***	-3.708***	-3.319***	-3.278***	-3.461***	-3.348***	-2.364*
	(0.455)	(0.562)	(0.451)	(0.509)	(0.765)	(0.636)	(1.221)
Latin America dummy		-10.51**			-9.795		
		(5.029)			(6.889)		
Emerging Europe dummy		-1.843			-1.054		
		(4.296)			(5.988)		
ASEAN 5 dummy		-5.361			-5.128		
		(5.182)			(7.098)		
Central & East Europe dummy		-5.349**			-5.620		
		(2.706)			(3.535)		
Other advanced countries dummy		-9.881*			-10.40		
		(5.073)			(6.956)		
Average RGDP growth during boom							1.688***
							(0.525)
Average finan. account bal boom							0.00611***
							(0.00116)
Average REER during boom							14.49
							(19.56)
Average real broad mon growth boom							0.416**
							(0.190)
Constant	-4.465	4.987	-4.256	-3.791	5.030	-2.464	-8.996
	(3.629)	(6.292)	(3.895)	(4.200)	(8.142)	(4.388)	(19.94)
Observations	1,202	1,202	1,202	1,081	1,081	1,081	118
R-squared				0.350	0.393	0.389	0.333
Number of countries	123	129	123	123	123	123	
Chi squared	641.2	825.5	672.8	354.4	660.3	666.9	
Log likelihood	-4877	-5146	-4867				-471.7

Source: authors' calculations.
Standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
1/ The sample excludes those episodes where the exchange rate regime switched at the time capital flows reversed.

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