

Are Capital Controls Prudential? An Empirical Investigation*

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Abstract

A growing theoretical literature advocates the use of prudential capital controls, that is, the tightening of restrictions on net capital inflows during booms and the relaxation thereof during recessions. We examine the behavior of capital controls in a large number of countries over the period 1995-2011. We find that capital controls are remarkably acyclical. Boom-bust episodes in output, the current account, or the real exchange rate are associated with virtually no systematic movements in capital controls. These results are robust to controlling for the level of development, external indebtedness, the exchange-rate regime, or the great contraction of 2007-2009.

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1 Introduction

In the past few years, capital controls have gone from villains to heroes with little transition. During the 1990s, a decade characterized by vigorous financial flows toward emerging countries, the predominant view was that capital controls are undesirable because they distort the international allocation of capital and in that way hinder long-run growth. In accordance with this view, policymakers in emerging countries, with few exceptions, allowed international capital to move largely unfettered into their economies. But many of these experiments with free capital mobility ended in sudden stops followed by severe financial or exchange-rate crises or both (Southeast Asia and Russia in the late 1990s, South America in the early 2000s, and peripheral Europe in the late 2000s). These failures persuaded many to look at capital controls with more benign eyes. Increasingly, free capital mobility has been blamed for causing real-exchange-rate overvaluation, excess nominal wage growth, and overborrowing during booms, opening the door to exacerbated rates of unemployment and bankruptcy during the downward phase of the cycle. An indication of the magnitude of this change of sentiment toward capital controls is that the International Monetary Fund, which until recently held a long-standing position against restrictions on international financial transactions, now considers capital controls an appropriate instrument for macroeconomic stabilization (see International Monetary Fund, hereafter IMF, 2011).

The recent negative experience with free capital mobility has spurred renewed interest among academics, policymakers, and policy observers in a particular type of capital control policy known as macro prudential policy. These are preventive interventions that take effect before the onset of a crisis. Particular attention has been paid to capital controls as a macro prudential instrument. A growing body of theoretical work has been devoted to characterizing environments in which prudential capital controls are desirable. In general, these models describe economies with externalities, in which capital controls represent second-best remedies.

New theories of prudential capital control policy can be broadly divided into two classes.

In one class, prudential capital control policy is beneficial because it can promote financial stability.¹ In the second class, prudential capital control policy is desirable because it can improve macroeconomic adjustment in economies with nominal rigidities and suboptimal monetary policy.²

In the first class of models, lending is collateralized, and the value of collateral depends on some relative price (e.g., the price of real estate) that agents take as given. During booms the relative price in question increases, expanding the value of collateral, and inducing agents to overborrow and overspend. In turn, overborrowing increases the probability of binding collateral constraints and sudden stops during downturns.

The prudential role of capital controls in the second class of theories can be illustrated by imagining an economy with downward nominal wage rigidity and a fixed-exchange-rate policy. During booms, the expansion in aggregate demand causes nominal wages to rise. This carries no problems at this stage, but can be the prelude to trouble down the road. For during the contractionary phase of the cycle, aggregate demand weakens, putting downward pressure on real wages. A fall in real wages can occur either by a fall in nominal wages or by an increase in prices. The first possibility is ruled out by downward nominal wage rigidity and the second by the fixed exchange-rate regime. As a result, involuntary unemployment emerges.

In both classes of models there is an externality caused by the individual agent's failure to internalize the fact that his own spending behavior during booms causes the value of collateral or the level of nominal wages to increase. Also, under both classes of models, it is optimal for the policymaker to impose capital controls during booms, because, by putting sand in the wheels of international borrowing, they contribute to curbing aggregate spending, thereby mitigating the inefficiencies caused by the externality.

In this paper, we investigate whether capital control policy has indeed been used in a

¹See for example, Lorenzoni (2008), Korinek (2010), Jeanne and Korinek (2011), Bianchi, (2011), Bianchi and Mendoza (2010), Fernández-Arias and Lombardo (1998), Benigno, Chen, Otrok, and Rebucci (2012a,b), and Uribe (2006, 2007).

²See, for instance, Schmitt-Grohé and Uribe (2012a,b) and Farhi and Werning (2012).

prudential manner as suggested by these new theories. To this end, the first contribution of this paper is to update Schindler's (2009) index of capital controls, which covers the period 1995-2005, by incorporating the period 2006-2011. The new data set covers 91 countries over the period 1995-2011 at an annual frequency. The data set provides information on restrictions on capital inflows and outflows separately and distinguishes six categories of assets and the residency of the transacting agent.

We use the updated data on capital controls to study the observed behavior of the cyclical component of capital controls. We report three main findings: First, the unconditional standard deviation of the cyclical component of capital controls is small. Essentially, policymakers do not change capital controls over the business cycle, contrary to what an active prudential stance would suggest. Second, the cyclical components of controls on capital inflows and outflows are positively correlated. This fact also suggests that capital controls are not primarily used as a stabilization instrument. For if this was the case, one would expect that during expansions policymakers increase capital controls on inflows and decrease capital controls on outflows and vice versa during contractions, inducing a negative correlation between the two types of restrictions.

The third and most important result emerges from examining the behavior of capital controls conditional on the economy being in a macroeconomic boom or bust. We define boom and bust episodes for three separate macroeconomic indicators, the output gap, the cyclical component of the real effective exchange rate, and the cyclical component of the current account. We find that on average, controls on capital inflows or outflows are virtually unchanged during macroeconomic booms or busts. This finding suggests that over the past one and a half decades countries around the world have not systematically applied capital controls in a prudential or countercyclical fashion. In particular, the average policymaker does not seem to tighten capital controls on inflows or soften capital controls on outflows to curb expansions in aggregate activity, or overvaluations of the real exchange rate, or large current account deficits. Capital controls are similarly unresponsive during downturns.

These findings are robust to disaggregating the data along a number of dimensions, including income levels, the exchange-rate regime, the level of external indebtedness, and type of assets. The results also hold when we limit attention to the global crisis of 2007-2009 or to episodic changes in capital controls.³

Although our index of capital controls is based on a binary variable at the level of individual assets, the fact that it includes many asset categories allows it to partly capture the intensity with which capital controls are imposed, as the coverage of this type of restrictions varies over asset categories across time. We illustrate this point by analyzing the behavior of our measure of capital controls for Brazil during the late 2000s. This case is of interest because of the availability of capital control tax rates (which fully capture the intensive margin), and because it has become an emblematic case study for the analysis of prudential capital control policy. We show that our index tracks well the behavior of capital controls in Brazil during the great contraction years. Also, we find that the Brazilian case is an unusual one, in the sense that on average, other countries did not appeal to capital control restrictions to counteract the capital inflows of the pre-great-contraction period. Additionally, we test the robustness of our results by using two alternative indices of capital controls, namely the Chinn-Ito (2006) and the Quinn (1997) indices. The latter is of particular interest because, although it does not distinguish between controls on inflows and outflows, it is based on a finer classification of restrictions at a granular level than the index used in this paper.

Our results allow for at least two interpretations. One is that, in light of the recent growing theoretical literature arguing that prudential capital control policy can be welfare improving, our findings point at a case of theory running ahead of policy practice. Under this view, one would expect that as time goes by and the message of the new theories percolate into policymaking circles, capital controls will become more cyclical. A second possible interpretation is that these theories may not be capturing all of the relevant economic or political factors that determine the cyclical properties of optimal capital controls.⁴ To the

³Klein (2012) refers to episodic changes in capital controls as ‘gates.’

⁴See, for instance, the caveats raised by Benigno, Chen, Otrok, and Rebucci (2011 and 2013) to collateral-

extent that policymakers have a better grasp of the complexity of factors determining optimal capital controls, our results could be interpreted as policy practice running ahead of theory.

The present paper is related to a fast growing empirical literature on capital controls. The primary focus of this literature has been to ascertain the effectiveness of capital controls as macroeconomic stabilizers. See, among others, Ostry et al. (2010), Klein (2012), and Forbes, Fratzscher, and Straub (2013). Our work departs from this literature in that its primary focus is not to gauge the ability of capital controls to affect macroeconomic outcomes, but to address the question of whether governments systematically use capital controls in a prudential or countercyclical fashion. In this regard, our work is related to Aizenman and Pasricha (2013) who argue that emerging countries that liberalized capital outflow controls during the 2000s did so primarily because of concerns about net capital inflows. Our data set does not provide evidence pointing in this direction. Specifically, we document that between 1995 and 2011 and in particular around the global contraction of 2007-2009, capital controls on outflows or inflows displayed a mute response to booms or busts in the current account. One important difference between our work and Aizenman and Pasricha's is that the latter includes restrictions on transactions between residents in the measure of capital controls. An example is currency based measures, which restrict transactions in foreign currency even if all parties involved are residents. By contrast, all of the restrictions included in our measure of capital controls involve one resident and one nonresident transactor.

The remainder of the paper is organized as follows. Section 2 describes the data used in the empirical analysis. Section 3 documents the unconditional cyclicity of capital controls. Section 4 studies the behavior of capital controls conditional on the state of the economy being a boom or a bust in aggregate activity. Section 5 analyzes the dynamics of capital controls during booms and busts in the real exchange rate and the current account. Section 6 focuses on the behavior of capital controls around the global contraction of 2007-2009. Section 7 analyzes the issue of intensity of our capital-control measure by studying

constraint-based theories of overborrowing.

the case of Brazil in the late 2000s and considering two alternative measures of capital controls, namely the Quinn (1997) and the Chinn-Ito (2006) indices. Section 8 studies whether episodic capital controls are prudential in nature. Section 9 concludes.

2 The Data

The bulk of our analysis uses Schindler's (2009) index of capital controls. Later in section 7, we use and briefly describe two additional indices, namely, those due to Chinn and Ito (2006) and Quinn (1997). Schindler's index is a *de jure* measure of capital controls and is constructed from information provided by the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) published by the IMF. The main advantage of this index, for the purpose of the present investigation, is that it distinguishes between controls on capital inflows and controls on capital outflows. Schindler's original data set covers 91 countries from 1995 to 2005 at an annual frequency.

One contribution of the present study is to update Schindler's data set through 2011 for all 91 countries.⁵ Thus our capital-control data set is a panel of 91 countries and 17 years.

The panel captures a rich set of countries, asset categories, and crisis episodes. It includes 22 developed countries, 45 emerging countries, and 24 low-income countries. It comprises restrictions on international transactions involving six asset categories: equity, bonds, money market instruments, foreign direct investment, collective investments (also referred to as mutual funds, investment funds, managed funds, or simply funds), and financial credit. These financial instruments constitute the majority of global cross-border asset holdings. The time dimension of the panel (1995-2011) is relatively short, but covers a significant number of crisis episodes, including those observed in Southeast Asia and Russia in the late 1990s, South America in the early 2000s and the global crisis of 2007-2009. In

⁵Klein (2010) provides a limited update of Schindler's index covering 44 countries through 2010 and does not include controls on capital outflows.

Table 1: Capital Controls: Mean Values

Capital Control	All Countries	Developed Countries	Emerging Countries	Low-Income Countries
Overall Index	0.32	0.07	0.35	0.54
Inflows	0.29	0.06	0.30	0.49
Outflows	0.35	0.08	0.38	0.59

Note. Country-group definitions follow IMF (2013).

addition to the direction of flows and asset categories, the index distinguishes the residency of the transacting agent (domestic or foreign) and the type of transaction (sale or purchase).

The index on capital controls on inflows takes on 13 possible values given by $i/12$ for $i = 0, 1, \dots, 12$, with 0 representing no restrictions and 1 representing restrictions on all types of international transactions.⁶ The same holds for the index on capital controls on outflows. An overall index of capital controls is constructed as the average of the indices of capital controls on inflows and outflows.

Table 1 reports means of capital control indices for different groups of countries. The average value of the overall capital control index is 0.32. Controls on inflows are on average somewhat lower than controls on outflows (0.29 versus 0.35). Restrictions on international transactions appear to be a decreasing function of income. Developed countries display the lowest values of capital controls with an average of around 0.07. The group of low income countries displays an average capital control index eight times higher than the one observed in developed countries. And emerging countries display an intermediate level of capital controls with an average index five times as large as the one observed in developed economies.

⁶The index is the result of a two-step aggregation procedure involving 10 binary variables representing granular capital control indices (0 for no restriction and 1 for restriction). These granular indices are organized as follows: Four of the six asset categories (equity, bonds, money market instruments, and collective investments) are associated with two binary variables each, defining controls by residency (domestic or foreign), and each of the remaining two asset categories (financial credit and foreign direct investment) is associated with one binary variable. The first aggregation occurs at the level of each individual asset category by arithmetic averaging of their associated binary components. This yields six indices, four taking on the values 0, 0.5, or 1, and two taking on the values 0 or 1. In the second step, indices are aggregated across asset categories by arithmetic averaging. This step yields the index of controls on capital inflows, which takes on 13 equally spaced values from 0 to 1. A similar aggregation procedure yields the index of controls on capital outflows.

To assess the countercyclicality and prudential nature of capital controls, we use three macroeconomic indicators, real gross domestic product (GDP), the real effective exchange rate (REER), and the current-account-to-GDP ratio (CA). The source for GDP is World Development Indicators, for REER is IMF-IFS, and for CA is the IMF World Economic Outlook.

To eliminate country and trend effects, we remove a country-specific linear trend from each capital control time series. We also remove a log-quadratic trend from GDP and the REER and a quadratic trend from CA. We refer to deviations of a variable from its trend as its cyclical component. In the case of GDP, we use the terms cyclical component and output gap interchangeably.

Finally, we removed from the panel all countries for which the time series of GDP is shorter than 25 years or does not cover the period 1995-2011. For more details, see table A.1 in the expanded appendix (Fernández, Rebucci, and Uribe, hereafter FRU, 2014). The length restriction is guided by the desire to obtain precise estimates of the trend and cyclical components of aggregate activity. We also eliminated one country, Bahrain, for which the AREAER does not provide data on capital controls for all six categories of assets. The resulting panel contains 78 countries and is comprised of 22 developed countries, 36 emerging countries, and 20 low-income countries.

3 The Unconditional Acyclicity Of Capital Controls

Table 2 presents a number of statistics on capital controls that characterize their cyclical properties. The first feature that stands out is the small standard deviations of the cyclical components of capital controls. For all countries combined, the standard deviation of capital controls on inflows is 0.07. To see why this number is small, recall that the index of capital controls on inflows aggregates 10 granular indices of controls on individual transactions (see footnote 6) and takes on 13 equally spaced values from 0 to 1, that is, it takes on the

Table 2: Capital Controls: Standard Deviation and Correlations

Statistic	All Countries	Developed Countries	Emerging Countries	Low-Income Countries
Controls on Capital Inflows				
Standard Deviation	0.07	0.03	0.08	0.08
Correlation with Output	-0.01	-0.01	0.05	-0.12
Controls on Capital Outflows				
Standard Deviation	0.06	0.04	0.07	0.06
Correlation with Output	-0.03	-0.10	0.03	-0.06
Correlation Between				
Controls on Inflows and Controls on Outflows	0.28	0.21	0.32	0.31

Note. Cross-country averages. Country-specific moments are computed using the cyclical components of the corresponding time series, as defined in section 2.

values $0, 0.0833, 2 \times 0.0833, 3 \times 0.0833, \dots, 1$. Now, if a country in a given year increases the number of capital restrictions in only one out of the 10 possible types of transactions, then its index goes up by 0.0833. Therefore, the observed standard deviation of 0.07 is less than one transaction out of 10. It is in this sense that we say that the standard deviation of controls on capital inflows is small. A similar result obtains for controls on capital outflows. This means that controls on capital flows do not move much over the business cycle.

Recent theories of optimal capital-control policy suggest that controls on capital inflows should be procyclical while controls on capital outflows should be countercyclical. In this way, capital control policy would discourage net capital inflows during expansions and encourage them during contractions. Table 2 shows that the cyclical components of controls on capital inflows and outflows are roughly acyclical. Overall, the average correlation between output and capital controls is -0.01 for inflows and -0.03 for outflows. For developed and low income countries, the average correlation of capital controls on inflows with output are actually negative, indicating that, contrary to what is prescribed by theory, countries tend to facilitate inflows during economic expansions. Similarly, an unexpected sign is observed for the average correlation of controls on capital outflows and output in emerging countries.

The average correlations between output and controls on capital outflows are negative for developed and low-income countries, as suggested by theory, but are relatively small.

Figure 1 displays country-by-country correlations of capital controls with output. The figure makes clear that countries do not seem to be setting restrictions on capital flows in a systematically countercyclical fashion. Most countries display insignificant correlations between controls on capital flows and output. From an unconditional perspective, the sign of the correlation for a given country appears to be dictated by the toss of a coin.⁷

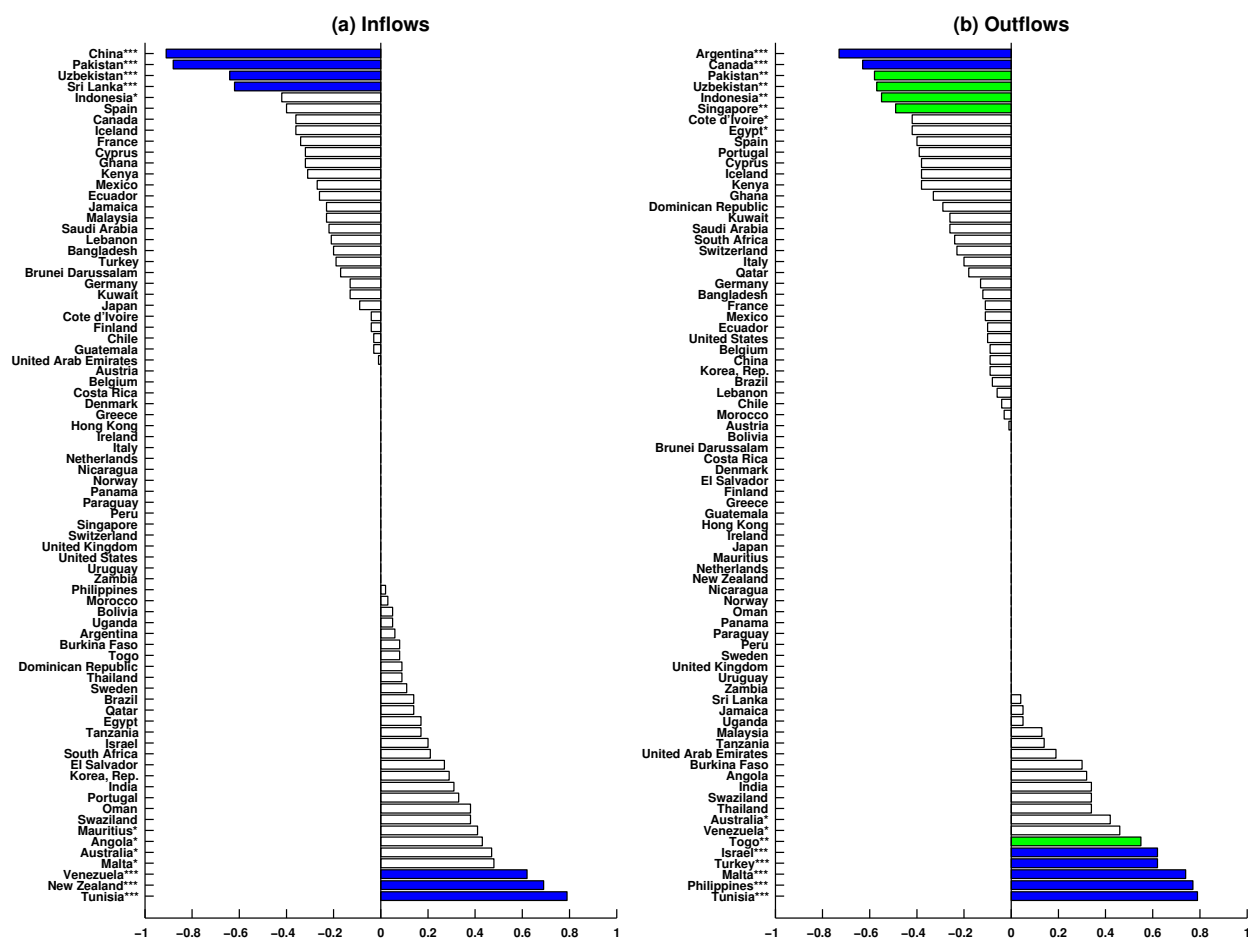
The observed comovement between controls on inflows and outflows also reveals the lack of a systematic use of restrictions to curb movements in net inflows. If this was the main purpose of capital control policy, we should observe a negative correlation between controls on inflows and controls on outflows. Periods in which the policymaker wishes to discourage net inflows should be associated with increases in controls on capital inflows and reductions in controls on capital outflows and vice versa. Figure 2 shows that this is not generally the case in reality. In most countries, the correlation between the cyclical components of controls on inflows and outflows is either nil or positive, suggesting that capital-control policy was not set with the primary intention of limiting the procyclicality of net capital inflows.

4 Capital Controls During Boom and Busts

The previous section demonstrated that unconditional second moments detect little if any macro prudential features in the observed behavior of capital controls. One reason for this failure may be that governments do not use capital controls to smooth capital flows caused by short-lived movements in aggregate activity. However, the government may put the capital-control machinery at work to face larger and more protracted deviations of output from trend. To the extent that aggregate fluctuations are dominated by relatively small and short-lived positive and negative output deviations from trend, unconditional correlations

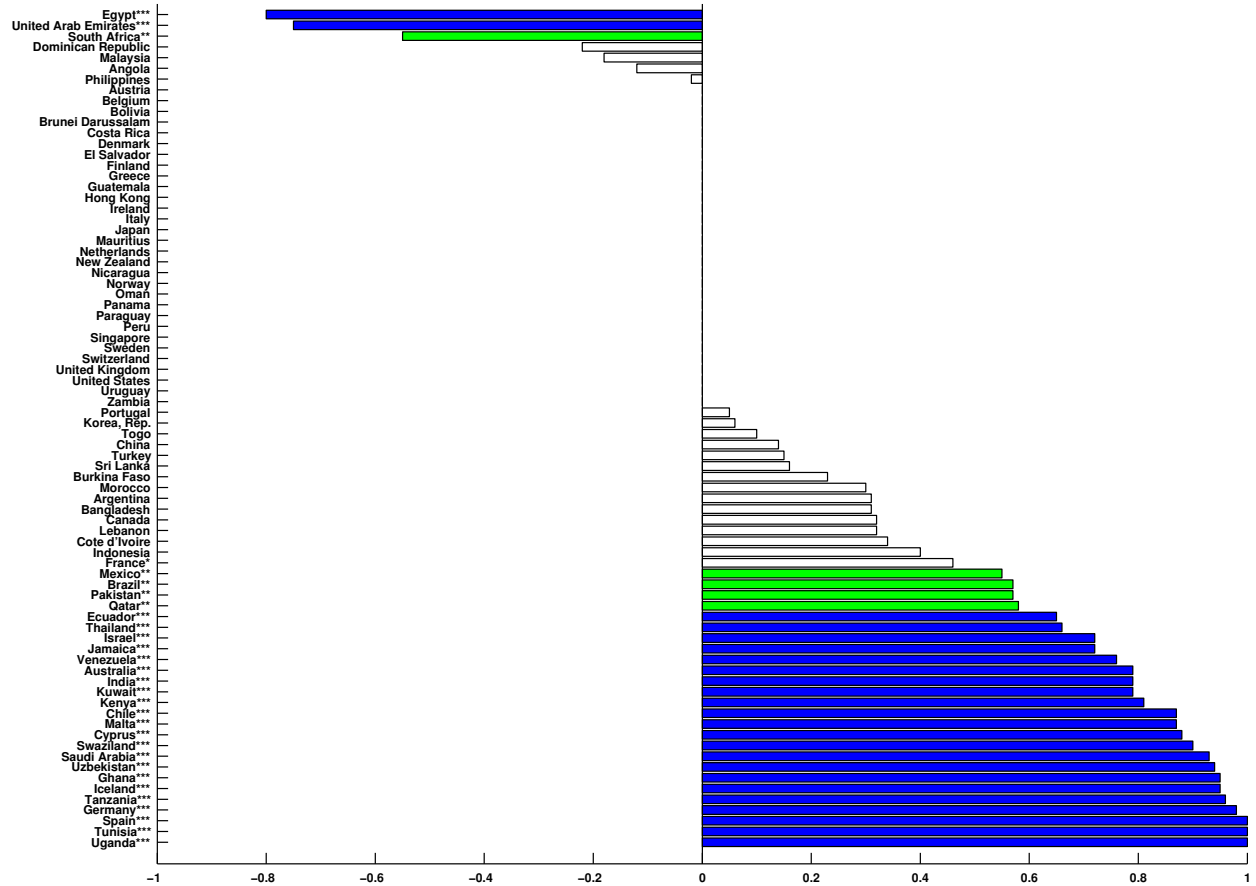
⁷Tables A.4.a and A.4.b in the expanded appendix (FRU, 2014) display average and country-by-country correlations at leads and lags.

Figure 1: Country-By-Country Correlations Between Capital Controls and Output



Note. Correlations are computed using the cyclical components of the corresponding time series, as defined in section 2. One, two, and three stars indicate, respectively, statistical significance at 1, 5, and 10 percent. Missing bars indicate covariance equal to zero.

Figure 2: Country-By-Country Correlations Between Controls on Capital inflows and Outflows



Note. Correlations are computed using the cyclical components of the corresponding time series, as defined in section 2. One, two, and three stars indicate, respectively, statistical significance at 1, 5, and 10 percent. Missing bars indicate covariance equal to zero.

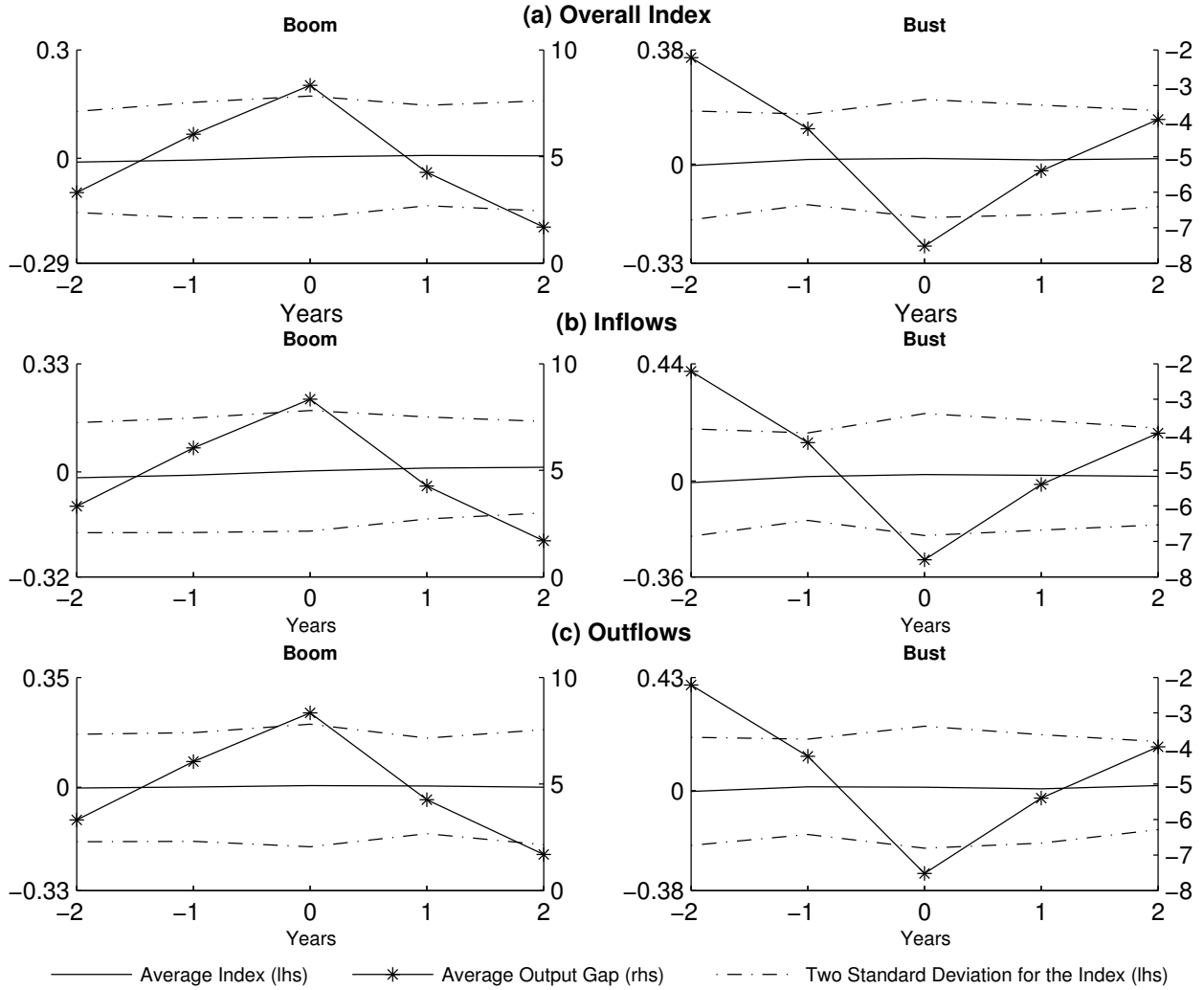
will fail to fully capture the countercyclical properties of capital control policy. Accordingly, in this section we study the comovement of capital controls and aggregate activity conditional on the state of the economy being characterized by either a boom or a bust in aggregate activity.

We define a boom (bust) as a period longer than or equal to three years in which GDP is always above (below) its trend level. The peak (trough) is the largest (smallest) value reached by the output gap during a boom (bust). These definitions identify large and protracted expansions and contractions in aggregate activity. The average magnitude of the output gap across peaks (troughs) is $+(-)8$ percent, or around 1.2 standard deviations. And the average duration of booms and busts is 7 years.

Figure 3 displays the average comovement between the output gap (starred lines) and the cyclical component of capital controls (solid lines) during boom and bust episodes along with two-standard-error bands for capital controls (dashed lines). Capital controls are virtually unchanged during booms or busts, and the two-standard error band is essentially centered around zero. This mute response of controls on capital inflows or outflows to booms or busts in aggregate activity suggests that restrictions on cross-border financial transactions do not behave in a macro prudential or countercyclical fashion.

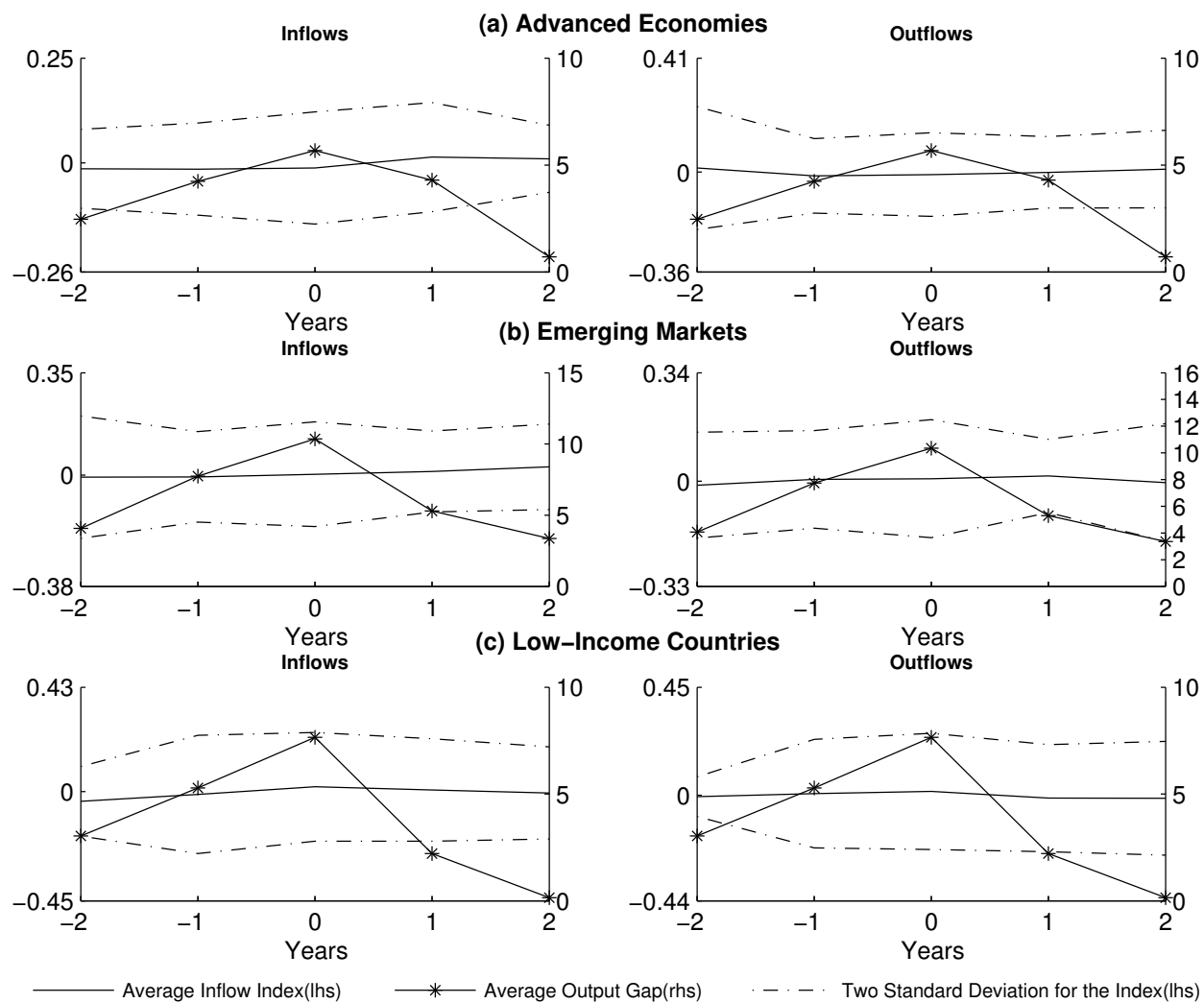
The comovement between capital-flow restrictions and output depicted in figure 3 is an average over all countries in the panel. The countries included in the sample are heterogeneous along a number of dimensions, including income level, monetary/exchange-rate policy, and external indebtedness. A natural question is whether the incentives to apply cyclical capital controls depend on the level of economic development of a country. Figures 4 and 15 (the latter placed in the appendix) display the comovement between capital controls and the output gap during booms and busts for groups of countries with different levels of development. One important difference between rich and poor or middle income economies is that the former are less volatile. In our sample, the standard deviation of the output gap is 4.0 percent for developed economies, 6.4 percent for emerging countries, and 5.8 percent

Figure 3: Boom-Bust Episodes and Capital Controls



Note. Booms (busts) are defined as periods longer than or equal to three years in which the output gap is always positive (negative). Capital controls and the output gap are expressed in deviations from trend as defined in section 2 and averaged across episodes. Output gaps are in percent.

Figure 4: Boom Episodes and Capital Controls By Level Of Development



Note. See note to figure 3. Country-group definitions follow IMF (2013).

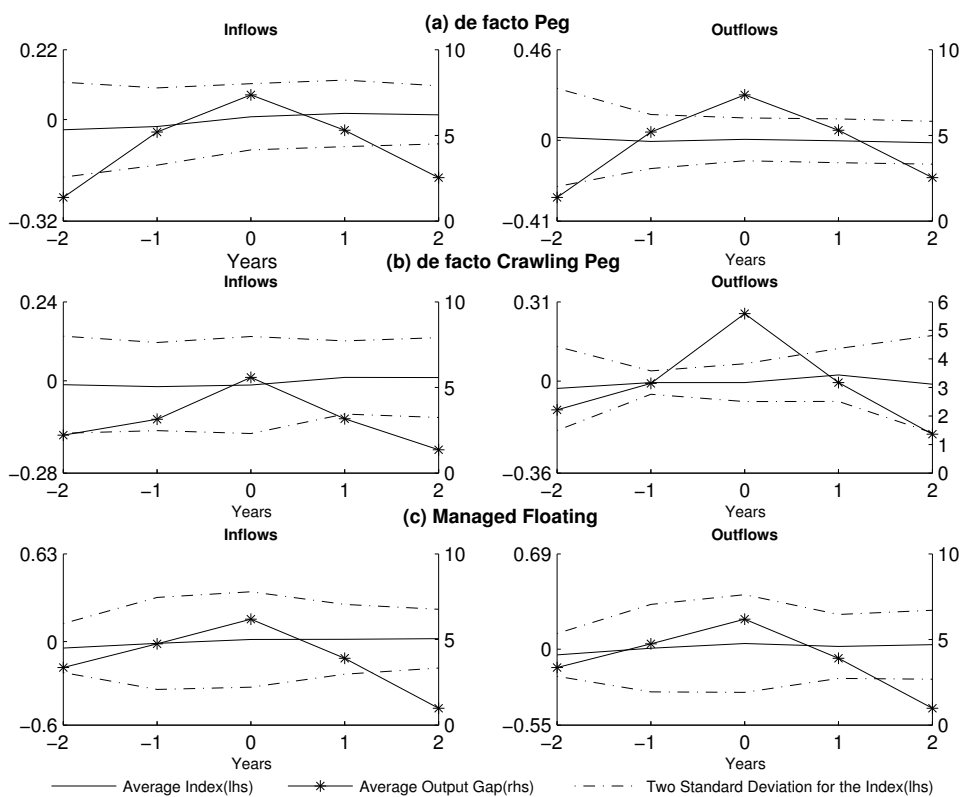
for low income countries. In general, recent theories of capital controls predict that more volatile economies are more likely to benefit from prudential capital-control policy. However, the figures show that even after disaggregating by level of development, controls on capital inflows or outflows do not move during booms or busts in aggregate activity. This result suggests that capital control policy is acyclical regardless of the level of development.

The theories surveyed earlier in the paper also suggest that, in the presence of nominal rigidities in factor or product prices, fixed-exchange-rate economies are particularly prone to unemployment caused by disturbances in aggregate activity. This is because the combination of rigidity in nominal prices and in the nominal exchange rate creates rigidities in relative prices, which can cause disequilibria in factor and/or product markets over the business cycle. Under these circumstances, the prudential use of capital controls can be beneficial as they have the potential to reduce the amplitude of expansions and contractions in aggregate demand. With this motivation in mind, in figure 5 we display the comovement between capital controls on inflows or outflows and the output gap during booms for countries with different exchange-rate arrangements. Figure 16 in the appendix displays the same information for bust episodes.⁸ Contrary to the predictions of recent theories of optimal capital controls, fixed-exchange-rate economies do not seem to be more likely to resort to prudential or cyclical capital flow restrictions to smooth the business cycle.

Figures 6 and 17 (the latter in the appendix) display the behavior of capital controls during booms and busts for two groups of countries, one with high levels of external debt, defined as having a net-foreign-asset-to-GDP ratio below the 20th percentile of the cross-country distribution, and the other with low levels (defined as the complement of the first group). The figures show that high-debt countries are characterized by larger booms and deeper busts than low-debt countries. However, high-debt countries do not seem to be more likely to apply prudential capital control policy. Indeed, capital controls on inflows or

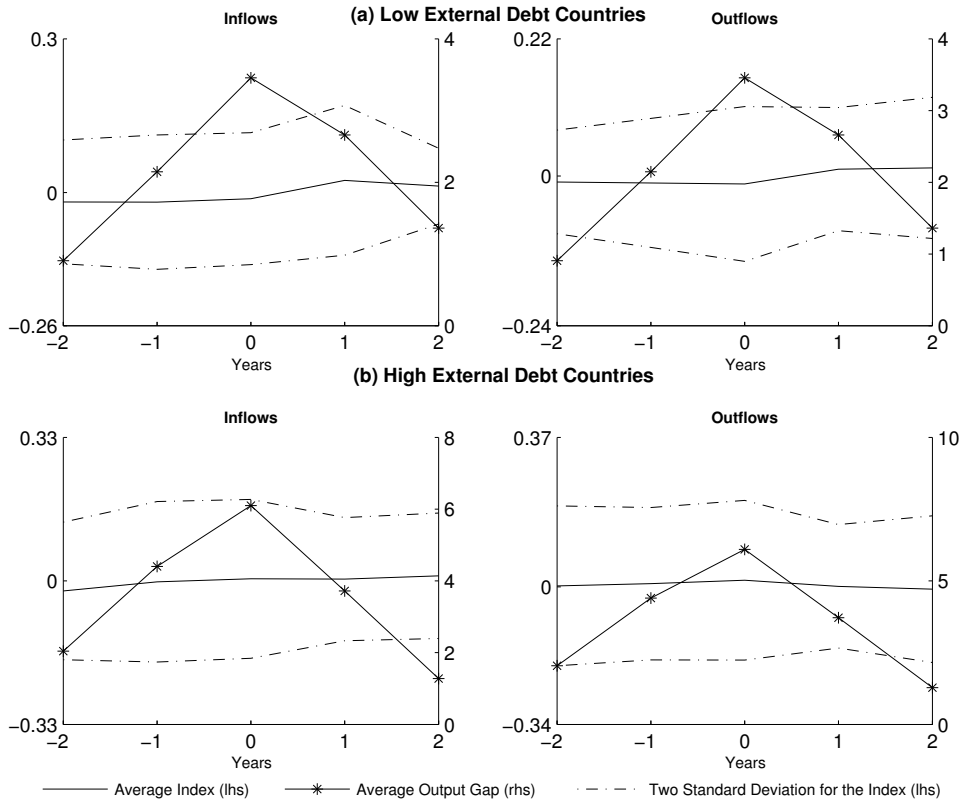
⁸The figures do not include the category ‘floating exchange rate’ because the panel includes two few episodes under this regime, which makes it impossible to construct error bands. Nonetheless, point estimates suggest that in floating regimes, capital controls do not seem to behave prudentially.

Figure 5: Boom Episodes and Capital Controls Across Exchange-Rate Regimes



Note. See note to figure 3. The exchange-rate regime classification is taken from Ilzetzky, Reinhart, and Rogoff (2010). Only boom episodes in which the exchange-rate regime did not change were considered.

Figure 6: Boom Episodes and Capital Controls By Level of External Indebtedness



Note. See note to figure 3. A country is classified as having a high (low) level of external debt if during the boom episode its net foreign asset to GDP ratio was below (above) the 20th percentile in the cross-country distribution. Data on net net-foreign-asset-to-GDP ratios are taken from Lane and Milesi-Ferreti (2007).

outflows appear to be unrelated to the state of the business cycle regardless of the level of external indebtedness.

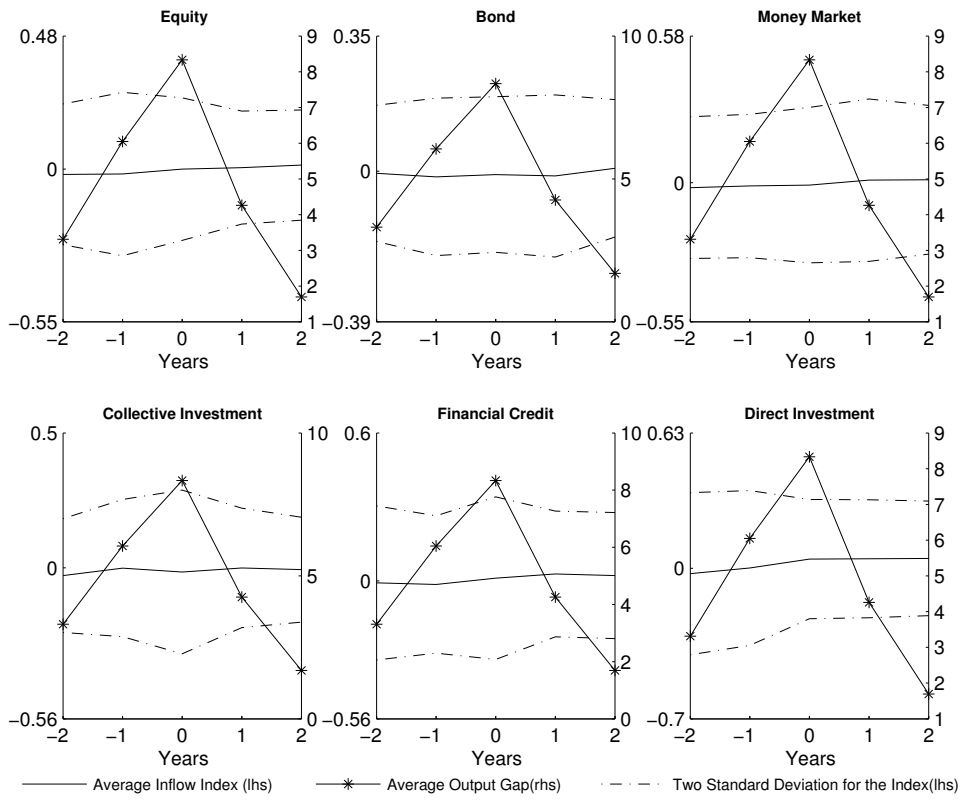
We close this section by exploring the possibility that capital controls on some types of assets be more cyclical than controls on other types. For instance, governments may have more incentives to regulate capital flows involving highly liquid assets, such as money market instruments, bonds, or equity, since this type of flows may have an easier time entering an economy during a boom and leaving as soon as economic conditions deteriorate. On the other hand, less liquid types of financial capital, such as foreign direct investment, may be less linked to short-run business conditions and more to long-run conditions, such as institutional quality, tax distortions, etc. For this type of assets, it is reasonable to expect capital controls to be less cyclical. Figures 7 and 18 (the latter in the appendix) display the behavior of controls on inflows during booms and busts for different categories of assets. The expanded appendix (FRU, 2014) displays the corresponding figures for outflows. The central result of this section holds after performing this disaggregation. That is, controls on capital inflows or outflows appear to be unrelated to the state of the business cycle. Interestingly, this result obtains for capital flows involving highly liquid types of assets, such as bonds and money market instruments.

5 Capital Controls, The Real Exchange Rate, And The Current Account

In a meta analysis of more than thirty empirical studies, Magud, Reinhart, and Rogoff (2011) find that two prominent rationales for governments to impose capital controls are to reduce real exchange rate pressures and to reduce the volume of capital flows.

The recent theoretical developments in capital-control policy discussed in section 1 provide foundations to these rationales. Consider, for example, an economy characterized by downward nominal wage rigidity and a fixed exchange rate regime. Suppose the economy

Figure 7: Boom Episodes and Capital Controls on Inflows Across Asset Categories



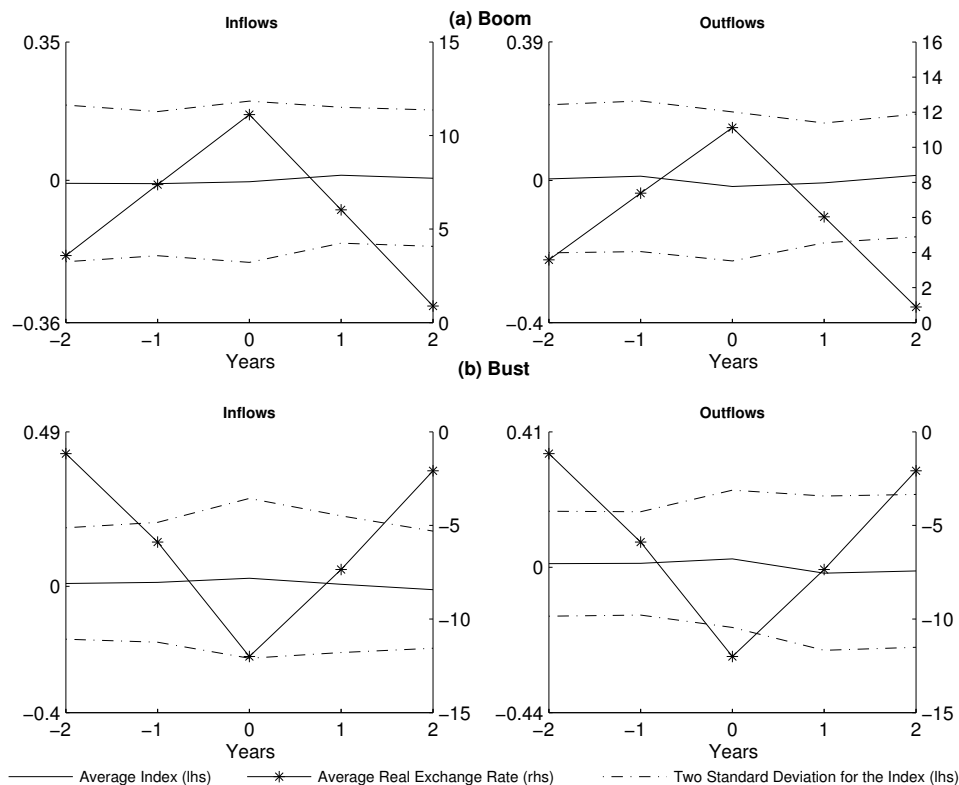
Note. See note to figure 3.

receives a large positive external shock, such as a large reduction in the country interest rate premium. In response to this improvement in external conditions, capital inflows surge facilitating an expansion in aggregate activity. The increase in aggregate demand causes an increase in wages and in the relative price of nontradables (or an appreciation of the real exchange rate). In the presence of downward nominal wage rigidity, this situation can be the preannouncement of a crisis. For when the favorable external conditions fade away (i.e., when the country premium goes back up to its normal level) aggregate demand contracts causing downward pressure on wages and a tendency for the real exchange rate to depreciate. However, if nominal wages are rigid and the nominal exchange rate is fixed, the downward adjustment in real wages will take place slowly, causing unemployment. In this case, capital controls during the expansionary phase of the cycle (i.e., prudential restrictions on international financial transactions) could be beneficial because, by discouraging capital inflows, they contribute to curbing the expansion in aggregate demand, the real-exchange-rate appreciation, and the initial increase in nominal wages. In turn, this moderation in wage growth during the boom phase creates conditions for a soft landing during the contractionary phase of the cycle.

Theories of collateralized lending also provide a rationale for using capital controls to moderate real exchange rate appreciations and surges in capital inflows. To see this, consider again the example of a fall in the country interest-rate premium that causes a surge in capital inflows, an expansion in aggregate demand, and an appreciation of the real exchange rate. To the extent that collateral is made up in part of nontradable goods, the real exchange-rate appreciation, by raising the relative price of these goods, produces an expansion in the value of collateral, which incentivates households to borrow more from the rest of the world. In this case, capital controls can be used to curb overborrowing and in this way allow for a more efficient intertemporal allocation of domestic absorption.

With this motivation in mind, we now analyze the observed comovement between capital controls and the cyclical components of the real effective exchange rate and the

Figure 8: Capital Controls During Booms and Busts In The Real Exchange Rate

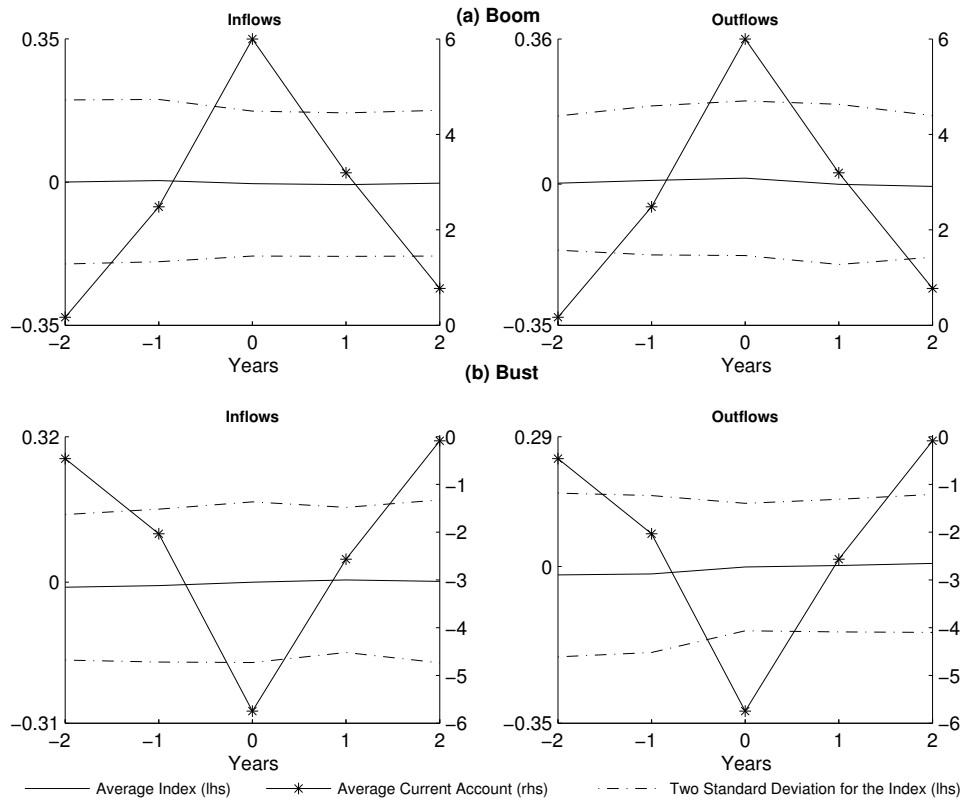


Note. See note to figure 3.

current-account-to-GDP ratio (CA). Data sources and the detrending methods used for each variable are described in section 2. As in the case of output, we define booms (busts) in the REER or the CA as periods longer than or equal to three years in which the variable is always above (below) trend. Figures 8 and 9 show that neither capital controls on inflows nor controls on outflows are sensitive to booms or busts in the real exchange rate or the current account. This result confirms the findings of the previous section suggesting that restrictions in cross-border financial transactions do not appear to behave in a prudential or countercyclical manner.⁹

⁹The results of this section are robust to controlling for income level (see FRU, 2014, tables A.14 to A.17).

Figure 9: Capital Controls During Booms and Busts In The Current-Account-To-GDP Ratio



Note. See note to figure 3.

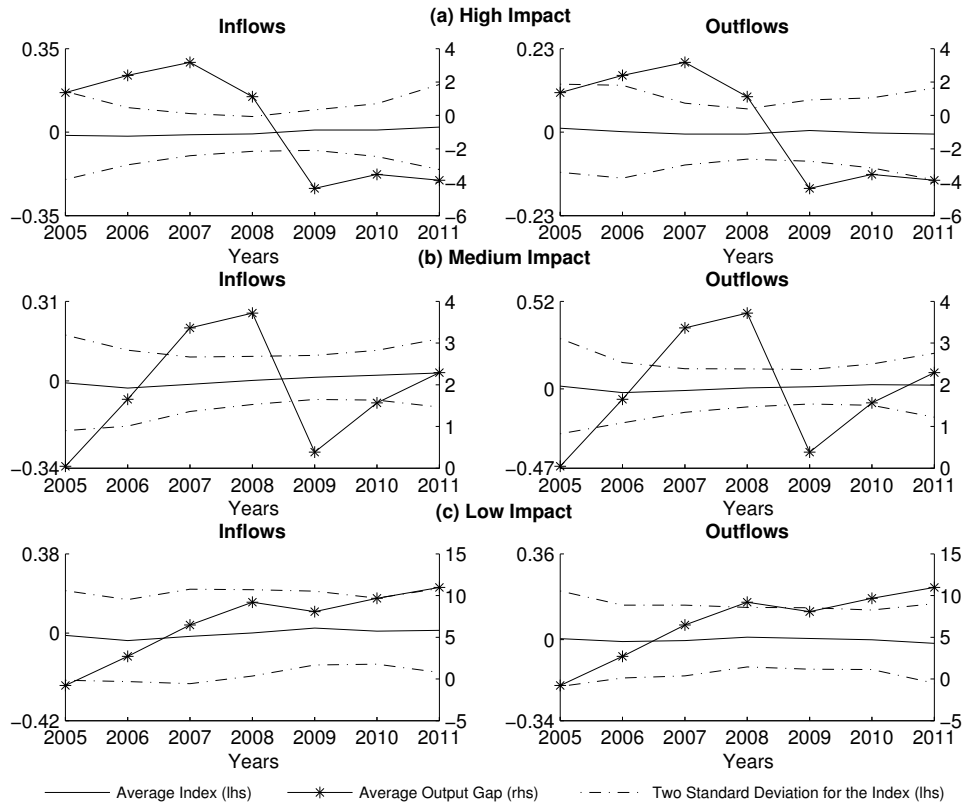
6 Capital Controls and the Great Contraction

The analysis thus far leaves open the possibility that some episodes of successful prudential capital control policy are left out precisely because capital controls managed to turn what could have been a boom-bust cycle into a milder course of business activity. To the extent that this type of episodes are numerous, the results presented in previous sections would introduce a downward bias in the estimated prudential content of capital control policy.

In an attempt to address this endogeneity problem, we analyze the comovement of capital controls and the output gap around the Great Contraction of 2007-2009. Arguably, this crisis originated in the United States—possibly as a consequence of the burst of a bubble in the domestic real estate market—and then spread around the world. Under this view, the Great Contraction can be taken as exogenous for most countries other than the United States. Of particular interest is the fact that not all countries were affected equally by the crisis. A natural question is then whether in countries that were less affected by the crisis, capital control policy displayed a more prudential or countercyclical behavior.

Figure 10 displays the behavior of controls on capital inflows and outflows and the output gap between 2005 and 2011 for three groups of countries: Low impact, medium impact, and high impact. Each impact group contains one third of the total number of countries in the panel. The low impact group contains the countries with the largest output gaps in 2009. The high impact group contains countries with the smallest output gaps in 2009. All other countries are placed in the medium impact group. The figure shows that regardless of the impact level, capital controls displayed virtually no movement before, during, or after the Great contraction. If anything, low impact countries applied slightly tighter restrictions on capital inflows in 2009 and thereafter than before 2009. Also, for this group of countries controls on inflows and outflows moved in tandem between 2005 and 2011, which, as argued in section 3 is at odds with a prudential or countercyclical policy stance. This result suggests that, in general, around the Great Contraction governments did not apply capital control policy in a systematically prudential or countercyclical fashion.

Figure 10: Capital Controls Around the Great Contraction By Impact Level



Note. Each impact group contains one third of the total number of countries in the panel. The low impact group contains the countries with the least negative output gaps in 2009. The high impact group contains countries with the most negative output gaps in 2009. All other countries are placed in the medium impact group.

7 Intensity Of Capital Controls

Our measure of capital controls is an aggregate of binary indices. Each of these indices captures an extensive margin. A specific type of international transaction is or is not regulated. However, because our index of capital controls combines many of these granular indices over many different types of international transactions, and because the value of each of these elementary indices may vary over time, movements in the aggregate index can be interpreted as an indirect measure of intensity. For they indicate how the number of asset categories and subcategories that are affected by regulation varies over time.

Here, we provide evidence on the ability of our index to capture the intensity of capital controls. To this end, we begin by focusing on the Brazilian experience in the late 2000s. This episode is of particular interest because the tax rates on international transactions are known, providing direct evidence on intensity of capital controls, and because it is a policy experiment that has been carefully studied in the recent related literature (see, for example, Pereira da Silva and Harris, 2012; Forbes et al., 2012; and Chamon and Garcia, 2013).

During the years 2008 and 2009, Brazil implemented a number of capital control measures on, among others, international transactions of equity and fixed income instruments, known as tax on financial operations or IOF for its Portuguese acronym. Figure 11 displays with a circled line the IOF tax rate on cross-border equity transactions and with a crossed line the IOF tax rate on cross-border transactions involving fixed-income instruments. The figure also displays, with a solid line, our index of controls on capital inflows for Brazil.¹⁰ The Schindler index tracks well the behavior of the more direct measures of controls around the 2008-2009 crisis. This evidence suggests that the aggregation of binary indices across a number of finely defined asset categories effectively captures the use of controls along the intensive margin.

A natural question is whether the behavior of capital controls in Brazil during the 2000s,

¹⁰Table A.12 in FRU (2014) in the appendix displays disaggregated information across asset categories of inflow restrictions in Brazil over the sub-sample 2008 to 2011.

Figure 11: Capital Controls in Brazil: The Schindler Index And Actual Tax Rates

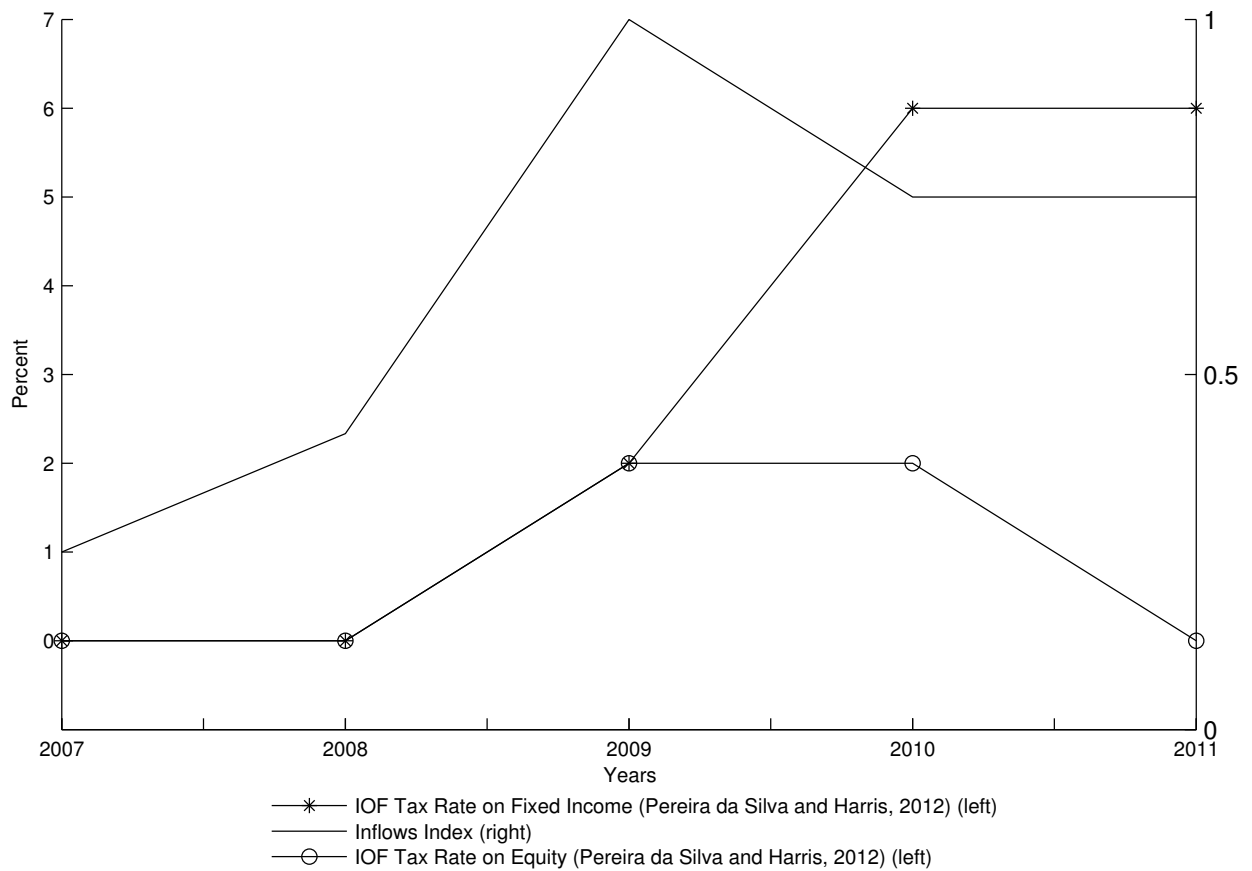
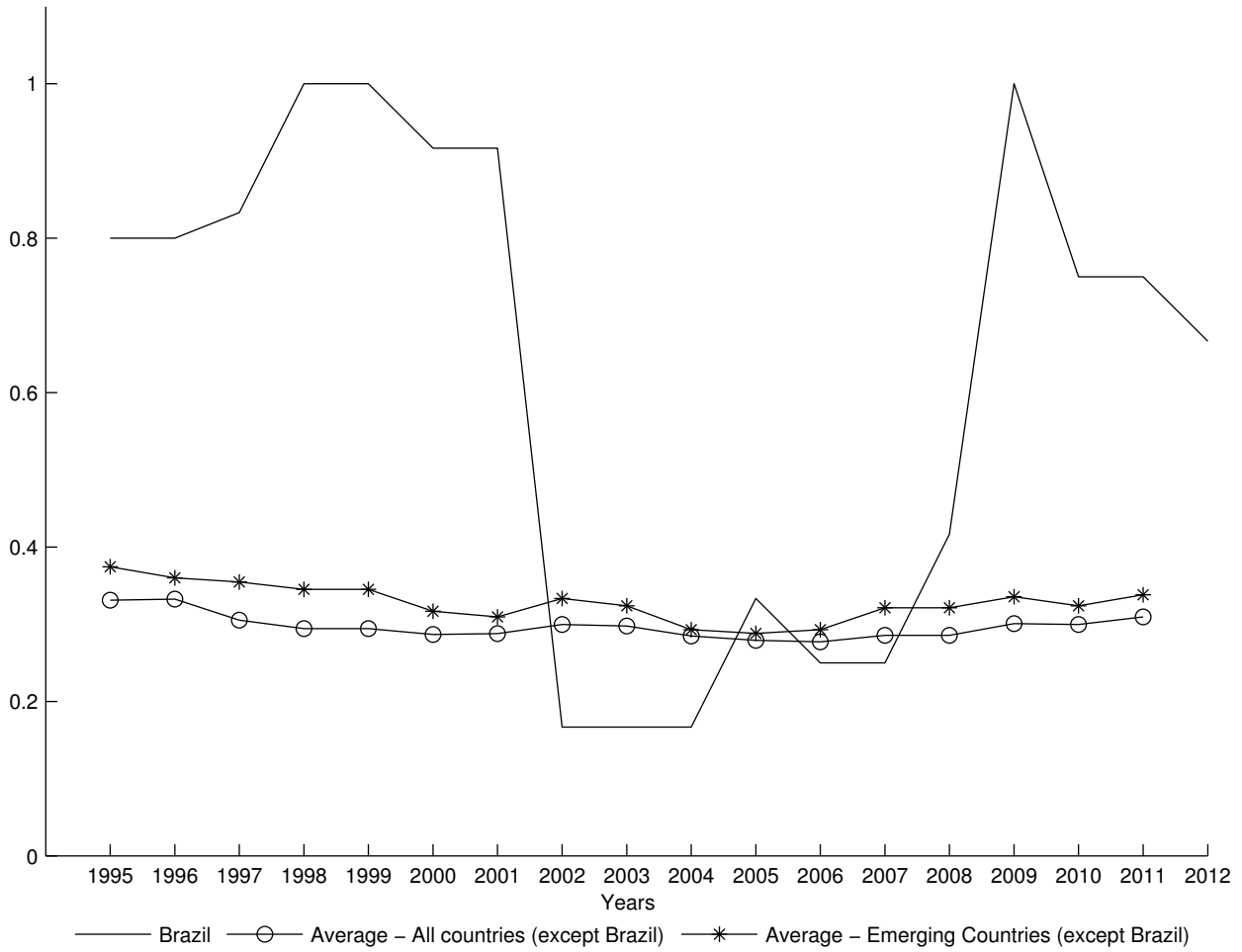


Figure 12: Capital Controls: Brazil Versus Other Countries



and particularly around the great-contraction years is representative of other countries or at least of other emerging countries. Figure 12 addresses this question. It displays the index of controls on capital inflows for Brazil (solid line) along with the average index over all other countries in the sample (circled line) and the average index over all emerging countries in the sample excluding Brazil (starred line) between 2000 and 2011. Unlike Brazil, on average, other countries did not increase capital controls in 2008 and 2009. The same is true for the years 2000 and 2001. During this period, low interest rates in the United States induced financial capital to flow to other countries. Brazil faced this situation with high controls on cross border transactions. By contrast, the rest of the countries whether emerging or

developed, on average, displayed very little movement in capital controls. This evidence suggests that the behavior of capital controls in Brazil during the first decade of the present century is not representative of capital control movements in the rest of the world over the same period.

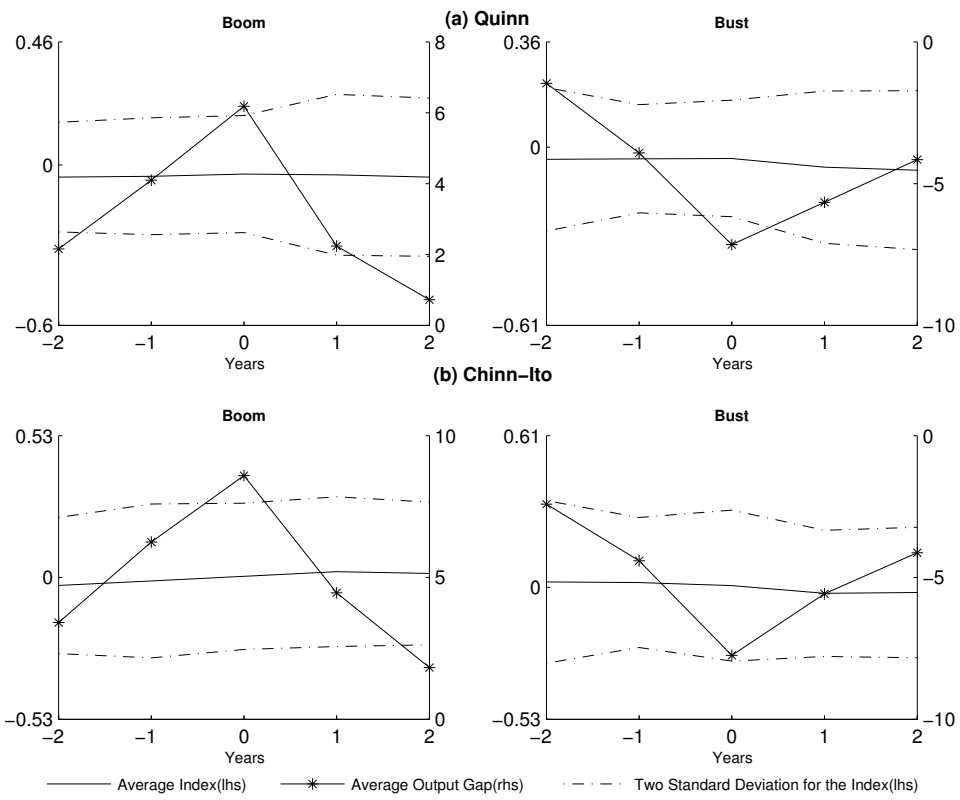
One way to enhance the ability of de jure indices of capital controls to capture intensity is to use more than two levels in the coding of the text in the AREAER describing the type of restrictions affecting international transactions. This approach was first adopted by Quinn (1997). The text in the AREAER is amenable to a finer coding because it is precise and consistent across time and space. Quinn's index covers 64 countries over the period 1950-1994. More recently, Quinn, Schindler, and Toyoda (2011) extend the time coverage of the Quinn index to 2007 and 142 countries. Unfortunately, this index does not distinguish between controls on capital inflows and capital outflows.

Figure 13 displays the average comovement of the cyclical component of the Quinn index and the output gap during boom and bust episodes observed in 68 countries over the period 1995-2007.¹¹ The results are consistent with those obtained using the Schindler index. The Quinn index is virtually flat across booms and busts in aggregate activity. This result confirms our finding that, on average, capital controls do not appear to be set in a prudential or countercyclical fashion.

A third index of capital controls that is widely used in the related literature is due to Chinn and Ito (2006). Like the Schindler and Quinn indices, the Chinn-Ito index draws information from the IMF's AREAER. However, it includes information on different variables related to restrictions on international transactions. Specifically, the Chinn-Ito index includes four binary indicators on: (1) Openness of the capital account; (2) openness of the current account; (3) restrictions on the repatriation or surrender of export proceeds; and (4) multiple exchange rates for international financial transactions. The Chinn and Ito index consists of

¹¹To maximize comparability, the countries and years included correspond to the intersection of our updated panel of Schindler's capital control indices and the panel of Quinn indices updated by Quinn, Schindler, and Toyoda.

Figure 13: Alternative Measures of Capital Controls



Note. Averages across boom or bust episodes. Capital control indices are linearly detrended at the country level.

the first principal component of these four variables. At the time of this writing, the index was available for 182 countries from 1970 to 2011 at annual frequency.¹² Figure 13 displays the average behavior of the cyclical component of the Chinn-Ito index and the output gap during boom or bust episodes observed in 75 countries over the period 1995-2011.¹³ The figure is in line with the results obtained with the Schindler and Quinn indices. There is virtually no movement in capital controls during booms or contractions in aggregate activity, suggesting that on average capital control policy is not prudential in nature.

8 Gates, Walls, And Other Robustness Checks

Here, we analyze the cyclical behavior of capital controls in countries that apply this type of restrictions episodically. Specifically, Klein (2012) distinguishes capital controls into ones that are in place more or less permanently (he refers to this category as ‘walls’) and ones that are applied episodically (he calls these ‘gates’). Although Klein limits attention to controls on capital inflows, our data set allows us to conduct the analysis using data on controls on inflows and outflows separately. Clearly, permanent capital controls cannot be prudential, since, by definition, they do not change over the business cycle. A natural question, then, is whether episodic capital controls behave in a prudential or countercyclical manner.

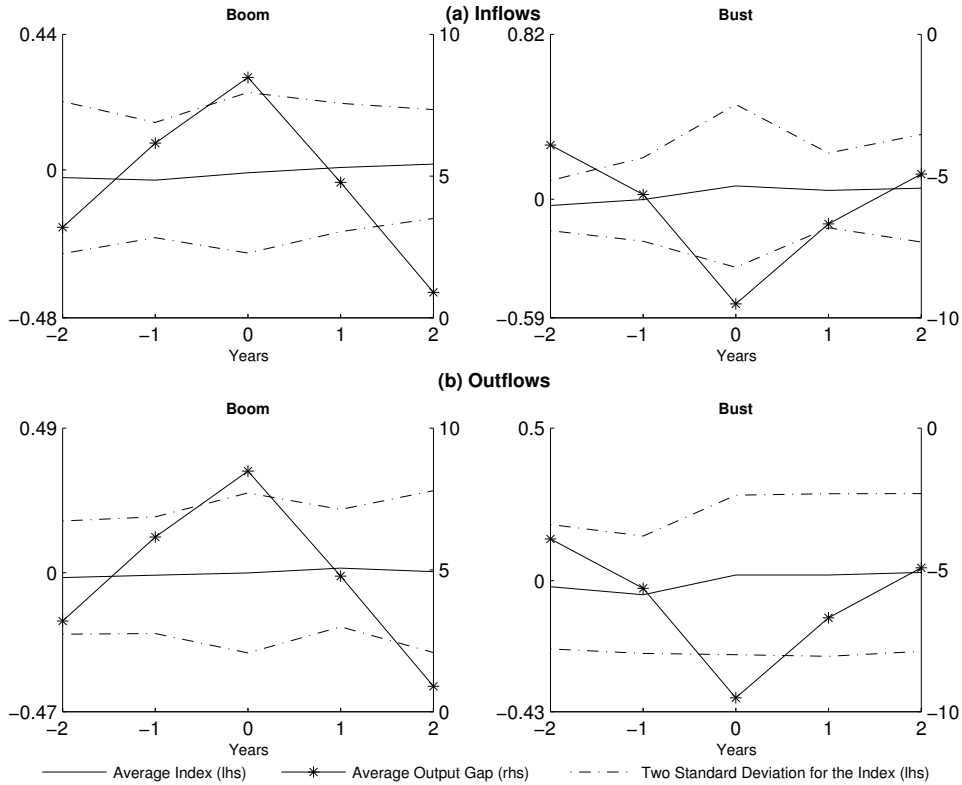
To address this question, we now restrict the analysis to the group of episodic countries listed in Klein (2012, table 2).¹⁴ The average standard deviation of the cyclical component of capital controls across episodic countries is 0.10 for inflows and 0.09 for outflows. These numbers are higher than the ones corresponding to the whole sample (0.07 and 0.06, respectively). However, the standard deviations are still small, for they are equivalent to movements in controls in slightly more than one out of 10 of the granular type of transactions comprising

¹²Earlier, Mody and Murshid (2005) constructed an index using the same dummy indicators, but aggregating them by addition.

¹³The criterion determining the country and time dimension of the sample is similar to the one described in footnote 11.

¹⁴We eliminated the Czech Republic and Hungary because they do not satisfy our requirement of at least 25 years of output data to ensure an adequate estimate of the output gap. We also eliminated Poland for comparability, as this country is not included in our extension of Schindler’s data set.

Figure 14: Boom-Bust Episodes and Episodic Capital Controls



Note. Averages across 20 boom and 17 bust episodes. The list of episodic countries is taken from Klein (2012, table 2). See also footnote 14.

each of the two indices. This means that even episodic capital controls move little over the business cycle. Figure 14 displays for episodic countries the behavior of capital controls on inflows and outflows conditional on the economy being in a boom or a bust. As in the entire sample, capital controls on inflows or outflows are virtually unchanged during booms or busts. This result suggests that even among episodic countries, on average, restrictions on international financial transactions do not seem to be driven by a macro prudential or countercyclical motive.

The expanded appendix (FRU, 2014) presents a number of additional robustness checks. In particular it shows that our main results hold at the level of each of the 10 granular transactions that constitute the indices of capital controls on inflows or outflows

(table A.6.a), when one limits attention to large booms and busts (figure A.6), when output is detrended using first differences rather than by removing a quadratic trend (table A.3.d and figure A.7), and when capital controls are not detrended (table A.3.c).

9 Conclusion

A growing recent theoretical literature argues that prudential capital control policy may be optimal. According to this body of work, booms in aggregate activity carry the seeds of economic crises. Therefore, these theories suggest that policymakers should act early and not wait until the crisis has taken place to pick up the broken pieces. That is, during booms controls on capital inflows should be tightened and controls on outflow loosened and vice versa during contractions. In this paper, we set out to establish whether observed capital control policy around the world has systematically behaved in a prudential or countercyclical manner during the past decade and a half.

To this end, the first contribution of our investigation is to update the index of capital controls constructed by Schindler (2009). The new data set covers 91 countries over the period 1995-2011. This capital control index distinguishes inflows from outflows, type of assets, and residency.

Equipped with this updated panel of capital control indices, we document patterns of comovement with various macroeconomic indicators. The central result of our analysis is that capital controls are virtually flat during macroeconomic booms or busts. This is the case regardless of whether the indicator used to identify booms and busts is output, the current account, or the real exchange rate. This result also holds for many different ways of disaggregating the data, including, the level of economic development, the degree of external indebtedness, the exchange rate regime, or the type of asset. We also document a quasi perfect acyclicity of capital controls during the Great Contraction of 2007-2009.

There are indications that policymakers are adopting more eclectic positions with re-

spect to the use of capital-account restriction for stabilization purposes. The IMF endorsement of this type of policy in recent years is perhaps the most clear signal in this regard. It would therefore be of interest to monitor over time the cyclical behavior of capital controls, by, for example, updating periodically the type of analysis carried out in this paper, to gauge the extent to which the perceived changes in views regarding the role of capital controls are put to work.

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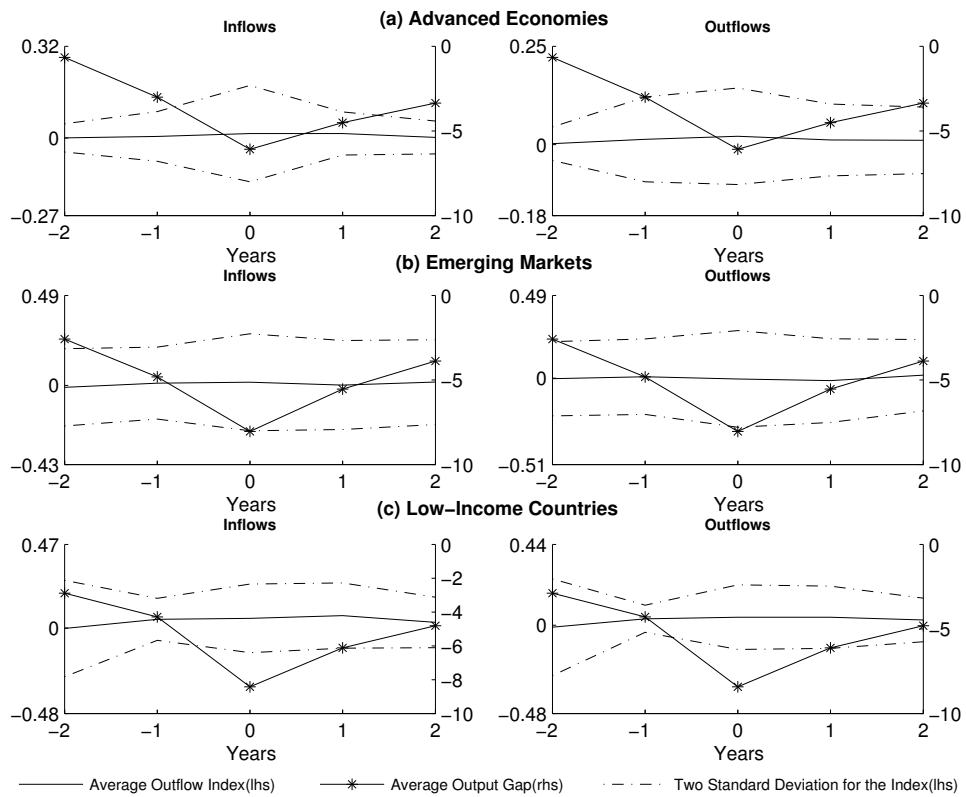
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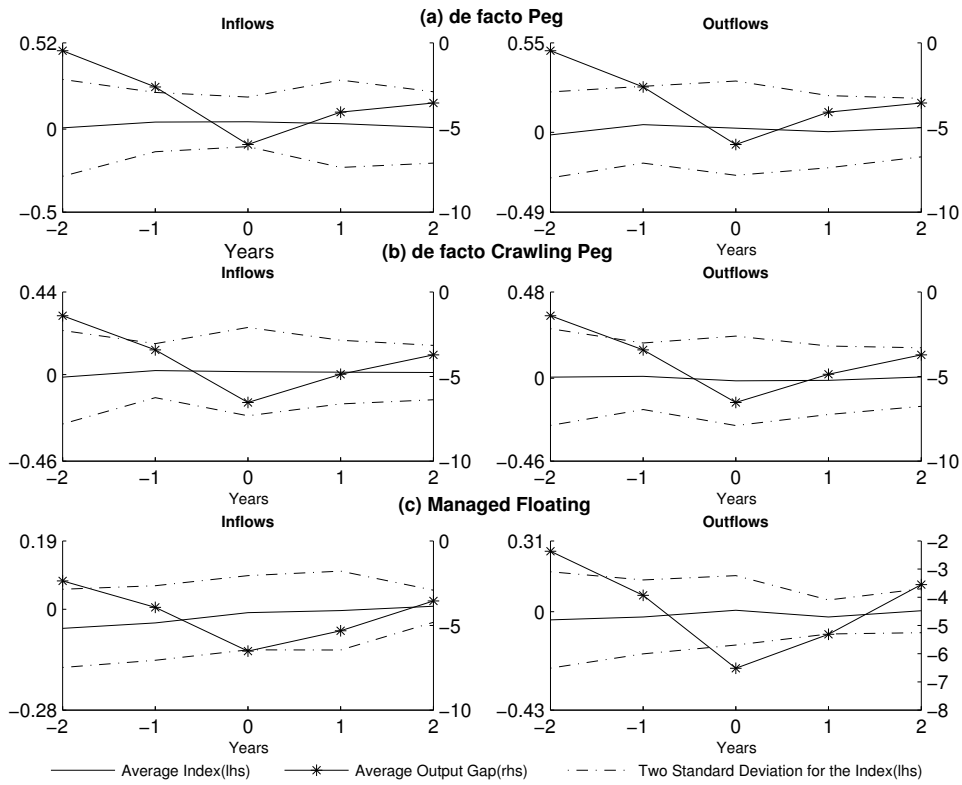
Appendix

Figure 15: Bust Episodes and Capital Controls By Level Of Development



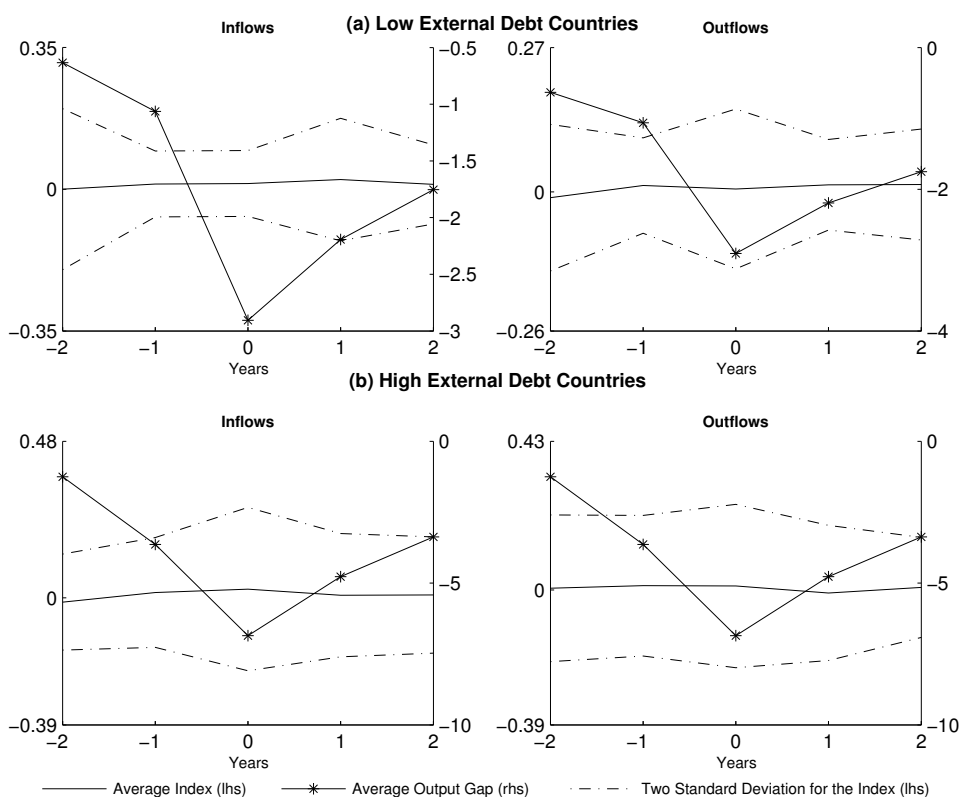
Note. See note to figure 3. Country-group definitions follow IMF (2013).

Figure 16: Bust Episodes and Capital Controls By Across Exchange-Rate Regimes



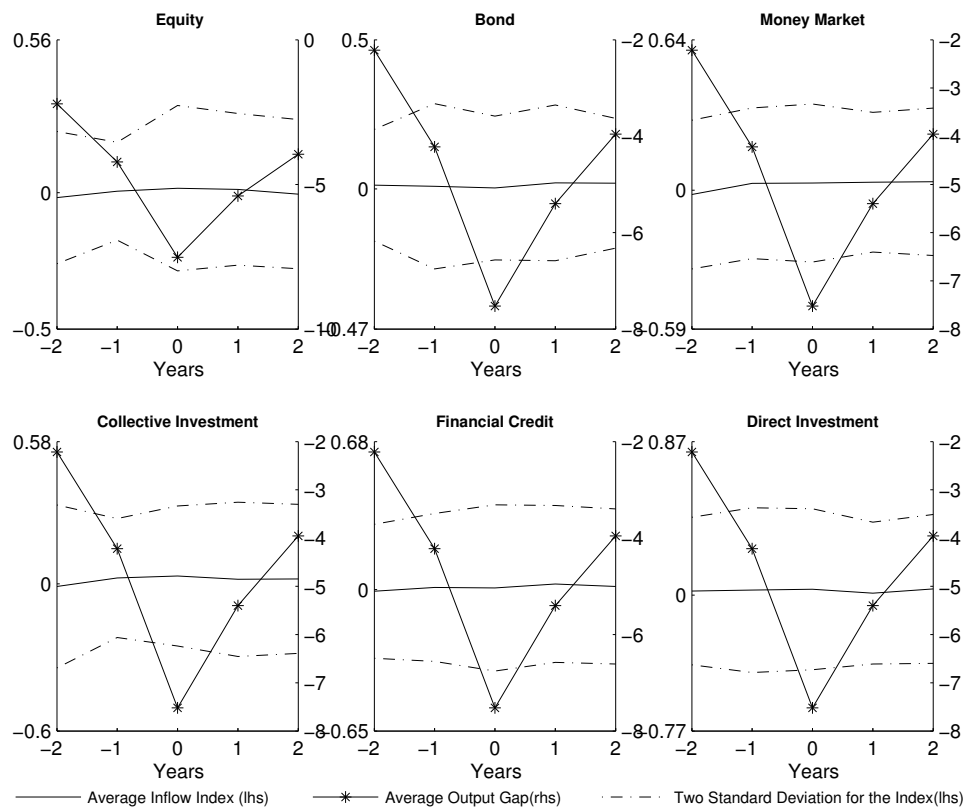
Note. See note to figure 3. The exchange-rate regime classification follows Ilzetzky, Reinhart, and Rogoff (2010).

Figure 17: Bust Episodes and Capital Controls By Level of External Indebtedness



Note. See note to figure 3. A country is classified as having a low (high) level of external debt if during the bust episode its net foreign asset to GDP ratio lies below (above) the 20th percentile of the world distribution. Data on net external debt to GDP ratios are taken from Lane and Milesi-Ferreti (2007).

Figure 18: Bust Episodes and Capital Controls On Inflows By Asset Category



Note. See note to figure 3.