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Capital Controls in Times of Crisis – Do They Work?

Apoorv Bhargava, Romain Bouis, Annamaria Kokenyne, Manuel Perez Archila, Umang Rawat, and Ratna Sahay

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Authorized for distribution by Annamaria Kokenyne
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ABSTRACT: This paper provides an analysis of the use and effects of capital controls in 27 AEs and EMDEs which experienced at least one financial crisis between 1995 and 2017. Countries often turn to using capital controls in crisis: some ease inflow controls while others tighten controls on outflows. A key finding is that countries with pervasive controls before the start of the crisis are shielded compared to countries with more open capital accounts, which see a significant decline in capital flows during crises. In contrast, the effectiveness of capital controls introduced during crises appears to be weak and difficult to identify. There is also some evidence that the introduction of outflow controls during crises is negatively associated with sovereign debt ratings, but that investors may actually forgive with time.

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WORKING PAPERS

Capital Controls in Times of Crisis – Do They Work?

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Executive Summary

Large and sudden capital outflows can pose significant economic and policy challenges to emerging market and developing economies. Facing an imminent crisis, many countries have imposed temporary capital controls on outflows or eased capital inflows to help prevent a free fall of the exchange rate, preserve foreign exchange reserves, and ensure liquidity in their domestic financial system. These measures have afforded countries important breathing space to implement the more slow-moving macroeconomic policies and structural reforms that may be warranted.

Historically, controls on outflows were widely used in the aftermath of the Great Depression but the eventual collapse of the Bretton Woods system was followed by large-scale liberalization of controls in many countries and more gradual opening up in others. Only in recent decades did some countries partly reverse the liberalization in response to financial crises, such as the Asian and the Global Financial Crises. Interestingly, despite exceptionally large capital outflows in a short period, the more recent COVID-19 crisis did not trigger a widespread introduction of capital controls.

The purpose of this paper is to document the inflow and outflow controls introduced in times of crisis, understand the design of such controls, and analyze their macroeconomic effects. To explore these questions, we use a sample of 27 countries which experienced a financial crisis between 1995 and 2017 and account for 63 crises episodes. These include the Asian Financial Crisis of the late 1990s, the Argentinean default of 2001, and the aftermath of the 2008 Global Financial Crisis in the European periphery.

Important contributions of this paper to the literature compared to previous cross-country studies are to systematically distinguish inflow and outflow controls and different types of controls in our econometric analyses as well as those introduced during a crisis versus those already existing before the onset of a crisis. Understanding the nature of such controls and their macroeconomic effects is crucial to understand their effectiveness during crises.

This paper presents several key findings:

First, we find that over half of the countries in the sample (14 of the 27) adjusted capital account restrictions — this included easing of inflow controls and tightening of outflow controls. They tightened restrictions on resident and/or nonresident outflows or eased restrictions on nonresident inflows.

Second, easing of inflow restrictions was mostly implemented in the earlier phase of the episode and large-scale outflow restrictions were usually last resort measures to prevent a mass exodus of capital and the associated exchange rate depreciation. When outflow controls were used, they were often placed on residents and nonresidents.

Third, country authorities relied on a wide variety of controls. Blunt tools such as bans and limits on outflows were imposed during crises. Over time, these blunt measures were softened and finetuned to reduce their distortionary effects, but many of them ended up remaining long after the crisis, despite initially being pitched as temporary. Price-based controls were in turn most often used to ease inflow controls. Other categories included administrative measures, surrender requirements, and mandatory holding periods.

Fourth, striking regional differences existed: In Asian emerging markets (EMs), resident outflows decreased by almost 50 percent during crises compared to non-crisis times, partially mitigating the decrease in inflows from nonresidents. In Latin America, resident outflows continued to be a source of pressure for net flows even during crises.

Fifth, we find that if capital controls were in place before the start of the crisis, they mitigated the negative impact of the crisis on net inflows, providing indirect support for pre-existing capital controls to contribute to financial resilience.

Sixth, neither relaxed controls on inflows nor tightened controls on outflows by residents or nonresidents introduced in response to crises are found to increase nonresident inflows or to curb resident or nonresident outflows. This finding, which is consistent with results of the literature, could reflect the lack of effectiveness of controls introduced in crisis times, or possibly, the severity of the endogeneity issue and the difficulty of robustly estimating a proper reaction function.

Relatedly, an analysis of the effect of outflow controls on sovereign debt rating (Annex 1) indicates a significant negative relationship between the introduction of the outflow controls and the sovereign debt rating. This relationship is however short lived, as it becomes statistically insignificant five quarters after the introduction of the controls, suggesting that capital controls may matter for market perception in the short term, but that investors may actually forgive with time, as suggested by results of a recent investors' survey on market perceptions of capital controls (Sahay et al., forthcoming).

I.   INTRODUCTION

Large and sudden capital outflows can pose significant economic and policy challenges to emerging market and developing economies (EMDEs). Facing an imminent crisis, temporary capital controls on outflows may help prevent a free fall of the exchange rate, preserve foreign exchange (FX) reserves and liquidity in the financial system, and provide breathing space while needed macro-financial policies are implemented.

Historically, controls on outflows were widely used in the aftermath of the Great Depression, as countries faced capital outflow pressures while supporting the gold standard. Cross-border financial transactions were tightly controlled after World War II (WWII), but the eventual collapse of the Bretton Woods system was followed by large-scale liberalization of controls in many countries and more gradual opening up in others. Only in the last decade of the twentieth century did some countries partly reverse the liberalization in response to financial crises (in particular, to the Asian Financial Crisis (AFC)) through tightening capital controls, a phenomenon that would re-emerge in Southern Europe in response to the Global Financial Crisis (GFC) and the subsequent European debt crisis.

Despite exceptionally large capital outflows in a short period, the COVID-19 crisis did not trigger a widespread introduction of capital controls. Indeed, countries mostly responded by easing controls on inflows (China, India, and Peru) and large-scale FX interventions made possible by previously accumulated external reserves to ease exchange rate pressures, even though they could not prevent a drop in gross outflows. The countries that introduced outflow controls were mainly small tourism dependent economies with fixed exchange rate regimes. The continuation of the unprecedented accommodative monetary policies in advanced economies (AEs) led to a swift recovery of capital inflows. Nonetheless, in past crises, countries occasionally introduced or tightened controls on capital outflows.

This paper documents and provides insights on the characteristics and effects of inflow and outflow controls introduced in times of crises, as well as those of pre-existing controls, using a sample of 27 countries that experienced a financial crisis between 1995 and 2017. These countries accounted for 63 crises, according to Laeven and Valencia (2020).

This paper presents several key findings. First, we find that 14 of the 27 countries in the sample responded to the crisis by changing their capital account restrictiveness. Second, countries often eased capital controls on inflows from nonresidents as a first response to a financial crisis, and when outflow controls were used, they were often placed on both residents and nonresidents. Third, countries relied on a wide variety of controls (blunt tools, such as bans and limits on outflows, price-based controls, administrative measures, surrender requirements and mandatory holding periods), many of which ended up remaining long after the crisis, despite initially being pitched as temporary. Fourth, striking regional differences existed: In Asian EMs, resident outflows decreased by almost 50 percent during crises compared to non-crisis times, while in Latin America, resident outflows continued to be a source of pressure for net flows even during crises. Fifth, we find that if capital controls were in place before the start of the crisis, they mitigated the negative impact of the crisis on net inflows, providing indirect support for pre-existing capital controls. Sixth, neither relaxed controls on inflows nor tightened controls on outflows by residents or nonresidents introduced in response to crises are found to increase nonresident inflows or to curb resident or nonresident outflows. This result could either reflect a lack of effectiveness of capital controls introduced in response to crises, or an endogeneity issue. Because countries usually introduced controls on outflows in the acute phase of the crisis, it is hard to identify and separate the effects of these capital controls econometrically, given the severity of the endogeneity issue and the difficulty of robustly estimating a reaction function, as the number of capital controls in the sample was too small. Finally,

we find that the sovereign debt rating was negatively associated with the introduction of outflow controls, but only in the first year of the introduction, suggesting that capital controls may matter for market perception in the short term, but that investors may actually forgive with time, in line with results of a recent investors' survey on market perceptions of capital controls (Sahay et al., forthcoming).

The rest of the paper is organized as follows. Section II offers a brief survey of the literature and provides the context for our study. Section III discusses capital controls in a historical perspective and presents the data and descriptive statistics on capital controls introduced in past crises. Section IV presents results of the econometric analysis of the effects of capital controls on capital flows. Section V concludes.

II. LITERATURE SURVEY

Although multi-country studies on the effectiveness of capital controls are numerous – see Montiel and Reinhart (1999), Kaplan and Rodrik (2002), Gupta et al. (2007), Baba and Kokenyne (2011), Ostry et al. (2011), Ghosh et al. (2014, 2017, 2020), Miniane and Rogers (2007), and Magud et al. (2018), and Basu et al. (2020), these studies find mixed and often contradictory evidence.[1]

One possible explanation for the mixed results of previous cross-country or multi-episode studies is that few studies systematically distinguish between pre-existing controls and controls introduced during a crisis. Moreover, most studies do not distinguish between inflow and outflow controls, which are often deployed for very different reasons. In this paper, we address these issues by identifying from the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) database capital control measures taken in response to crises on inflows and on outflows for residents and nonresidents, while also considering the effects of controls in place before the start of the crisis. Our paper contributes to the literature on the effects of capital controls in crisis times by looking at experiences during the interwar and WWII periods (not covered by the econometric analysis), the AFC, the Argentinean default of 2001, and the aftermath of the GFC in the European periphery.

Individual country crises that involved controls on outflows have been studied extensively, but systematic cross-country comparisons are rare. For instance, the Malaysian introduction of capital controls on outflows in the context of the AFC has been thoroughly analyzed in Ariyoshi et al. (2000), Edison and Reinhart (2000), Dornbusch (2001), Kaplan and Rodrik (2002), Tamirisa (2004), and Epstein et al. (2008). Overall, the literature finds that the Malaysian controls have been effective in eliminating the offshore ringgit market and have been modestly successful in supporting a more rapid economic recovery.

Studies of Argentina's experience with capital controls during the 2001 *corralito* (the economic measures taken by the country at the end of 2001 to stop a run on the banks) have provided mixed evidence. Some analyses found that the suspension of convertibility implied by the controls had been very effective (Samartin et al. 2005), but the country's continued outflows, the economy's poor performance after the sovereign's default, and the resulting protracted crisis serve as cautionary notes. Moreover, although measures were taken to prevent capital flight, nonresident capital outflows remained significant, as investors circumvented the controls through

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[1] Of particular relevance for our study are findings by Gupta et al. (2007) and Ostry et al. (2011) showing that capital controls that were in place before the crises enhanced economic resilience during the crises. More recently Basu et al. (2020) find that preemptive controls on external FX debt can reduce borrowing in FX and thus reduce financial stability risks arising from FX mismatches.

the use of American depository receipts, paying large premiums to exit the country (Auguste et al. 2002; Melvin, 2003).

Recent uses of capital controls in response to the European crises, namely in Cyprus, Iceland, and Ukraine, have been less well-studied, although narratives on individual experiences are documented in Baldursson and Portes (2014), Michaelides (2014), and Baldursson et al. (2017). Of particular interest is the prolonged duration of the controls in Iceland (more than eight years), where addressing the large claims of the creditors of the failed banks was necessary before lifting the controls.

III. HISTORICAL PERSPECTIVE, DATA, AND DESCRIPTIVE STATISTICS

This section discusses capital controls from a historical perspective – focusing on the interwar and WWII periods, the AFC, and the GFC – and presents data and descriptive statistics.

A. Historical Perspective

Historically, countries tended to rely on capital controls during extreme periods of stress. This approach was more common in the run up to and during WWII than in later periods. After WWII, the Bretton Woods international monetary system relied on widespread control of capital flows. Following the collapse of the Bretton Woods system in the early 1970s, most countries began to liberalize their capital accounts, albeit at varying speeds, and prioritizing different types of flows. The AFC of the 1990s and the GFC in 2008 witnessed reversals of this liberalization trend, although they were not as widespread as during the world war periods. In fact, during the GFC most controls were imposed in AEs in Europe.

During the gold standard after WWI, capital flowed freely, especially between AEs (Figure 1). However, with the onset of the Great Depression in 1929, countries started introducing capital controls on outflows, often in the form of exchange controls. The Depression was the first financial crisis in the era of modern economic growth in which a large number of countries responded to balance-of-payments pressures by imposing restrictions on capital movements. As the gold standard started to crumble, countries resorted to large scale capital controls, including Central and Eastern European countries, Iran, Japan, and Latin American countries. In most countries, exchange controls took the form of administrative controls, with the government centralizing exchange dealings, setting official exchange rates, and hindering the transfer of capital abroad by private citizens to stop capital flight and curb speculation. Governments also took control of export proceeds (Ellis, 1942). Some controls were rather extreme, such as the requirement in Japan in 1937 for residents to sell their external assets and deposit them with the Bank of Japan. Similar measures were put in place in the United Kingdom during the two world wars and nonresidents had to put their proceeds from the sale of their investments in blocked accounts. During the WWII, national security called for additional controls on capital flows in several countries.

In terms of the effectiveness of capital controls, previous research has found that the abandonment of the gold standard sped up the recovery from the Great Depression (Choudhri and Kochin, 1980; Eichengreen and Sachs, 1985; Campa, 1990) and that imposing capital controls offered some relief from "golden fetters" (Eichengreen, 1995; Obstfeld and Taylor, 1998). Mitchener and Wandschneider (2015) find that controls stemmed gold outflows in the year following their imposition. However, they also find that real economic outcomes in terms of industrial production, prices, and exports in countries that imposed strict controls were similar to those of countries that went off the gold standard and floated.

Figure 1. Net Capital Flows to Selected Countries

Source: Ghosh et al (2020).
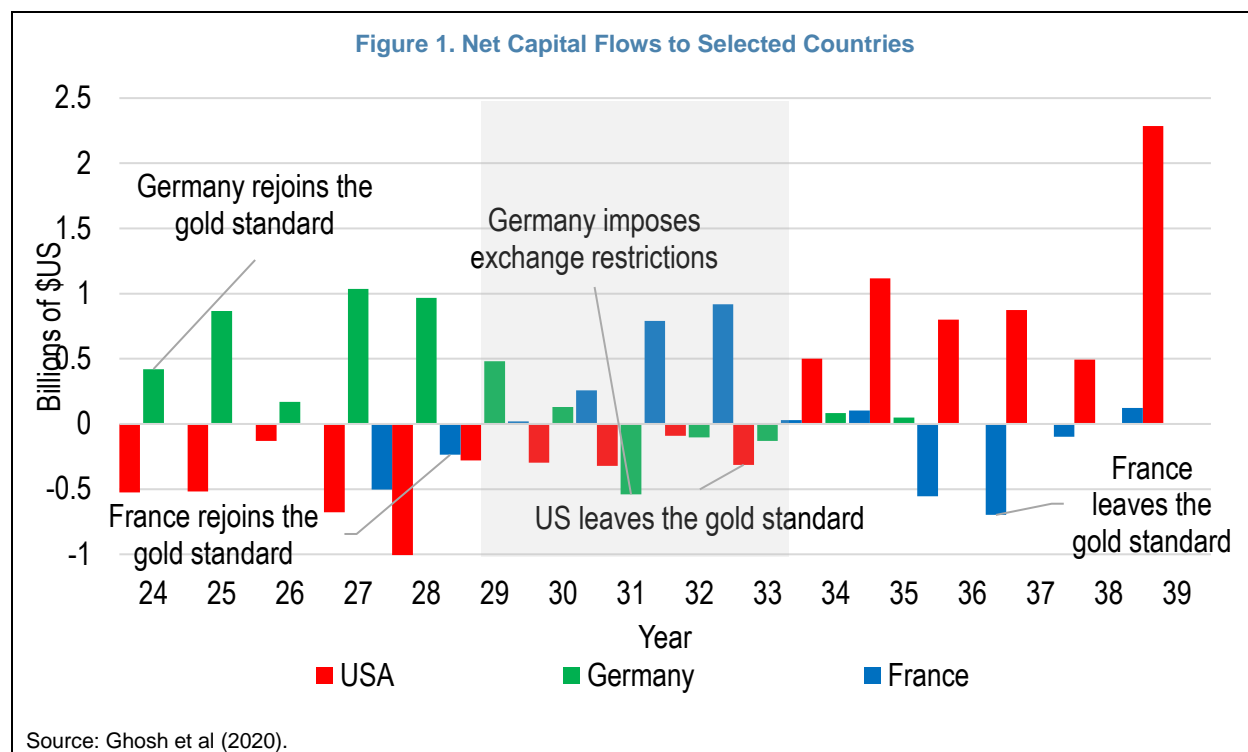
Note: Based on data available from 1927-38 (France), 1924-35 (Germany), and 1924-39 (United States).

A broad international agreement was in place to regulate cross-border capital flows during the Bretton Woods era in the post-WWII period. Controls (on inflows and outflows) were embedded in the new architecture of the international financial system, and as such were not used specifically to respond to financial crises, which, as it turned out, were less common. It was not until the 1970s and the 1980s following the collapse of the Bretton Woods system, that the global discourse on capital controls shifted, leading to a widespread liberalization of capital accounts that reached its pinnacle during the 1990s. The widespread liberalization of the capital accounts and the expansion of global financial markets coincided with financial crises becoming more common. These financial crises prompted a rethink of and, in many cases, a (re)imposition of capital controls.

During the AFC (1997-98), capital control responses varied widely across countries (Figure 2). Some countries, such as Korea, responded by easing their pre-existing controls on nonresident inflows. Other countries, such as Malaysia and Thailand, tightened outflow controls on residents and nonresidents. Finally, such countries as China and India were able to shield part of the shock through their pre-existing controls but slowed the liberalization of their capital accounts in response to the shock of the AFC.

During the GFC (2008-09), few capital controls were introduced in EMDEs. Most financial crises occurred in Europe. Countries in severe distress, such as Iceland and Ukraine, imposed controls on resident and nonresident outflows (Figure 3). In both countries, sweeping measures restricting outflows and inflows (mainly to prevent circumvention of outflow controls) were introduced and lasted a long time. Cyprus also imposed wide-ranging controls, although for a shorter period.

Figure 2. Net Nonresident Inflows to Asian Economies during the AFC

Sources: IMF FFA database and authors' calculations.
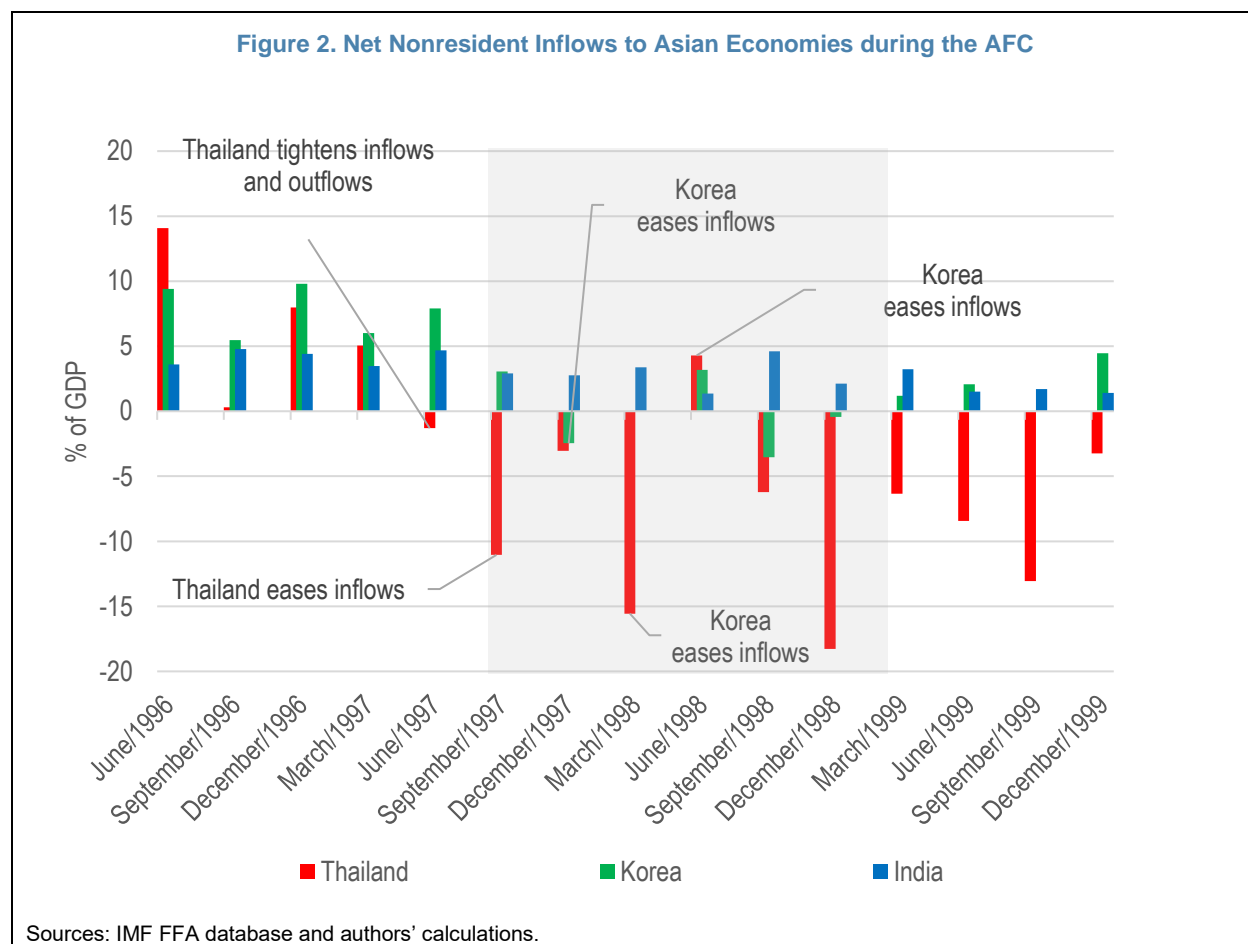
In Iceland, previously existing assets of nonresident investors were locked in krona-denominated accounts, while caps were introduced on new lending to and borrowing from nonresidents and portfolio investments abroad. The use of krona in cross-border transactions became restricted and investors were required to reinvest their proceeds in certain local financial instruments to avoid capital flight. Baldursson and Portes (2014) and Baldursson et al. (2017) argue that the capital controls were necessary, if painful, in engineering the Icelandic recovery. In particular, Baldursson and Portes (2014) contend that the Icelandic capital controls were necessary for a prolonged period of time because "significant restructuring of domestic holdings of foreign creditors of the old banks was required before capital controls could be lifted; even if the controls are damaging, the gains from lifting them were likely to be much lower than the costs associated with a potential currency crisis following a premature liberalization of capital outflows."

In Ukraine, the transfer of nonresidents' profits and income from investments was restricted by implementing a mandatory five-day delay. Strict limits were imposed on resident and nonresident individuals' FX purchases and transfers, and residents were not allowed to have overdrafts on their foreign currency payments cards to shield the banking sector and reduce parallel market activity. Residents were prohibited from purchasing foreign currency to service their external debt before the debt came due and banks were banned from lending in foreign currency to resident individuals or nonresidents except banks. The period for the repatriation of export proceeds was reduced to 90 days to increase liquidity in the banking sector. To encourage FX inflows, the reserve requirement for funds received by banks from nonresidents was reduced. There was some circumvention, but the controls appear to have provided the needed breathing space to the authorities to

restore macroeconomic and financial stability as part of their IMF-supported programs. Eventually, controls introduced during the crisis as well as some imposed before the crisis were removed.

The Cypriot case of imposing and maintaining controls was shorter, albeit equally dramatic given that the imposition of capital controls within the euro area amounted to an effective devaluation of the euro within Cyprus. Michaelides (2014) studies the imposition of the controls in the context of the bail-in agreement reached in March 2013, which led to a bank holiday of 11 working days, the temporary introduction of cash withdrawal limits, and strict ceilings on transfers within the country and abroad. The controls were gradually eased and then lifted within two years of their introduction. These controls, including the cash withdrawal restrictions, were harsh, but they appear to have helped support the necessary macroeconomic adjustments and financial sector reforms, including the restructuring of the banking sector, by maintaining liquidity in the banking system until depositors' confidence returned.

Most EMDEs, on the other hand, did not impose capital controls in response to the GFC, despite facing significant outflows in its early phase. These outflows began to reverse with the large-scale easing of monetary policies in AEs. In many cases, the repatriation of residents' assets abroad also helped attenuate capital outflows, signaling an increasingly important role for resident flows (Kruger and Pasricha, 2016).

Figure 3. Net Nonresident Inflows to Selected European Countries in Crisis during the GFC

Sources: IMF FFA database and authors' calculations.
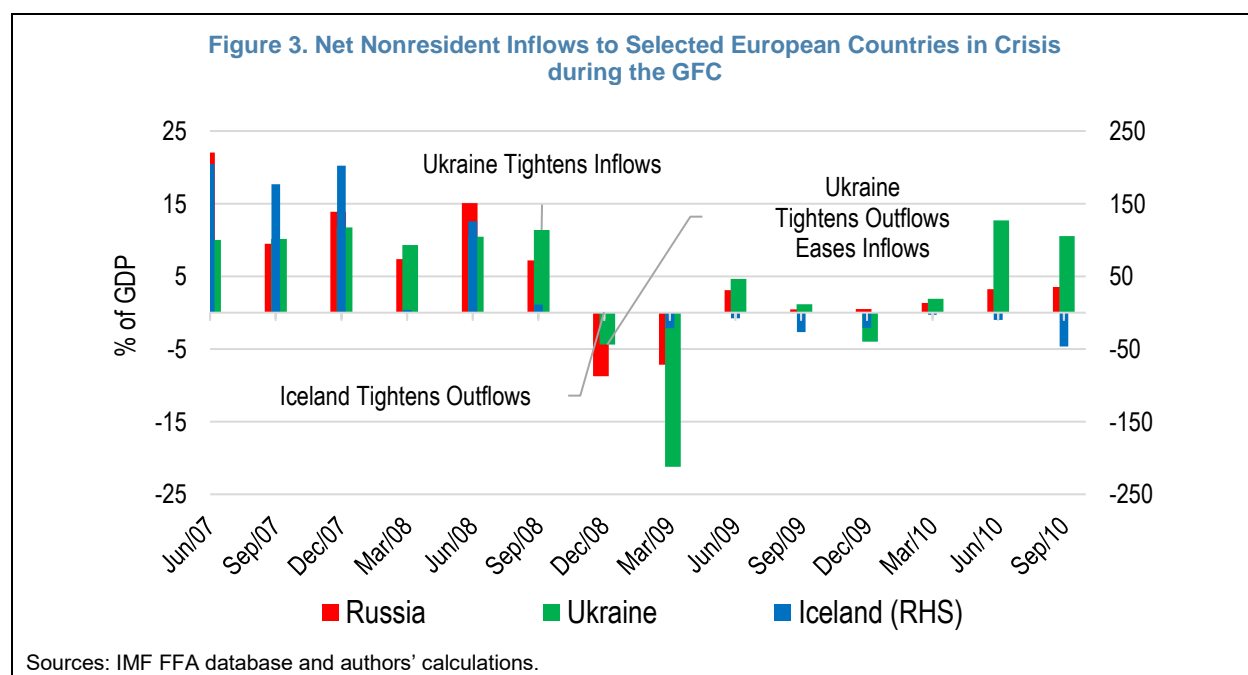
B. Data and Descriptive Statistics

The initial sample of the empirical analysis is composed of 41 AEs and EMDEs, over the period 1995-2017.[2] Among these 41 countries, we selected countries that had experienced a financial crisis (banking, currency, and/or sovereign debt) since 1995 based on Laeven and Valencia's (2020) database, and collected information on capital controls that were adjusted (easing controls on inflows of nonresidents and tightening controls on outflows of residents and/or of nonresidents) in response to crises from the AREAER database and from the

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[2] Argentina, Australia, Bangladesh, Bolivia, Brazil, Canada, Chile, China, Colombia, Cyprus, Egypt, Germany, Ghana, Iceland, India, Indonesia, Israel, Japan, Kazakhstan, Kenya, Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Peru, Philippines, Poland, Romania, Russia, Singapore, South Africa, Switzerland, Tanzania, Thailand, Türkiye, Ukraine, United States, Uruguay, Vietnam.

literature. We checked each capital control manually to distinguish between pre-existing controls and those that were imposed in response to the crisis. Quarterly data on total nonofficial capital flows (in percentage of GDP) are sourced from the IMF BOP database.

Of the 41 countries included in the sample, 27 experienced a financial crisis in the period 1995–2017 (Appendix Table 1). Only 14 of these 27 countries adjusted capital controls when hit by a crisis – tightening restrictions on resident and/or nonresident outflows or easing restrictions on nonresident inflows (Appendix Table 2).[3,4] Easing of inflow restrictions was mostly implemented in the earlier phase of the episode to attract more nonresident inflows and prevent the crisis from starting or worsening. However, evidence from severe crises (e.g., Cyprus and Iceland in the wake of the GFC) suggests that large scale outflow measures were usually deployed as measures of last resort to prevent a mass exodus of capital and the associated exchange rate depreciation.

Figure 4 shows the use of capital controls during 24 crisis episodes in 14 countries. In seven crisis episodes, outflow capital controls were introduced on residents and nonresidents. In four cases, only controls on nonresident outflows were tightened: during Ukraine's 1998 banking, currency, and sovereign debt crisis; and during the currency crises of the Philippines in 1998, Ukraine in 2009, and Argentina in 2013. In all four cases, tight pre-existing outflow controls on residents were in place, which could explain why only nonresident outflows were tightened. In five cases, countries tightened outflow controls and eased pre-existing controls on nonresident inflows. Finally, in eight crisis episodes, the only capital flow management policy response was to relax inflow controls.

Figure 4. Use of Capital Controls during 24 Crisis Episodes in 14 countries

	Resident and nonresident outflows tightened	Only nonresident outflows tightened	Outflows (resident or nonresident) tightened and nonresident inflows eased	Only nonresident inflows eased
No. of crisis episodes	7	4	5	8
No. of countries*	7	2	4	7

Sources: IMF AREAER database and authors' calculations.

Note: * The number of countries may not add up to 14 because a country can experience multiple crisis episodes and implement different controls.

Figure 5 indicates that country authorities relied on a wide variety of controls. Bans and limits were common when tightening outflow controls because broad and blunt measures were implemented at the outset to

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[3] There are no measures easing controls on inflows of residents in response to a crisis as controls on resident inflows are rarely used.

[4] The 13 countries that did not use outflow controls or did not ease controls on inflows in response to a crisis show heterogenous profiles. They include advanced economies with open capital accounts usually considered to be safe havens, such as Germany, Japan, Switzerland, and the United States but also EMDEs with relatively closed capital accounts like Egypt, Ghana, Kazakhstan, Nigeria, Uruguay, or Vietnam.

increase effectiveness. Later, these blunt measures were often fine-tuned to adjust to changing conditions and reduce their distortionary effects. Price-based controls, that were more targeted and often difficult to adequately calibrate for outflows were most often used to ease inflow controls. Other categories include administrative measures, surrender requirements, and mandatory holding periods. Bans on inflows were rarely lifted during crisis episodes, reflecting that countries tended to remove "walls" only as a part of a broader liberalization of the capital account, while they tended to ease "gates" to attract nonresident inflows during stress periods.

Figure 5. Capital Controls in Crisis Episodes by Type of Instrument and Coverage of Assets (1995-2017)[5]

Sources: IMF AREAER database and authors' calculations.
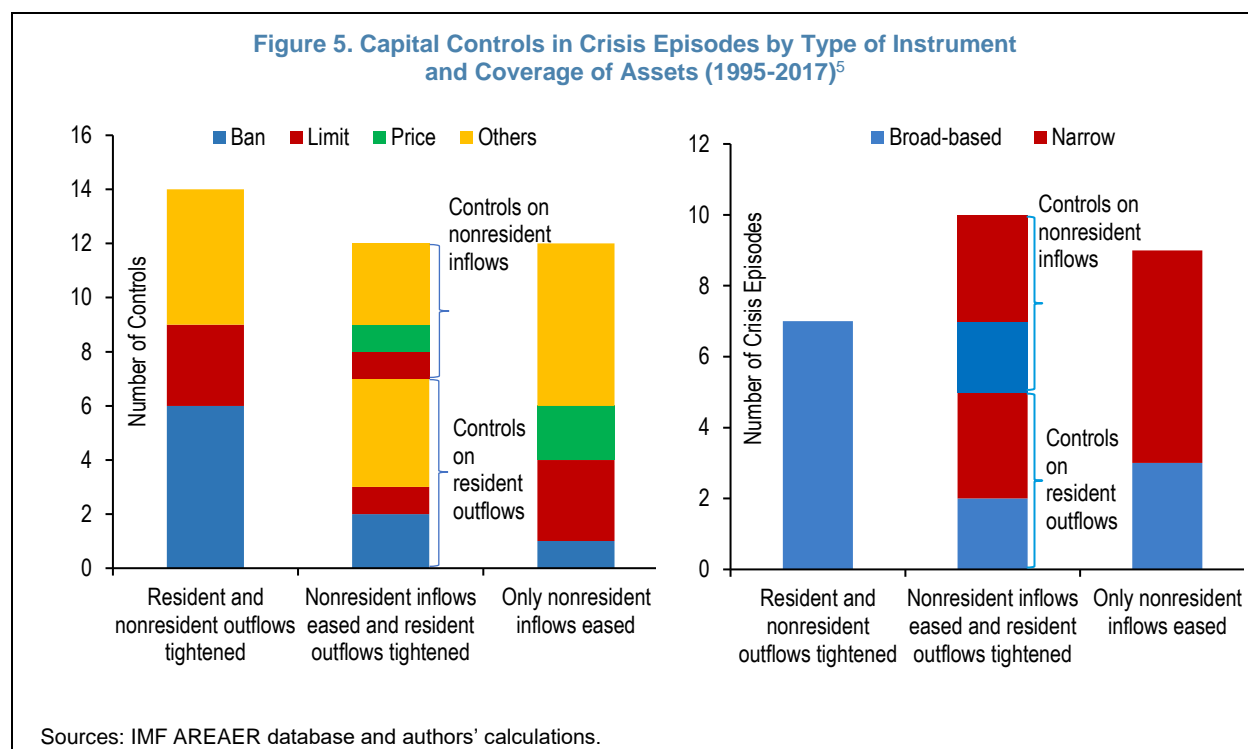
Moreover, although initially pitched as temporary, many of these controls ended up remaining long after the crisis (Figure 6). In line with Baldursson et al. (2017), we find that the Icelandic experience was not an outlier, as controls on outflows introduced during crises remained in place well beyond the duration of the initial downturn. Also, even if in some cases controls were eased relatively soon (e.g., the limits on transfers abroad from Cyprus were raised some weeks after their imposition), their full removal could take several years.

Figure 6. Duration of Capital Controls on Outflows

Sources: IMF AREAER database and authors' calculations.

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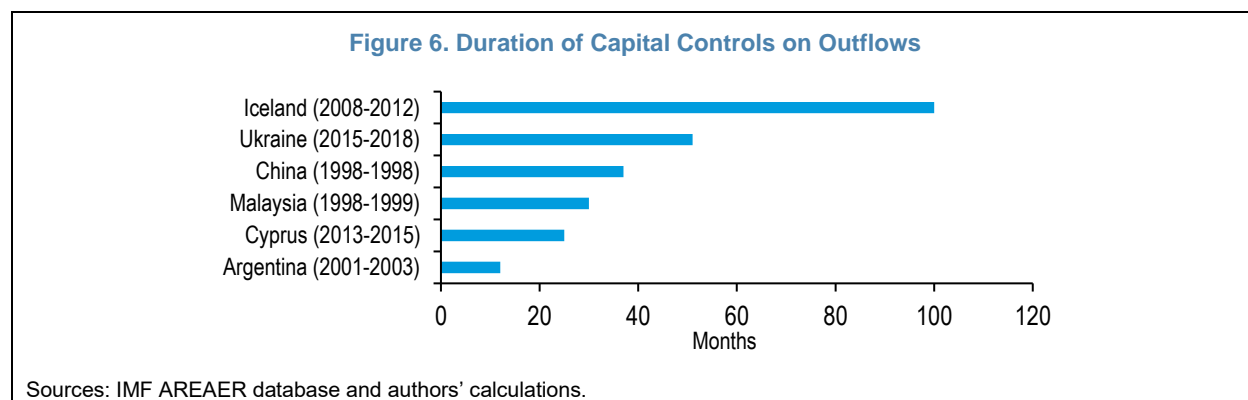
[5] Ukraine (1998q3) and Argentina (2013q4) tightened nonresident outflows only which are not added to the chart for simplicity.

Additionally, interesting patterns on nonresident and resident flows can be discerned in Figure 7. Nonresident inflows to EMs were lower and more volatile during crises than during normal times. Resident outflows from EMs also tended to decrease during crises, although to a lesser degree, signaling the drying up of capital for external investments and reducing the magnitude and volatility of the net flows.

Figure 7. Average Capital Flows to EMEs during and outside Crisis Episodes

Sources: IMF BOP database and authors' calculations.
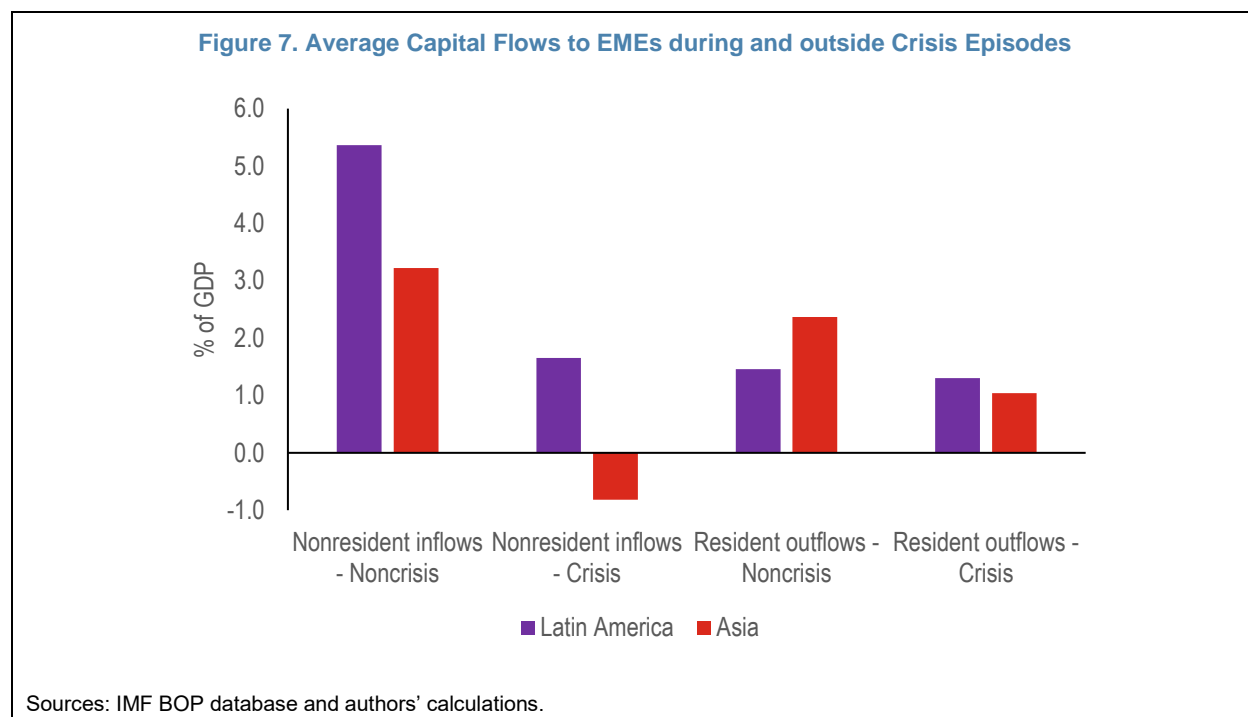
Furthermore, some regional differences are worth pointing out: Although the decrease in nonresident inflows during crises was of similar magnitude across regions, resident outflows behaved differently. In Asian EMs, resident outflows decreased by almost 50 percent during crises compared to non-crisis times, partially mitigating the decrease in inflows from nonresidents. However, in Latin America, resident outflows continued to be a source of pressure for net flows, even during crises. This could be explained in part by the higher frequency of financial crises experienced in Latin America since WWII as compared to Asia, which created incentives for Latin American residents to park their savings in "safe havens" abroad.[6]

Finally, it is also of interest to consider the average pre-existing level of controls for each of the crisis episodes. Figure 8 shows the average Fernández et al. (2016) capital account restrictiveness index in the year before the start of the crisis episode. Overall, countries that did not adjust capital controls (maroon bars) during the crisis had on average, more liberalized capital account regimes than those that did (blue bars). This difference might suggest that countries that had largely liberalized their financial account were more reluctant to reverse their stance, while the scope for further easing inflow controls was limited. Second, countries that tightened controls on nonresident outflows had similar levels of capital account restrictiveness as those that tightened controls on resident flows. Third, countries that eased controls on nonresident inflows had the highest levels of capital account restrictiveness relative to other groups. The latter might be explained by the fact that the scope for easing controls (and thus attracting inflows) was the highest in those countries that had the most restrictions and the scope for further tightening controls on outflows may have been more limited. Finally, the 13 countries

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[6] Nonresident net inflows are here defined as nonresident inflows minus outflows, also commonly known as gross inflows. Resident net outflows are defined as resident outflows minus inflows, also known as gross outflows. The difference between gross inflows (nonresident net inflows) and gross outflows (resident net outflows) is referred to as net inflows.

that did not experience any crises (green bars) had similar low levels of restrictiveness as those that had a crisis but chose not to impose controls. However, these averages mask considerable heterogeneity, as suggested by individual crisis episodes plotted in Appendix Figures 1 and 2.

Figure 8. Average Pre-existing Level of Capital Account Restrictiveness during 50 Crises Episodes in 27 Countries

	Tightening control on nonresident outflows	Tightening control on resident outflows	Easing control on nonresident inflows	No controls	No crisis
No. of countries*	9	4	5	13	14

Capital Account Restrictiveness (vertical axis 0.0 to 1.0)

Sources: Fernández et al. (2016) and authors' calculations.

Note: The chart plots the average of the pre-existing controls across crisis episodes based on the value of the Fernández et al. (2016) indices *ka* in the year preceding the crisis, which vary between zero (the least restrictive) and 1 (the most restrictive). For crisis episodes during 1995 (the start of the sample) the value of the index during the year of the crisis is used. The episodes are categorized according to the "harshest response", where restricting outflows by nonresidents is the harshest, followed by restricting resident outflows and finally easing nonresident inflows. For countries in the sample that saw no crises, the average level of their capital account restrictiveness in the sample 1995-2017 is used. See Appendix Figures 1 and 2 for more details. *The number of countries that introduced controls is higher than 14 since some countries experienced multiple crisis and introduced different types of controls.

IV. ECONOMETRIC ANALYSIS

This section investigates the effect of capital controls on nonresident net capital inflows and on resident net capital outflows during crises. We distinguish between capital controls implemented in response to crisis versus those that were pre-existing and generally reflect the restrictiveness of capital accounts.

A. Empirical Approach

Capital controls implemented in response to crises considered in the analysis are linked to the type of investor (resident, or nonresident, or sometimes both), but not to the type of asset. The dependent variable is the total

nonresident (or resident) net capital inflows (or outflows), covering all categories of assets. It is assumed that a control on a specific type of asset, e.g., on FX derivatives or on bank loans, can affect flows at the macroeconomic level in the same direction, despite possible substitution effects between flows of assets of different types.[7] More specifically, we estimate the following dynamic panel regression with quarterly data:

$$NCF_{i,t} = \beta_1 NCF_{i,t-1} + \beta_2 Crisis_{i,t} + \beta_3 Nonresident\,Restriction_{i,t-4}$$

$$+\beta_4 Nonresident\,Restriction_{i,t-4} \times Crisis_{i,t} + \sum_{l=0}^{4} \beta_{5,l} Intro\ Control\ Nonres\ Outflows_{i,t-l}$$

$$+\sum_{l=0}^{4} \beta_{6,l} Intro\ Control\ Res\ Outflows_{i,t-l} + \sum_{l=0}^{4} \beta_{7,l} Intro\ Eased\ Control\ Nonres\ Inflows_{i,t-l}$$

$$+\beta_8 \log\left(Reserves/GDP\right)_{i,t-4} + \beta_9\left(Private\,Debt/GDP\right)_{i,t-4} + \beta_{10}\left(Public\,Debt/GDP\right)_{i,t-4}$$

$$+\beta_{11} Diff\,GDP\,growth_{i,t-1} + \beta_{12} Diff\,IR_{i,t-1} + \alpha_i + \gamma_t + \varepsilon_{i,t}, \tag{1}$$

where *NCF* is the nonresident net capital inflows (that is nonresident inflows minus outflows) in percentage of GDP; *Crisis* is a dummy variable equal to 1 if the country is experiencing a crisis in quarter *t* (banking, currency, or sovereign) according to Laeven and Valencia (2020) database and is expected to reduce *NCF*; and *Nonresident Restriction* is the Fernández et al. (2016) overall inflow restriction index (on all asset categories) lagged by four quarters and used as a proxy of pre-existing capital controls on nonresidents, also expected to negatively affect *NCF*.[8] *Intro Control Nonres Outflows* (*Intro Eased Control Nonres Inflows*) is a dummy variable equal to 1 in the quarter when a tightening (easing) measure on control on nonresident outflows (on nonresident inflows) is introduced in response to a crisis and should reduce (support) *NCF*.[9] Likewise, *Intro Control Res Outflows* is a dummy variable equal to 1 in the quarter when a tightening measure on resident outflows is introduced in response to a crisis. This latter variable is introduced in the regression as it may indirectly dampen nonresident flows through a negative signaling effect: If a country introduces controls on resident outflows, nonresident investors may infer that this country will also introduce controls on nonresident transactions in a near future, reducing their willingness to invest there. Because the effects of controls may take time to materialize, introduction dummies of outflow and inflow capital controls enter the regression contemporaneously and with lags from one to four quarters.

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[7] Following the introduction of a control on a specific asset type, substitution effects between flows of different types of assets could be observed. For instance, a control restricting nonresident bank loans to domestic companies could lead to an increase in nonresident purchases of bonds issued by domestic firms. However, the net effect of the introduction of the control should be negative at the macroeconomic level because the substitution effect might not be large enough (e.g., lower nonresident bank loans cannot be fully substituted by larger bond issuances as some firms do not have access to the bond market), because of complementary effects (some FDIs for instance require bank financing and should therefore be indirectly affected by restrictions on nonresident bank financing), or due to some signaling effects (a control restricting flows on a specific asset type could signal future restrictions on other asset categories, deterring investors from investing in the country).

[8] The Fernández et al. (2016) restriction index varies from 0 to 1, with higher values denoting more restrictions on capital account transactions.

[9] We also consider two alternative definitions of our capital control variables. First, the variable of capital controls on inflows or outflows is taking the value one in the quarter it is introduced and in subsequent quarters of the crisis. Second, the variable of capital controls is taking the value one in the quarter it is introduced until the *N*-1 quarter it is removed (or until the end of the sample if still in place). One limitation of this third approach is that it does not allow to estimate the effect of measures whose introductions are separated by a few quarters. Results (not reported) are anyway qualitatively similar whatever the approach considered.

Several push and pull factors used in the literature are considered as control variables. FX reserves as a share of GDP reflects the capacity of a country to support domestic currency and should be positively associated with nonresident net inflows. The variable, which enters the regressions with a four-quarter lag to limit reverse causality, is expressed in log, as some observations exhibit very high values and the effect is hypothesized to be non-linear. Private and public debts, as a share of GDP are proxies for macroeconomic vulnerabilities and are expected to be negatively associated with nonresident net inflows (these variables are also considered with a four-quarter lag to limit reverse causality). *Diff GDP growth* and *Diff IR* are respectively, the real GDP growth differential and the interest rate differential between country i and the United States, both lagged by one quarter. These two variables should positively explain *NCF*. α_i and γ_t are country and time fixed effects, respectively.

In alternative regressions, we consider the interaction between the crisis dummy and a dummy variable (lagged by four quarters) taking the value of 1 if the capital restriction index of a given country in a given quarter is above the sample median (observations with high restrictions on capital account transactions).

A similar regression is estimated for resident net outflows, in which the introduction of capital controls on outflows is specifically targeted at outflows by residents, but also nonresident transactions to capture possible signaling effects:

$$RCF_{i,t} = \beta_1 RCF_{i,t-1} + \beta_2 Crisis_{i,t} + \beta_3 Resident\ Restriction_{i,t-4}$$

$$+\beta_4 Resident\ Restriction_{i,t-4} \times Crisis_{i,t} + \sum_{l=0}^{4} \beta_{5,l} Intro\ Control\ Res\ Outflows_{i,t-l}$$

$$+\sum_{l=0}^{4} \beta_{6,l} Intro\ Control\ Nonres\ Outflows_{i,t-l} + \sum_{l=0}^{4} \beta_{7,l} Intro\ Eased\ Control\ Nonres\ Inflows_{i,t-l}$$

$$+\beta_8 \log\left(Reserves/GDP\right)_{i,t-4} + \beta_9\left(Private\ Debt/GDP\right)_{i,t-4} + \beta_{10}\left(Public\ Debt/GDP\right)_{i,t-4}$$

$$+\beta_{11} Diff\ GDP\ growth_{i,t-1} + \beta_{12} Diff\ IR_{i,t-1} + \alpha_i + \gamma_t + \varepsilon_{i,t}, \tag{2}$$

where *RCF* is the resident net capital outflows (that is resident outflows minus inflows) in percentage of GDP. The variable of easing controls on resident inflows is not included as such measures are not present in the sample. The Fernández et al. (2016) restriction index, the variable *Resident Restriction*, is the overall outflow restriction index (on all asset categories) summarizing all restrictions on resident flows already in place a year before the start of the crisis and should be negatively related to *RCF*. *Intro Control Res Outflows* should limit capital outflows of residents and therefore reduce *RCF*. *Intro Control Nonres Outflows* might instead signal to residents possible restrictions on their outflows in a near future, increasing today their net outflows *RCF*. The impact from *Intro Eased Control Nonres Inflows* is a priori ambiguous. It might be negative insofar as authorities may be more inclined to introduce this measure when the country's attractiveness is low and resident outflows are high. On the other hand, the introduction of this measure could boost nonresident inflows in the country and thereby reduce resident net outflows *RCF* by supporting the return of domestic assets.

In both regressions, the estimated coefficients of *Intro Control Nonres Outflows*, *Intro Eased Control Nonres Inflows*, and *Intro Control Res Outflows* can be interpreted as interaction coefficients with the *Crisis* variable, as

capital controls are always introduced in response to a crisis, by construction in the current analysis. The description and sources of variables are reported in Appendix Table 3.

Regressions are estimated using the least-square dummy variable estimator, with robust standard errors. The presence of the lagged dependent variable can give rise to the well-known Nickell (1981) bias, but given the structure of the panel (N small and T large), the bias is expected to be insignificant.

B. Estimation Results

Results for nonresident and resident flows are presented in Tables 1 and 2, respectively.[10]

Nonresident inflows

Estimated coefficients of the regressions of nonresident inflows (Table 1) are statistically significant with the expected signs, except for the variables for the easing/introduction of the controls in response to crises.

The effect of the crisis dummy is statistically significant with the expected negative sign in all regressions. This means that nonresident capital inflows drop and outflows from the liquidation of nonresident assets increase during crises. Interestingly, this effect is mitigated in countries/observations with a higher restriction index on capital account transactions of nonresidents. This result holds true when considering the interaction of the crisis dummy with the continuous time-varying restriction index (regressions (1) and (2)) or with a dummy variable equal to 1 for observations with an index above the sample median (regressions (3) and (4)). For example, based on results of regression (3), in the short term, the crisis translates to a drop of nonresident inflows of 13.3 percentage points of GDP.[11] In comparison, observations with a high level of restrictions have in normal times a lower level of nonresident inflows (the coefficient of the variable "high level of nonresident restriction dummy", -8.49, is significantly negative), but they also do not experience any significant change in nonresident inflows in crisis times (the sum of the coefficients -13.257+12.854 is not statistically different from zero). In sum, countries with more restricted financial accounts experience lower capital outflows by nonresidents during a crisis.

These results are in line with boom-bust patterns of capital flows reflecting various degrees of capital account openness. They echo the finding of Gupta et al (2007) and Ostry et al. (2011), indicating stronger resilience of GDP growth in the wake of the GFC in countries that had capital controls in place at the time of the crisis.

The estimated coefficient of easing controls on inflows is not significantly different from zero, irrespective of the number of lags, except in regression (7), with the expected positive sign, but only at a 10-percent statistical level. Using lagged variables may not be enough to counter the endogeneity issue of the regressions. Countries are more likely to ease controls on inflows when nonresident inflows drop, implying that the relationship between inflow controls and nonresident inflows is negatively biased.[12]

Likewise, the coefficient of controls on nonresident outflows is negative and statistically different from zero in some regressions, probably reflecting an even more severe endogeneity issue compared to easing controls on

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[10] Coefficients on contemporaneous and on lagged capital controls which are not significantly different from zero are not reported in the regressions to save space.

[11] Given the lagged-dependent variable, the long-run effect is 1/(1-0.158)×-13.3 = -15.8 percentage points of GDP for observations with a low level of restrictions, as observed a year before the start of the crisis.

[12] Regressions (2) and (4) exclude safe-haven countries of the estimation sample (Germany, Japan, Switzerland, and the United States). These countries never ease controls on inflows while in crisis, they tend to experience a less severe drop in nonresident inflows compared to EMDEs, possibly biasing results towards finding a negative or non-significant coefficient on inflow controls. Excluding these safe-haven countries does not, however, change results qualitatively.

inflows as outflow controls tend to be implemented at the height of the crisis when net capital inflows collapse. The same holds true for controls on resident outflows introduced in response to crises whose coefficient has the expected negative sign (although statistically significant in only one specification). This latter result could reflect a negative signaling effect: Because the country restricts resident outflows in response to the crisis, nonresident investors may reduce their investments in this country, anticipating that authorities might also restrict nonresident outflows in the near future. The result could however also mirror an endogeneity issue and the severity of the crisis, as restrictions on resident outflows are likely to be introduced in crises for which the drop of capital inflows (including from nonresidents) is particularly severe.

Table 1. Effects of Crises and Capital Controls on Nonresident Net Inflows

	Dependent variable: Total nonofficial net nonresident inflows (percent of GDP)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total nonofficial net nonresident inflows, t-1	0.156***	0.167***	0.158***	0.169***	0.156***	0.153**	0.149**
	(2.64)	(2.59)	(2.65)	(2.60)	(2.63)	(2.58)	(2.56)
Crisis	-17.926***	-21.192***	-13.257***	-14.469***	-11.988***	-15.042***	-14.185***
	(-3.89)	(-3.49)	(-4.11)	(-3.73)	(-3.74)	(-3.73)	(-3.56)
Nonresident restriction, t-4	-14.871***	-14.054***					
	(-4.61)	(-4.59)					
Nonresident restriction, t-4 $\times$ Crisis	24.831***	29.321***					
	(3.75)	(3.35)					
Intro Eased Control Nonres Inflows, t-3	0.176	-0.097	0.084	-0.278	1.825	1.237	5.105*
	(0.08)	(-0.04)	(0.03)	(-0.11)	(0.77)	(0.41)	(1.82)
Intro Control Nonres Outflows, t-1	-11.958	-10.221	-12.047*	-11.004	-13.393*	-12.798*	-14.454
	(-1.63)	(-1.36)	(-1.70)	(-1.52)	(-1.65)	(-1.65)	(-1.64)
Intro Control Res Outflows, t	-6.178	-6.614	-5.930	-6.169	-3.951	-9.041*	-7.225
	(-1.34)	(-1.39)	(-1.29)	(-1.31)	(-0.89)	(-1.84)	(-1.58)
Log of reserves to GDP, t-4	-1.814	-3.360	-1.482	-3.025	-1.238	-0.501	-0.489
	(-1.07)	(-1.44)	(-0.88)	(-1.30)	(-0.70)	(-0.28)	(-0.27)
Private Debt (% of GDP), t-4	-0.004	0.008	-0.007	0.005	-0.004	-0.010	-0.001
	(-0.16)	(0.31)	(-0.31)	(0.19)	(-0.16)	(-0.39)	(-0.04)
Public Debt (% of GDP), t-4	-0.110***	-0.182***	-0.120***	-0.195***	-0.125***	-0.155***	-0.162***
	(-4.06)	(-4.01)	(-4.20)	(-4.09)	(-4.26)	(-4.58)	(-4.69)
High level of nonres. restriction dummy, t-4			-8.491***	-8.064***	-8.353***	-11.284***	-11.277***
			(-5.03)	(-5.14)	(-4.80)	(-4.91)	(-4.92)
High level of nonres. restrict. dummy, t-4 $\times$ Crisis			12.854***	13.491***	12.101***	14.980***	14.870***
			(3.94)	(3.53)	(3.73)	(3.80)	(3.81)
Real GDP growth differential with US, t-1					0.452***		0.701***
					(2.83)		(3.24)
Policy rate differential with US, t-1						0.108***	0.168***
						(2.88)	(3.29)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	27	23	27	23	27	27	27
Number of observations	2147	1798	2147	1798	2080	1927	1899
Adjusted R-squared	0.228	0.252	0.226	0.248	0.229	0.228	0.232

Note: Regressions (2) and (4) exclude safe-haven countries of the sample, that is Germany, Japan, Switzerland, and the United States. All regressions include contemporaneous and up to 4-quarter lagged controls on inflows and outlfows (coefficients on lagged or contemporaneous variables which are not reported are not significantly different from zero). t-statistics based on robust standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

In additional regressions (not reported), we try to address the endogeneity issue between the introduction of capital controls and the severity of the drop in nonresident net inflows by using a two-step approach. In a first-stage regression (a probit model), we estimate a reaction function for the introduction of capital controls. The relationship between capital controls introduced in response to crises and nonresident net inflows is then estimated in a second-stage regression using the residue of the first-stage regression. Results are, however, qualitatively similar as those presented in Table 1, given the difficulty to properly estimate a reaction function for capital controls introduced in response to crises and the severity of the endogeneity bias.

Finally, push and pull factors, such as public debt and the differentials of real GDP growth rates and interest rates between the country of interest and the United States are significant with the expected signs: Countries

with larger public debt attract less capital from abroad while those that are growing faster and/or are offering higher interest rates with respect to the United States are associated with larger nonresident capital net inflows.

Resident outflows

Results of regressions of resident outflows (Table 2) indicate that crises are also negatively associated with resident net outflows (defined as resident outflows minus inflows).[13] This result probably reflects the fact that countries experiencing a crisis are exporting less capital in stress times, for example, because the domestic banking sector is under stress and/or because the depreciation of the domestic currency makes investments abroad less affordable.[14] This effect may dominate the surge of capital outflows often observed in crisis times when residents try to increase their savings in safe-haven locations. In particular, residents may well refrain from investing in FDI, portfolio assets, and loans when experiencing a crisis but still transfer their savings into deposits in local foreign exchange accounts or buy cash foreign currency. These latter transactions would be captured not in our measure of resident outflows but in the errors and omissions section of the balance of payments.

To test for this hypothesis, we augment the dependent variable "resident net outflows" by the errors and omissions of the balance of payments. Results (not reported) are however qualitatively similar to those presented in Table 2 (the crisis dummy remains significantly negative at less than 1 percent), suggesting that during a crisis, lower exports of capital dominate any savings in FX or their transfer abroad by residents.

Similar to regressions of nonresident net inflows, the estimated coefficient of the restriction index is significantly negative while the interaction with the crisis dummy is positive: Not surprisingly, resident capital outflows are lower for observations with less open capital accounts, while in crisis times, the drop of resident outflows is less severe. Indeed, a country that is barely exporting capital in normal times because of restrictions imposed on outward capital transactions (the negative coefficient of the restriction index) is unlikely to experience a large drop of gross resident outflows during crises, in comparison to countries with more open capital accounts (as reflected by the positive coefficient of the interaction between the crisis dummy variable and the restriction index). On the other hand, countries that are more open may experience a larger drop in resident outflows.

The coefficient of the controls on resident outflows is negative. This finding however probably reflects an endogeneity issue given the negative coefficient of the crisis dummy (resident outflows decrease during crises, while at the same time, authorities are more likely to introduce controls on outflows in severe crises), rather than the effectiveness of controls in curbing outflows. More generally, the literature has failed to find a significant effect of controls on resident outflows, in particular due to circumventions (see e.g., Loungani and Mauro (2001) in the case of the Russian experience of the 1990s or Magud et al. (2018) for a cross-country survey). Regardless, the result seems fragile, as the coefficient is statistically significant only in regressions (6) and (7).

The coefficients of controls on nonresident outflows (with a three-quarter lag) and on nonresident inflows are found to be positively associated with resident net outflows in several regressions. These findings could reflect a negative signaling effect of controls on nonresidents that would incentivize residents to transfer their money abroad (expecting future controls on their capital movements), leading to an increase in net resident outflows. Relatedly, an analysis of the effect of outflow controls on sovereign debt rating (Annex 1) indicates a significant negative relationship between the introduction of the outflow controls and the sovereign debt rating. This

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[13] We cannot estimate regressions separately for nonresident inflows and nonresident outflows as such data are not available.

[14] The finding that resident outflows decrease in crises is not driven by outliers: We check the robustness of this result by removing from the estimation sample each country experiencing a crisis one by one and find a similar finding.

relationship is however short lived, as it becomes statistically insignificant five quarters after the introduction of the control, suggesting that capital controls may matter for market perception in the short term, but that investors may actually forgive with time.

Table 2. Effects of Crises and Capital Controls on Resident Net Outflows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent variable: Total nonofficial net resident outflows (percent of GDP)							
Total nonofficial net resident outflows, t-1	0.189***	0.205***	0.196***	0.211***	0.196***	0.192***	0.190***	0.190***
	(2.80)	(2.72)	(2.89)	(2.79)	(2.86)	(2.79)	(2.79)	(2.82)
Crisis	-19.242***	-23.428***	-12.587***	-14.606***	-11.490***	-15.381***	-14.405***	-19.535***
	(-3.10)	(-3.00)	(-3.34)	(-3.20)	(-3.05)	(-3.38)	(-3.21)	(-3.18)
Resident Restriction, t-4	-12.321***	-11.442***						-12.009***
	(-4.38)	(-3.96)						(-4.34)
Resident Restriction, t-4 × Crisis	23.430***	28.456***						24.679***
	(3.02)	(2.94)						(3.15)
Intro Control Res Outflows, t	-4.955	-5.460	-4.698	-5.152	-3.625	-9.253**	-8.499**	-7.199
	(-1.17)	(-1.22)	(-1.13)	(-1.17)	(-0.83)	(-2.55)	(-2.36)	(-1.42)
Intro Control Nonres Outflows, t-3	6.345	7.168	8.253	9.224*	7.763	10.306*	8.813	
	(1.18)	(1.30)	(1.56)	(1.71)	(1.35)	(1.85)	(1.45)	
Inro Eased Control Nonres Inflows, t	4.082**	3.811**	3.175*	2.785	3.189*	4.332*	4.373*	
	(2.40)	(2.07)	(1.78)	(1.47)	(1.71)	(1.67)	(1.66)	
Log of reserves to GDP, t-4	0.258	0.329	0.507	0.420	0.736	1.012	1.025	0.279
	(0.14)	(0.13)	(0.28)	(0.17)	(0.39)	(0.53)	(0.52)	(0.16)
Private Debt (% of GDP), t-4	-0.028	-0.018	-0.030	-0.021	-0.028	-0.037	-0.030	-0.028
	(-0.84)	(-0.49)	(-0.92)	(-0.58)	(-0.83)	(-1.05)	(-0.83)	(-0.87)
Public Debt (% of GDP), t-4	-0.083***	-0.137***	-0.093***	-0.150***	-0.095***	-0.115***	-0.118***	-0.087***
	(-2.99)	(-2.84)	(-3.21)	(-2.98)	(-3.17)	(-3.39)	(-3.40)	(-3.10)
High level of res. restriction dummy, t-4			-4.479***	-4.295***	-4.662***	-4.985***	-5.177***	
			(-3.43)	(-3.44)	(-3.40)	(-3.02)	(-3.08)	
High level of res. restrict. dummy, t-4 × Crisis			12.868***	14.661***	11.856***	15.486***	14.907***	
			(3.55)	(3.37)	(3.25)	(3.59)	(3.46)	
Real GDP growth differential with US, t-1					0.295*		0.525**	
					(1.69)		(2.17)	
Policy rate differential with US, t-1						0.104***	0.146***	
						(2.90)	(3.01)	
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	27	23	27	23	27	27	27	27
Number of observations	2149	1802	2149	1802	2082	1929	1901	2149
Adjusted R-squared	0.172	0.176	0.164	0.170	0.166	0.166	0.168	0.174

Note: Regressions (2) and (4) exclude safe-haven countries of the sample, that is Germany, Japan, Switzerland, and the United States. All regressions include contemporaneous and up to 4-quarter lagged controls on inflows and outlfows (coefficients on lagged or contemporaneous variables which are not reported are not significantly different from zero). t-statistics based on robust standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Finally, regressions consider the effect of crises and capital controls on net inflows, that is on the difference between nonresident net inflows and resident net outflows. Results, presented in Appendix Table 4 indicate that crises do not have a significant effect on capital flows anymore, likely because crises reduce nonresident net inflows and resident net outflows, so the net effect is unclear. Controls on (nonresident and/or resident) outflows are again significant, with a negative sign in some of the regressions, reflecting the endogeneity issue mentioned above: Because such measures are introduced in severe crises, they tend to be negatively correlated with net capital inflows.

V.   CONCLUSION

This paper provides an analysis of the effects of capital controls in 27 AEs and EMDEs which faced at least one financial crisis between 1995 and 2017. We differentiate between the impact of controls introduced in response to a crisis and controls that were in place before the start of a crisis.

We find that countries with more pervasive pre-existing capital controls saw a smaller decline in capital flows during crises than did those countries with more open capital accounts, even after accounting for the smaller capital flows that generally characterize these countries. In contrast, neither relaxed controls on inflows nor tightened controls on outflows by residents or nonresidents introduced in response to crises are increasing nonresident inflows or curbing resident or nonresident outflows. This finding could reflect a lack of effectiveness of controls introduced in response to crises. It could also be explained by endogeneity issues which render empirical evidence on the effectiveness of capital controls introduced during crises weak insofar as countries were more likely to introduce such controls in the face of large capital flow movements.

The results are nevertheless in line with anecdotal evidence that capital controls introduced in response to crises are implemented too late to be fully effective or are circumvented and suggest that the removal of pre-existing controls should be carefully considered and commensurate with a country's ability to deal with capital flow volatility. The latter are likely to depend on the depth of domestic financial markets, the currency mismatch of external debt, and the maturity structure of external debt profile, among other factors. It may also lend support to preemptively using inflow controls to attenuate the boom-bust pattern of capital flows in the presence of stock vulnerabilities, in particular where important currency mismatches make countries vulnerable to systemic financial risks in case of capital flow reversals, in line with the IMF Institutional View on the liberalization and management of capital flows (IMF, 2022). Finally, while the introduction of capital controls in a crisis is negatively related to sovereign debt ratings, such a relationship is short lived, suggesting that investors tend to forgive with time, in line with results of a recent investors' survey on market perceptions of capital controls (Sahay et al., forthcoming).

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Annex 1. Effects of Outflow Controls on Sovereign Debt Rating

Relatively few countries introduced outflow controls in response to crises, due to possible negative repercussions, in particular on the country's attractiveness to international investors. This Annex investigates the financial market reaction – as summarized by the evolution of the sovereign debt rating – to controls on outflows (on residents and/or nonresidents) introduced in response to crises. The rating considered is the Standard and Poor's (S&P) rating of sovereign debt in foreign currency, ranging from value 22 (AAA rating) to value 1 (default D). S&P Global Ratings offers a larger country and time coverage of data than the two other major credit rating agencies (CRAs), Fitch Ratings and Moody's Investors Service. Standard and Poor's tend also to be considered as leading ratings of Fitch and Moody's and is regarded as possessing the highest level of expertise (see e.g., Chen et al. 2019).

The evolution of the average sovereign debt rating (rebased at value 10 the quarter before the start of the crisis) in countries experiencing a crisis is reported on Annex Figure 1. Countries that introduced outflow controls on residents and/or nonresidents faced a downgrade of their rating in the short term which was twice as large as countries that did not impose controls, and on average by more than three points at the end of the first year of the crisis. In general, countries introduced outflow controls the quarter the crisis starts, and in a few cases, one or two quarters after. This difference could reflect a negative signal to market participants facing capital controls and/or that countries tightening outflow controls experience more severe crises than countries that do not in crisis years. However, in the medium term, the average rating of countries that introduced controls converged towards the average of the group of countries without controls.

Annex Figure 1. Average Rating of Countries with and without Outflow Controls Introduced in Crisis Quarter t
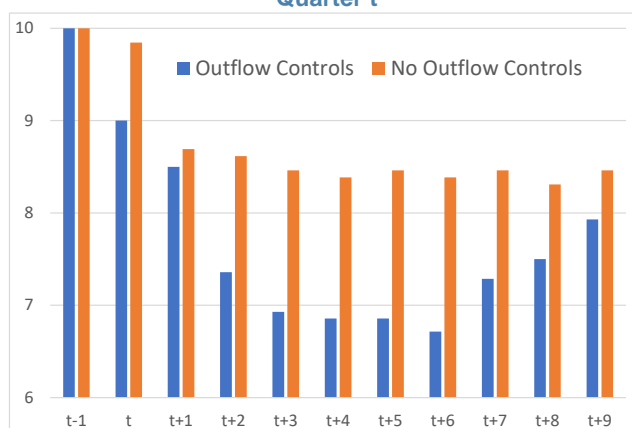
Sources: IMF FFA and AREAER databases, S&P Global Market Intelligence, Laeven and Valencia (2020), and authors' calculations.

Note: This figure shows the average Standard and Poor's rating on sovereign debt in foreign currency (ranging from 1 for default to 22 for AAA), rebased at value 10 the quarter before the crisis year *t*, for countries introducing outflow controls in response to a crisis starting in quarter *t*, and for those also experiencing a crisis but not introducing outflow controls. Safe-haven countries of the sample (Germany, Japan, Switzerland, the United States) are excluded in the average of the group of "No Outflow Controls" as well as observations with introductions of outflow controls overlapping over the short and medium terms (cases of Argentina, Cyprus, Thailand, and Ukraine).

It is noteworthy that cases of "fallen angel" during crises were actually more common among countries that did not introduce outflow controls in response to a crisis than those that did. A bond is considered as a "fallen angel" if its rating was downgraded to non-investment grade by at least two of the three major CRAs.[15] High-yield (or speculative) status can trigger a wave of selling by investors whose mandates prevent them from holding credits below investment grade, so that a downgrade to a speculative status can have an abrupt and larger impact on flows compared to an ordinary downgrade. Cases of fallen angels during crises have been observed in our sample in Colombia in 1999Q3, Indonesia in 1997Q4 (downgraded by the three rating agencies simultaneously), Korea in 1997Q4, Russia in 2015Q1, South Africa in 2017Q2, and Uruguay in 2002Q1.[16] Brazil was downgraded to speculative only by Standard and Poor's in 2015Q3, but the two other agencies also downgraded Brazil's sovereign debt rating to speculative shortly after: in 2015Q4 for Fitch and 2016Q1 for Moody's. Among these seven episodes of "fallen angels", only two have been associated with a tightening of outflow controls. In the vast majority of cases, downgrades from investment to speculative grades have been observed among countries which did not implement controls on outflows in response to crises.[17] These observations are indicative as there may be other factors at play. We use an econometric analysis to assess the effect of the introduction of outflow controls on sovereign debt rating by controlling for several factors. The dynamic effect of the introduction of the outflow control measures on the change of the rating is estimated by using Jordà's (2005) local projection approach, that is by running a series of regressions of the change of the rating between t-1 and $t+k$ on the outflow control measure introduced in quarter t. Specifically, we estimate for $k = 0,…,8$:

$$R_{i,t+k} - R_{i,t-1} = \beta_{1,k} Crisis_{i,t} + \beta_{2,k} Crisis_{i,t-1} + \beta_{3,k} Intro\ Control\ Outflows_{i,t}$$

$$+ \beta_{4,k} Eased\ Control\ Inflows_{i,t} + \sum_{j=0}^{k} \beta_{5+j,k} Diff\ GDP\ growth_{i,t+j} + \alpha_i + \gamma_t + \varepsilon_{i,t,k}, \qquad (A1)$$

where $R_{i,t}$ is the Standard and Poor's sovereign rating on foreign currency debt (value 1 to 22) of country i in quarter t, $Crisis$ is a dummy variable equal to one in quarters when the country experiences a crisis according to Laeven and Valencia (2020) database, $Intro\ Control\ Outflows$ is a dummy variable equal to one in quarters when the country introduces a control in response to the crisis on resident outflows, on nonresident outflows, or simultaneously on both types of outflows. Regressions also control for contemporaneous effects of easing controls on inflows of nonresidents, $Eased\ Control\ Inflows$,[18] as well as for the real GDP growth differential between country i and the United States, $Diff\ GDP\ growth$, both lagged and observed over the horizon of the analysis, and for country and time fixed effects α_i and γ_t.[19]

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[15] Downgrades from investment grade to high-yield correspond to downgrades from rating BBB– (value of 13) to rating BB+ (value of 12) in the case of S&P Global Ratings.

[16] Cyprus has also been downgraded to high yield by at least two rating agencies in 2012Q1 but this happened more than one year before the country introduced a control in response to the crisis.

[17] These differences do not reflect the fact that countries not introducing controls and becoming fallen angels are proportionally more numerous to have an investment grade status before the crisis than countries introducing controls. Indeed, among countries which did not introduce outflow controls, 5 observations out of 8 which were "investment grade" before the start of the crisis, have been downgraded to "speculative". For countries which introduced outflow controls, only 2 observations out of 6 which were "investment grade" before the crisis have seen its debt downgraded to "high yield". The size of the sample is however too small to draw any conclusion on the effect of capital controls on the probability of being downgraded from an "investment grade" to a "high-yield" status.

[18] Using the variable $Intro\ Eased\ Control\ Inflows$ (dummy variable equal to one only in the quarter the measure is introduced, zero otherwise) instead of $Eased\ Control\ Inflows$ (dummy variable equal to one during all the quarters the measure is in place, zero otherwise) does not qualitatively change the results.

[19] The real interest rate differential between the country of interest and the United States is not included in the regressions given an endogeneity issue with the sovereign debt rating. Also, this variable is not available for several observations, so its inclusion reduces significantly the sample size.

In the cases of Argentina, Thailand, and Ukraine, which introduced several outflow controls in response to a crisis, only measures which do not overlap over the medium term are considered, that is, controls introduced in 2001Q4 for Argentina, 1997Q2 for Thailand, and in 1998Q3, 2008Q3, and 2014Q1 for Ukraine. Safe-haven countries of the sample (Germany, Japan, Switzerland, and United states) are excluded of the estimation, although results are qualitatively similar if included.

Results, reported in Annex Table 1, seem to confirm that sovereign debt ratings are not significantly impacted by capital controls in the longer term. As expected, the crisis dummy tends to have a persistent negative effect on the rating over the whole horizon of the analysis (that is at least up to 8 quarters after the start of the crisis) and the real GDP growth differential with the United States is positively related to the change in rating. The coefficient of the introduction of the outflow control measure, $\beta_{3,k}$, is negative and statistically significant in the quarter the measure is introduced and four quarters after, suggesting that outflow controls introduced in response to crises may affect negatively the country's rating, on top of the effect stemming from the crisis itself. This effect is, however, short lived as the coefficient is not statistically significant in subsequent quarters. Results are robust to including the level of capital account restrictiveness (the Fernández et al. (2016) index) as well as the interaction of this variable with outflow controls (not significant and not reported).

Thus, capital controls seem to matter for market perception in the short term, but investors may actually forgive, in line with results of Gelos et al. (2004) which do not find any strong punishment of defaulting countries by credit markets, and as suggested by results of a recent investors' survey on market perceptions of capital controls (Sahay et al., forthcoming).[20,21]

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[20] Our econometric result is also consistent with the analysis of Edison and Reinhart (2000), noting that "The initial reaction to the imposition of controls, especially for Malaysia, was quite negative. Subsequently, however, Malaysia seems to have fared reasonably well – although not as well as Korea, which did not introduce new restrictions on capital movements. Furthermore, institutional investors appear to have short memories, as Malaysia's controls do not seem to have reduced investors' appetite for returning to Malay capital markets once controls were eased."

[21] This does not mean however that sovereign debt downgrades are not costly for the economy in the short and medium terms, as they tend to be associated with an increase in the cost of funding for the government and the private sector with repercussions on credit and activity (Adelino and Ferreira, 2016 and Almeida et al., 2017).

Annex Table 1. Dynamic Effect of Outflow Controls on Sovereign Debt Rating

				Dependent variable: $\text{Rating}_{t+k} - \text{Rating}_{t-1}$					
$k = 0,\dots,8$	t	t+1	t+2	t+3	t+4	t+5	t+6	t+7	t+8
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Control Outflows introduced in quarter t	-1.54***	-1.04**	-1.69**	-1.80**	-1.44*	-1.04	-1.24	-0.62	-0.73
	(0.55)	(0.50)	(0.71)	(0.76)	(0.81)	(0.87)	(0.93)	(1.09)	(1.11)
Eased Control Inflows present in quarter t	-0.02	0.10	0.24	0.38	0.68	0.82*	0.76*	0.75	0.72
	(0.30)	(0.38)	(0.46)	(0.49)	(0.42)	(0.42)	(0.44)	(0.47)	(0.47)
Crisis dummy, quarter t	0.02***	-0.02	-0.02	0.01	0.03*	0.01	0.02	0.04	0.05*
	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Crisis dummy, quarter $t-1$	-0.09	-0.51**	-0.29	-0.44	-0.45	-0.54*	-0.70**	-0.67*	-0.56
	(0.12)	(0.24)	(0.25)	(0.27)	(0.29)	(0.31)	(0.36)	(0.39)	(0.39)
Real GDP growth diff. with US in quarter t	-0.12	0.16	-0.08	0.08	0.11	0.19	0.48	0.65*	0.83**
	(0.13)	(0.23)	(0.25)	(0.27)	(0.28)	(0.30)	(0.33)	(0.38)	(0.37)
Real GDP growth diff. with US in quarter $t+1$		0.08***	0.01	-0.01	-0.01	0.04	0.01	0.01	0.02
		(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)
Real GDP growth diff. with US in quarter $t+2$			0.11***	0.04*	0.03	0.02	0.07**	0.03	0.03
			(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
Real GDP growth diff. with US in quarter $t+3$				0.12***	0.05**	0.03	0.03	0.08**	0.04
				(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
Real GDP growth diff. with US in quarter $t+4$					0.13***	0.05*	0.04	0.05	0.10***
					(0.02)	(0.03)	(0.03)	(0.03)	(0.04)
Real GDP growth diff. with US in quarter $t+5$						0.13***	0.04	0.02	0.03
						(0.03)	(0.03)	(0.03)	(0.03)
Real GDP growth diff. with US in quarter $t+6$							0.14***	0.04	0.02
							(0.03)	(0.03)	(0.03)
Real GDP growth diff. with US in quarter $t+7$								0.14***	0.04
								(0.03)	(0.03)
Real GDP growth diff. with US in quarter $t+8$									0.15***
									(0.03)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	1841	1818	1795	1773	1750	1727	1704	1681	1658
Adjusted R-squared	0.09	0.15	0.22	0.27	0.30	0.32	0.34	0.35	0.38

Note: Robust standard errors in parentheses. ***, **,* denote statitical significance at the 1, 5, and 10 percent levels, respectively.
Observations of safe-haven countries (Germany, Japan, Switzerland, United States) are excluded of the estimation sample.
Introductions of outflow controls overlapping over the medium term (cases of Thailand and Ukraine) are disregarded.

Appendix Table 1. Crisis Episodes in Countries of the Sample since 1995

Country	Systemic Banking Crisis (starting date)	Currency Crisis (year)	Sovereign Debt Crisis (year)
Argentina	1995Q1, 2001Q4	2002Q1, 2013Q4	2001Q4, 2014Q3
Brazil		1999Q1, 2015Q1	
China, P.R.	1998Q1		
Colombia	1998Q2		
Cyprus	2011Q2		2013Q3
Egypt		2016Q4	
Germany	2008Q3		
Ghana		2000Q1, 2009Q1, 2014Q1	
Iceland	2008Q3	2008Q3	
Indonesia	1997Q4	1998Q1	1999Q1
Japan	1997Q4		
Kazakhstan	2008Q3	1999Q3, 2015Q3	
Korea	1997Q3	1998Q1	
Malaysia	1997Q3	1998Q1	
Mexico		1995Q1	
Nigeria	2009Q3	1997, 2016Q2	
Philippines	1997Q3	1998Q1	
Romania	1998Q1	1996Q1	
Russia	1998Q3, 2008Q3	1998Q3, 2014Q4	1998Q3
South Africa		2015Q4	
Switzerland	2008Q3		
Thailand	1997Q3	1998Q1	
Türkiye	2000Q4	1996Q2, 2001Q1	
Ukraine	1998Q3, 2008Q3, 2014Q1	1998Q3, 2009Q1, 2014Q1	1998Q3, 2015Q4
United States	2007Q4		
Uruguay	2002Q1	2002Q2	2002Q3
Vietnam	1997Q4		

Sources: Laeven and Valencia (2020) and authors' research.

Appendix Table 2. Tightening Controls on Outflows and Easing Controls on Inflows Introduced in Response to Crises

Country	Time of introduction	Tightening control on nonresident outflows	Tightening control on resident outflows	Easing control on nonresident inflows
Argentina	2001q4	X	X	
Argentina	2002q1		X	
Argentina	2013q4		X	
Brazil	1995q1			X
Brazil	1999q1		X	X
Brazil	2015q1			X
China	1998q3	X	X	
Colombia	1998q3			X
Cyprus	2013q1	X	X	
Iceland	2008q4	X	X	
Indonesia	1997q3	X		X
Indonesia	1998q1			X
Indonesia	1998q2			X
Indonesia	1998q3			X
Korea	1997q1			X
Korea	1997q2			X
Korea	1997q4			X
Korea	1998q1			X
Korea	1998q2			X
Korea	1998q3			X
Romania	1999q3			X
Malaysia	1998q3	X	X	
Philippines	1998q2	X		
Russia	1998q3	X	X	
Thailand	1997q2		X	
Thailand	1997q3			X
Thailand	1997q4			X
Ukraine	1998q3	X		
Ukraine	2008q3		X	
Ukraine	2008q4			X
Ukraine	2010q1	X		
Ukraine	2014q1	X		X
Ukraine	2014q3		X	
Ukraine	2014q4		X	
Ukraine	2015q1	X	X	

Sources: AREAER database and literature review.

Appendix Table 3. Variable Definition and Sources

| Variable	Description	Sources
Nonresident gross inflows	Nonresident capital inflows minus outflows.	IMF Financial Flows Analytics database.
Resident gross inflows	Resident capital outflows minus inflows.	IMF Financial Flows Analytics database.
Outflow controls	Controls on resident gross outflows or on nonresident gross inflows introduced in response to a crisis.	IMF AREAER database and literature review.
Inflow controls	Controls on nonresident gross inflows introduced in response to a crisis.	IMF AREAER database and literature review.
Restriction indices	Overall capital account restriction index (all asset categories) *ka*; overall inflow capital account restriction index (all asset categories) *kai*; overall outflow capital account outflow restriction index (all asset categories) *kao*.	Fernández et al. (2016).
Crisis	Dummy variable taking value one in quarters of a systemic banking, currency, and/or sovereign debt crisis as identified.	Laeven and Valencia (2020) crises database.
FX reserves	Foreign exchange reserves as a share of GDP.	IMF International Financial Statistics database.
Private debt	Private debt (loans and debt securities) as a share of GDP.	IMF Global Debt Database.
Public debt	Public debt as a share of GDP.	
Real GDP growth differential with US	Differential of real GDP growth between the country of interest and the United States.	IMF WEO database.
Interest rate differential with US	Differential of interest rates between the country of interest and the United States.	IMF WEO database.
Standard and Poor's rating; Fitch rating, Moody's rating.	Standard and Poor's rating on sovereign debt in foreign currency, ranging from 1 (default D) to 22 (AAA); Fitch rating on sovereign debt in foreign currency, ranging from 1 (default D) to 20 (AAA); Moody's rating on sovereign debt in foreign currency, ranging from 1 (default C) to 21 (Aaa).	Fitch Solutions, Moody's, S&P Global Market Intelligence.

Appendix Table 4. Effects of Crises and Capital Controls on Net Inflows (Nonresident Net Inflows minus Resident Net Outflows)

	Dependent variable: Total nonofficial net inflows (percent of GDP)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Total nonofficial net inflows, t-1	0.125***	0.115***	0.125***	0.115***	0.124***	0.124***	0.122***
	(7.88)	(6.94)	(7.89)	(6.94)	(7.75)	(7.70)	(7.53)
Crisis dummy	0.014	-0.527	0.211	-0.237	0.671	1.229	1.527
	(0.01)	(-0.17)	(0.14)	(-0.13)	(0.43)	(0.68)	(0.85)
Overall restriction index, t-4	-0.039	0.232					
	(-0.02)	(0.15)					
Overall restriction, t-4 × Crisis dummy	-0.773	-0.513					
	(-0.20)	(-0.11)					
Easing control on inflows introduced in crisis, t-4	0.778	0.764	0.859	0.825	1.479	1.474	2.593
	(0.45)	(0.42)	(0.50)	(0.45)	(0.85)	(0.63)	(1.08)
Control on nonres. and res. outflows introduced in crisis, t-1	-5.969**	-5.482**	-5.856**	-5.403**	-5.145*	-4.994*	-4.446
	(-2.23)	(-2.01)	(-2.16)	(-1.96)	(-1.77)	(-1.73)	(-1.43)
Log of reserves to GDP, t-4	-1.084*	-2.531***	-1.066*	-2.515***	-0.968	-0.806	-0.747
	(-1.83)	(-3.26)	(-1.82)	(-3.25)	(-1.60)	(-1.34)	(-1.22)
Private Debt (% of GDP), t-4	0.015	0.022	0.014	0.022	0.015	0.016	0.018
	(0.62)	(0.87)	(0.62)	(0.86)	(0.63)	(0.63)	(0.69)
Public Debt (% of GDP), t-4	-0.051***	-0.088***	-0.050***	-0.087***	-0.054***	-0.059***	-0.062***
	(-4.12)	(-4.06)	(-4.00)	(-3.95)	(-4.26)	(-4.15)	(-4.27)
High level of nonres. restriction dummy, t-4			-0.310	-0.069	-0.184	-1.115	-1.126
			(-0.46)	(-0.11)	(-0.27)	(-1.31)	(-1.31)
High level of nonres. restrict. dummy, t-4 × Crisis dummy			-1.583	-1.329	-1.847	-2.595	-2.752
			(-0.79)	(-0.60)	(-0.90)	(-1.12)	(-1.17)
Real GDP growth differential with US, t-1					0.143		0.174
					(1.59)		(1.45)
Policy rate differential with US, t-1						0.012	0.029
						(0.61)	(1.14)
Country Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Number of countries	27	23	27	23	27	27	27
Number of observations	2147	1798	2147	1798	2080	1927	1899
Adjusted R-squared	0.178	0.177	0.179	0.178	0.179	0.180	0.181

Note: Regressions (2) and (4) exclude safe-haven countries of the sample, that is Germany, Japan, Switzerland, and the United States. All regressions include contemporaneous and up to 4-quarter lagged controls on inflows and outlfows (coefficients on lagged or contemporaneous variables which are not reported are not significantly different from zero). t-statistics based on robust standard errors are reported in parentheses. ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively.

Appendix Figure 1. Pre-existing Level of Nonresident Restrictiveness by Episode (Fernández et al., kai variable)

Appendix Figure 2. Pre-existing Level of Resident Restrictiveness by Episode (Fernández et al., kao variable)
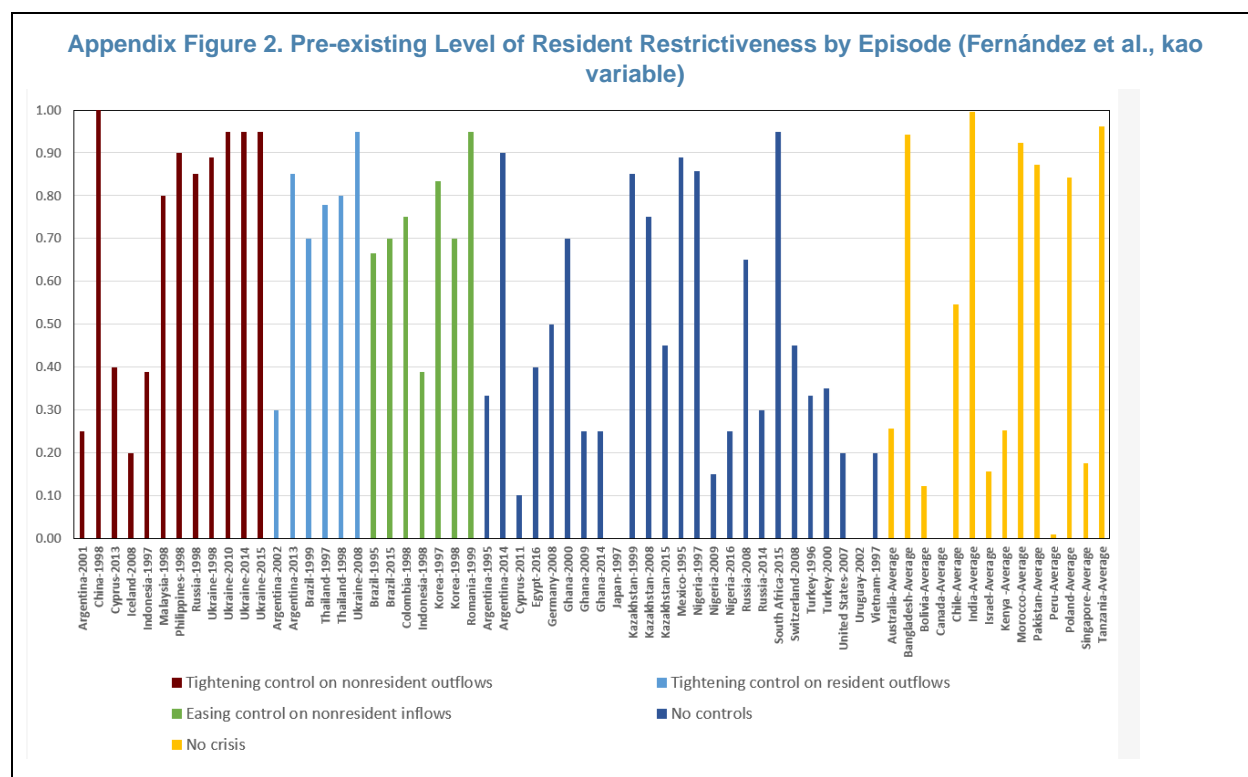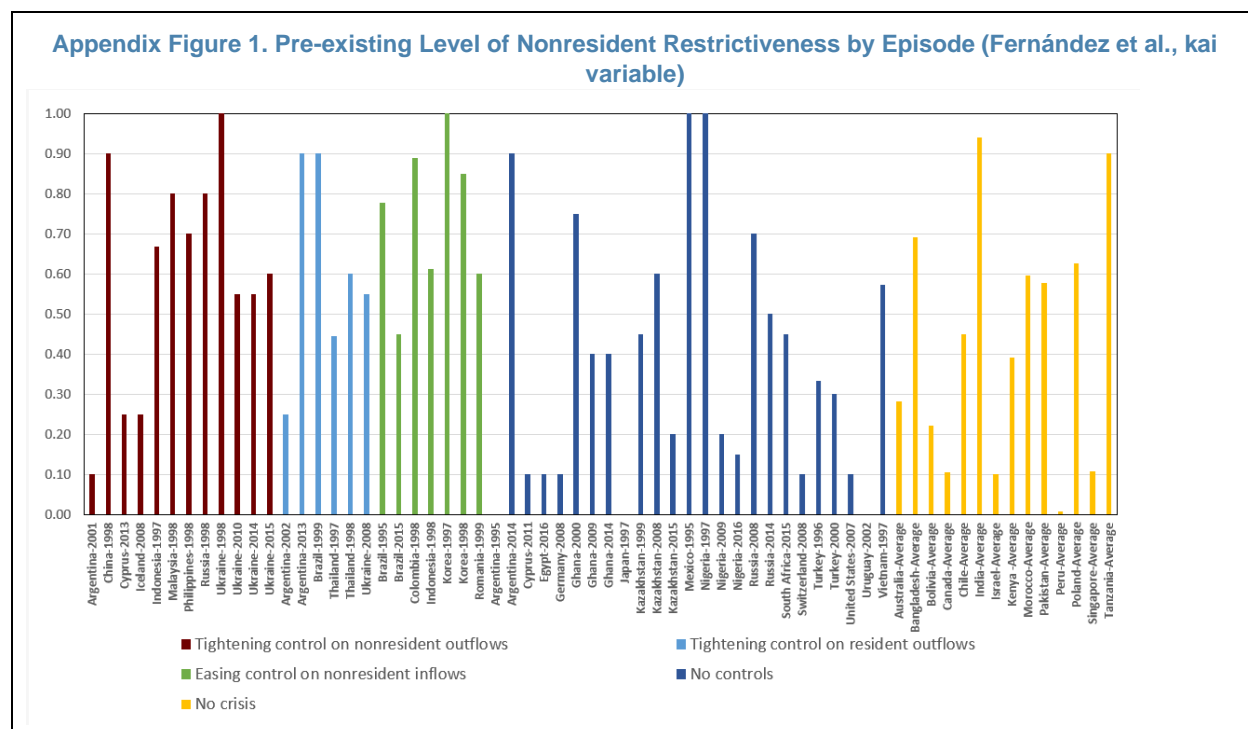
Note: In case a country is using more than one control response, the "harshest response" is reported, where restricting outflows from nonresidents is considered to be the harshest response, followed by restricting resident outflows, and finally easing nonresident inflows. For countries of the sample that did not experience any crisis, the figures report the average level of the capital account restrictiveness over the period of 1995-2017.