Current Account and Real Exchange Rate changes: the Impact of Trade Openness*

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Abstract

In the transfer problem debate with Keynes, Ohlin suggests that income effects should lessen relative price variations necessary to produce trade surpluses, and that that impact is related to the degree of openness of the economy. We illustrate this mechanism in a simple model, and take it to the data. First, using data for developed and emerging economies for the period 1970–2011, we identify events of sudden stops of capital flows and of abrupt real exchange rate depreciations. Then, we investigate the relationship between openness to trade, real exchange rate depreciations, and changes in current account and trade balances during these events. We find that, controlling for real exchange rate changes, more open economies experience a larger increase in current account and trade balances. In other words, our results indicate that improvements in current account and trade balances are accompanied by a smaller real exchange rate depreciation in more open economies.

Keywords: trade openness, sudden stops, real exchange rate depreciation.
JEL classification: F32, F37.

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1 Introduction

Both advanced and emerging economies have experienced high growth of capital flows over the past twenty years. Throughout the years 2000s, this growth was accompanied by large current account imbalances, raising many concerns with respect to the potential adverse consequences of abrupt interruptions of these flows. In particular, the magnitude of exchange rate depreciation over the adjustment process of current accounts has been a key element of discussion (Obstfeld and Rogoff, 2005, 2007; Corsetti et al., 2013), reviving the famous debate between John Maynard Keynes and Bertil Ohlin over the payment of war debts in Germany during the 1920s, known as the "Transfer Problem".

In the transfer problem debate, Keynes (1929) argued that, in order to pay for the war damages in foreign currency, Germany would have to raise the resources through trade balance surpluses. Relative prices of tradable goods would then have to increase, implying a real exchange rate depreciation. According to Ohlin (1929), however, the decline in Germany's disposable income due to the external payments would entail an increase in trade balance with lesser relative price changes. The mechanism is that, with lower income, the country would buy less of "the goods which go easily between them", using Ohlin's words, thereby improving its trade balance. Clearly, the efficiency of this mechanism depends on the share of those goods in the consumption basket, that is, on the degree of openness of the economy.

The reversion of large current account imbalances brings about a similar adjustment mechanism, where the magnitude of real exchange rate depreciations may be mitigated by the income effect, particularly in more open economies. In this paper, we take this adjustment mechanism to the data. More specifically, we ask: do more open economies endure lesser real exchange rate depreciation when facing a current account reversal?

Clearly, many different variables affect the relation between real exchange rates and current accounts, and it would be a daunting, if not an impossible task, to control for all of them. To circumvent this problem, we focus our analysis on episodes of sudden stops in capital flows and of abrupt real exchange rate depreciations. In the case of sudden stops, it is reasonable to assume that, on average, other shocks affecting current accounts and real exchange rates would assume a lesser role, so that the observed real exchange rate change would be associated to the current account movement. By the same token, in events of abrupt exchange rate depreciation, the corresponding change in current account can be taken as mostly related to the observed exchange rate depreciation.

Empirical research generally recognizes the importance of openness to trade in determining a country's vulnerability to sudden stops. For example, Calvo, Izquierdo, and Mejia (2004) present evidence that more open economies, understood as countries with larger supply of tradable goods, are

less prone to sudden stops in capital flows. Similarly, Cavallo and Frankel (2008) show how this relationship is even stronger when correcting for the endogeneity of the openness to trade measure.

The currency crises literature equally stresses the importance of trade openness. Examining the factors that help predict the occurrence of these extreme episodes, Milesi-Ferretti and Razin (2000) find that a higher degree of openness to trade decreases the probability of exchange rate crises. Moreover, they also show how more open economies tend to grow faster in the aftermath of a currency crisis. Similar findings are discussed in Glick and Hutchison (2011), who show that greater trade integration reduces a country's the likelihood of experiencing a currency crisis. They argue that a greater openness ratio decreases the likelihood of sharp reversals of capital flows, as the country is more able to service its external obligations.

All in all, the literature has established the importance of trade openness in mitigating a country's vulnerability to sudden stops and currency crises. We take a new perspective by investigating the role of trade openness *during* these episodes. More specifically, we analyze the role played by trade openness on the relation between current account and real exchange rate during sudden stops and abrupt real exchange rate depreciation episodes, for both advanced economies and emerging markets.

We first build a theoretical framework that captures the role of trade openness on the relationship between current account reversals and real exchange rate changes. We model a small open economy in which sudden stops can occur due to binding collateral constraints on the country's external debt. We show that the effect of sudden stops differs according to the degree of openness of the economy. In particular, more open economies experience a lower exchange rate depreciation, in order to achieve the same change in the current account.

We then examine the empirical implications of this model for a sample of both advanced and emerging economies during the period 1970–2011. We first identify sudden stops and abrupt real exchange rate depreciation episodes by following a standard methodology used in the sudden stops literature.

We show that during sudden stops more open economies endure lower depreciation of the real exchange rate. We also provide evidence that trade openness has a positive impact on trade balance and current account variations during episodes of sudden stops and of abrupt exchange rate depreciation. The direct implication of these findings is that more open economies seem to be able to reach equilibrium in the balance of payments with lower real exchange rate depreciation.

The outline of the paper is as follows. In Section 2 we present a theoretical framework that establishes how openness affects exchange rate depreciation under sudden stops. Section 3 describes the data, while the empirical results are presented in Section 4. Section 5 concludes.

2 Theoretical Framework

This section presents a simple theoretical framework that captures the main mechanism highlighted in this paper: how, during sudden stops, more open economies experience lesser real exchange rate depreciations. The formal specification of the model follows the small open economy literature with tradable and nontradable goods sectors in the presence of credit constraints (see Mendoza, 2005, 2010; Bianchi, 2011; Korinek and Mendoza, 2013).

2.1 Set-up

The economy is populated by a continuum of identical households that receive in every period an endowment of tradable (y_t^T) and nontradable (y_t^N) goods. They allocate their consumption (C_t) between these two goods, by maximizing the following expected utility function:

$$U = \sum_{t=0}^{\infty} \beta^t E\left[u\left(C_t\right)\right], \tag{1}$$

where β is the discount factor and C_t is the consumption basket. For simplicity, we assume Cobb-Douglas preferences, so that:

$$C_t = \left(c_t^T\right)^{\gamma} \left(c_t^N\right)^{1-\gamma}, \tag{2}$$

where γ is the share of tradable goods in consumption.

Households can invest in a foreign asset denominated in units of tradable goods. This asset matures in one period and pays a fixed gross interest rate R. Taking the price of tradables as the numeraire and denoting by p_t^N the price of nontradables, the representative household's budget constraint can be written as:

$$b_{t+1} + c_t^T + p_t^N c_t^N = y_t^T + p_t^N y_t^N + Rb_t, \tag{3}$$

where b_{t+1} represents the amount of bonds held by the household at time t.[1]

We assume that this economy faces a credit constraint. More specifically, we assume that access to foreign financing is constrained to a fraction k of tradable income. In this case, the credit constraint is represented by:

$$b_{t+1} \geq -ky_t^T. \tag{4}$$

The market clearing condition in the nontradables sector is given by:

$$c_t^N = y_t^N, \tag{5}$$

[1] b corresponds to the net international investment position. Notice that debtor countries present a negative value of b.

which we substitute into the budget constraint in equation (3) to rewrite it as:

$$c_t^T = y_t^T + Rb_t - b_{t+1}. \tag{6}$$

Our main interest lies in investigating the impact of sudden stops on this small open economy. In line with Mendoza (2005, 2010); Bianchi (2011); Korinek and Mendoza (2013), we model sudden stops as situations in which the international borrowing constraint becomes binding. These events will generate a decrease a tradable goods consumption, a real exchange rate depreciation and a current account deficit smaller than desired. Hence, we start by describing the equilibrium when the credit constraint in not binding, and then we compare this with the situation when it is binding. Finally, we show how the effect of a sudden stop differs according to the degree of openness of the economy.

2.2 Non-binding credit constraint

For simplicity, we assume that the nontradable output is constant over time, $y_t^N = \bar{y}^N$ for all t and that $\beta R = 1$. Given these assumptions, when the credit constraint does not bind, the equilibrium simply reflects a perfect consumption smoothing of tradable goods: $c_t^T = \bar{c}^T$ for all t. Assuming a no-Ponzi game condition, the intertemporal budget constraint (6) implies the following value for the constant tradables consumption:

$$\bar{c}^T = \left(\frac{R-1}{R}\right)\left(\sum_{t=0}^{\infty} R^{-t} y_t^T + Rb_0\right). \tag{7}$$

Consumers maximize utility when relative price of nontradables is equal to the marginal rate of substitution between the two types of goods. The equilibrium price of nontradables is then given by:

$$p_t^N = \left(\frac{1-\gamma}{\gamma}\right)\frac{c_t^T}{\bar{c}^N}, \tag{8}$$

which is constant at $\bar{p}^N$ in this case with non binding credit constraint.

We define the real exchange rate, ε, as the ratio between the price of tradable goods and the price of nontradables, i.e. $\varepsilon_t = \frac{1}{p_t^N}$. Hence, real exchange rate is also constant ($\bar{\varepsilon}$) in this unconstrained economy.

We now introduce a wealth neutral shock in this economy. Following Mendoza (2005), we first define a sequence of time invariant tradables endowment ($\bar{y}^T$) that yields the same present value of the actual arbitrary time varying sequence of tradables income. According to this definition, tradables consumption under no credit constraints (equation (7)) can be written as:

$$\bar{c}^T = \bar{y}^T + (R-1)\, b_0. \tag{9}$$

Let us assume, for the moment, that the current account is balanced when the economy is hit by the wealth neutral negative shock. With non-binging credit constraint, the negative effect of a shock to the tradable endowment in period 0 is offset by a positive shock in period 1, so that the present value of the tradable output remains unchanged. Thus a wealth neutral shock, should not affect the consumption path. In order to keep the present value of the sequence of the tradables income constant, the endowment shock needs to satisfy the following condition:

$$\left(\bar{y}^T - y_0^T\right) R = y_1^T - \bar{y}^T. \tag{10}$$

If the shock to y_0^T is not large enough to trigger the credit constraint, consumption allocation and the price of nontradables remain unchanged. Indeed, at date 0 the country will consume the same level of tradables, $c_0^T = \bar{c}_t^T$, thanks to the increased foreign debt:

$$\bar{b}_1 - b_0 = y_0^T - \bar{y}^T < 0. \tag{11}$$

At date 1, the positive shock that offsets the one occurred at date 0 will allow the country to maintain a constant consumption and to reimburse the increase in debt of the previous period, so that $\bar{b}_2 - \bar{b}_1 = -\left(\bar{b}_1 - b_0\right)$. In such a situation, the effect of the shock is only reflected on the current account, with the country facing a deficit at date 0 and a surplus at date 1.

2.3 Binding credit constraint: sudden stop episode

We now analyze the impact of an unanticipated shock to the endowment of tradable goods that triggers the liquidity constraint. This shock would result in a debt level $\bar{b}_1$ that does not satisfy the credit constraint in equation (4), so that $\bar{b}_1 < -ky_0^T$. Notice that, given the change in debt induced by the endowment shock in equation (11), it must be the case that:

$$y_0^T < \frac{\bar{y}^T - b_0}{1+k}. \tag{12}$$

In this case, equation (4) is binding, so that:

$$b_1 = -ky_0^T > \bar{b}_1. \tag{13}$$

where $\bar{b}_1$ is the indebtedness level that would be necessary to keep consumption constant, as defined in the previous subsection. We denote this shock a **sudden stop**, since it depicts a situation in which the country would be willing to get more indebted but foreign investors are not willing to offer that credit.

The consumption of tradables at date 0 is then given by:

$$c_0^T = (1+k)\, y_0^T + Rb_0, \tag{14}$$

which is clearly smaller than the original consumption smoothing plan: $c_0^T < \bar{c}^T$. Moreover, the price of nontradables is now equal to:

$$p_0^N = \left(\frac{1-\gamma}{\gamma}\right)\frac{c_0^T}{\bar{c}^N} < \bar{p}^N, \tag{15}$$

which means a more depreciated real exchange rate: $\varepsilon_0 > \bar{\varepsilon}$.

Notice that, with the binding credit constraint, the current account is also larger than in the case of the unconstrained economy:

$$b_1 - b_0 > \bar{b}_1 - b_0, \tag{16}$$

since $b_1 > \bar{b}_1$, by construction. Furthermore, the difference between the two values of the current account is captured by the drop in consumption. Using equation (6) to compute the consumption when the endowment is equal to y_0^T, and equation (9) for the consumption in the unconstrained economy, we have that:

$$\bar{c}^T - c_0^T = (b_1 - b_0) - \left(\bar{b}_1 - b_0\right). \tag{17}$$

In sum, when an unanticipated shock triggers the credit constraint to bind, i.e., when a sudden stop episode occurs, we have that: (i) the consumption of tradable goods decreases, (ii) the real exchange rate depreciates, and (iii) the current account deficit is smaller than it would be under no credit constraint.[2]

2.3.1 The importance of trade openness

We define the degree of openness of an economy as the share of tradable goods in consumption, which, given consumer preferences represented in equation (2), can be expressed as:

$$Openness_t = \frac{c_t^T}{p_t^N \bar{c}^N + c_t^T} = \gamma. \tag{18}$$

Consider two economies, denoted O and C, with different degrees of openness, such that O is more open than C, i.e. $\gamma_O > \gamma_C$. Both economies have the same constant endowment of nontradable goods. As for the tradables endowment, its present value is larger in the more open economy, and the difference is such that the real exchange rate is the same in the two economies when they are not credit constrained. From equations (8) and (9), this condition is satisfied when:

[2] We have assumed here that the sudden stop is originated by an unanticipated shock to the endowment of tradable goods. Similar results can be obtained by assuming that the exogenous shock is generated by an unexpected increase in the perceived risk of a country. This unexpected shock would trigger the credit constraint by decreasing the fraction k of tradable income that can be borrowed in the international markets.

$$\bar{y}_O^T = \frac{\gamma_O\,(1-\gamma_C)}{\gamma_C\,(1-\gamma_O)}\left(\bar{y}_C^T + (R-1)b_{0C}\right) - (R-1)b_{0O}. \tag{19}$$

Suppose both economies are initially consuming at the unconstrained consumption level with a balanced current account, when they are hit by an unexpected, wealth-neutral, negative shock in tradables endowment that triggers the budget constraint. What will be the effect on the consumption of tradables, on nontradables prices and on the real exchange rate?

Since the shock is wealth-neutral, the negative shock at date 0 is compensated in each economy by a positive shock in period 1 satisfying the condition in equation (10). Moreover, in order to trigger the credit constraint, tradable endowment must satisfy inequality (12). Finally, to facilitate the comparison between the two economies, we assume that the shock induces the same decrease in tradables consumption. Hence, it satisfies the following condition: $y_{0O}^T - y_{0C}^T = \frac{\bar{y}_O^T - \bar{y}_C^T}{1+k}$.

Figure 1: Equilibrium price for open and closed economies

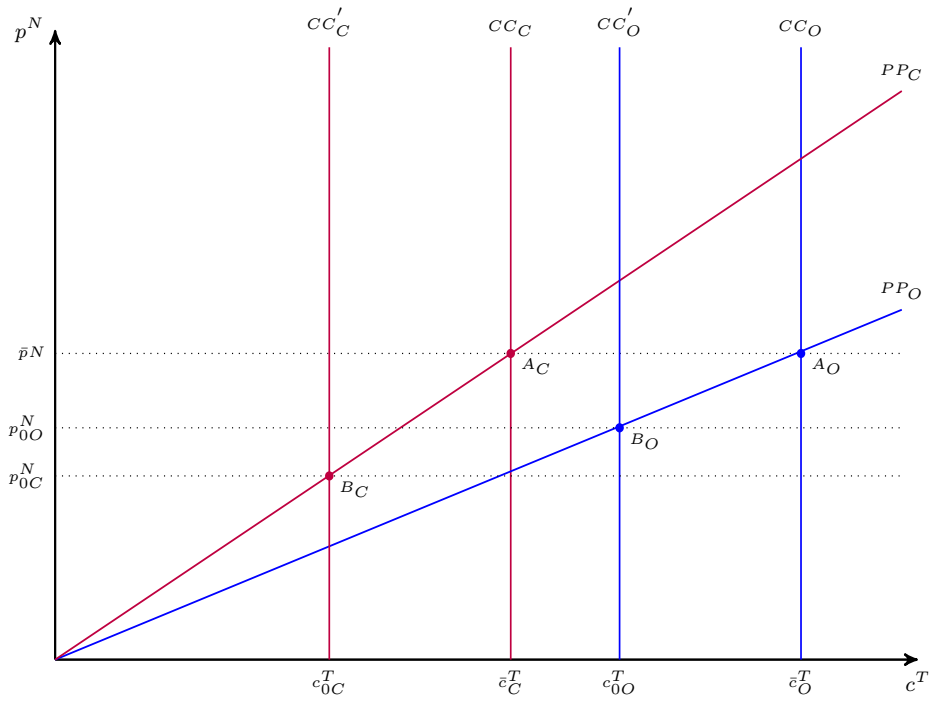


Figure 1 illustrates the effect of sudden stops for the two economies characterized by a different degree of openness. The vertical lines CC_O and CC_C represent the tradables consumption $\bar{c}^T$ given by equation (9) when the credit constraint is not binding. Given our assumption that the present value

of tradables endowment is higher in the more open economy (see equation (19)), we have that $\bar{c}_O^T > \bar{c}_C^T$. Notice that the budget constraints do not depend on the price of nontradable, therefore those are vertical lines on the graph.

Optimal consumption allocation across sectors relates consumption of tradables to the price of nontradables, as established by equation (8). They are represented by lines PP_O and PP_C in the figure, for the more open and the more closed economies, respectively. According to equation (8), nontradables price is a positive function of tradables consumption, and prices are more sensitive to tradables consumption in more closed economies. Hence, the PP_C schedule is steeper than the PP_O one in the graph.

In both economies, the equilibrium price of nontradables is obtained at the intersections of the CC and PP lines, represented by points A_O and A_C. By construction, the initial price of nontradables $\bar{p}^N$ is the same in both economies.

The tradable endowment shock that triggers the credit constraint shifts tradables consumption to CC'_O in the case of the more open economy and to CC'_C in the more closed economy (see equation (14)), resulting in a new equilibrium points B_O and B_C, respectively.

Despite the fact that the change in the consumption of trabables is equal for both economies ($\Delta c_{0O}^T = \Delta c_{0C}^T$), the more closed economy exhibits a larger decrease on the relative price of nontradable goods. This implies that the shock to the tradables endowment at date 0 generates a larger real exchange rate depreciation for the less open economy. Thus, during sudden stops, for the same variation of the current account, more open economies endure a lower real exchange rate depreciation.

Going back to the Keynes-Ohlin debate, we could say, in light of this argument, that Ohlin would be right for economies with a high degree of openness. The credit constraint that is triggered by the endowment shock decreases the disposable income, depressing consumption of both types of goods. Nontradables prices have then to decrease to reestablish equilibrium in the nontradables market. The more open the economy, the larger is the decrease in total tradables consumption and the smaller the decrease in nontradables consumption for a given decrease in available income. Hence, the lesser the relative price changes.

We investigate whether the data meets this argument. More specifically, we verify whether real exchange rate depreciations are smaller in more open economies when they are hit by sudden stops. We also look at the issue from the opposite perspective, that is, in events of large real exchange rate depreciations, whether the increase in current account and in trade balance is larger in more open economies.

3 Event analysis and data

This section describes how we identify sudden stops and exchange rate depreciation episodes, which are the events on which we base our empirical investigation. We use quarterly data from the IFS-IMF database for a sample of 181 developed and emerging economies for the period 1970-2011.[3]

3.1 Sudden stops

We define sudden stops by adapting the methodology implemented by Calvo et al. (2004) to *quarterly* data. We identify an episode as a sudden stop when the year-over-year change in quarterly net capital flows falls two standard deviations below its mean. As common in the literature, once an episode is identified, we set the beginning of the sudden stop in the first quarter in which the fall in capital flows is larger than one standard deviation below its mean. The episode ends once the fall in net capital flows is smaller than one standard deviation.

In line with Calvo et al. (2004), and contrary to other studies (i.e. Guidotti et al., 2004; Edwards, 2004; Calderón and Kubota, 2013), we do not normalize the changes in capital flows by GDP or exclude the episodes for which the shock does not exceed a certain threshold of GDP. By limiting sudden stops to events for which the change in net capital flows exceed a certain threshold (for example Guidotti et al., 2004, fix this threshold at 5% of GDP), we might exclude episodes that occurred in countries characterized by a low capital flows volatility or less open economies.

Our methodology differs from Calvo et al. (2004) in three main aspects. First, we measure capital flows on a quarterly, rather than on a yearly basis and compute the year-over-year changes to avoid seasonal fluctuations. Second, we compute the three years moving average and standard deviation of capital flows and not their historical average and standard deviations. By limiting the time horizon for the computation of the mean and the standard deviation, we are better able to detect "unexpected" reductions in net capital flows. Finally, whenever we identify two sudden stops episodes separated by only one quarter, we consider them as a unique episode.

We proxy the capital inflows K of country c in quarter q as the quarterly change in international reserves IR minus the quarterly current account CA:[4,5]

[3] The list of countries and the period of availability of the data are provided in Appendix Table 1.

[4] All series are measured in constant 2005 dollars.

[5] In our approach, we follow a long literature that identifies sudden stops as changes in net capital flows. Recent studies on sudden stops are interested in the behavior of different types of gross capital flows and their role in the determination of sudden stops (see Broner et al., 2013; Calderón and Kubota, 2013; Forbes and Warnock, 2012; Rothenberg and Warnock, 2011). Abrupt reversals in these gross capital flows are not necessarily

$$K_{c,q} = (IR_{c,q} - IR_{c,q-1}) - CA_{c,q}. \tag{20}$$

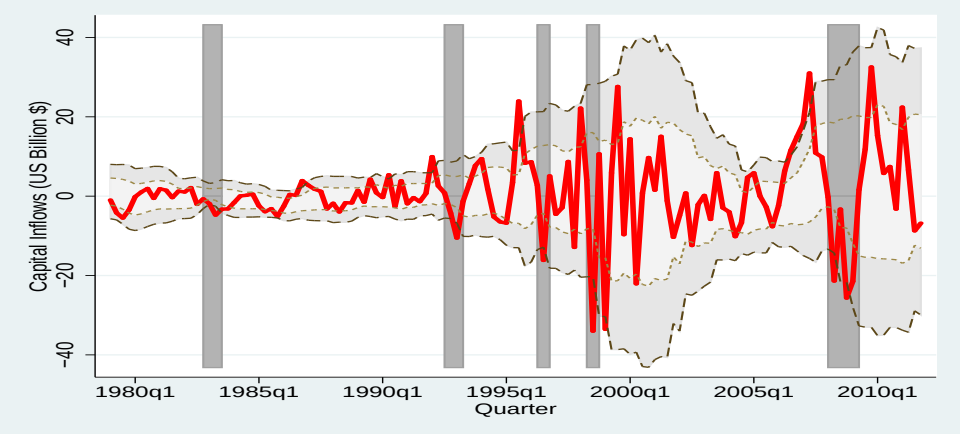
The year-over-year changes in capital flows are then defined as $\Delta K_{c,q} = K_{c,q} - K_{c,q-4}$. We identify sudden stops whenever the following condition is met:

$$\Delta K_{c,q} < \mu_q(\Delta K_{c,q}) - 2\sigma_q(\Delta K_{c,q}), \tag{21}$$

where μ_q and σ_q represent the three years moving average and standard deviation, respectively.

As an example, the vertical bars in Figure 2 depicts the sudden stop episodes identified for Brazil from 1979 to 2011. The solid line plots $\Delta K_{c,q}$. The values within the dashed lines are up to two standard deviations above and below the three years moving average, while the short dashed lines delimit values within one standard deviation of that average. During this period, Brazil experienced five sudden stops, as highlighted by the vertical bars.

Figure 2: Sudden stops in Brazil (1979-2011)



Using this methodology we identify 329 sudden stop episodes for a sample of 123 countries, during the period 1970-2011: 205 of them occurred in emerging markets and developing countries (as classified by the IMF World Economic Outlook) and 124 in advanced economies. Figure 3 shows the dispersion of sudden stops across countries.

associated with abrupt falls in net capital inflows and are generally due to cross-border bank flows. However, there is no clear evidence that these reversals are associated with real exchange rate depreciations and current account adjustments, which are our main variables of interest.

Figure 3: Sudden stop episodes across countries (1970-2011)

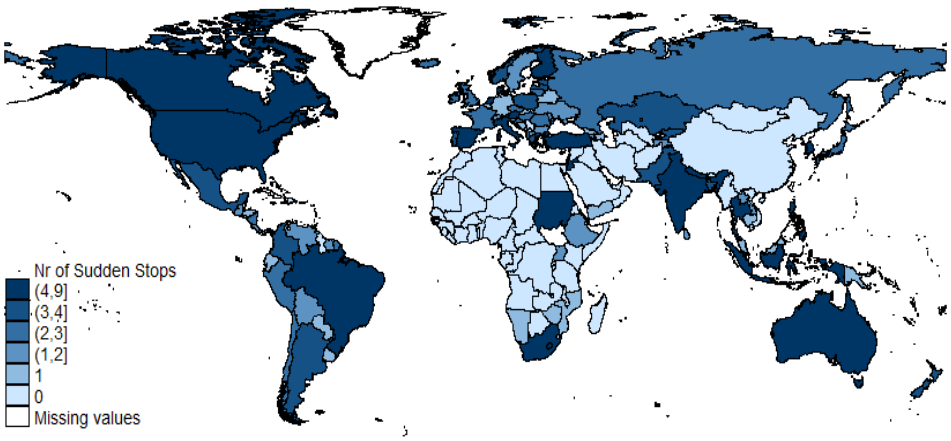


Figure 4: Frequency of sudden stops (1970-2011)

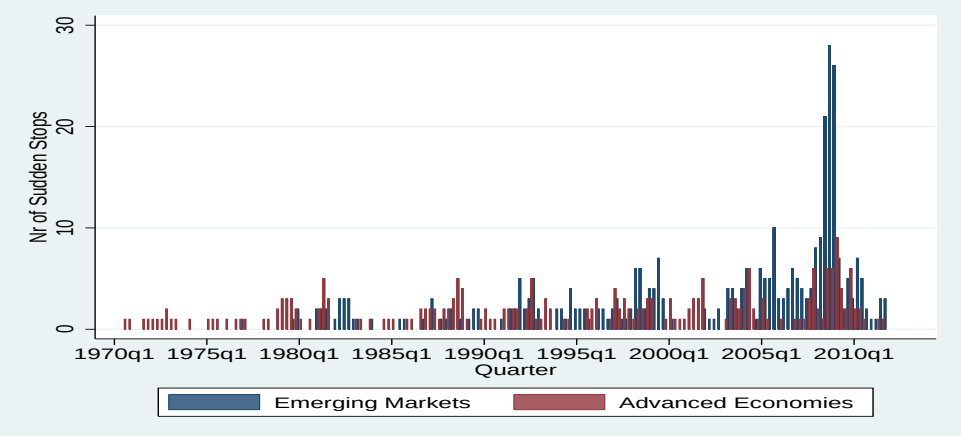
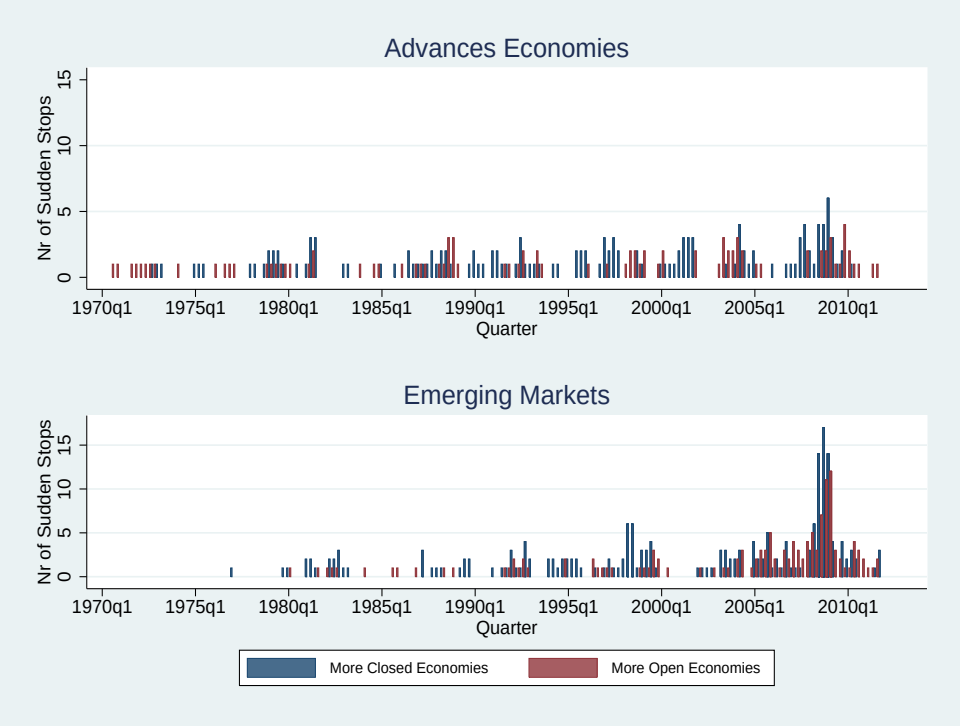


Figure 4 shows the distribution of these events across time. For advanced economies, we observe an increase in sudden stop episodes during the European Monetary System crisis (1990 and 1992) and the Asian crisis (1998). In emerging markets these episodes are concentrated around the Mexican (1994 to 1995), Asian (1997), Russian (1998) and Argentinean (2001) crises. Note that there are missing data for many emerging market economies before the 1990s, which may explain the relatively fewer sudden stops among those countries for the first twenty years of our sample. Looking at the period 1990–2011, we find 174 sudden stops in capital flows among emerging and developing countries and 83 in advanced economies. As expected, these events are much more common in emerging markets. A large number of sudden stops in both emerging and developed economies is detected over

the late 2000s, in the midst of the global financial crisis.

Following Rey and Martin (2006), we split our sample in terms of their openness to trade. We measure trade openness as the average of exports plus imports as a ratio of GDP, over the whole period. We then classify as more open economies those for which the openness ratio is above the median of its group. Figure 5 confirms that more closed economies have experienced a higher number of sudden stops among both advanced economies and emerging markets, in line with the results from Calvo, Izquierdo, and Mejia (2004) and Cavallo and Frankel (2008).

Figure 5: Frequency of sudden stops, by degree of openness (1970-2011)



3.2 Episodes of abrupt exchange rate depreciations

Empirical studies on exchange rate variations commonly focus their attention on nominal exchange rate movements and, more specifically, on currency crises (see, among others, Milesi-Ferretti and Razin, 2000; Laeven and Valencia, 2013). We, in turn, focus on identifying episodes of abrupt RER depreciation.

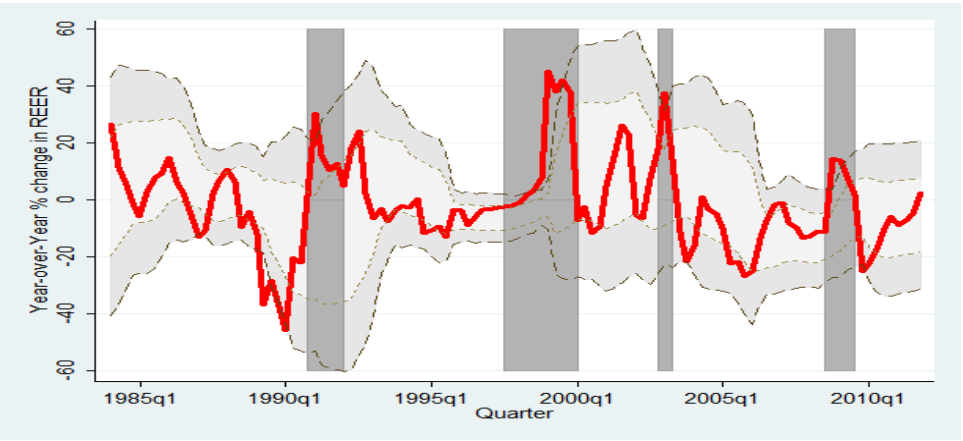
We introduce the concept of **abrupt REER depreciations**, applying to REERs the same methodology used for the identification of sudden stops,

described in subsection 3.1. More precisely, an abrupt REER depreciation occurs when the year-over-year depreciation of the quarterly real effective exchange rate is larger than two standard deviations above its mean. Moreover, the episode window of a REER depreciation: i) begins once the REER depreciation is higher than one standard deviation above its mean; ii) ends when the REER increase falls below one standard deviation of its mean.

The IMF defines the REER as domestic price index divided by foreign price indices, measured in the same currency, so that a decline in its value denotes a real depreciation of the home currency. To facilitate a comparison of the results obtained for REER with those of RER, we compute the year-over-year change of the quarterly REER as $\Delta REER_{c,q} = ln(REER_{c,q-4}/REER_{c,q})$. Consequently, a positive variation of the REER represents a real depreciation of the home country.

The REER is a more accurate measure of the purchasing power of domestic currency in the world market than RER, since REER measures the value of a currency against a weighted average of foreign currencies. The only drawback is that the availability of REER data is restricted to a smaller sample of countries, while RER data is available for a longer period and a larger set of countries. We then also use RERs instead REERs as an alternative measure, looking at episodes of abrupt RER depreciation, which we identify following the same methodology.[6]

Figure 6: ΔREER and depreciation episodes in Brazil (1981-2011)



Figures 6 and 7 portray the cases of abrupt REER and RER depreciа-

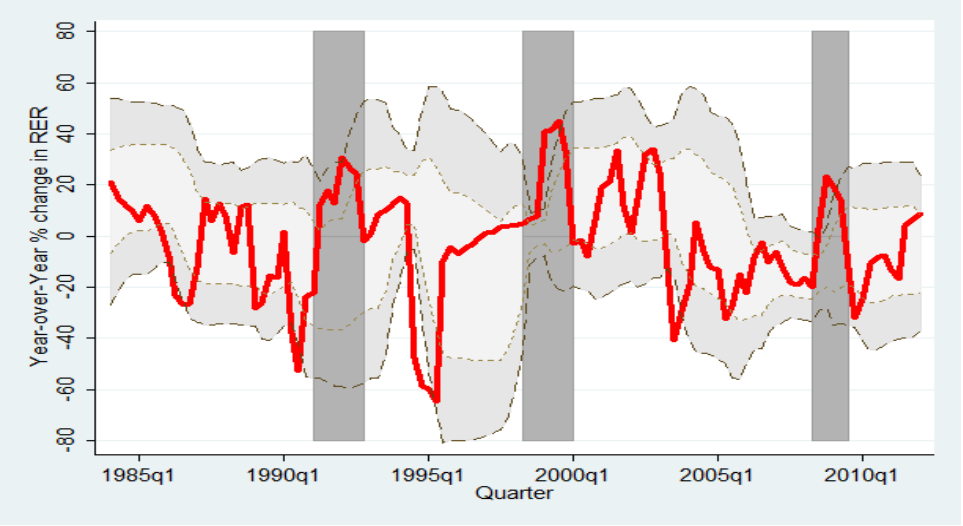
[6]The real exchange rate ε of country c in quarter q is measured as the nominal exchange exchange rate E, defined as domestic currency per unit of US dollar, multiplied by the ratio between the consumer price index in the US and in country c:

$$\varepsilon_{c,q} = E_{c,q} * \frac{CPI_{US,q}}{CPI_{c,q}}.$$

We then compute the yearly change of the quarterly RER as: $\Delta\varepsilon_{c,q} = ln(\varepsilon_{c,q}/\varepsilon_{c,q-4})$.

tion episodes identified for Brazil from 1981 to 2011. Similarly to Figure 2 from the previous section, the solid lines plot $\Delta REERc, q$ and $\Delta RERc, q$, while the dashed and short dashed lines depict the intervals of two and one standard deviations from the moving average, respectively. Over the period, Brazil experienced four abrupt REER depreciation episodes and three abrupt RER depreciations, indicated by the vertical bars in Figures 6 and 7.

Figure 7: ΔRER and depreciation episodes in Brazil (1981-2011)



Comparing the two figures, we notice that the real appreciation of the Brazilian currency between 1994 and 1995, was not followed by an appreciation of the real effective exchange rate. This event could have had a negative impact on the bilateral trade between Brazil and the US and only a marginal effect on the overall values of imports and exports of the country. Apart form that event, the REER and the RER follow similar patterns.

In a broad set of 166 countries, for the period 1970–2011 we find 227 abrupt REER depreciation episodes and 295 for the RER. Figure 8 shows how these episodes are spread across countries, whereas Figure 9 depicts their frequency over time. Comparing the frequency of episodes we see that REER depreciations events are more spread over time (starting from the 1980s) compared to RER depreciations episodes.

The descriptive statistics presented in this section highlight the relative large frequency of sudden stops and of episodes of abrupt exchange rate depreciations. They also provide motivation for our methodological approach in which we single out these episodes in a cross-section. We turn to describing this methodology next.

Figure 8: REER depreciation episodes across countries (1970-2011)

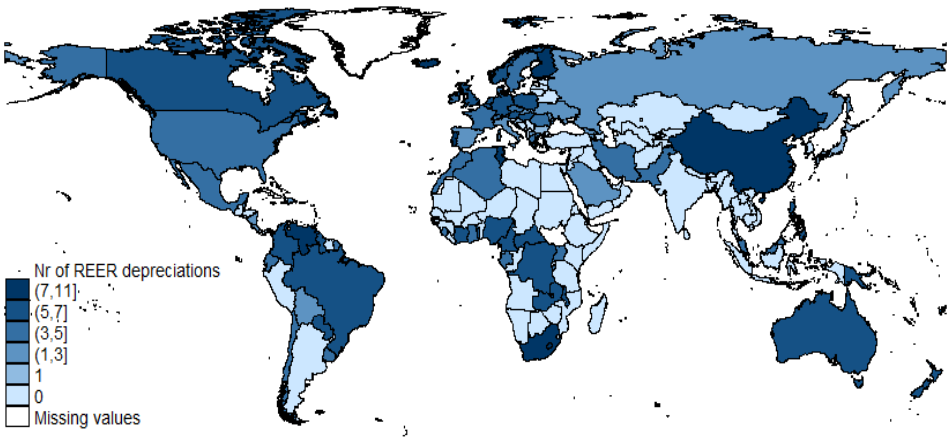
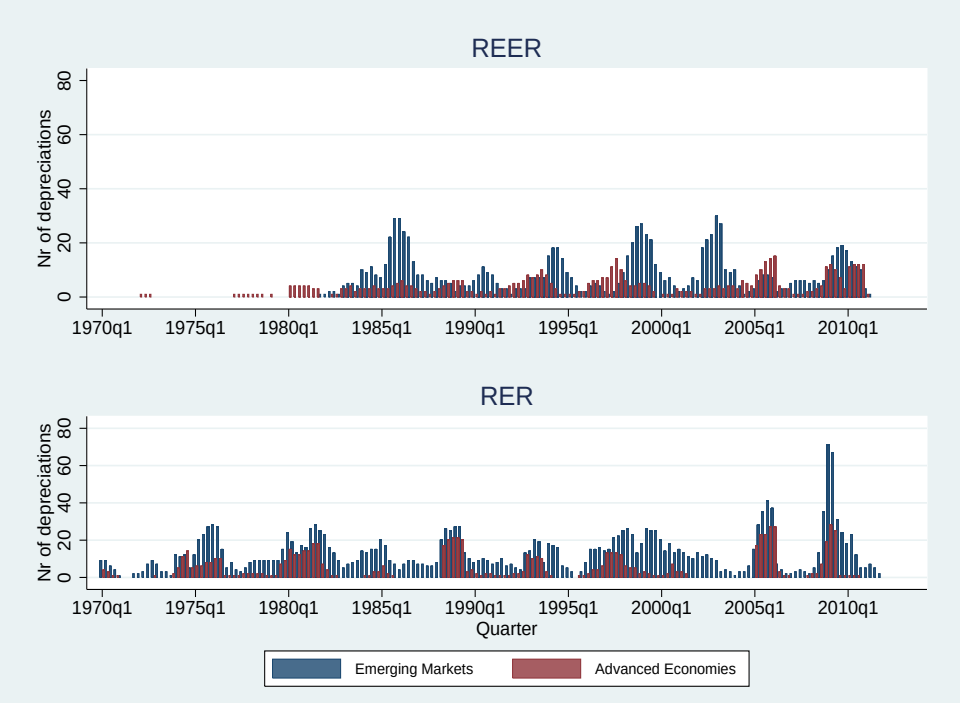


Figure 9: Frequency of REER depreciation episodes (1970-2011)



3.3 Event-study analysis

Our goal is to identify whether the degree of trade openness of a country has an impact on the relationship between current account and exchange

rate changes during episodes of sudden stops and of abrupt exchange rate depreciations. To that end, our approach differs from the literature that studies the probability of occurrence of sudden stops, which relies panel data analysis where these extreme events are captured by a categorical variable. Part of the empirical literature on currency crisis, on its turn, has also used event-study analysis, such as Barry et al. (1995) and Kaminsky and Reinhart (1999).

We implement an event-study analysis in which each of the events identified in sections 3.1 and 3.2 represents one observation. The event-study analysis allows us to circumvent the problem related to the identification of all the variables that might affect the relationship between current account and exchange rate changes.[7]

To avoid transitory movements, we add three quarters to each episode window identified, that is, the episode window is $[t_{eb}, t_{ee} + 3]$, where t_{eb} represents the beginning of an episode and t_{ee} its end.[8] The pre-episode horizon is, on its turn, defined as $[t_{e,b-n}, t_{e,b-1}]$, where $n \equiv t_{ee} + 3 - t_{eb}$,so that it includes the same number of quarters as the episode window. This ensures us that we compute the average value of our key variables over two symmetric periods around a sudden stop or an abrupt exchange rate depreciation.

Using the episode and pre-episode windows as explained in the previous paragraph, we compute the changes in current account and trade balance over GDP, as well as the changes in REER and RER, as the difference in (the log of) their averages over the two symmetric intervals around a shock.

3.4 Sources of data

We use quarterly data on exchange rates, current accounts, CPI, imports and exports obtained from the International Monetary Fund's International Financial Statistics (IFS). We compute the changes in these variables following the event study technique outlined before.

We compute the degree of openness to trade as the sum of imports and exports over GDP. Notice that this measure of openness is not exactly the definition of openness used in the theoretical model (section 2), where we had defined it as the share of tradables in consumption. Literally, tradable goods should be the sum of all goods that could potentially be exported and the imported goods. We know, however, that there is a big difference between being *potentially* exported, and being *actually* exported. For a potentially exportable good to be exported there are non negligible costs involved, and

[7]For discussion on the variables that might affect current account and exchange rate changes see, for example, Calderón and Kubota (2013), Calvo et al. (2004) and Milesi-Ferretti and Razin (2000).

[8]Recall that an episode ends once the change in the variable of interest bounces back within the range of one standard deviation around its mean.

a fast growing literature, particularly after the influential paper of Melitz (2003), certifies that these fixed costs do prevent a large fraction of tradable goods to be actually traded. The tradable goods in the theoretical model refer to "goods which go easily between [the countries]", again, paraphrasing Ohlin. Hence, the sum of imports and exports is a good proxy for this kind of goods.

The degree of openness to trade is might be influenced by the changes in current account, trade balance and real exchange rates during the episode window of the shocks identified. In order to avoid endogeneity problems, we take the lagged value of this measure, that is, we use the average value of openness in the year before the beginning of a shock.[9]

Together with openness to trade, we control for other variables that might affect the relationship between current account and exchange rate changes, namely: terms of trade, world export growth, exchange rate flexibility, government debt to GDP, and an index of the original sin and one of financial dollarization.

The terms of trade used is the annual Net barter terms of trade index provided by the World Bank, interpolated to obtain quarterly data. For a large country is the international goods market, changes in trade balance might impact its terms of trade. Again, to avoid endogeneity problems, we compute the average change of the quarterly terms of trade data in the year before the beginning of each shock.

Real world exports growth was computed as the year-over-year change in quarterly export obtained from the International Monetary Fund's International Financial Statistics (IFS). This variable should not be endogenous to a country specific shock, so we compute its value following the same technique used for computing the changes in current account, trade balance and exchange rates.

The degree of exchange rate flexibility is obtained from the exchange rate regime classification developed by Reinhart and Rogoff (2004) and updated by Ilzetzki et al. (2009). An higher value of this measure corresponds to more flexible exchange rate regimes.

The fact that governments in emerging markets cannot finance their debt in domestic currency increases their vulnerability to shocks.[10] Moreover, in countries characterized by a positive net foreign currency position (foreign currency assets minus foreign currency liabilities), exchange rate depreciations might deteriorate the current account, instead of improving it, due to its impact of the country's debt burden. Hence, we also control for the degree of financial dollarization of the country.

[9] As robustness checks, we have also used the two and three-years average values before the beginning of each episode.

[10] Tovar (2005) documents that, in Latin America, around two fifths of government bonds have been issued internationally, and virtually none of this is denominated in local currency.

More precisely, we add the following explanatory variables: the ratio of government debt over GDP, an index of the original sin and an index of financial dollarization. The gross government debt-to-GDP ratio is obtained from Horton et al. (2010). Following Hausmann and Panizza (2003), we compute the original sin index (OSIN) as one minus the share of the stock of international securities issued by the country in its own currency. Data for computing the index have been obtained from Fitch Ratings. Finally, the index of financial dollarization has been obtained from Yeyati (2006), who uses data on official credit, cross-border loans, external private and public bonded debt and domestic deposits, to compute the degree of financial dollarization of a country. For all of these three measures, we use their values in the year before the beginning of each episode.

4 Empirical results

This section describes the empirical results obtained by investigating the impact of openness to trade on current account, trade balance and exchange rate depreciations during episodes of sudden stops and of abrupt REER and RER depreciations.

4.1 Openness, exchange rate depreciations and current account reversals during sudden stops

We investigate the impact of openness on exchange rate (REER and RER) depreciations and current account adjustment during episodes of sudden stops in capital inflows. We start by looking at the correlation between openness and RER changes, controlling for the intensity of the sudden stop.

In the event-study analysis, some countries may appear more than once, when they suffer more than one sudden stop over the time span of our study. Therefore, in all our regressions we relax the assumption of independently distributed error terms across time, allowing the clustering of observations by country. We assume instead that the error term is i.i.d. across countries, but not necessarily so for different observations for the same economy. All reported standard errors are adjusted for clustering.

As a first glance of the data, Table 1 shows the result of a simple regression that tries to capture the correlation between openness and exchange rate changes in episodes of sudden stops. In line with our expectations, we do find a negative correlation between trade openness and RER changes during sudden stops, while controlling for the change in capital flows, which provides a measure of the intensity of the sudden stops. When we use the real effective exchange rate, the coefficient of openness is also negative, although not significant. Notice that the data set is much smaller when we use REER, which could be one possible explanation for the non significant

Table 1: RER and REER depreciation and openness during sudden stops

Dependent Variable:	Δ RER	Δ REER
Openness	-0.00031**	-0.00012
	(0.000)	(0.000)
Δ Capital Flows	-0.00000*	-0.00000**
	(0.000)	(0.000)
Constant	0.01746	-0.00198
	(0.013)	(0.011)
Observations	265	170
Nr of countries	87	59
R-squared	0.027	0.026

Robust standard errors in parentheses. ** p<0.05, * p<0.1.

coefficient. These results suggest that more open economies, when hit by sudden stops, endure a smaller real exchange rate depreciation.

One of the problems with just looking at exchange rate changes is that government intervention in the foreign currency market may, at least partially, prevent current account adjustment from occurring, and therefore we would observe smaller depreciations. If governments in more open countries are, for some reason, more prone to intervene to prevent depreciations, these interventions could be driving the results, instead of the mechanism described in the theoretical model.

It is actually more appropriate to investigate directly whether openness to trade has an impact of the relation between current accounts and real exchange rates. We do so by checking whether openness affects current account, once REER or RER changes are controlled for. As shown in columns 1 (for REER) and 8 (for RER) of Table 2, in events of sudden stops, both trade openness and exchange rate depreciation have a positive and significant effect on current account, as predicted by the theory.

Columns (2–7) and (9–14) in the table present the results of regressions adding additional controls to make sure that the result in columns (1) and (8) are not being driven by omitted variables. The coefficient of terms of trade is positive, that is, improvements in the terms of trade have a positive impact on the current account balance. However, the coefficient is not significant in most regressions controlling for REER. The coefficient of world export growth, on its turn, is not significant in all regressions.

We add a dummy variable for emerging markets to capture possible differences between developed and emerging economies. These two type of economies differ in a number of ways, including the level of external debt, risk, trade patterns, among others, which could potentially affect how their current accounts respond to exchange rate changes. We also control for time with three decade dummies, for the 1970s, 1980s and 1990s.

Table 2: Current account and openness during sudden stops

Dependent variable: Changes in current account/GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Openness	0.00020***	0.00020***	0.00023***	0.00023***	0.00023***	0.00033***	0.00038	0.00023**	0.00023**	0.00025**	0.00021*	0.00024*	0.00028	0.00082***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ REER	0.06565	0.07330	0.11676**	0.11744**	0.11350**	0.15438***	0.12973*							
	(0.050)	(0.044)	(0.045)	(0.045)	(0.047)	(0.054)	(0.071)							
Δ RER								0.04107*	0.04374*	0.04104	0.04271	0.03475	0.00637	0.05268
								(0.023)	(0.023)	(0.031)	(0.032)	(0.031)	(0.041)	(0.042)
Control Variables:														
Δ Terms of Trade			0.07236	0.07315	0.06553	0.10720*	0.07576			0.15209***	0.12901***	0.14242**	0.08207	0.14996***
			(0.045)	(0.046)	(0.050)	(0.060)	(0.062)			(0.048)	(0.048)	(0.054)	(0.055)	(0.053)
World Real Export Growth		-0.02677	0.01090	0.01135	0.00788	0.01672	-0.02159		-0.00832	0.03215	0.03456	0.02122	0.05219	-0.00342
		(0.022)	(0.020)	(0.020)	(0.020)	(0.024)	(0.051)		(0.023)	(0.028)	(0.028)	(0.027)	(0.032)	(0.051)
Exchange Rate Regime				-0.00058							-0.00599**			
				(0.002)							(0.003)			
Debt/GDP					-0.00003							-0.00019		
					(0.000)							(0.000)		
OSIN						-0.02865							0.01502	
						(0.038)							(0.045)	
Financial Dollarization							0.00152							0.00090
							(0.001)							(0.001)
IMF Emerging Mkt Dummy		0.00522	-0.00491	-0.00488	-0.00509	-0.01179	0.01326		0.01214**	-0.00070	-0.00063	-0.00072	0.00140	0.01752
		(0.007)	(0.006)	(0.006)	(0.006)	(0.010)	(0.012)		(0.006)	(0.007)	(0.007)	(0.007)	(0.013)	(0.015)
Dummy '70s		0.03188*							0.01158					
		(0.018)							(0.009)					
Dummy '80s		-0.00406	0.01431	0.01588	0.01344				-0.00045	0.04047***	0.03572***	0.03376**		0.02417*
		(0.005)	(0.009)	(0.010)	(0.010)				(0.006)	(0.013)	(0.013)	(0.015)		(0.014)
Dummy '90s		-0.00102	-0.00060	-0.00029	0.00002	0.01341	-0.00477		-0.00019	0.00754	0.00822	0.00577	0.01878	0.01541
		(0.008)	(0.008)	(0.008)	(0.008)	(0.012)	(0.013)		(0.007)	(0.009)	(0.009)	(0.009)	(0.013)	(0.016)
Constant	0.00421	0.00212	0.00116	0.00265	0.00308	0.00002	-0.03397	0.00783	0.00099	0.00090	0.01662	0.01175	-0.00446	-0.05609***
	(0.005)	(0.006)	(0.006)	(0.009)	(0.008)	(0.010)	(0.022)	(0.006)	(0.007)	(0.009)	(0.012)	(0.011)	(0.016)	(0.018)
Observations	167	167	105	105	104	83	50	261	259	170	166	167	120	97
R-squared	0.057	0.084	0.136	0.136	0.129	0.170	0.132	0.047	0.063	0.096	0.096	0.097	0.054	0.190

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

The impact of the emerging markets dummy is positive and significant in column (9), where terms of trade variation is not included. In all other regression its coefficient is not significantly different from zero.

In column (4) and (11) we control for the exchange rate regime flexibility, but its coefficient is only significant if we control for the RER depreciation. Hence, economics with less flexible exchange rate regimes might experience higher changes in the current account over GDP, while facing a sudden stop. The results in columns (5–7) and (12–14) do not indicate a significant impact of the different forms of dollarization on current account changes in sudden stop events.

It is important to note that the coefficient of openness is robust to the inclusion of all of the control variables described in the previous paragraphs. The results indicate that more open economies are able to achieve a higher improvement in their current account balances for a given exchange rate depreciation.

Trade balance is an important part of current account, and current account reversals are achieved mainly by improvements in the trade balance. We thus re-do the empirical investigation using trade balance as dependent variable. The results, presented in Table 3 are qualitatively similar, with some important differences. First, we observe no relevant differences in the ability of openness to drive changes in current account or in trade balance. Second, exchange rate depreciation has a stronger impact on trade balance changes compared to current account changes, as captured by the larger coefficient of this variable in the trade balance regressions in Table 3 compared to the current account regressions in Table 2. Finally, terms of trade variations and world real export growth, which do not have a significant impact on current account balance changes while controlling to REER changes, have a positive and significant impact on trade balance changes. Consequently, improvements in terms of trade and higher world export growth positively affect the trade balance of a country.

We have found that, during sudden stops, countries more open to trade experience more improvement in current account and trade balance, controlling for exchange rate changes. Putting differently, to achieve the same level of current account or trade balance improvement, a more open economy endures a smaller exchange rate depreciation. Now: is this effect economically relevant? In our sample, the degree of openness to trade varies significantly across countries, with a mean of 85% and a standard deviation of 58%. Given the coefficients presented in column (3) of Tables 2 and 3, a country with a degree of openness equal to the mean will have to depreciate its currency by less than 1% in order to obtain an increase of its current account over GDP equal to 2.5% (1% for the case of trade balance). For countries with a lower degree of openness, say, equal to the 1st quartile (48%), a real exchange rate depreciation of more than 5% (3.8%) is needed in order to obtain the same variation in the current account / trade balance.

Table 3: Trade balance and openness during sudden stops

Dependent variable: Changes in trade balance/GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Openness	0.00024**	0.00026***	0.00025**	0.00025**	0.00024**	0.00030**	0.00056***	0.00026**	0.00029**	0.00027**	0.00023*	0.00023*	0.00023	0.00076***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ REER	0.07039	0.07357	0.12743**	0.12691**	0.12057*	0.19510***	0.09455							
	(0.055)	(0.051)	(0.056)	(0.057)	(0.061)	(0.051)	(0.107)							
Δ RER								0.09336**	0.08581**	0.10227*	0.10671*	0.10129*	0.03678	0.11214
								(0.036)	(0.038)	(0.055)	(0.057)	(0.057)	(0.045)	(0.083)
Control Variables:														
Δ Terms of Trade			0.17773**	0.17713**	0.16076*	0.27692***	0.11506			0.27191***	0.27774***	0.25545***	0.24294***	0.26839***
			(0.074)	(0.074)	(0.083)	(0.082)	(0.098)			(0.066)	(0.072)	(0.068)	(0.084)	(0.083)
World Real Export Growth		0.00887	0.05853**	0.05817**	0.04978*	0.06069**	0.05501		0.01972	0.05287	0.05846	0.04752	0.08468***	0.02634
		(0.031)	(0.026)	(0.026)	(0.025)	(0.024)	(0.082)		(0.032)	(0.035)	(0.035)	(0.034)	(0.028)	(0.066)
Exchange Rate Regime				0.00045							-0.00652**			
				(0.003)							(0.003)			
Debt/GDP					-0.00010							-0.00023		
					(0.000)							(0.000)		
OSIN						-0.04121							-0.00577	
						(0.050)							(0.047)	
Financial Dollarization							0.00017							0.00098
							(0.001)							(0.001)
IMF Emerging Mkt Dummy		0.00671	-0.00624	-0.00625	-0.00715	-0.01999	0.01539		0.00971	-0.00404	-0.00456	-0.00431	-0.00846	0.00683
		(0.008)	(0.008)	(0.008)	(0.008)	(0.013)	(0.014)		(0.007)	(0.007)	(0.007)	(0.007)	(0.011)	(0.012)
Dummy '70s		0.03709**							0.02063**					
		(0.015)							(0.009)					
Dummy '80s		0.01163**	0.03246**	0.03123*	0.03049*				0.01158*	0.06291**	0.08306**	0.03337*		0.03907**
		(0.005)	(0.015)	(0.016)	(0.016)				(0.007)	(0.030)	(0.036)	(0.018)		(0.017)
Dummy '90s		0.01388	0.01281	0.01256	0.01401	0.04116**	0.00888		0.01600*	0.01855*	0.02044*	0.01599	0.03929**	0.02548
		(0.011)	(0.013)	(0.013)	(0.013)	(0.017)	(0.017)		(0.009)	(0.010)	(0.011)	(0.011)	(0.016)	(0.019)
Constant	-0.00100	-0.01233	-0.01056	-0.01171	-0.00389	-0.00662	-0.04974***	0.00154	-0.01317	-0.00902	0.00716	0.00557	-0.00749	-0.05778***
	(0.005)	(0.008)	(0.008)	(0.011)	(0.011)	(0.014)	(0.017)	(0.006)	(0.009)	(0.010)	(0.013)	(0.012)	(0.016)	(0.015)
Observations	168	168	106	106	105	84	50	263	261	172	168	169	121	98
R-squared	0.043	0.066	0.122	0.123	0.119	0.334	0.084	0.056	0.072	0.152	0.166	0.148	0.161	0.193

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

4.2 Openness, exchange rate depreciations and current account reversals during abrupt depreciations

We follow the same empirical strategy for events of abrupt REER and RER depreciation. Table 4 presents the results of the regressions explaining current account changes in events of abrupt changes in exchange rates. Comparing to the results in Table 2, we notice important similarities. Current account improvement tends to be larger when exchange rate depreciations are larger and when the economy is more open to trade. For abrupt RER depreciation episodes, these effects are significant and robust to the inclusion of the following control variables: the terms of trade variation, the world exports growth, exchange rate regime, the debt to DGP ratio, the original sin index, the degree of financial dollarization, emerging market dummies, and decade dummies. When REER is used, though, the degree of openness to trade loses its significance once we control for other explanatory variables.

Terms of trade changes seem to explain less changes in current account balances in abrupt exchange rate devaluation events, compared to sudden stop events. More specifically, the coefficients of terms of trade variation are not significantly different from zero in all regression in Table 4, whereas they are positive and significant in the regressions presented in Table 2, while controlling for changes in the RER.

Table 5 presents the results obtained under the same specifications as in Table 4, but looking this time at the impacts on trade balance variation. Here, again, exchange rate depreciations and openness have a positive and significant impact on trade balance, and this impact is robust to the inclusion of a number of control variables. The changes in terms of trade, whose coefficient is not significant explaining current account changes in Table 4, have a positive and significant impact on trade balance improvement in most of the specifications of the empirical model, as shown in columns (3–5) and (10–14) of Table 5.

Table 4: Current account and openness during REER and RER depreciation episodes

Dependent variable: Changes in current account/GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	REER deepreciations							RER deepreciations						
Openness	0.00013**	0.00011*	0.00006	0.00003	0.00007	0.00006	0.00032	0.00025***	0.00023***	0.00027***	0.00027***	0.00029***	0.00038**	0.00086***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ REER	0.11398***	0.09632***	0.11118**	0.11940**	0.11789**	0.09843*	0.02626							
	(0.030)	(0.035)	(0.049)	(0.052)	(0.050)	(0.055)	(0.101)							
Δ RER								0.07297***	0.06113**	0.08288***	0.08988**	0.08119***	0.09885**	0.09723**
								(0.023)	(0.025)	(0.030)	(0.037)	(0.030)	(0.038)	(0.043)
Control Variables:														
Δ in Terms of Trade			0.03509	0.03306	0.02302	0.02454	0.01458			0.04308	0.04535	0.02626	0.07297	0.06228
			(0.041)	(0.040)	(0.046)	(0.066)	(0.045)			(0.034)	(0.034)	(0.035)	(0.059)	(0.072)
World Real Export Growth		-0.07426*	-0.09916*	-0.09019	-0.10171*	-0.09020	-0.26471		-0.06737*	-0.09708*	-0.09752*	-0.09949	-0.06435	-0.20580*
		(0.040)	(0.053)	(0.056)	(0.056)	(0.056)	(0.250)		(0.040)	(0.056)	(0.058)	(0.060)	(0.075)	(0.119)
Exchange Rate Regime				-0.00318							-0.00145			
				(0.003)							(0.004)			
Debt/GDP					-0.00013							-0.00029*		
					(0.000)							(0.000)		
OSIN						-0.04792							-0.08765**	
						(0.051)							(0.042)	
Financial Dollarization							0.00097							0.00282***
							(0.001)							(0.001)
IMF Emerging Mkt Dummy		0.00977	0.00856	0.00888	0.00686	-0.00288	-0.00559		0.00740	0.01105	0.01139	0.01040	-0.00125	0.00381
		(0.007)	(0.009)	(0.009)	(0.009)	(0.011)	(0.020)		(0.005)	(0.008)	(0.008)	(0.008)	(0.013)	(0.013)
Dummy '70s		0.00777*							-0.00340					
		(0.004)							(0.009)					
Dummy '80s		-0.01119	-0.02624*	-0.02489*	-0.02820*		-0.01954		-0.01568	-0.02723**	-0.02927**	-0.02594**		0.01721
		(0.009)	(0.014)	(0.013)	(0.015)		(0.038)		(0.011)	(0.012)	(0.012)	(0.013)		(0.022)
Dummy '90s		-0.00127	-0.01023	-0.00708	-0.00823	-0.00427	-0.00078		-0.01442	-0.01407	-0.01304	-0.01029	0.00069	-0.02123
		(0.006)	(0.010)	(0.011)	(0.010)	(0.011)	(0.019)		(0.009)	(0.011)	(0.012)	(0.012)	(0.011)	(0.024)
Constant	-0.00458	-0.00633	-0.00367	0.00465	0.00272	0.00677	-0.00191	-0.01167**	-0.00344	-0.00507	-0.00229	0.00762	-0.00063	-0.04250*
	(0.005)	(0.005)	(0.006)	(0.010)	(0.011)	(0.015)	(0.039)	(0.005)	(0.010)	(0.012)	(0.011)	(0.015)	(0.018)	(0.022)
Observations	160	160	100	100	98	84	44	278	277	164	162	161	115	80
R-squared	0.068	0.122	0.133	0.136	0.137	0.107	0.244	0.060	0.080	0.112	0.114	0.136	0.118	0.260

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

4.3 Robustness checks

We perform a number of robustness checks with regards to the identification methodology of sudden and abrupt exchange rate depreciations, as well as the specification of the sample.

First, we redefine sudden stops and exchange rate depreciations by looking at five years averages and standard deviations as threshold for identifying the events. This alternative identification strategy reduces the number of shocks identified, however it does not significantly impact our main results.

Next, we exclude from our sample events that also correspond to banking and currency crisis. We do this by cross checking whether any of the shocks identified using our methodology happen in years in which Laeven and Valencia (2013) identified a banking or a currency crises.

Finally, we re-run our estimations excluding all the sudden stops in which an abrupt depreciation occurred in the quarter before the episode window of such event. We also excluded all depreciations anticipated by a sudden stop. Again, all of these checks do not impact our results quantitatively. The results of the robustness checks have not been included here, but are available upon request.

5 Concluding remarks

The empirical investigation carried out in this paper aims to verify whether openness to trade facilitates current account and trade balance improvements. To this end, we identify events of sudden stops in capital flows and of abrupt exchange rate depreciations, and we check whether openness helps explaining current account and trade balance improvements.

We present a theoretical framework that highlights the mechanism through which openness should affect the relation between current account changes and real exchange depreciation. It should be noted that, according to our simple theoretical model, the size of the RER depreciation has not impact on welfare. Welfare changes depend on the size of the income shocks that cause the sudden stop, but not on how the economy adapts to it. More specifically, if it adjusts through major relative price changes or through income effects.

In line with the predictions of our theoretical model, we find that the degree of openness have a positive effect on changes in current account and on trade balance. Our results indicate that more open economies can rebalance their current account and trade balance with smaller domestic currency devaluations after an external shock. Hence, more open economies would be better able to overcome external shocks that entails the need of current account reversals.

Table 5: Trade balance and openness during REER and RER depreciation episodes

Dependent variable: Changes in trade balance/GDP

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	REER deepreciations							RER deepreciations						
Openness	0.00048***	0.00048***	0.00053***	0.00054***	0.00053***	0.00050***	0.00079***	0.00022*	0.00024**	0.00038**	0.00037**	0.00038**	0.00053***	0.00059
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ REER	0.02320	0.02218	0.02210	0.03976	0.02662	0.14746***	0.01614							
	(0.015)	(0.017)	(0.023)	(0.037)	(0.023)	(0.048)	(0.041)							
Δ RER								0.05099**	0.04052	0.03616	0.04625	0.02783	0.08284**	0.08047***
								(0.024)	(0.025)	(0.035)	(0.038)	(0.033)	(0.037)	(0.024)
Δ in Terms of Trade			0.15461***	0.17334***	0.15753***	0.08942	0.12695			0.14521***	0.15739***	0.14177***	0.16302**	0.16788**
			(0.041)	(0.046)	(0.042)	(0.064)	(0.076)			(0.036)	(0.042)	(0.037)	(0.070)	(0.073)
World Real Export Growth		-0.03665	-0.05408	-0.05315	-0.05177	-0.03762	-0.03243		-0.08653*	0.00085	0.00489	0.01116	0.06331	-0.05003
		(0.030)	(0.037)	(0.050)	(0.038)	(0.033)	(0.137)		(0.051)	(0.060)	(0.061)	(0.060)	(0.111)	(0.074)
Exchange Rate Regime				0.00014							-0.00577			
				(0.008)							(0.004)			
Debt/GDP					-0.00012							-0.00023		
					(0.000)							(0.000)		
OSIN						-0.15529**							-0.09619*	
						(0.065)							(0.051)	
Financial Dollarization							0.00179**							0.00274***
							(0.001)							(0.001)
IMF Emerging Mkt Dummy		0.00943	0.01267	0.01221	0.01189	-0.02094	0.01909		0.01190*	0.01885*	0.01992*	0.01823	0.01439	0.00188
		(0.007)	(0.008)	(0.008)	(0.008)	(0.015)	(0.016)		(0.007)	(0.011)	(0.012)	(0.011)	(0.019)	(0.026)
Dummy '70s		0.04168***							0.00284					
		(0.013)							(0.012)					
Dummy '80s		-0.00726	-0.00328	-0.00865	-0.00533		-0.00447		-0.01635	0.01048	0.01244	0.00532		0.00877
		(0.009)	(0.014)	(0.017)	(0.015)		(0.034)		(0.013)	(0.014)	(0.014)	(0.011)		(0.020)
Dummy '90s		0.01319	0.03474*	0.03402*	0.03615*	0.03119*	0.02602		-0.02379**	-0.00066	0.00465	0.00878	0.00365	-0.01140
		(0.010)	(0.019)	(0.020)	(0.019)	(0.016)	(0.018)		(0.011)	(0.014)	(0.015)	(0.014)	(0.013)	(0.019)
Constant	-0.01825**	-0.02948**	-0.03309***	-0.03434*	-0.02685	-0.00357	-0.06452***	-0.00267	0.00069	-0.02396	-0.01235	-0.01351	-0.02558	-0.03887
	(0.008)	(0.012)	(0.012)	(0.020)	(0.017)	(0.015)	(0.021)	(0.007)	(0.012)	(0.017)	(0.017)	(0.016)	(0.027)	(0.041)
Observations	254	254	158	156	153	103	60	498	477	243	236	236	134	111
R-squared	0.087	0.118	0.235	0.246	0.245	0.384	0.249	0.020	0.038	0.106	0.114	0.113	0.141	0.130

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

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APPENDIX TABLES

Table 1: Analyzed countries and data availability

Country	Capital Flows	Δ RER	Δ REER	Country	Capital Flows	Δ RER	Δ REER
Afghanistan	–	2005-2011	–	Estonia	1993-2011	1993-2012	–
Albania	1996-2011	1993-2011	–	Ethiopia	1978-2009	1967-2011	–
Algeria	–	1975-2011	1981-2011	Euro Area	2000-2011	–	1981-2011
Angola	–	1993-2011	–	Fiji	2001-2010	1970-2011	1981-2011
Anguilla	–	1999-2011	–	Finland	1976-2011	1966-2012	1968-2011
Antigua and Barbuda	–	–	1977-2011	France	1976-2011	1966-2012	1981-2011
Argentina	1977-2011	1966-2011	–	Gabon	–	1966-2011	1981-2011
Armenia	1994-2011	1994-2011	1995-2011	Gambia, The	2008-2010	1966-2011	1981-2011
Aruba	1987-2010	1987-2011	–	Georgia	1998-2011	1996-2012	1994-2011
Australia	1966-2010	1966-2011	1981-2011	Germany	1972-2011	1966-2012	1976-2011
Austria	1971-2011	1966-2012	1976-2011	Ghana	–	1966-2011	1981-2011
Azerbaijan	2000-2011	–	–	Greece	1977-2011	1966-2012	1981-2011
Bahamas, The	1977-2011	1967-2011	1981-2011	Grenada	–	1977-2011	1977-2011
Bahrain, Kingdom of	–	1967-2011	1981-2011	Guatemala	1978-2011	1966-2011	–
Bangladesh	1977-2011	1994-2011	–	Guinea	–	2005-2011	–
Barbados	–	1966-2011	–	Guinea-Bissau	–	1987-2011	–
Belarus	2003-2011	–	–	Guyana	–	1995-2011	1981-2011
Belgium	2003-2011	1966-2012	1976-2011	Haiti	–	1966-2011	–
Belize	2002-2011	1984-2011	1981-2011	Honduras	2005-2011	1966-2012	–
Benin	–	1993-2011	–	Hungary	1990-2011	1977-2012	1981-2011
Bhutan	–	1980-2010	–	Iceland	1977-2011	1966-2012	1976-2011
Bolivia	1978-2010	1966-2011	1981-2011	India	1976-2010	1966-2011	–
Bosnia and Herzegovina	2002-2011	2007-2011	–	Indonesia	1982-2011	1969-2012	–
Botswana	–	1975-2011	–	Iran, Islamic Republic of	–	1966-2011	1976-2011
Brazil	1976-2011	1981-2012	1981-2011	Iraq	–	1966-2011	–
Brunei Darussalam	2003-2009	1985-2011	–	Ireland	1982-2011	1966-2012	1976-2011
Bulgaria	1993-2011	1992-2012	1993-2011	Israel	1973-2011	1966-2012	1976-2011
Burkina Faso	–	1966-2011	–	Italy	1971-2011	1966-2012	1981-2011
Burundi	–	1966-2011	1976-2011	Jamaica	–	1966-2012	–
Cambodia	1995-2010	1995-2011	–	Japan	1978-2011	1966-2011	1981-2011
Cameroon	1980-1987	1969-2011	1981-2011	Jordan	1978-2011	1977-2012	–
Canada	1966-2011	1966-2011	1976-2011	Kazakhstan	1996-2011	1994-2012	–
Cape Verde	1999-2011	1985-2012	–	Kenya	–	1966-2012	–
Central African Rep.	–	1982-2010	1981-2011	Korea, Republic of	1977-2011	1971-2012	–
Chad	–	1984-2010	–	Kosovo	2010-2011	–	–
Chile	1992-2011	–	1981-2011	Kuwait	–	1974-2011	–
China, P.R.: Hong Kong	2000-2011	1981-2011	–	Kyrgyz Republic	1996-2011	1996-2011	–
China, P.R.: Macao	–	1989-2011	–	Lao, P.D.R.	1995-2010	1989-2010	–
China, P.R.: Mainland	2011-2011	–	1981-2011	Latvia	1994-2011	1993-2012	–
Colombia	1997-2011	1966-2012	1981-2011	Lebanon	2003-2010	–	–
Congo, Dem. Rep. of	–	1966-2009	1981-2010	Lesotho	1986-2007	1974-2011	1976-2011
Congo, Republic of	–	1991-2010	–	Libya	–	1966-2011	–
Costa Rica	2000-2011	1966-2011	1981-2011	Lithuania	1994-2011	1993-2012	–
Cote d'Ivoire	–	1966-2011	1981-2011	Luxembourg	1996-2011	1966-2012	1976-2011
Croatia	1994-2011	1993-2012	1993-2011	Macedonia, FYR	1997-2010	1994-2012	1993-2011
Cyprus	2002-2011	1966-2012	1981-2011	Madagascar	2004-2005	1966-2011	–
Czech Republic	1994-2011	1994-2012	1991-2011	Malawi	–	1981-2011	1981-2011
Czechoslovakia	1990-1992	–	–	Malaysia	2000-2010	1966-2011	1976-2011
Denmark	1976-2011	1966-2012	1976-2011	Maldives	–	2005-2011	–
Djibouti	–	1982-2011	–	Mali	–	1988-2011	–
Dominica	–	1966-2011	1976-2011	Malta	1996-2011	1966-2011	1976-2011
Dominican Republic	–	1966-2012	1981-2011	Mauritania	–	1986-2011	–
Ecuador	1994-2011	–	1981-2011	Mauritius	2001-2010	1966-2012	–
Egypt	–	1966-2011	–	Mexico	1980-2011	1966-2012	1981-2011
El Salvador	2000-2011	1966-2012	–	Moldova	1995-2011	1995-2011	1995-2011
Equatorial Guinea	–	1986-2008	1986-2011	Mongolia	2005-2010	1992-2011	–
Eritrea	1999-2000	–	–	Montenegro, Republic of	–	2006-2011	–

Analyzed countries and data availability

Country	Capital Flows	Δ RER	Δ REER	Country	Capital Flows	Δ RER	Δ REER
Morocco	2004-2010	1966-2011	1981-2011	Slovak Republic	1994-2010	1994-2012	1991-2011
Mozambique	2000-2010	1993-2011	–	Slovenia	1993-2011	1993-2012	–
Myanmar	1977-2011	1971-2011	–	Solomon Islands	2007-2010	1971-2011	1979-2011
Namibia	2000-2010	2003-2012	–	South Africa	1966-2011	1966-2012	1976-2011
Nepal	1978-2010	1966-2011	–	Spain	1976-2011	1966-2012	1981-2011
Netherlands	1968-2011	1966-2012	1976-2011	Sri Lanka	1978-2010	1966-2011	–
Netherlands Antilles	1999-2010	1969-2010	1976-2010	St. Kitts and Nevis	–	1980-2011	1976-2011
New Zealand	1981-2011	1966-2011	1976-2011	St. Lucia	–	1966-2011	1976-2011
Nicaragua	1994-2011	2000-2012	1981-2011	St. Vinc. and the Gren.	–	1976-2011	1976-2011
Niger	–	1969-2011	–	Sudan	1978-2010	1966-2011	–
Nigeria	1991-1994	1966-2011	1981-2011	Suriname	1978-2010	1966-2011	–
Norway	1976-2011	1966-2012	1976-2011	Swaziland	–	1966-2011	–
Oman	–	2002-2011	–	Sweden	1976-2011	1966-2012	1976-2011
Pakistan	1977-2011	1966-2011	1981-2011	Switzerland	2000-2011	1966-2012	1976-2011
Panama	1999-2011	1966-2011	–	Tajikistan	2003-2010	–	–
Papua New Guinea	1977-2001	1972-2011	1981-2011	Tanzania	–	1970-2012	–
Paraguay	2002-2011	1966-2011	1981-2011	Thailand	1977-2011	1966-2012	–
Peru	1978-2011	1966-2012	–	Togo	–	1971-2011	1981-2011
Philippines	1978-2011	1966-2012	1976-2011	Tonga	1978-2010	1977-2011	–
Poland	1986-2011	1981-2012	1981-2011	Trinidad and Tobago	–	1966-2011	1976-2011
Portugal	1976-2011	1966-2012	1976-2011	Tunisia	–	1988-2011	1976-2011
Qatar	–	2004-2012	–	Turkey	1985-2011	1970-2012	–
Romania	1992-2011	1991-2012	1981-2011	Uganda	1981-2010	1982-2012	1981-2011
Russian Federation	1995-2011	1993-2011	1995-2011	Ukraine	1995-2011	1993-2012	1993-2011
Rwanda	–	1966-2012	–	United Kingdom	1971-2011	1966-2012	1976-2011
Samoa	2004-2011	1966-2011	1976-2011	United States	1974-2011	1966-2012	1981-2011
San Marino	–	2004-2010	–	Uruguay	2001-2010	1966-2011	1981-2011
Saudi Arabia	2007-2011	1972-2011	1981-2011	Vanuatu	1985-2008	1977-2011	–
Senegal	–	1969-2011	–	Venezuela, Rep. Boliv.	1995-2011	1966-2011	1981-2011
Serbia, Republic of	2009-2011	1998-2011	–	Vietnam	–	1996-2011	–
Seychelles	1980-2011	1970-2011	–	Yemen, Republic of	2001-2010	1998-2011	–
Sierra Leone	–	–	1981-2011	Zambia	–	1986-2011	1981-2011
Singapore	1996-2010	1966-2011	1976-2011	Zimbabwe	1982-1994	–	–