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***Martín Tobal*** (Banco de México)

***Renato Yslas*** (Banco de México)

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# A Historical Perspective on Prudential Regulation, Currency Mismatches and Exchange Rates in Latin America and the Caribbean

MARTIN TOBAL AND RENATO YSLAS (BANCO DE MEXICO)\*

## Abstract

This paper runs a survey across seventeen countries from Latin American and the Caribbean about the use, implementation characteristics and policy motivations of limits and requirements on FX positions, as well as the exchange rate regimes of these economies over 1992-2012. Among other novel stylized facts, we show that when referring to policy motivations, national authorities linked their regulatory measures mostly to currency mismatches and fluctuations of the exchange rate, and this pattern was clearer for the more flexible exchange rate regimes adopted in the aftermath of the currency crisis of the 1990s and early 2000s. Thus, we use the survey and the synthetic control method to show that changes in limits and requirements on FX positions affected fluctuations of the exchange rate.

**Keywords:** *Prudential Regulation; Exchange Rate Regimes; Foreign Currency Positions.*

**JEL Classification:** E58, F31.

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## 1. Introduction

Monetary and regulatory authorities have been traditionally committed to the objectives of price and financial stability. Nonetheless, the policy instruments they use and the way they use each instrument vary over time, frequently, in the aftermath of large economic crisis. Thus, for instance, several emerging market economies (EMEs) started to use interest rate setting with inflation target (IT) regimes after the currency crises the 1990s and 2000s, while several advanced economies (AEs) started to use quantitative easing after the Global Financial Crisis hit. Regulation is not an exception since, historically, policy-makers have used regulatory instruments with distinct purposes and in different manners in EMEs and AEs.

Thus, this paper takes a historical perspective and studies the use of a set of FX regulatory instruments in Latin America and the Caribbean over the period 1992-2012 (Fernandez et al., 2016).<sup>1</sup> In particular, the paper runs a survey across national authorities from seventeen Latin American and Caribbean countries and, using this survey, constructs a new database with information about the use, implementation characteristics and policy motivations of limits and requirements on FX positions, as well as the exchange rate regimes adopted by these countries over 1992-2012. Furthermore, we use information from the survey, the synthetic control method and Ghosh et al.'s (2015) definition of exchange rate variability to evaluate empirically the impact of the policies on fluctuations of the exchange rate (see Chamon et al., 2017 for a use of this method in studies involving these fluctuations).

Among the five sections of the survey, this paper focuses on sections 1 and 3 (Tobal, 2018 provide details on the other sections, its structure and its content; see also Appendix 1). Section 1 requests national authorities: i) to identify the status of the limits, as well as the liquidity and the reserve requirements on FX positions that was in place in their country in 1992; ii) to track all relevant changes they implemented over 1992-2012; iii) to describe the implementation characteristics of these policies; and iv) to link their motivation to a list of six items. Section 3 requested national authorities to define their exchange rate regimes.

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<sup>1</sup> Fernandez et al. (2016) review how a different type of regulatory instrument linked to the external sector, capital controls, have been used with different purposes over time.

Interestingly, the period covered by the survey is 1992-2012 which allows us to perform the investigation in two distinct periods of time: a first period preceding the currency crises of the late 1990s and early 2000s, which were associated with abandonments of targets for the exchange rate, and a second period that followed these crises. A potential disadvantage of the survey is that it does not cover regulatory policies that solely dealt with financial derivatives markets (see Tobal, 2018 for a role of financial derivatives in the region).

We present evidence on differences and commonalities in implementation characteristics across different types of policies. The results show that, when regulating the FX positions of banks, the Latin American and Caribbean countries had a stronger tendency to use limits and requirements on long FX positions than to regulate other FX position types; establishments, eliminations and changes in these regulatory instruments represent 36 percent of all policies in our sample. Limits and requirements on short FX positions represent 32 percent and rank second; while limits and requirements on open FX positions and policies that regulated short and long FX positions jointly rank third and fourth, respectively.

This classification is silent about the impact of the policies on the sign and volatility of FX positions or on the volatility of the exchange rate (see reference to Canales-Kriljenko and Habermeier (2004) below). For example, a limit on long FX positions may tighten or loosen, and this has opposite implications for the gap between FX assets and FX liabilities. Thus, we classify the policies according to their potential impact. Policies expected to reduce the gap between FX assets and FX liabilities were the most commonly used over 1992-2012 (42 percent of all measures). Peru is the economy that took this policy type the highest number of times, which is consistent with the fact that FX mismatches and negative balance sheet effects are frequently more of a concern in economies with financial dollarization.

Policies expected to increase the gap between FX assets and FX liabilities represent 33 percent and rank second. Policies that increase the lower end of the interval over which FX positions can fluctuate and reduce its upper end jointly are expected to reduce the gap between FX assets and FX liabilities and its negative value at the same time. They are likely to reduce the volatility of FX positions and the exchange rate and rank third.

Finally, policies expected to increase the gap between FX assets and FX liabilities and its negative value jointly rank forth. None of the Latin American and Caribbean countries in our sample implemented these policies by relaxing or eliminating limits and requirements on the

long and the short FX position of banks at the same time; instead, they did so by relaxing or eliminating limits and requirements on open FX positions. Costa Rica is the country that implemented this type of policies the highest number of times, beginning in 2006 its central bank adopted a series of policies to increase the limit on the variation of daily FX positions.

In terms of exchange rate regimes, we consider three categories we label as fixed; intermediate and floating. According to national authorities' responses, the regimes in the former two categories were less used than the regimes in latter one. The country with the longest spell in the intermediate category was Costa Rica reflecting, in part, that its central bank let the Colon fluctuate as it adopted crawling bands in 2006 as part of a gradual change towards an inflation target (IT) regime (Cubero et al., 2019). The country with the longest spell in the floating category was Peru, which is consistent with the fact that its central bank moved to a managed floating regime it has complemented with FX interventions to avoid excess exchange rate volatility and negative balance sheet effects (Armas and Vega, 2019).

As we divide the sample in the two periods mentioned above, the results show that the percentage of quarters with floating regimes was larger in the 2000s than in the 1990s (26% and 64%, respectively). This is consistent with anecdotal evidence suggesting in different studies that Latin American countries transitioned towards more flexible exchange rate regime in the late 1990s and early 2000s, regardless of whether they faced large currency crisis triggered by speculative attacks, such as Mexico or Brazil, or whether they faced smaller crises, such as Chile (Frenkel and Rapetti, 2010; Frankel, 2010). Since *de jure* and *de facto* categorizations of exchange rate regimes can differ (Levy Yeyati and Sturzenegger, 2010), we check that the result holds with Ilzetzki et al. (2019)'s *de facto* classification.

Regarding the motivations of the regulatory measures, the two items to which countries linked their policies the most were currency mismatches and fluctuations in the exchange rate. This is consistent not only with the possibility that the policies help reduce solvency and liquidity FX risk by diminishing currency mismatches (Goldstein and Turner, 2004; Zettelmeyer et. al., 2011; Lee, 2012) but also with literature arguing that the regulatory measures affect banks' demand for and supply of foreign currency (Canales-Kriljenko and Habermeier, 2004), potentially affecting also the exchange rate.<sup>2</sup>

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<sup>2</sup> Bolivia also mentioned some of its policies aimed at remonetizing the banking system to improve its efficiency as a lender of last resort and the monetary policy transmission mechanism. This is consistent with rate and with the idea that they

We find that the importance of currency mismatches and exchange rate fluctuations relative to the other items in the list increases in the 2000s, a period in which the Latin American and Caribbean countries had more flexible exchange rate regimes. Given this and that, following arguments from the literature, one could argue in opposite directions about whether policies motivated by currency mismatches and exchange rate fluctuations are used more intensively in more flexible or more rigid regimes, we address the issue with our dataset (Section 5 reviews related debates by using contributions from Mishkin, 1996; Obstfeld, 1998; Reinhart and Reinhart, 1998; Eichengreen and Hausmann, 1999; McKinnon, 2001; Burnside et al., 2001; Goldstein, 2002; Arteta, 2005 and Magud et al., 2011).<sup>3</sup> Our results show that policies whose motivations were linked to currency mismatches and exchange rate fluctuations were used more intensively in the most flexible regimes, being this outcome clearer for the latter type of policies, that is, for policies linked to fluctuations in the exchange rate.

In light of these results, a natural question is whether these policies changed currency mismatches and exchange rate fluctuations. Since the first case is considered by Tobal (2018) for the same sample of countries, this paper studies the impact on fluctuations in the exchange rate. We use the synthetic control method of Abadie and Gardeazabal (2003) as Chamon et al. (2017) which overcomes concerns associated with standard difference-in-differences techniques. Specifically, it overcomes concerns of non-parallel trends in the pre-intervention period, a problem that in the context of prudential regulatory policies is frequently associated with countries' time-varying unobservable characteristics (see Section 6).

We use the measure of exchange volatility of Gosh et al. (2015) and study the impact of policies whose motivations were, according to national authorities' responses to the survey, linked to fluctuations in the exchange rate. As a way of providing robustness, we also study the impact of a different set of policies; namely, policies that modified the lower and upper ends of the regulatory interval over which FX fluctuate in opposite directions and at the same time. As noted above, the implementation characteristics of these policies are such that they should affect the volatility of FX positions and the exchange rate. For the two types of

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provide central banks with more power as lenders of last resort in financially dollarized economies (Ize and Levy-Yeyati, 2003; Rennhack and Nozaki, 2006).

<sup>3</sup> As we mention in Section 5, the literature argues in opposite directions about whether currency mismatches are larger or smaller in more flexible exchange rate regimes. Moreover, some studies argue that a disadvantage of sterilizing FX market interventions with sales of government securities is that this can lead to increases in interest rates and thus appreciations of the exchange rate (Reinhart and Reinhart, 1998; Magud et al., 2011). In this context, an advantage of regulatory policies is that they can substitute for FX market interventions in dampening fluctuations of the exchange rate.

analysis, we compute average outcome trajectories across all policies to account for the possibility that the results are driven by other policies that could have been implemented at the same time or by the occurrence of non-considered events.

The results suggest that the policies that were expected to reduce fluctuations in the exchange rate did reduce it. For policies after which we expected to see a rise in exchange rate fluctuations, we observe an increase in Gosh et al.'s (2015) measure of volatility, i.e., the outcomes suggest that this measure would have been on average 34 percent higher in the absence of the former policies and 29 percent lower in the absence of the latter ones. The robustness checks with the alternative definition of policies confirm the results.

The paper is organized as follows. Section 2 presents an overview of the survey and the characteristics of the data collection process. Section 3 studies differences in implementation characteristics and potential impacts of the policies, and it reviews the information on exchange rate regimes. Section 4 reviews the literature on potential motivations for implementing FX regulation and links them to national authorities' responses to the survey. Section 5 explores the interaction of the policies with exchange rate flexibility, FX market interventions and monetary policy. Finally, Section 6 evaluates the effect of the regulatory policies on the volatility of the exchange rate and Section 7 concludes.

## **2. The Survey**

### **2.1 Brief Overview**

The survey was run across central banks from Latin America and the Caribbean. The data collection process comprised two stages. In the first stage, which started in November-December of 2012, the survey was sent to the heads of the research and financial stability departments of the central banks. They distributed the survey within their institution and other national authorities they considered relevant. This ensured that that each question was answered by the best qualified person to this end.<sup>4</sup> The second stage comprised contacts by email or by phone and personal interactions with national authorities that complemented the information collected in the first stage.

#### **2.1. Data Collection Process**

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<sup>4</sup> The responses of Peru, for example, contained information on policies taken by the Superintendency of Banks, Insurance Companies, and Private Administrators of Pension Fund.



### 2.2.1 Prudential Policies

We had to define the set of prudential regulatory policies that would be incorporated in the analysis. If the set of policies was too large, we would consider regulatory instruments with completely different characteristics, and this would prevent us from making comparisons of policies across countries and over time. On the contrary, if the set of policies was too small, the analysis would not be comprehensive enough. Hence, we used the two stages of the data collection process to counterbalance the forces of this trade-off: in the first stage we required information on several regulatory instruments to avoid that the set was too small and then, in the second stage, we narrowed it down.

Specifically, in the first stage we requested national authorities to identify the status of several policies affecting FX positions in 1992; to track every change they had introduced until 2012; to describe their implementation characteristics and to link the motivations for these policies to a list of six items (see Subsection 4.2). Then, we excluded policies that, according to authorities' judgment in the second stage, were consolidation procedures and refinements, and policies that lasted less than a week (for details, see Appendix 2).<sup>5</sup> We also excluded the few policies that did not directly affect the two sides of the balance sheet, i.e., FX assets and FX liabilities, to narrow down the set and gain comparability.<sup>6</sup>

The resulting group of policies included three types of regulatory instruments that affect FX positions: limits, as well as liquidity and reserve requirements. Limits impose direct constraints on FX positions, frequently as a percentage of capital, and thus significantly affect them and consider both sides of the balance sheet; reserve and liquidity requirements on FX positions also fulfill all conditions mentioned above.<sup>7</sup> Therefore, when using the expression “policies,” in the remainder of the paper, we will be referring to the establishment, elimination and changes in these limits and requirements.

### 2.2.2 Exchange Rate Regimes

We also had to define categories of exchange rate regimes. These categories had to be narrow enough to capture heterogeneity in terms of exchange rate regimes. On the other hand, they

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<sup>5</sup> We relied on the judgement of central banks to know which policies were refinements and consolidation procedures.

<sup>6</sup> This led to the exclusion of policies that were of different types and that, according to their implementation characteristics and the relationships they constrained in the balance sheet, were hard to compare to limits and requirements on FX positions and were taken in only four countries.

<sup>7</sup> Chile and Colombia restricted the difference between short-term FX liabilities and short-term FX assets but named this instrument as a limit on short current FX positions. We refer to them as liquidity requirements.

had to be broad enough to ensure that each category would contain a large amount of responses and we could make meaningful comparisons across countries and over time. Hence, we used again the two stages of the data collection process to counterbalance the forces of this trade-off.

In the first stage, we requested information on the exchange rate regimes the countries had adopted from 1992 to 2012. The responses in the first stage covered a wide range of exchange rate regimes. Thus, we gained comparability across countries in the second stage. The grouping of exchange rate regimes that best counterbalanced the forces of the trade-off at the end of this stage was: 1. “Fixed;” 2. “Intermediate;” and 3. “Floating.” These categories are narrow enough so that as one moves from “1” to “2” and from “2” to “3,” the flexibility of the corresponding regime increases. At the same time, they are broad enough that each contains a sufficiently large amount of responses.

### 2.2.3 Surveyed Countries and Delivered Data

By mid-January of 2013, most countries had responded to our request and completed the survey in the first stage. During that year we maintained personal interactions and phone contacts with fifteen of them. Hence, by December of 2013 only the authorities of Bahamas, ECCU (the countries of the Eastern Caribbean Currency Union), Ecuador, El Salvador, Haiti, Suriname, Mexico and Venezuela had not gone through the second step.

However, for different reasons, the information of ECCU and Mexico ended up being incorporated in the analysis. For ECCU, the reason is that no further information was required; its answers could be understood without further information on the context, it complied with the standards initially required, and it could be easily fit in the set of policies and classifications of exchange rate regimes defined for the other countries. Mexico provided valuable feedback and interactions that enabled completion of the second step in 2017. Hence, the final list of countries considered in the analysis was the following: Argentina, Aruba, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, ECCU, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Paraguay, Peru and Uruguay.

## 3. FX Regulation and Exchange Rate Flexibility

### 3.1 Implementation Characteristics of FX Regulation

We classify the policies according to the type of relations they constrain in the balance sheet by considering the four groups of Table 2 in Appendix 4: in this table, “Long positions” refers to policies that established, increased, eliminated and reduced limits and requirements on the long FX position of banks. That is, policies that regulated explicitly the positive value of the difference between FX liabilities and FX assets, regardless of whether they reduced or increased this difference. “Short positions” refers to policies related to limits and requirements on short FX positions, and therefore, policies that regulated explicitly the negative value of the difference between FX assets and FX liabilities; “Open positions” refers to policies that regulated the difference and its negative value jointly, imposing the same severity of regulation on both; and “Short and long positions” refers to policies that regulated the two differences but imposed a distinct severity of regulation on each.<sup>8</sup>

Table 2 shows that the policies “Long positions” represent 36 percent of all measures, being the policy type most commonly used over the period 1992-2012. That is, when regulating the FX positions of banks, the Latin American and Caribbean countries had a stronger tendency to use limits and requirements on long positions than to regulate other position types. “Short positions” ranks second and represents 32 percent of all measures, while “Open positions” and “Short and long positions” rank third and fourth, representing 19 and 13 percent, respectively.

This classification provides a technical categorization but is ambiguous about the impact of the policies on the sign and volatility of FX positions. For instance, a “Long positions” policy type may reduce or increase the long FX position of banks, depending on whether the corresponding limit or requirement tightens or loosens. Hence, we use a second criterion to generate the groups of Table 3 and show their frequency of use in Table 4 of Appendix 4.<sup>9</sup>

The policies “DEC” in this table are those expected to reduce the difference between FX assets and FX liabilities, that is, to reduce the long FX position of banks or to increase their short FX position. Most of them were of the “Long positions” type (10/19): when

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<sup>8</sup> Consider a country that establishes a limit on short and long positions and years later changes only the former limit. In this case, we compute a policy of type “short and long positions” and a policy of type “short positions” later.

<sup>9</sup> We consider that the policies can either directly constraint the behavior of banks or modify their incentives in choosing their optimal FX portfolio. Table 4 excludes two policies considered in Table 2. These policies introduced new elements in the definition of the numerator or the denominator in the limits, so that the net impact of this on long FX positions cannot be determined. For example, consider the measure of Argentina in 1992. This central bank raised the limit on short FX positions but also shrank the capital base over which this limit was calculated (see Appendix 3 for these policies).

implementing DEC policies, the Latin American and Caribbean countries had a stronger tendency to limit or deter the difference between FX assets and FX liabilities than to relax or uplift policies concerning its negative value. The policies DEC were the most commonly used over 1992-2012 (42 percent of all measures) and were taken in seven countries (Argentina, Bolivia, Brazil, Colombia, Honduras, Paraguay and Peru). Peru is the economy that took these policies the highest number of times which is consistent with two facts: (i) Peru had a tradition of financial dollarization; and (ii) there is frequently more concern about mismatches between FX assets and FX liabilities in economies with this tradition.<sup>10</sup>

The policies “INC” are those expected to diminish the short FX position of banks or to increase their long FX positions. They represent 33 percent of all measures and Brazil is the country that used them the highest number of times (5 policies), which is consistent with the fact that the two parallel FX markets prevailing in this country before 2005 induced Brazilian banks to hold relatively short FX positions (Tobal, 2013).

The VOL DEC policies are those expected to reduce the gap between FX assets and FX liabilities and its negative value jointly. They reduce the upper end of the interval over which FX positions can fluctuate and increase its lower end at the same time; in this sense, they are more likely to reduce the volatility of FX positions than the other measures considered. They were of both the “Open positions” and the “Short and long positions” types: they were implemented through the establishment and tightening of limits on open FX positions and through simultaneous tightenings of limits on the short and the long FX positions of banks (3 and 2 times, respectively; see Table 4). They represent 11 percent of all measures and were taken by Bolivia, Guatemala, Costa Rica, Honduras and Mexico.<sup>11</sup> For instance, sometime after adopting an Inflation Targeting (IT) regime, Mexico tightened the limit on open FX positions, possibly to address risks associated with exchange rate adjustments (in IT regimes, interest rate setting is more devoted to meet inflation targets, see Section 6).

Finally, the VOL INC policies are those expected to increase the gap between FX assets and FX liabilities and its negative value at the same time. All these measures were of the “Open positions” type, that is, the Latin American and Caribbean economies did not

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<sup>10</sup> In these economies it tends to be more common to save in U.S. dollars than in others.

<sup>11</sup> See Section *M.6 Posiciones del Mercado de Divisas* of Circular 2008/94 and Section *M.61 Posiciones de Riesgo Cambiario* of Circular-Telefax 7/2002. These circulars are publicly available at <http://www.banxico.org.mx/disposiciones/normativa/normativa-vigente-agrupada-po.html>.

implement these policies by simultaneously relaxing or uplifting the limits on the short and the long FX positions of banks; instead, they did so by relaxing or uplifting limits on open FX positions. Costa Rica is the country that implemented this policy type the highest number of times. Beginning in 2006, its central bank adopted a series of related policies, raising the limit on the variation of daily FX positions.

### 3.2 Exchange Rate Regimes

Table 5 in Appendix Section 4 shows that the “Fixed” regimes were the least commonly adopted regimes. They were mentioned in reference to 19 percent of the quarters with available information and adopted, at least in part of the sample, by Argentina, Aruba, Dominican Republic, ECCU and Nicaragua. ECCU is the country that maintained a “Fixed” regime for the highest number of consecutive quarters. The Eastern Caribbean dollar has been pegged to the US dollar at 2.70 Eastern Caribbean dollars per US dollar since 1976.

The “Intermediate” were the second most common regimes and the number of quarters in which they were adopted represent 34 percent of all quarters with available information. Costa Rica is the country with the longest spell in this type of regime. In 1984, after a loss of international reserves that caused the abandonment of its fixed exchange rate, the country introduced a crawling peg regime. This regime contributed to maintain external stability over the next two decades. In October 2006, the Central Bank of Costa Rica abandoned it and adopted crawling bands as part of a gradual change towards the adoption of a system with inflation targets (Cubero et al., 2019).

The regimes in the “Floating” category, managed floating and fully floating regimes, were the most commonly used over 1992-20212. The number of quarters with these regimes represents 47 percent of all quarters with available information and were adopted, at least in part of the sample, by eleven countries (Argentina, Brazil, Chile, Colombia, Dominican Republic, Guatemala, Jamaica, Mexico, Paraguay, Peru and Uruguay). Peru is the economy with the longest spell in this regime. In August 1990, with its international reserves at low levels, the Central Reserve Bank of Peru moved from a peg regime to a managed floating regime. Since then, Peru has maintained it, which has been accompanied by foreign exchange interventions aimed at avoiding excess exchange rate volatility that could generate negative balance sheet effects (Armas and Vega, 2019).

To study how exchange rate flexibility changed over time, we divide the sample in two halves, periods of time of similar length: 1992-2001 and 2002-2012. Dividing the sample in this manner allows us to distinguish between two meaningful periods; a first period comprising the years that preceded the currency crises of the late 1990s and early 2000s and a second one comprising the years that followed these crises. Since these crises led several countries to abandon their pegs, it could be speculated that the Latin American and Caribbean economies had a stronger tendency to adopt more flexible regimes during the second period. Ultimately, nonetheless, this remains an empirical question.

To address this question, Table 6 calculates the percentage of quarters with “Floating” regimes in each period. The table shows that the percentage of quarters with “Floating” regimes was significantly larger in 2002-2012 than in 1992-2001 (26% and 64%, respectively). This result is consistent with anecdotal evidence in different studies suggesting that Latin American countries transitioned towards more flexible exchange rate regime in the late 1990s and early 2000s, regardless of whether they faced large currency crisis triggered by a speculative attack, such as Mexico and Brazil, or whether they faced smaller crises, such as Chile (Frenkel and Rapetti, 2010; and Frankel, 2010).

To provide external validity, we check the results with the actual (*de facto*) classification of exchange rate regimes of Ilzetzki et al. (2019)’s classification, which is based data on exchange rate behavior, reserve holdings and FX purchases (for differences between *de facto* and *de jure* categorizations, see Levy Yeyati and Sturzenegger, 2010). We retrieve monthly data from Ilzetzki’s webpage and transform their monthly classification into a quarterly one by assigning to each quarter the regime that was in place for at least two months. Among the six categories they consider, “Crawling Band, Managed Floating” and “Freely Floating” are the ones referring to the most flexible regimes. Using this fact, Table 7 in Appendix 4 shows that the percentage of quarters in which these regimes were in place equaled 22 percent for 1992-2001 and 40 percent for 2002-2012. That is, according to their classification, exchange rate regimes were also more flexible in 2002-2012 than in 1992-2001.

#### **4. Motivations and Policies**

##### **4.1. Motivations for the Policies in the Literature**

The literature acknowledges that the regulatory policies hereby studied can be linked to at least the following five motivations:

### 1. Solvency Risks

In the presence of currency mismatches, exchange rate adjustments modify the domestic currency value of FX liabilities. This can trigger negative effects on banks' balance sheets and, thus, undermine their capacity to meet obligations (Hartmann, 1994; Goldstein and Turner, 2004; Zettelmeyer et. al., 2011; Lee, 2012). Hence, the policies can be used to affect currency mismatches and, thus, help reduce solvency risks.

### 2. FX Liquidity Risks

If banks are exposed to FX liquidity risks, a limit or a requirement on FX positions can account for the maturity of assets and liabilities, contributing to dampen liquidity risks (Goldstein and Turner, 2004; Lee, 2012).

### 3. Exchange Rate Fluctuations

By affecting bank's purchases and sales of FX assets and liabilities, regulatory policies that affect the FX positions of banks can alter their supply of and demand for foreign currency and, thus, potentially also affect exchange rate volatility. The uplift of regulatory policies implemented in the past can allow for the exchange rate to fluctuate more freely (Canales-Kriljenko and Habermeier, 2004).

### 4. Encouraging De-Dollarization to Improve Monetary Policy Transmission

The greater financial dollarization is, the more difficult it is for a central bank to affect liquidity conditions through domestic currency-based conventional monetary policy. Thus, by deterring dollarization, the policies can improve the transmission mechanisms of monetary policy (Ize and Levy-Yeyati, 2003; Rennhack and Nozaki, 2006).

### 5. Encouraging De-Dollarization to Recover the Role of Lender of Last Resort

Financial dollarization dampens the capacity of central banks to act as a lender of last resort. Thus, by deterring dollarization, the policies under consideration can help central banks to fulfil this task (Rennhack and Nozaki, 2006).

#### 4.2. Motivation for the Policies in the Survey

The survey asked national authorities to link the motivations for the policies to management of credit growth, fluctuations in the exchange rate, currency mismatches, maturity mismatches in foreign currency, current account imbalances and/or other items not considered. When choosing the latter option, they had to provide a brief explanation.

Using the responses, we proceed as follows: for each policy, we assign a value of 1 to the item or items that national authorities mentioned in their responses and a value of 0 to those they did not. Then, we take the mean across all policies of the same country and obtain a measure of the intensity with which its policies were linked to each item. Table 8 in Appendix 4 shows that currency mismatches was the item to which the countries linked their policies the most: on average, national authorities mentioned it 51 percent of the times. Argentina, Honduras and Bolivia referred to it the highest number of times, with the former two economies having mentioned only this item.

Fluctuations in the exchange rate, which among the list of motivations from the literature review of 5.1 most likely resembles “Exchange rate fluctuations” ranks second. National authorities referred to it on average 36 percent of the times, with Aruba, Costa Rica, Paraguay and Peru being the countries that mentioned it the highest number of times.

The third place is for maturity mismatches which, among the list of 5.1., most likely resembles “FX Liquidity Risks” and was mentioned, 6 percent of the times. Management of credit growth and current account imbalances were not mentioned and the Central Bank of Bolivia chose the option related to items not considered. It said it had implemented policies to “remonetize the banking system” with the purposes of: a) improving the efficiency of the central bank as a lender of last resort; and b) improving the mechanism transmission of monetary policy. In this sense, its response most like resembles “Encouraging De-Dollarization to Improve the Transmission Mechanism of Monetary Policy;” “Encouraging De-Dollarization to Recover the Role of Lender of Last Resort;” and “Reducing Solvency Risks” within the list of Subsection 5.1.

Let us now consider the periods of Subsection 3.2. For each policy, we assign a value of 1 to the item or items that countries mentioned in their responses and a value of zero to those they did not. Then, we take the mean across all policies for 1992-2001 on one side and for 2002-2012 on the other. Table 9 in Appendix 4 shows that currency mismatches and exchange rate fluctuations are the items to which the countries linked their policies most of the times in each of the two periods.

Moreover, the countries linked the policies to these items more frequently when referring to 2002-2012 than when referring to 1992-2001. They referred to currency mismatches 47 percent of the times in the first case and 56 percent of them in the second one. As for



fluctuations in the exchange rates, the Latin American and Caribbean economies linked their policies to this item round 1.22 times more in 2002-2012 than in 1992-2001 (27 and 33 percent, respectively).

## **5. Relationship with other Macro-policy Measures**

### **5.1. Potential Advantages and Interactions in the Literature**

When referring to the relationship between regulatory policies on FX positions and other macro-policy measures, the literature mentions at least the following three points.

#### **1. Substituting for Monetary Policy in Dampening Imbalances**

To dampen the build-up of financial imbalances, such as maturity mismatches, central banks can tighten monetary policy and/or use regulation on FX positions, among others. The advantage is that this regulation can be tailored to dampen risks in specific sectors or loan portfolios without causing large reductions in economic activity (Lim et al., 2011).

#### **2. Substituting for Monetary Policy in Curbing Credit**

When credit expansions are mostly financed with foreign financial resources, regulatory policies on FX positions can be used to curb its pro-cyclical behaviour, freeing the interest rate to anchor inflation expectations (Park, 2011).

#### **3. Substituting for FX Market Interventions in Avoiding Large and Frequent Fluctuations in the Exchange Rate**

When performing FX market interventions to mitigate appreciations, central banks sell domestic currency. To sterilize these operations, they can withdraw excess liquidity by selling government securities. However, the ensuing rise in the supply of government bonds can increase interest rates, inducing further appreciation pressures (Reinhart and Reinhart, 1998; Magud et. al., 2011). An advantage of the regulatory policies in this context is that they can substitute for FX market interventions in dampening fluctuations of the exchange rate.

### **5.2. Policies and Exchange Rate Flexibility**

The survey shows that currency mismatches and exchange rate fluctuations are the two items to which the Latin American and Caribbean countries linked their policies the most and that this pattern was clearer in the 2000s, precisely when they had more flexible exchange rate regimes. In this context, a natural question is whether these policies were used more intensively in more flexible exchange rate regimes.

When considering the policies linked to currency mismatches, it is useful to learn what the literature says about the relationship between these mismatches and exchange rate flexibility. If, for instance, exchange rate flexibility prompted currency mismatches, one could expect the intensity of use to be higher in more flexible regimes. A strand of the literature argues in this direction, claiming that currency mismatches increase with insurance costs which are higher with exchange rate volatility, and thus potentially also in more flexible regimes (Eichengreen and Hausmann, 1999; McKinnon, 2001). However, a different strand argues in opposite direction (Mishkin, 1996; Obstfeld, 1998; Burnside et al., 2001; Goldstein, 2002; Arteta, 2005). Part of it claims that the commitment to defend a peg makes agents believe themselves immune to FX risk, leading to larger currency mismatches in more rigid regimes.

As for the policies linked to exchange rate fluctuations, one could also argue in opposite directions. As mentioned in Subsection 5.1, these policies can substitute for FX market interventions in affecting exchange rate fluctuations. Thus, one could argue that they will be more intensively used in regimes with larger exchange rate fluctuations, and thus, in more flexible exchange rate regimes. On the other hand, one could argue that these policies facilitate the maintenance of the currency parity in less flexible regimes, providing monetary and international reserve policies with more leeway to meet other goals. All in all, the question of whether the policies linked to exchange rate fluctuations are used more intensively in more flexible regimes remains an empirical question.

To address this question, we use the survey results and proceed in a similar way as in 4.2. For each policy, we assign a value of 1 to the item or items the countries mentioned in their responses and a value of 0 to those that they did not. Then, for each item, we sum up across all policies taken in the same regime and divide the result by the total number of quarters with available information for this regime. This provides a measure of the intensity with which the policies linked to the same item were used in each regime. The results in Table 10 of Appendix 4 shows that the policies linked to currency mismatches and exchange rate fluctuations were used more intensively in the most flexible regimes, i.e., intermediate and floating regimes. For the case of exchange rate fluctuations, Table 10 also shows that the increase in the intensity of use is monotonic with exchange rate flexibility. That is, for these policies, the use is greater in Floating regimes than in Intermediate regimes.

In light of these results, a natural question is whether these policies affected currency mismatches and exchange rate fluctuations. Their impact on currency mismatches are considered in Tobal (2018) and exceed the scope of this paper. The effects of the regulatory policies on exchange rate fluctuations are studied in the following section.

## **6. Empirical Analysis**

### **6.1. Definition of Treatments and Empirical Measure of Exchange Rate Volatility**

We study the impact of policies that, according to the survey, relate to fluctuations in the exchange rate. This approach has the advantage of choosing policies on the basis of countries' responses. Within this set of regulatory measures, we further define two mutually exclusive cases: (i) policies that tend to narrow the range over which FX positions fluctuate; these policies are more likely to diminish the volatility of the demand for and the supply of foreign exchange and therefore to have reduced FX volatility; and (ii) policies that widened this range and therefore are more likely to have increased FX volatility.<sup>12</sup> To provide robustness to the analysis, we complement this first treatment by considering a different set of policies that could have also affected exchange rate volatility. In this robustness check, we study the impact of the VOL DEC and VOL INC policies on the volatility of the exchange rate.

The analysis uses the same measure of exchange rate volatility as Ghosh et al. (2015), that is, a moving standard deviation of monthly percentage changes in the nominal exchange rate for a period of 6 months. Ghosh et al. (2015) combine this measure of exchange rate volatility with information on countries' FX market interventions to analyze macrofinancial vulnerabilities across exchange rate regimes with different degrees of flexibility. In building this measure, we retrieve information on bilateral nominal exchange rates with respect to the US dollar (USD) from Bloomberg. This information was not available for Aruba and ECCU.

### **6.2. Methodology**

Countries that implement prudential policies frequently do it in response to differential outcome trajectories in variables of their own economy, potentially because these trajectories are affected by time-varying country-level characteristics. This complicates the identification of policy impacts since it implies that, even in the absence of the policies, the outcome

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<sup>12</sup> For instance, if a country reduces its limit on long positions but leaves the limit on short positions unchanged, we consider that it reduced the range over which FX positions can fluctuate.

trajectories in the implementing and non-implementing countries would have differed. This is not considered by standard difference-in-difference techniques since these methods do not account for unobservable country-level characteristics that vary over time.

To overcome this concern, we follow Chamon et al. (2017) and Tobal (2018) in using the synthetic control method (Abadie and Gardeazabal 2003). This method controls for time-varying unobservable characteristics by constructing a synthetic unit and by subsequently using the outcome trajectory of this unit as a counterfactual to the prudential policies. The outcome trajectory of the synthetic unit results from assigning a weight ( $\mathbf{w}_j$ ) to the trajectory of each of the countries included in the control group, i.e., non-implementing countries. Importantly, the weights are chosen so that the synthetic unit most closely resembles the treated country in the pre-intervention period; i.e., the vector of weights  $\mathbf{W}$  is chosen so as to minimize  $(\mathbf{X}_1 - \mathbf{X}_0\mathbf{W})'\mathbf{V}(\mathbf{X}_1 - \mathbf{X}_0\mathbf{W})$ , where  $\mathbf{X}_1$  and  $\mathbf{X}_0$  contain pre-intervention values of outcome predictors for the treated and control countries, respectively, and  $\mathbf{V}$  is a diagonal matrix that reflects their relative importance. Hence, when constructing the synthetic unit, this method accounts for differences in outcome trajectories in the pre-intervention period and, thus, for the existence of time-varying unobservable characteristics.

### 6.3. Implementation

The analysis considers an event window comprising the 6 months prior and the 6 months posterior to a policy implementation. The month of the intervention is normalized at  $t = 0$ , so that the event window is given by  $t \in [-6, 6]$ .<sup>13</sup> Just as Abadie and Gardeazabal (2003) and Tobal (2018) do, the outcome variable (exchange rate volatility) is the predictor included in the  $\mathbf{X}_1$  and  $\mathbf{X}_0$  matrices.<sup>14</sup>

In the first treatment, the control group is defined as the set of countries that, during the corresponding event window, neither had a fixed exchange rate regime nor implemented policies linked, according to the survey responses, to fluctuations in the exchange rate. In the second treatment, the control group is the set of countries that, during the event window, neither had a fixed exchange rate regime nor implemented DEC VOL or INC VOL policies.

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<sup>13</sup> A shorter window would have been left fewer pre-intervention months to estimate synthetic weights, while a longer window would have included a larger number of events other than the policy that could potentially determine outcome trajectories of both the treated country and the synthetic unit.

<sup>14</sup> The  $V$  matrix is given by the default option in STATA *Synth* routine. This option chooses  $V$  using a regression that finds the best-fitting  $W$  conditional on this regression.

To evaluate the effect of a policy, we consider the difference between the outcome trajectories of the treated country and that of the synthetic unit after policy intervention. A potential problem is that this difference could be also due to the implementation of other policies or the occurrence of non-considered events. Hence, for each treatment, we also compute average outcome trajectories and compare these means. Specifically, we take the average of our exchange rate volatility measure across treated countries and their synthetic units for different cases. Since the averages are taken for distinct countries and across different points in time, their difference is less likely to have been by specific events.

#### 6.4. Responses to the Survey

##### 6.4.1 The case study of Peru: Higher FX Volatility

Peru was one of the most active countries in implementing the type of policies we consider. One of the earliest measures in our sample took place in 1992, when the Superintendencia de Banca, Seguros y Administradoras Privadas de Fondos de Pensiones (SBS) established a limit on short FX positions for commercial banks equal to 2.5 percent of their capital. According to research by officials from this institution, the objective was to avoid that banks had large losses capital losses due to the depreciation trend of the Sol (Canta et al., 2007). Nevertheless, this seemed no longer to be a threat for the sol by the end of 2003. Thus, the SBS evaluated the possibility of alleviating the regulatory restrictions and, in January of 2004, it increased the limit on short FX positions to 5 percent of banks' capital.

Figure 1 in Appendix 4 shows the trajectories of the exchange rate volatility measure associated with the policy; the solid and dashed lines show the trajectories of Peru and the synthetic unit, respectively. In this figure, the standard deviation of the monthly percentage changes in the exchange rate equals 0.0017 percent in the month prior to the intervention. However, when the intervention took place, this number started to increase until it reached 0.0062 percent. Most importantly, the comparison between the standard deviation measure for Peru and for the synthetic unit shows that that the former measure was greater over the post-intervention period, 0.0035 and 0.0019 percent on average, respectively; that is, a difference of 46 percent.

##### 6.4.2 The case study of Paraguay: Lower FX Volatility

Paraguay faced significant pressures in its FX market triggered by the GFC. The large capital inflows the country had been receiving started to reverse in mid-2008 as the crisis unfolded,

generating a depreciation of the Guaraní. In response to these strains, and to moderate the pressures on the exchange rate, the Central Bank of Paraguay tightened the regulation on long FX positions in October of 2008, taking this limit from 50 to 30 percent of banks' patrimony (IMF, 2009).

The standard deviation of the monthly percentage changes in the exchange rate had a slight increase after the policy took place (Figure 2 in Appendix 4). However, this standard deviation was smaller for Paraguay than it was for the synthetic unit over the post-intervention period (0.046 and 0.060 percent on average, respectively).

### **6.4.3 First Treatment: Average Trajectories**

Both Peru and Costa Rica took policies that, according to the survey responses, were linked to fluctuations in the exchange rate stability over 2000-2012.<sup>15</sup> Specifically, Peru implemented policies of this type in January of 2004 and in March of 2005 while Costa Rica implemented them in September of 2006, July and November of 2007, and May of 2008.

The results show that, as one takes the average for the trajectories associated with all these policies and their synthetic unit, the standard deviation of monthly percentage changes in the exchange rate was larger for the average treated country than for the average synthetic units over the post-intervention period; in particular, this standard deviation was 0.007 percent in the first case and 0.005 in the second one (Figure 3 in Appendix 4). That is, on average, the measure of exchange rate volatility was 29 percent higher.

The policies that acted in opposite direction were taken by Paraguay in October of 2008 and by Peru in February and November of 2010. The results show that these policies reduced, on average, the volatility of the exchange rate; the standard deviation of monthly percentage changes in the exchange rate was 0.019 percent for the average treated country and 0.025 for the average synthetic unit over the post-intervention period (Figure 4 in Appendix 4). This suggests that, on average, the standard deviation in treated countries would have been 34 percent higher.

## **6.5 Robustness Checks: VOL-INC and VOL-DEC Types of Policies**

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<sup>15</sup> For the period prior to 2000 the daily data on bilateral exchange rates are not available for all the Latin American and Caribbean countries considered.

### **6.5.1 VOL-INC: The Case Study of Costa Rica**

In November of 2007 the Central Bank of Costa Rica raised the limit on the daily variation of open FX positions for banks from 3 to 4 percent of their total patrimony. This policy increased the range over which FX positions could vary on a daily basis. After this increase, our measure of exchange rate volatility went from virtually 0 percent to an average of 0.014 percent in the post-intervention period (Figure 5). More importantly, over this period, the volatility of the exchange rate was on average larger for Costa Rica than for the synthetic unit (0.014 and 0.001 percent, respectively).

### **6.5.2 VOL-DEC: The Case Study of Mexico**

In 2001 Mexico adopted an Inflation Targeting (IT) regime, consistent with a low and stable inflation environment (Schmidt-Hebbel and Werner, 2002).<sup>16</sup> In IT regimes the nominal anchor of monetary policy is inflation; in particular, it is not the exchange rate. Thus, in this sense, it is natural to think that some of the regulatory measures that Mexico took at the time attempted to mitigate financial risks associated with adjustments in the exchange rate. This could be the case, for instance, of the prudential measure undertaken in April of 2002, when the central bank of Mexico tightened the limit on open FX positions by shrinking the capital base over which this limit was calculated.

After the measure was taken, the standard deviation of the monthly percentage changes in the exchange rate increased by little; on average, it went from 0.015 percent over the pre-intervention period to 0.016 percent over the post-intervention period. However, the comparison with the counterfactual shows that the reduction in the limit was associated with a reduction in exchange rate volatility; precisely, Figure 6 in Appendix 4 shows that, while the average standard deviation of monthly percentage changes in the exchange rate was equal to 0.016 percent for Mexico after the intervention.

### **6.5.3 Robustness Check Treatment: Average Trajectories**

The VOL INC policies were taken over 2000-2012 only by Costa Rica, in September of 2006, July and November of 2007, and May of 2008. On average, these policies are associated with an increase in exchange rate volatility: during the post-intervention period, the average

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<sup>16</sup> By 2002, Mexico had in place the main ingredients of a pure IT regime including a floating exchange rate, an independent central bank, inflation as the main goal of monetary policy, the absence of other nominal anchors and of fiscal dominance, and conduction of monetary policy within a transparent framework (Schmidt-Hebbel and Werner, 2002).

standard deviation of the monthly percentage changes in the exchange rate were 0.0096 and 0.0061 percent for the treated countries for the synthetic units, respectively (Figure 7 in Appendix 4).

The VOL DEC policies were taken by Costa Rica in October of 2001, by Guatemala in May of 2001 and by Mexico in April of 2002.<sup>17</sup> These policies are associated with a reduction in the volatility of the exchange rate: over the post-intervention period, the mean standard deviation was 0.0072 and 0.0143 in the treated countries and the synthetic units, respectively (Figure 8 in Appendix 4).

## **7. Conclusions**

This paper conducts a survey across seventeen countries from Latin American and Caribbean about the use of limits and requirements on FX positions for 1992-2012. The results suggest that policy-makers' concerns and the implementation characteristics of the regulatory instruments varied considerably across countries. Along with these differences, we observe differences across countries in terms of exchange rate regimes.

Policies motivations seemed to be primarily linked to currency mismatches and fluctuations in the exchange rate. This pattern was clearer for the 2000s than in the 1990s, being the former period the one in which the Latin American and Caribbean countries adopted more flexible exchange rate regimes.

The results of the empirical exercises we perform suggest that the regulatory measures significantly affected the volatility of the exchange rates.

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<sup>17</sup> In December of 2000, the Congress approved the Law for the Free Negotiation of Foreign Exchange in Guatemala, which legalized the use of foreign currency in financial intermediation activities. In this context, the Central Bank of Guatemala established a limit on open FX positions of 20 percent of banks' equity in March of 2001 in an attempt to reduce the exposure of banks to these risks (see the Resolution JM-128-2001 of the Central Bank of Guatemala).



## References

- Abadie, A. and J. Gardeazabal (2003). "The Economic Costs of Conflict: A Case Study of the Basque Country." *American economic review*, 93(1), 113-132.
- Armas, A., and M. Vega (2019). "Peru: Foreign exchange intervention under financial dollarization." In M. Chamon, M. Hofman, N. E. Magud and A. Werner (Ed.). *Foreign Exchange Intervention in Inflation Targeters in Latin America*, International Monetary Fund.
- Arteta, C. O. (2005). "Exchange rate regimes and financial dollarization: Does flexibility reduce currency mismatches in bank intermediation?" *Topics in Macroeconomics*, 5(1).
- Benediktsdóttir, S., G. Feldberg, and N. Liang (2020). "What Macroprudential Policies Are Countries using to Help their Economies through the COVID-19 Crisis?" Brookings Upfront.
- Burnside, C., M. Eichenbaum, and S. Rebelo (2001). "Hedging and Financial Fragility in Fixed Exchange Rate Regimes," *European Economic Review* 45, pp. 1151-1193.
- Canta, M., P. Collazos and M. Shiva (2007). "Límites a las Posiciones de Cambio como Mecanismo de Mitigación del Riesgo Cambiario." *Revista de Temas Financieros*, IV(1), 119-135.
- Canales-Kriljenko, J. I., and K. Habermeier (2004). "Structural Factors Affecting Exchange Rate Volatility: A Cross-Section Study." *IMF Working Paper No. WP/04/147*.
- Chamon, M., M. Garcia, M. and L. Souza (2017). "FX Interventions in Brazil: A Synthetic Control Approach," *Journal of International Economics*, 108, 157-168.
- Cubero, R., V. Lankester, and E. Munoz (2019). "Costa Rica: Learning to Float." In M. Chamon, M. Hofman, N. E. Magud and A. Werner (Ed.). *Foreign Exchange Intervention in Inflation Targeters in Latin America*, International Monetary Fund.
- Eichengreen, B., and R. Hausmann (1999). "Exchange Rates and Financial Fragility." *National Bureau of Economic Research Working Paper 7418* (November).
- Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., and Uribe, M. (2016). Capital control measures: A new dataset. *IMF Economic Review*, 64(3), 548-574.
- Frankel, J. (2010). "Monetary Policy in Emerging Markets." In *Handbook of Monetary Economics*, Vol. 3, pp. 1439-1520.
- Frenkel, R., and M. Rapetti (2010). "A Concise History of Exchange Rate Regimes in Latin America." *Center for Economic Policy and Research*, Washington D.C.
- Ghosh, A. R., J. D. Ostry and M. S. Qureshi (2015). "Exchange Rate Management and Crisis Susceptibility: A Reassessment." *IMF Economic Review*, 63(1), 238-276.
- Goldstein, M. (2002). "Managed Floating Plus." *Policy Analyses in International Economics* 66, Washington, D.C.: Institute for International Economics (March).
- Goldstein, M., and P. Turner (2004). "Controlling Currency Mismatches in Emerging Markets." Peterson Institute Press: All Books.
- Hartmann, P. (1994). "Foreign Exchange Risk Regulation: Issues for Industrial and Developing Countries." *IMF Working Paper No. WP/94/141*.
- Ilzetzki, E., C. M. Reinhart, and K. S. Rogoff (2019). "Exchange Arrangements Entering the 21st Century: Which Anchor Will Hold?" *Quarterly Journal of Economics*, 134(2), 599-646.
- IMF (2009). "Paraguay: 2009 Article IV Consultation-Staff Report." *IMF Country Report No. 09/182*.

- Ize, A., and E. L. Yeyati (2003). "Financial Dollarization." *Journal of International Economics*, 59(2), 323-347.
- Lee, J. K. (2012). "The Operation of Macro Prudential Policy Measures." *Mimeo* (Seoul: Bank of Korea).
- Levy Yeyati, Eduardo and F. Sturzenegger (2010). "Monetary and Exchange Rate Policies," in Rodrik, D. *Handbook of Development Economics*, Elsevier.
- Lim, C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel, and X. Wu. 2011. "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences." *IMF No. Working Paper WP/11/238*.
- Magud, N. E., C. Reinhart, and K. Rogoff (2011). "Capital Controls: Myth and Reality-A Portfolio Balance Approach." *NBER Working Paper.w16805*.
- McKinnon, R. (2001). "The East Asian Dollar Standard, Life after Death?" in Joseph Stiglitz and Shahid Yusuf (eds.), *Rethinking the East Asian Miracle*, World Bank and Oxford University Press.
- Mishkin, F. (1996). "Understanding Financial Crises: A Developing Country Perspective," in Michael Bruno and Boris Pleskovic (eds.), *Annual World Bank Conference on Development Economics 1996*, Washington, D.C., pp. 29-62.
- Obstfeld, M. (1998). "The Global Capital Market: Benefactor or Menace?" *Journal of Economic Perspectives* 12, pp. 9-30.
- Park, Y. C. (2011). "The Role of Macro-Prudential Policy for Financial Stability in East Asia's Emerging Economies." *ADB Working Paper Series*, May.
- Ranciere, R., A. Tornell, and A. Vamvakidis. 2010. "A New Index of Currency Mismatch and Systemic Risk." *IMF Working Paper No. WP/10/263*.
- Reinhart, C. and V. Reinhart (1998). "Some Lessons for Policy Makers Who Deal with the Mixed Blessing of Capital Inflows," in Miles Kahler, ed. *Capital Flows and Financial Crises*, Council on Foreign Relations Book, Ithaca, NY: Cornell University Press, 93-127.
- Rennhack, R., and, M. Nozacki. 2006. "Financial Dollarization in Latin America." *IMF Working Paper No. WP/06/7*.
- Schmidt-Hebbel, K., and A. Werner (2002). "Inflation Targeting in Brazil, Chile, and Mexico: Performance, Credibility, and the Exchange Rate." *Economia*, 2(2), 31-89.
- Tobal, M. (2013). "Currency Mismatch: New Database and Indicators for Latin America and the Caribbean." *Working Paper at CEMLA*.
- Tobal, Martín. (2018). "Currency Mismatch in the Banking Sector in Latin America and the Caribbean" *International Journal of Central Banking*, 14(1), 317-364.
- Zettelmeyer, J., P. M. Nagy, and S. Jeffrey (2011). "Addressing Private Sector Currency Mismatches in Emerging Europe," in *Financial Market Regulation and Reforms in Emerging Markets*. Brookings Institution Press: Washington DC.

## **Appendix Section**

### **Appendix 1: Survey Description**

The survey was split up into five sections, four of them dealt with prudential regulation and capital flow management measures, and the remaining one collected data on FX assets and FX liabilities. We proceed by describing each section.

Section 1 focuses on prudential policies aimed at regulating FX positions. This section requested information about four dimensions of these policies. First, the status of the regulatory measures at the beginning of the sample, set at June of 1992. Second, all the changes that occurred in these measures over the entire sample, spanning from June 1992 to June 2012. Third, the implementation characteristics of the regulatory measures such as, for instance, if limits on foreign currency positions were established as a percentage of banks' capital, and so on. Fourth, how the implementation of these policies was linked to a list of six items. In particular, we asked whether the motivations for the policies were linked to credit growth, exchange rate stability, currency mismatches, maturity mismatches in foreign currency positions, current account imbalances, or other non-listed item. When choosing the option "Other", we requested the officials from the central banks to provide a brief explanation on the side.

Section 2 covered regulatory policies dealing with capital flows such as, for example, taxes, reserve requirements and limits to external assets and liabilities or to capital flows. As in the case of Section 1, the information requested in this section focused on four dimensions of the capital management measures; i.e., their initial status at the beginning of the sample (i.e. June 1992), all their changes until June 2012, their implementation characteristics, and links among the motivations for the policies with a list of six items. In the case of this section, we requested central banks whether the motivations for the policies were linked to capital flows and credit growth, exchange rate stability, the maturity composition of capital inflows, current account imbalances and other motivations. Again, when choosing the option "Other", the section asked for a brief explanation.

Section 3 dealt with FX market interventions and exchange rate regimes. In particular, this section requested the number of operations in the FX market performed by central banks (or the corresponding authority) between 1992 and 2012. In addition, the section requested central banks to identify the exchange rate regime under which these operations were performed and the type of these interventions. Regarding the type of the interventions, the section requested to choose between two options; i.e., Following a Pre-established Rule and Discretionary Interventions. We also requested whether the motivations for the policies were linked to exchange rate volatility and sudden stops, exchange rate volatility and its impact on financial wealth, exchange rate and current account imbalances, exchange rate volatility and other reasons. As in the cases of Section 1 and 2, this last option had to be accompanied by a brief explanation.

Section 4 studied policies aimed at regulating credit and deposits denominated in foreign currency such as, for instance, reserve and capital requirements over these credits/deposits. As in Sections 1 and 2 of the survey, this section requested to identify the initial status of each of these prudential measures at the beginning of the period (i.e. June 1992) and, from that date, to track all the changes in these measures until the end of the sample (i.e. June 1992). We also asked central banks about the implementation characteristics and the links among the motivations for the policies and a list of items. Specifically, we requested whether these motivations were linked to the credit cycle, exchange rate stability, loans to borrowers unhedged from exchange rate variations, current account imbalances and others. A brief explanation had to be provided when choosing the option “Other.”

Finally, Section 5 requested data on foreign currency assets and foreign currency liabilities which was used to construct a comprehensive dataset available only to the cooperating central banks. The data were requested on a quarterly frequency, only for the banking sector (excluding the government), and disaggregated by asset/liability category. For the disaggregation of the data at the category level, central banks were provided with a table listing the categories in which data should be provided. Being aware that the information required is not available for a long period of time, the beginning of the sample was set at the “earliest date for which the data is available.” Furthermore, when the information requested was not available at the quarterly frequency and/or disaggregated by asset/liability type,

central banks were asked to provide the data at the highest frequency available and/or for many categories as possible.

## Appendix 2: Refinements, Consolidation Procedures and a Policy lasting 2 Days

This section describes in detail the policies that were considered as relevant regulatory changes but, rather, as part of refinements and consolidation procedures. Two countries implemented this type of policies: Brazil and Mexico

### **Brazil**

#### Unification of Foreign Currency Positions held in the Two Parallel Markets

The Central Bank of Brazil determined, as from February 1<sup>st</sup> of 1999, to unify FX positions held by banks in the two parallel markets; the positions held by banks in the floating exchange rate market (MCTF) and in the free rate foreign exchange market (MCTL) were unified and calculated as the sum of both. Notwithstanding, this unification did not alter the level of limits on banks' short or long foreign currency positions. Indeed, for instance, the limit on short positions for banks which operated in both markets was set equal to the sum of the limit in the MCTF and the limit in the MCTL in force at the time.

However, this change was part of a more comprehensive policy taken on February 1<sup>st</sup> of 1999. More precisely, the unification of foreign currency positions in both markets was accompanied by the establishment of new limits on long positions; on that date, the central bank tightened these limits both for banks that operated in both markets and for banks that operated only in the MCTF. In this sense, even though the unification did not alter the level of limits and the constraints faced by banks per se, it was considered implicitly as part of a more comprehensive policy that tightened the limits on long positions on February 1<sup>st</sup> of 1999. Since this last policy changed limits on long positions and thus modified bank's constraints, it was considered economically relevant and included in the final set of policies systemized in the present paper.

#### Consolidation of the Rules for Limits on Foreign Currency Positions

On May 25<sup>th</sup> of 1999, there were already in place limits on both short and long foreign currency positions in Brazil. Regarding short positions, the limit was equal to 100 percent of adjusted bank's net worth. The limit on long positions, in turn, was set depending on whether

the bank was authorized or not to operate in the two parallel FX markets existent at that time. In particular, for banks operating in both the MCTF and the MCTL, the excess amount to 6 million US dollars in long positions had to be deposited in the central bank. For banks operating only in the MCTF, this limit was equal to 1 million US dollars.

The Central Bank of Brazil consolidated the rules concerning the abovementioned limits on May 25<sup>th</sup> of 1999. Regarding the limits on long foreign currency positions, for instance, the central bank specified the accounting rules to determine these positions, as well as the rules and conditions under which deposits in the central bank had to be made. As for the limits on short positions, the central bank specified the penalties for not complying with the limits. However, this consolidation procedure did not include any change in the level of limits on foreign currency positions and, as a result, it did not modify banks' constraints. Hence, this regulatory change was not considered economically relevant and it was excluded from the final set of regulatory policies the present paper focuses on.

#### Refinement and Consolidation of the Rules for Reserve Requirements on FX positions

The Central Bank of Brazil introduced, on January 6<sup>th</sup> of 2011, a reserve requirement on short foreign currency positions of banks that exceeded the smaller between 3 billion US dollars and their capital base. This requirement could reach 60% of the excess amount in short positions.

On July 8<sup>th</sup> of 2011, the Brazilian authorities decided to redefine and consolidate the rules regarding these reserve requirements. This redefinition and consolidation of the regulation, however, focused only on the way in which the requirements on short positions were calculated. In contrast to the previous regulation, for instance, this new regulation stipulated that the requirement should be calculated over the five-day moving average of short positions. Given that this regulatory change did not change the level of limits, it did not alter banks' constraints and, therefore, it was not considered economically relevant. Thus, it was not included in the final set of policies.

#### A Policy lasting 2 Days

The Central Bank of Brazil issued a regulation prohibiting short and long foreign currency positions for only 2 days, June 29<sup>th</sup> and 30<sup>th</sup> of 1994. This policy entailed two opposite changes in a very short period of time; i.e., at the end of June 1994 the central bank reduced, first, limits to zero and, then, two days later it increased them to its previous level. Hence, it

is not clear whether the policy taken in June 1994 effectively turned out the limits more restrictive in that month.

## **Mexico**

### **Refinement of Liquidity Requirements for Foreign Currency Operations**

By October 31<sup>st</sup> of 2000, there was already in place a liquidity requirement on foreign currency operations in Mexico. According to this regulation, the weighted sum of foreign currency liabilities with maturity equal to or shorter than 60 days could not be larger than foreign currency liquid assets. In addition, the regulation established that banks' foreign currency liabilities with a maturity equal to or shorter than 60 days could not surpass foreign currency assets of the same maturity. In this sense, the regulation implicitly imposed a limit on short foreign currency positions which involved only short-term components of the balance sheet; i.e., these short positions were not allowed by the regulation.

The Central Bank of Mexico refined this liquidity requirement on October 31<sup>st</sup> of 2000. This refinement changed the way in which the requirement should be determined. In contrast to the previous regulation, for instance, the central bank determined that foreign currency liabilities with maturity equal to or shorter than 60 days that had no corresponding assets of the same or shorter maturity must be entirely matched by liquid foreign currency assets. In addition, the weighted sum of liabilities with maturity equal to or shorter than 60 days that were not covered by liquid or non-liquid foreign currency assets of the same or shorter maturity must be entirely matched by liquid foreign currency assets.

However, the refinement did not change the level of the limit on short positions implicitly imposed by the requirement; short positions which involved short-term components of the balance sheet denominated in foreign currency was still prohibited. In this sense, this regulatory change did not modify banks' constraints and, therefore, it was not considered economically relevant. Moreover, this change in the regulation was implemented on the same date as other policies; i.e., on the same date as the limit on net foreign currency liabilities was established. Given that the refinement of the liquidity requirement on October 31<sup>st</sup> of 2000 was not considered economically relevant and that it was taken on the same date as other regulatory measures, it was excluded from the final set of regulatory policies on which the present paper focuses.

### Appendix 3: Policies with Ambiguous Impact on Long FX Positions

This subsection describes the policies that exerted ambiguous impacts on the FX position of banks and, as a result, were considered in all tables of the manuscript but Table 4.

#### **Argentina, 1992**

Before December 1992, the positive difference between the short global position and the “financial” net sell position was not allowed to exceed the larger between: (i) 5 percent of computable equity capital; and (ii) 15 percent of the non-immobilized own resources. The regulation of December 1992 established that short global positions could not be greater than 25 percent of computable equity, generating two changes relative to 01/12/1992. First, it was no longer allowed to subtract the “financial” sell position from global short positions. This change made the limit more restrictive. Second, since non-immobilized own resources are a component of computable equity, the limit increased in absolute terms. Because the two changes pointed out in different directions, it could not be determined the direction of the change; i.e. if the limit became more or less restrictive. Hence, this policy were not taken into account in the elaboration of Table 4.

#### **Mexico, 2000**

In 31/10/2000 Mexico introduced a limit equal to 1.83 times the Tier 1 capital on net foreign currency liabilities, defined as the positive difference between the sum of foreign currency liabilities weighted by its term and the sum of liquid foreign currency assets weighted by their credit risk. Under this regulation, banks’ foreign currency short positions had to be between zero and the equivalent to 1.83 times their Tier 1 capital (if the bank acquired foreign currency obligations equal to the 183 percent of Tier 1 capital and it did hold liquid foreign currency assets). In this sense, the change in the regulation on 31/10/2000 did not modify the limits relative to the previous regulation. However, by allowing banks to subtract liquid foreign currency assets from their weighted sum of foreign currency liabilities, this policy relaxed the restriction on foreign currency liabilities.



## Appendix 4: Main Tables and Figures

**TABLE 1. CLASSIFICATION OF EXCHANGE RATE REGIMES**

Broad categories for exchange rate regimes (final classification)	Exchange rate regimes initially reported by central banks
Fixed	Fixed
	Hard peg
	Quasi-currency board
Intermediate	Crawling band
	Crawling peg
	Pegged float
	Target zone
Floating	Managed Floating
	Floating

Source: National authorities.

**TABLE 2. TYPES OF POLICIES AND FREQUENCY OF USE**

Policy-type	The policy constrains:	Number of policies	Percentage over total
Long positions	FX assets – FX liabilities	17	36
Short positions	–(FX assets – FX liabilities)	15	32
Open positions	FX assets – FX liabilities	9	19
Short and long positions	FX assets – FX liabilities; –(FX assets – FX liabilities)	6	13

Sources: National authorities and author's calculations.

Notes: The table includes policies that are considered as relevant regulatory changes and that directly affect both the liability and asset side of the FX balance sheet (for details, see Subsection 2.2). Policies are classified based on the relations they constrain in the balance sheet. Policies taken within the same quarter are considered as the same policy.

**TABLE 3. POLICIES INCLUDED IN EACH POLICY-TYPE**

Policy-type	DEC (“Decrease long positions”)	INC (“Increase long positions”)
Regulatory Policies	Establishment of limits and liquidity or reserve requirements on long FX positions; elimination of these limits or requirements on short FX positions; reductions in limits or requirements on long positions; increases in limits or requirements on short positions; policies that imply the latter two options.	Establishment of limits and liquidity or reserve requirements on short FX positions; elimination of these limits or requirements on long FX positions; reductions in these limits or requirements on short FX positions; increases in limits on long FX positions; policies that imply the latter two options.
Policy-type	VOL DEC (“Decrease volatility”)	VOL INC (“Increase volatility”)
Regulatory Policies	Establishment of limits and liquidity or reserve requirements on open FX positions; joint establishment of limits on short and long positions; joint reductions in limits on short and long positions.	Elimination of limits and liquidity or reserve requirements on FX open positions; joint elimination of limits on short and long positions; joint increases in limits on short and long positions.

Sources: National authorities and author's calculations.

Notes: DEC stands for “decrease long FX positions;” INC stands for “increase long FX positions;” VOL DEC stands for “reduce the volatility of long FX positions;” VOL INC stands for “increase the volatility of long FX positions.”

**TABLE 4. TWO-WAY CLASSIFICATION AND FREQUENCY OF USE**

Impact on:		Long FX Positions		Volatility of FX positions	
Relation constrained in balance sheet		DEC	INC	VOL DEC	VOL INC
	Long positions	10	7	0	0
	Short positions	6	7	0	0
	Open positions	0	0	3	6
	Short and long positions	3	1	2	0
	Total	19	15	5	6
	Percentage	42.2%	33.4%	11.1%	13.3%
Country with larger use		Peru <sup>1</sup>	Brazil	Mexico <sup>2</sup>	Costa Rica

Sources: National authorities and author's calculations.

Notes: *DEC* stands for "decrease long FX positions;" *INC* stands for "increase long FX positions;" *VOL DEC* stands for "reduce the volatility of long FX positions;" *VOL INC* stands for "increase the volatility of long FX positions." The table includes policies that are considered as relevant regulatory changes and that directly affect both the liability and asset sides of the FX balance sheet (for details, see Subsection 2.2). Policies taken within the same quarter are considered the same policy. Moreover, two policies considered in Tables 2 are not considered because they introduced new elements in the definition of numerator or the denominator in the limits, so that the net impact of this on long FX positions cannot be determined. As an example, consider the measure by the Central Bank of Argentina in 1992. This central bank raised the limit on short FX positions but, at the same time, shrank the capital base over which this limit was calculated (see Appendix 3 for these policies). /1 Brazil has taken policies of type *DEC* the same number of times as Peru. 2/ Bolivia, Costa Rica, Guatemala and Honduras have taken policies of type *VOL DEC* the same number of times as Mexico.

**TABLE 5. EXCHANGE RATE REGIMES**

Period	Percentage of quarters with:		
	"Fixed" regimes	"Intermediate" regimes	"Floating" regimes
1992-2012	19%	34%	47%
Country with larger spell	ECCU <sup>1</sup>	Costa Rica <sup>2</sup>	Peru <sup>3</sup>

Sources: National authorities and author's calculations.

Notes: /1 Aruba adopted a "Fixed" exchange rate regime for the same spell as ECCU. /2 Bolivia and Honduras adopted an "Intermediate" exchange rate regime for the same spell as Costa Rica. /3 Paraguay adopted a "Floating" exchange rate regime for the same spell as Peru.

**TABLE 6. EXCHANGE RATE FLEXIBILITY OVER TIME (I)**

Period	Quarters with "Floating"	Quarters with available data	Percentage of quarters with "Floating"
1992-2001	159	608	26%
2002-2012	472	743	64%

Sources: National authorities and author's calculations.

Note: The exchange rate systems result from central banks' answers to the survey.

**TABLE 7. EXCHANGE RATE FLEXIBILITY OVER TIME (II)**

Period	Quarters with "Crawling Band, Managed Floating, or "Freely Floating"	Quarters with available data	Percentage with quarters with "crawling band, managed floating" or "freely floating"
1992-2001	147	680	22%
2002-2012	290	748	40%

Sources: Ilzetzki et al. (2019) and author's calculations.

Notes: The exchange rate systems result from Ilzetzki et al. (2019)'s coarse classification.

**TABLE 8. LINK BETWEEN POLICIES MOTIVATIONS AND ITEMS**

	ITEMS					
	Reducing Currency Mismatches	Achieving Exchange Rate Stability	Controlling Credit Growth	Reducing Maturity Mismatches in FX Positions	Correcting Current Account Imbalances	Others
Average for all countries	51%	36%	0%	6%	0%	7%
Countries that pursued the item more intensively	Argentina, Honduras, Bolivia	Aruba, Paraguay, Costa Rica, Peru	--	Colombia	--	Bolivia, Costa Rica

Sources: National authorities and author's calculations.

Notes: The table includes policies that are considered as relevant regulatory changes and that directly affect both the liability and asset sides of the FX balance sheet (for details, see Subsection 2.2). Policies taken within the same quarter are considered as the same policy. For each policy, we assigned a value equal to 1 to the item or items that national authorities mentioned in their responses and a value equal to 0 to those that they did not. Then, we took the mean across all policies corresponding to the same country and obtained a mean per country-item pair. ARG (Argentina); ARU (Aruba); BOL (Bolivia); BRA (Brazil); CHI (Chile); COL (Colombia); CRC (Costa Rica); DOM (Dominican Republic); ECCU (Eastern Caribbean Countries); GUA (Guatemala); HON (Honduras); JAM (Jamaica); MEX (Mexico); NIC (Nicaragua); PAR (Paraguay); PER (Peru) and URU (Uruguay).

**TABLE 9. ITEMS OVER TIME**

Period	Currency mismatches <sup>1</sup>	Fluctuations in the exchange rate <sup>2</sup>	Others
1992-2001	47%	27%	27%
2002-2012	56%	33%	11%

Sources: National authorities and author's calculations.

Notes: The table considers only those policies that are considered relevant regulatory changes and that directly affect both the liability and asset sides of the balance sheet denominated in foreign currency (see Subsection 2.2). Policies taken within the same quarter are considered as the same policy.

<sup>1</sup> The item is to reduce currency mismatches.

<sup>2</sup> The item is to achieve exchange rate stability.

**TABLE 10. ITEMS ACROSS REGIMES**

Exchange rate regime	Frequency of use of policies that pursued		
	Currency mismatches <sup>1</sup>	Fluctuations in the exchange rate <sup>2</sup>	Others
Fixed	0.0000	0.0039	0.0000
Intermediate	0.0216	0.0086	0.0086
Floating	0.0190	0.0127	0.0048

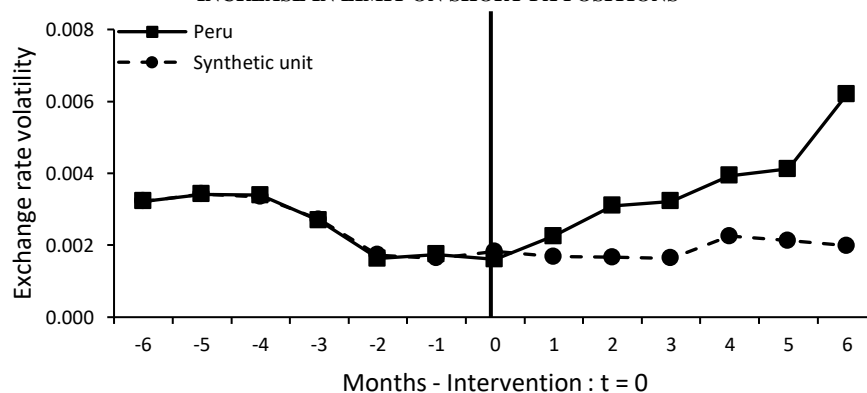
Sources: National authorities and author's calculations.

Notes: The table considers only those policies that are considered relevant regulatory changes and that directly affect both the liability and asset sides of the balance sheet denominated in foreign currency (see Subsection 2.2). Policies taken within the same quarter are considered as the same policy. For each policy, we assign a value of 1 to the item or items the countries mentioned in their responses and a value of 0 to those that they did not. Then, for each item, we sum up across all policies taken in the same regime and divide the result by the total number of quarters with available information for this regime.

<sup>1</sup> The item is to reduce currency mismatches.

<sup>2</sup> The item is to achieve exchange rate stability.

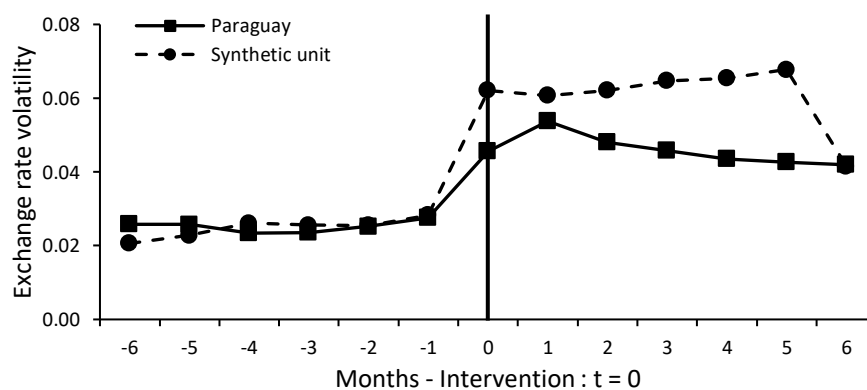
**FIGURE 1. POLICY AND EXCHANGE RATE VOLATILITY IN PERU**  
**PERU: JANUARY OF 2004**  
**INCREASE IN LIMIT ON SHORT FX POSITIONS**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

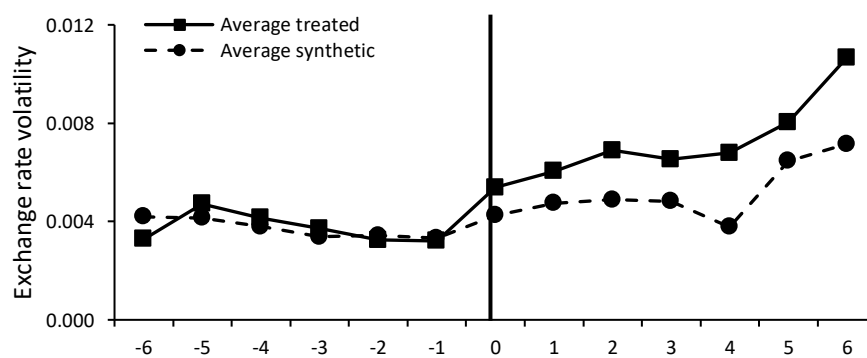
**FIGURE 2. POLICY AND EXCHANGE RATE VOLATILITY IN PARAGUAY**  
**PARAGUAY: OCTOBER OF 2008**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

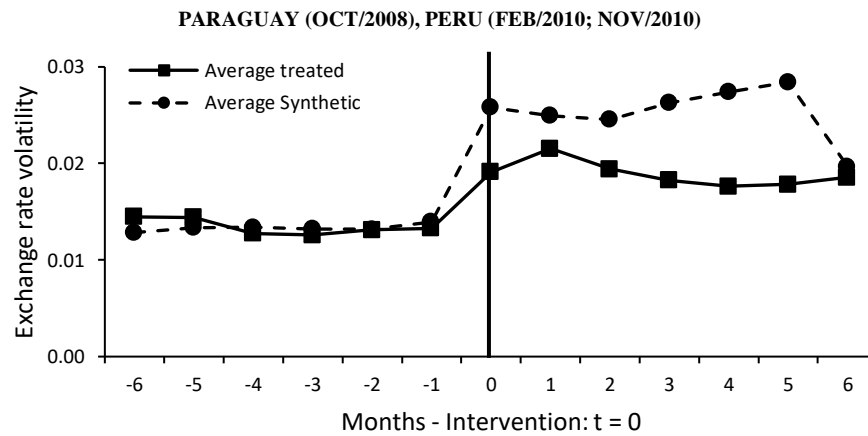
**FIGURE 3 AVERAGE TRAJECTORIES FOR POLICIES IN THE FIRST CASE OF THE FIRST TREATMENT**  
**COSTA RICA (SEPT/2006; JUL/2007; NOV/2007; MAY/2008),**  
**PERU (JAN/2004; MARCH/2005)**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

**FIGURE 4. AVERAGE TRAJECTORIES FOR POLICIES IN THE SECOND CASE OF THE FIRST TREATMENT**

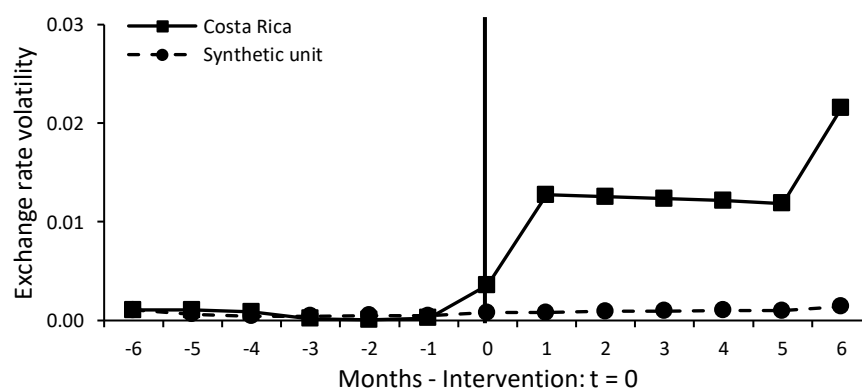


Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

**FIGURE 5. POLICY AND EXCHANGE RATE VOLATILITY IN COSTA RICA**

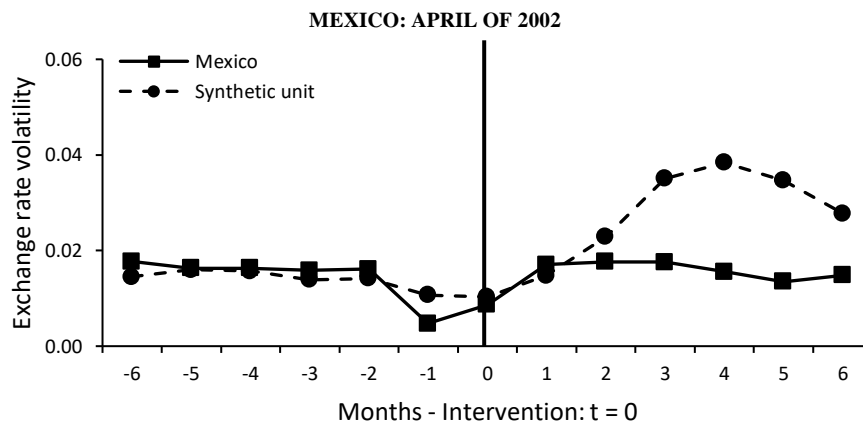
**COSTA RICA: NOVEMBER OF 2007  
INCREASE IN LIMIT ON DAILY VARIATION OF OPEN FX POSITIONS**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

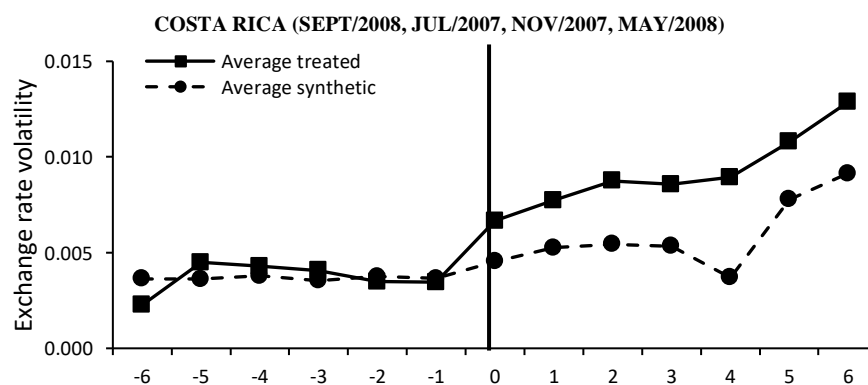
**FIGURE 6. POLICY AND EXCHANGE RATE VOLATILITY IN MEXICO**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

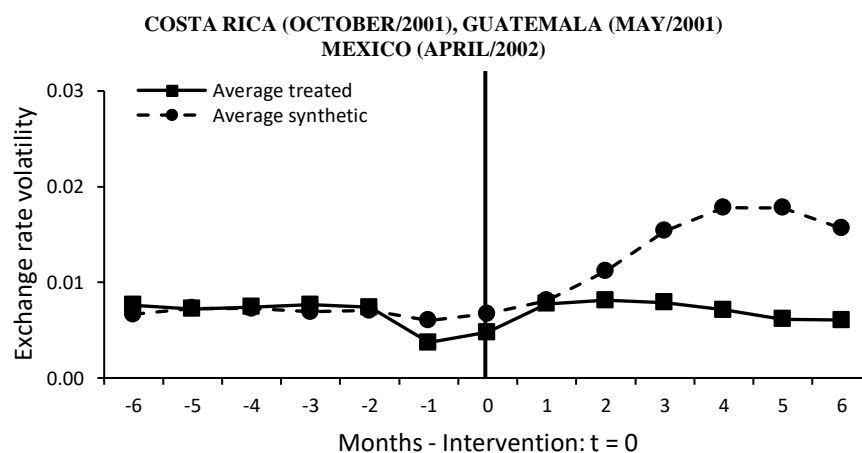
**FIGURE 7. AVERAGE TRAJECTORIES FOR POLICIES IN THE FIRST SUB-TREATMENT GROUP OF THE SECOND TREATMENT**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

**FIGURE 8. AVERAGE TRAJECTORIES FOR POLICIES IN THE SECOND SUB-TREATMENT GROUP OF THE SECOND TREATMENT**



Source: National authorities and author's calculations.

Notes: Exchange rate volatility is computed as the moving standard deviation of monthly percentage changes in the nominal exchange rate over 6 months.

## Appendix 5: Additional Tables

**TABLE A1. COUNTRIES THAT DELIVERED INFORMATION**

Country	Stages of the information collection process	
	First stage	Second stage
Argentina	Yes	Yes
Aruba	Yes	Yes
Bahamas	Yes	No
Bolivia	Yes	Yes
Brazil	Yes	Yes
Chile	Yes	Yes
Colombia	Yes	Yes
Costa Rica	Yes	Yes

Dominican Republic	Yes	Yes
Eastern Caribbean Countries	Yes	No
Ecuador	Yes	No
El Salvador	Yes	No
Guatemala	Yes	Yes
Haiti	Yes	No
Honduras	Yes	Yes
Jamaica	Yes	Yes
Mexico	Yes	Yes
Nicaragua	Yes	Yes
Paraguay	Yes	Yes
Peru	Yes	Yes
Suriname	Yes	No
Uruguay	Yes	Yes
Venezuela	Yes	No

Source: National authorities.