Are capital controls countercyclical?

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ABSTRACT

A growing theoretical literature advocates the use of countercyclical capital control policy, 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 78 countries over the period 1995–2011. We find that capital controls are remarkably acyclical. Booms and busts in aggregate activity are associated with virtually no movements in capital controls. These results are robust to controlling for the level of development, external indebtedness, and the exchange-rate regime. They also obtain around the great contraction of 2007.

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1. Introduction

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. 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 (International Monetary Fund, hereafter IMF, 2011).

A recent theoretical literature characterizes environments in which countercyclical capital-control policy is desirable. In general, these models describe economies with externalities, in which capital controls represent second-best remedies. These new theories of countercyclical capital-control policy can be broadly divided into two classes. In one class, countercyclical capital-control policy is beneficial because it can promote financial stability.[1] In the second class, countercyclical capital control policy is

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[1] See for example, Lorenzoni (2008), Korinek (2010), Jeanne and Korinek (2011), Bianchi (2011), Bianchi and Mendoza (2010), Fernández-Arias and Lombardo (1998), and Benigno et al. (2014).

desirable because it can improve macroeconomic adjustment in economies with nominal rigidities and suboptimal monetary or exchange-rate policy.[2] 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 is exacerbated by signals that are distorted by the presence of financial or nominal frictions. 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 countercyclical manner as suggested by these new theories. To this end, the first contribution of this paper is to update Schindler (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 countercyclical 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 countercyclical fashion, as advocated by the theories described above.

These findings are robust to disaggregating the data along a number of dimensions, including, individual asset categories, individual asset location, income levels, the exchange-rate regime, and the level of external indebtedness. The results also hold when we limit attention to the global crisis of 2007 or to countries that actively change capital controls (or gates, in the terminology coined by Klein, 2012).

Our index of capital controls is based on a binary variable at the level of individual assets and location. However, the fact that the index includes many asset categories and asset locations allows it to capture the intensity with which capital controls are imposed, as the coverage of this type of restrictions varies over asset categories and asset locations across time. We illustrate this property of the capital control index by analyzing its behavior 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 countercyclical capital control policy. We show that our index tracks well the behavior of effective capital control taxes 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 countercyclical 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. To the 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 et al. (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 impose capital controls in a countercyclical fashion.

The remainder of the paper is organized as follows. Section 2 describes the data. Section 3 documents the unconditional acyclicality of capital controls. Section 4 studies the behavior of capital controls during booms and busts 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. Section 8 concludes.

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[2] See, for instance, Schmitt-Grohé and Uribe (2015) and Farhi and Werning (2012).

2. The data

Our analysis uses an updated version of Schindler (2009) index of capital controls. This is a *de jure* measure 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 this data set through 2011. Thus our capital-control data set is a panel of 91 countries covering the period 1995–2011.[3] The data set is available online.[4]

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.[5] 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 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 $i=0, 1, ..., 12$, with 0 representing no restrictions and 1 representing restrictions on all types of international transactions. The 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. 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 our capital control index for different groups of countries. Controls on inflows are on average somewhat lower than controls on outflows (0.31 versus 0.37). The average value of the overall index is 0.34 $(=(0.31+0.37)/2)$. 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 0.08. The group of low income countries displays an average capital control index seven times higher than the one observed in developed countries. And emerging countries display an intermediate level of capital controls with an average index four times as large as the one observed in developed economies.

To assess the countercyclicality 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 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 Online Appendix. The length restriction is guided by the desire to obtain precise estimates of the trend and cyclical components of aggregate activity. The resulting panel contains 78 countries and comprises 22 developed countries, 36 emerging countries, and 20 low-income countries.

3. The unconditional acyclicality of capital controls

Capital restrictions move little over the business cycle. Table 1 presents a number of statistics that characterize their cyclical properties. The first feature that stands out is the small standard deviations of the cyclical components of capital controls. For the group of all countries, the average standard deviations of both capital-inflow and capital-outflow controls equal 0.07. To see why this number is small, recall that the index of capital controls on inflows our outflows each aggregates 10 binary indices of controls on individual transactions aggregated in two steps (see Section 2) and takes on 13 equally spaced values from 0 to 1, that is, it takes on the values $0, 1/12, 2/12, ..., 1$. Now, if a country in a given year increases the

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[3] The data on international bond transactions starts in 1997, as in Schindler's data set.

[4] Recently, Fernández et al. (2015) build on this data set by including additional asset categories, years, and countries.

[5] The income classification follows WEO 2013.

Table 1
Capital controls: mean, standard deviation, and correlations.

Statistic	All countries	Developed countries	Emerging countries	Low-income countries
Controls on capital inflows				
Mean	0.31	0.07	0.35	0.51
Standard deviation	0.07	0.03	0.08	0.08
Correlation with output	0.00	−0.07	0.07	−0.04
Controls on capital outflows				
Mean	0.37	0.10	0.40	0.60
Deviation	0.07	0.05	0.07	0.07
Correlation with output	0.00	−0.07	0.03	0.04
Correlation between controls on inflows and controls on outflows	0.31	0.19	0.32	0.43

Note: Sample 1995–2011, 22 developed countries, 36 emerging countries, and 20 low-income countries. All moments are computed country by country and then averaged across countries. Second moments are computed using cyclical components, as defined in Section 2.

number of capital restrictions in only one out of the 10 possible types of transactions, then its index goes up by at least 1/12, or 0.0833. Therefore, the observed standard deviations of 0.07 represent less than one change in restriction in one out of 10 types of asset transactions. It is in this sense that we say that the standard deviations of controls on capital inflows and capital outflows are small.

How do capital controls comove with aggregate activity? 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, theory goes, capital-control policy discourages net capital inflows during expansions and encourages them during contractions, thereby contributing to macroeconomic stability. Table 1 shows that overall capital-inflow and capital-outflow controls are roughly acyclical. For the group of all countries, the average correlation between output and capital controls, whether on inflows or outflows, is nil. When countries are sorted by income level, the correlation is also small and often of the wrong sign. 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 between outflow controls and output in emerging and low-income countries.

Fig. 1 displays country-by-country correlations of capital controls with output. The figure shows that countries do not seem to be setting restrictions on capital flows in a systematically countercyclical fashion. Most countries display insignificant correlations, and, unconditionally, the sign of the correlation can be positive or negative with roughly equal probability.[6]

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.

Fig. 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 booms and busts

The previous section suggests that unconditional second moments detect little if any systematic cyclical features in the observed behavior of capital controls. One reason for this failure may be that governments do not bother imposing capital controls to smooth capital flows caused by small and short-lived movements in aggregate activity. However, governments may be more willing to 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 deviations of output from trend, unconditional correlations 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) of a boom (bust) is defined as the largest (smallest) output value observed during that boom (bust). These definitions identify large and protracted expansions and contractions in aggregate activity. The average magnitude of

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[6] A similar pattern emerges when one examines correlations at leads and lags both on average and country by country (see the Online Appendix).
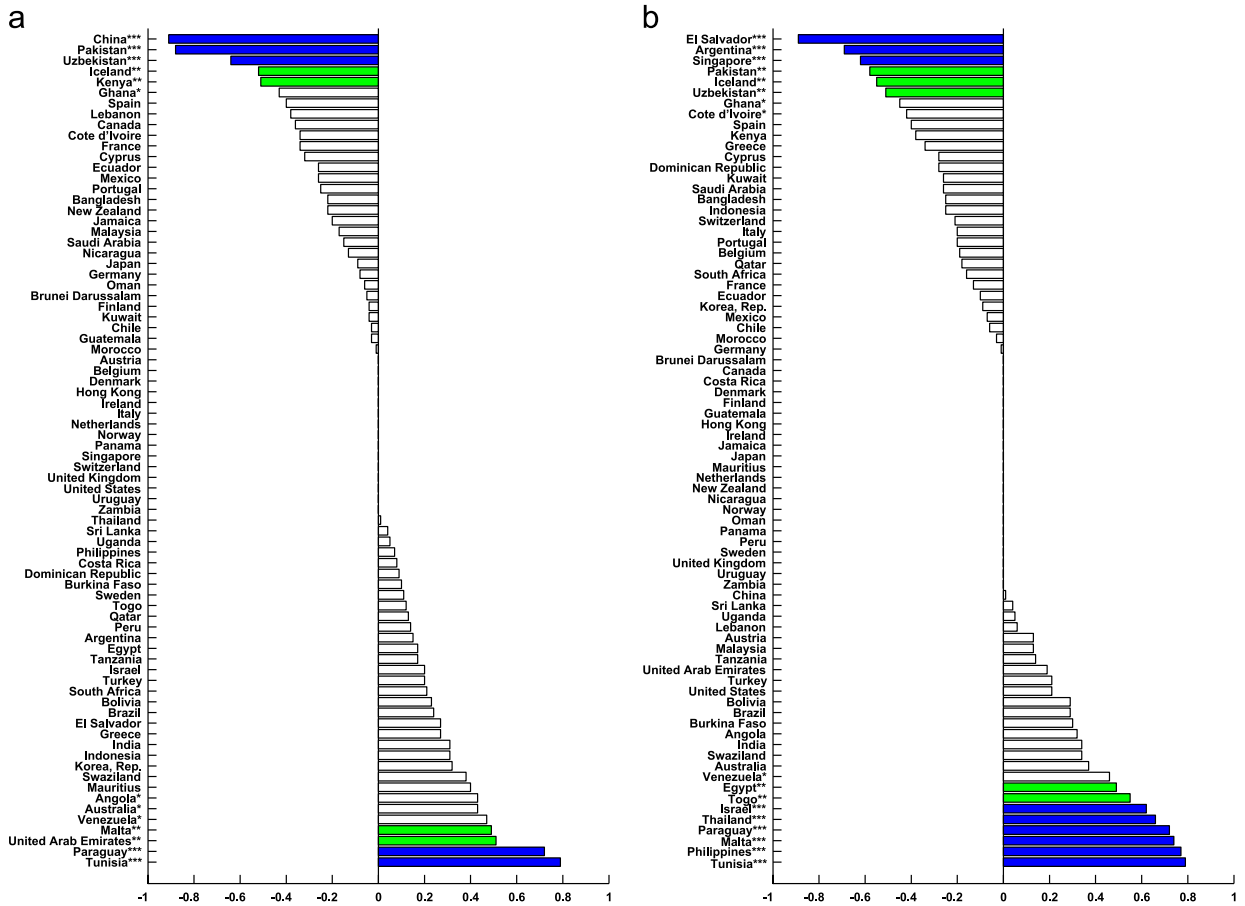
Fig. 1. Country-by-country correlations between capital controls and output. *Note*: Correlations are computed using the cyclical components of the corresponding time series, as defined in Section 2. One star, two stars (green bars), and three stars (blue bars) indicate, respectively, statistical significance at 10, 5, and 1 percent. Missing bars indicate covariance equal to zero. (For interpretation of the references to color in this figure caption, the reader is referred to the web version of this paper.)

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.

Fig. 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).[7] Our measure of capital controls is 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 the imposition of restrictions on cross-border financial transactions does not behave in a countercyclical fashion.[8]

4.1. Disaggregation by asset category and asset location

As mentioned earlier, the measures of restrictions on capital inflows and outflows depicted in Fig. 3 are each based on indices that comprise restrictions on six asset categories, equity, bonds, foreign direct investment, money market instruments, collective investments, and financial credit. The first three categories represent the bulk of gross international capital transactions and are each quantitatively important (Lane and Milesi-Ferretti, 2007). For this reason, it is of interest to examine the cyclicality of capital controls on each of these three asset categories separately. This test rules out, for example, the possibility that a bias toward acyclicality of capital controls is due to the fact that policymakers do not change controls on the other asset categories simply because they are too small to matter. The first row of Fig. 4 displays the behavior of

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[7] Standard errors are computed as the cross-country standard deviation of the cyclical component of capital controls at each point of the boom or bust. An alternative measure, shown in the Online Appendix, is to compute standard deviations across time for each country and then average them across countries. The results are robust to adopting this method.

[8] The Online Appendix shows that the results presented in Fig. 3 hold when one limits attention to large booms and busts, when output is detrended using first differences rather than by removing a quadratic trend, and when capital controls are not detrended.
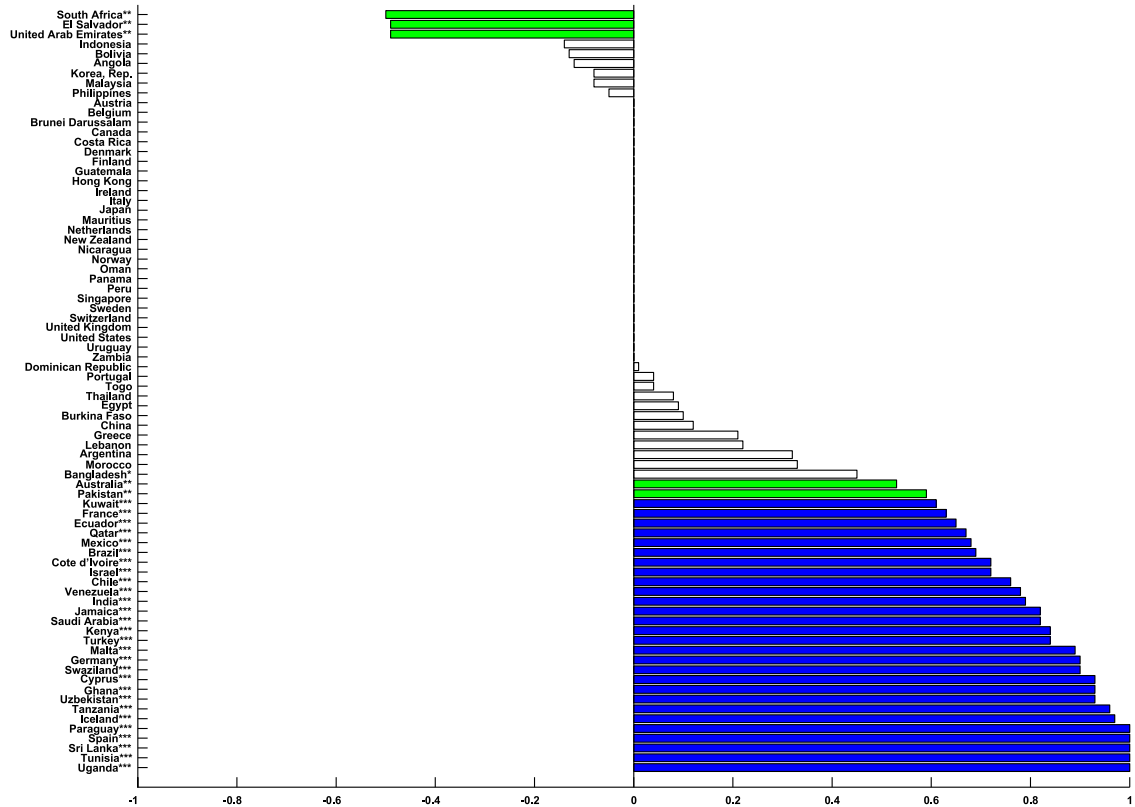
Fig. 2. Country-by-country correlations between controls on capital inflows and outflows. *Note*: Correlations are computed using the cyclical components of the corresponding time series, as defined in Section 2. One star, two stars (green bars), and three stars (blue bars) indicate, respectively, statistical significance at 10, 5, and 1 percent. Missing bars indicate covariance equal to zero. (For interpretation of the references to color in this figure caption, the reader is referred to the web version of this paper.)

capital-inflow controls on equity (eq), bonds (bo), and foreign direct investment (di) during economic booms. The figure suggests that capital controls are acyclical even at the level of each of the three main components of international asset transactions.[9]

Restrictions on asset-specific categories can be disaggregated further by asset location. For equity and bonds, capital-inflow restrictions are indices of restrictions on two types of transactions, 'purchase locally by nonresidents' (plbn) and 'sale or issue abroad by residents' (siar). This type of aggregation may induce a bias in measured cyclicality insofar as the two location categories are quantitatively heterogeneous. For instance, the simultaneous elimination of controls on equity-plbn and imposition of restrictions on equity-siar in a given country and year will result in no change in the equity index of capital-inflow controls for that country/year, but may be a tightening in reality if equity-plbn is quantitatively insignificant and equity-siar is quantitatively significant.[10] To rule out this kind of bias, the middle and bottom panels of Fig. 4 display the cyclical behavior of capital-inflow restrictions on equity and bonds disaggregated into their respective plbn and siar components. The main result of this disaggregation is that capital controls behave acyclically even at the most granular level allowed by the data.

For foreign direct investment, the index of capital-inflow restrictions can be disaggregated into an index of restrictions on inflows of foreign direct investment proper (dii) and an index of restrictions on liquidation of foreign direct investment (ldi). The last column of Fig. 4 shows that both of these types of restrictions appear to be flat during economic booms. The online appendix shows that all of the results of this section obtain when one considers restrictions on capital outflows or economic contractions.

4.2. Disaggregation by income level, exchange-rate regime, and external indebtedness

The comovement between capital-flow restrictions and output depicted in Fig. 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,

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[9] The Online Appendix displays a disaggregation of all figures of this paper into bonds and equity separately. All results are robust to performing this disaggregation.

[10] This is further complicated by the fact that, although the classification requires that international transactions involve a domestic and a foreign investor, it is based on the residency of the asset and not on the residency of the transactor (Forbes and Warnock, 2012).
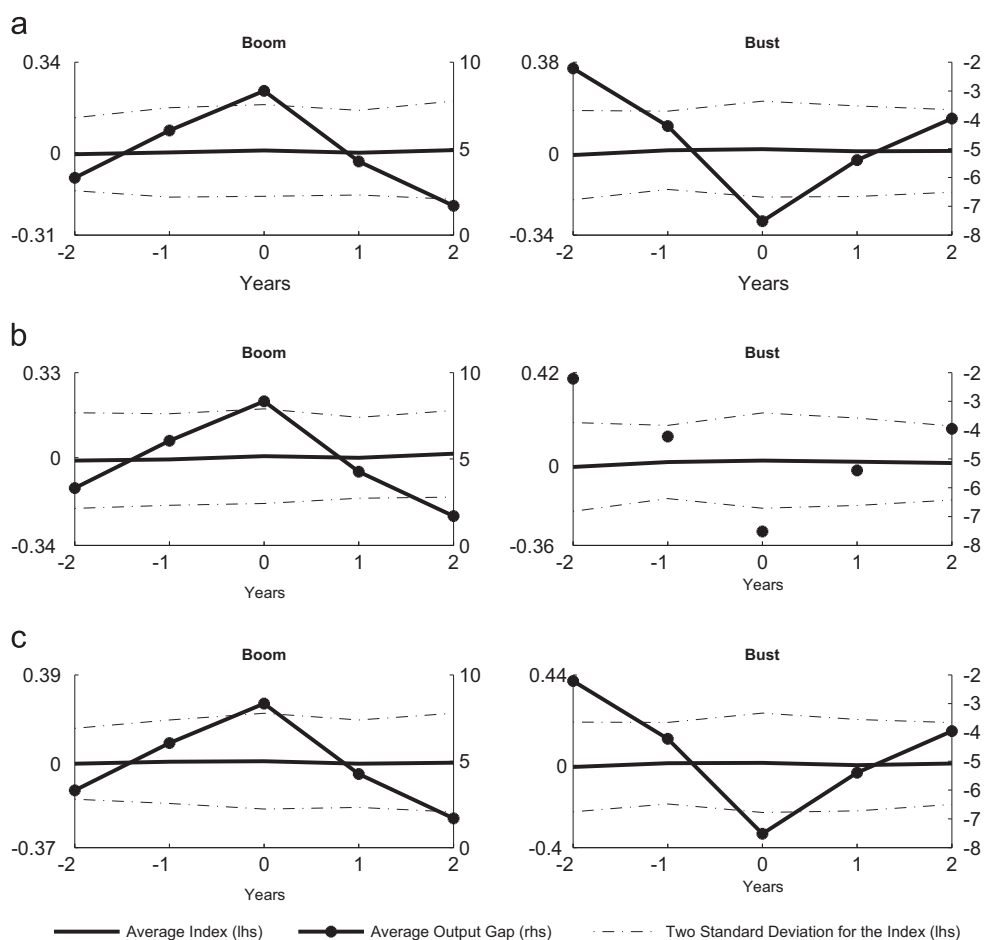
Fig. 3. Boom-bust episodes and capital controls. *Note*: Booms (busts) are defined as periods longer than or equal to three years in which the output gap is always positive (negative). Capital controls and the output gap are expressed in deviations from trend as defined in Section 2 and averaged across episodes. Output gaps are in percent.

monetary/exchange-rate policy, and external indebtedness. A natural question is whether the incentives to apply cyclical capital controls vary across these dimensions.

Fig. 5 addresses this question. The first row displays the comovement between capital-inflow controls and output during booms for groups of countries with different levels of development. One important difference between the group of rich economies and the groups of poor or middle-income economies is that the former are significantly 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 for low income countries. Recent theories of capital controls predict that more volatile economies are more likely to benefit from countercyclical capital-control policy. However, the figure shows that even after disaggregating by level of development, capital controls do not move during booms in aggregate activity.

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 countercyclical use of capital controls can be beneficial as they have the potential to reduce the amplitude of expansions and contractions in aggregate demand. This type of prediction motivates the middle panel of Fig. 5, which displays the comovement between capital-inflow controls and output during booms for countries with different exchange-rate arrangements.[11] Contrary to the predictions of recent theories of optimal capital-control policy, fixed-exchange-rate economies do not seem to be more likely to resort to cyclical capital flow restrictions.

How does the cyclicality of capital controls change with a country's external indebtedness? To address this question, the bottom panel of Fig. 5 displays the behavior of capital-inflows controls during booms for three groups of countries, one with

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[11] The figure does omit the category 'floating exchange rate' because the panel includes too few episodes under this regime. Nonetheless, point estimates suggest that in floating regimes, capital controls do not behave countercyclically.
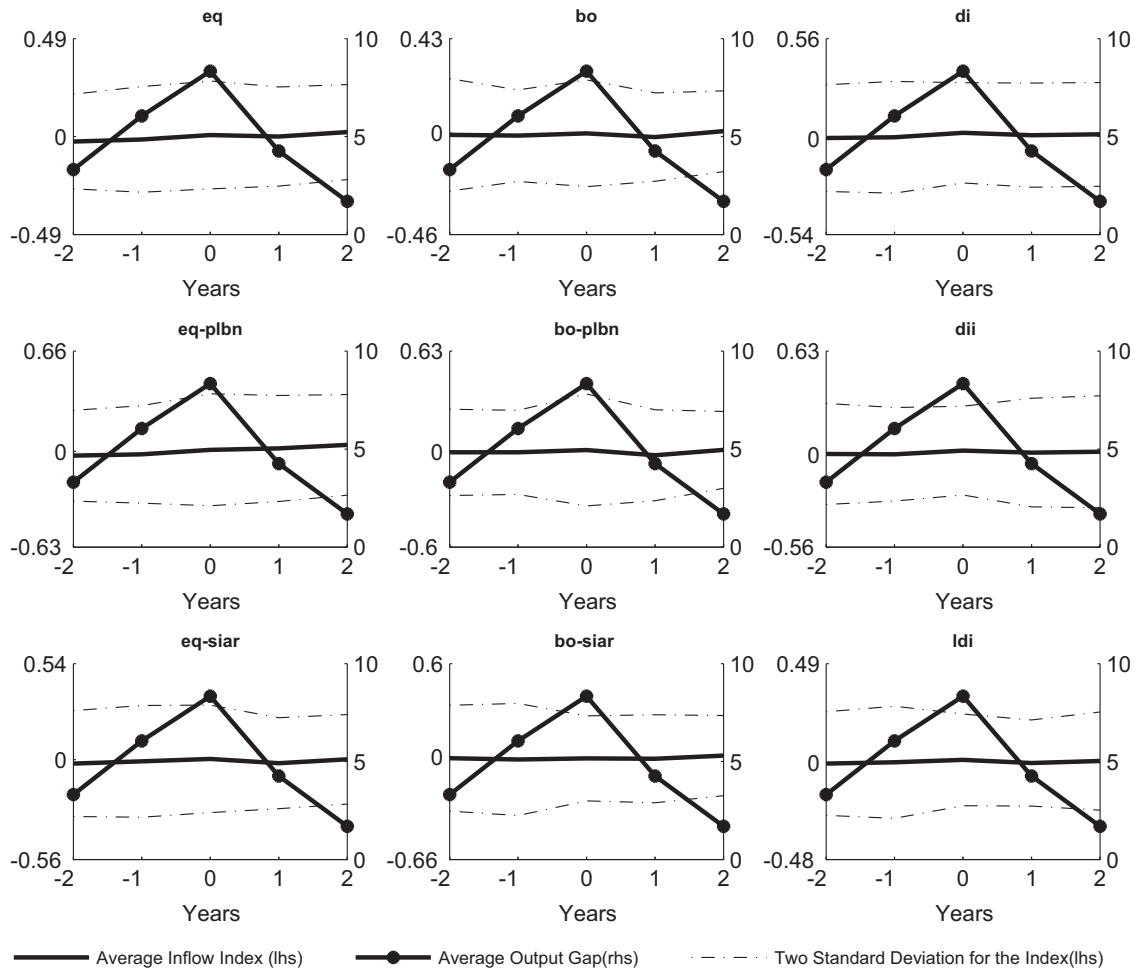
Fig. 4. Acyclicality of granular measures of capital-inflow controls. *Note*: See note in Fig. 3.
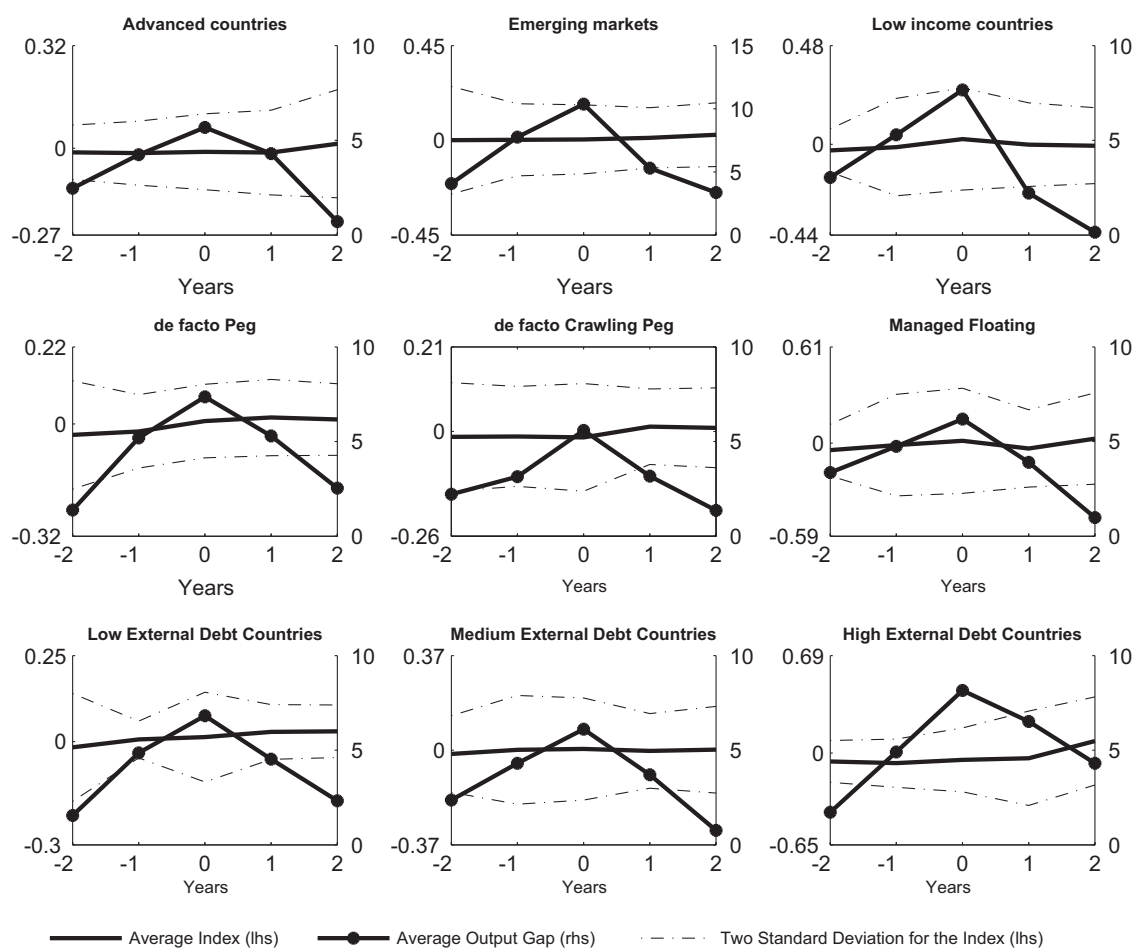
high levels of external debt, defined as having a net-foreign-asset-to-GDP ratio within the bottom 20 percent of the cross-country distribution, one with low levels of external debt, defined as having a net-foreign-asset-to-GDP ratio within the top 20 percent of the cross-country distribution, and one with medium levels of external debt, defined as the complement of the other two groups. 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 capital control policy countercyclically. Indeed, if at all, high debt countries appear to slightly relax capital-inflow restrictions during economic booms. Overall, capital controls appear to be unrelated to the state of the business cycle regardless of the level of external indebtedness. The results displayed in Fig. 5 extend to capital-outflow restrictions and economic contractions (see the Online Appendix).

5. Capital controls, the real exchange rate, and the current account

In a meta-analysis of more than 30 empirical studies, Magud et al. (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.

With this motivation in mind, we analyze the observed comovement between capital controls and the cyclical components of the real effective exchange rate and the current-account-to-GDP ratio. 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 real exchange rate or the current-account-to-GDP ratio as periods longer than or equal to three years in which the variable is always above (below) trend. Fig. 6 shows that controls on capital inflows are not sensitive to booms or busts in the real exchange rate or the current account. The result extends to restrictions on capital outflows and to controlling for income level (see the Online Appendix).

Fig. 5. Capital-inflow controls during booms by income level, exchange-rate regime, and level of external indebtedness. *Note*: See note in Fig. 3. Income level definitions follow IMF (2013). The exchange-rate regime classification is taken from Ilzetzki et al. (2010) . Boom episodes containing changes in exchange-rate regime were excluded. 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 is within the top (bottom) 20 percent of the cross-country distribution. All other countries are classified as having a medium level of external debt. Data on net-foreign-asset-to-GDP ratios are taken from Lane and Milesi-Ferretti (2007).

6. Capital controls and the great contraction

The analysis thus far leaves open the possibility that some episodes of successful countercyclical 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 countercyclical content of capital control policy.

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 countercyclical behavior.

Fig. 7 displays the behavior of capital-inflow and capital-outflow controls 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-flow restrictions 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.
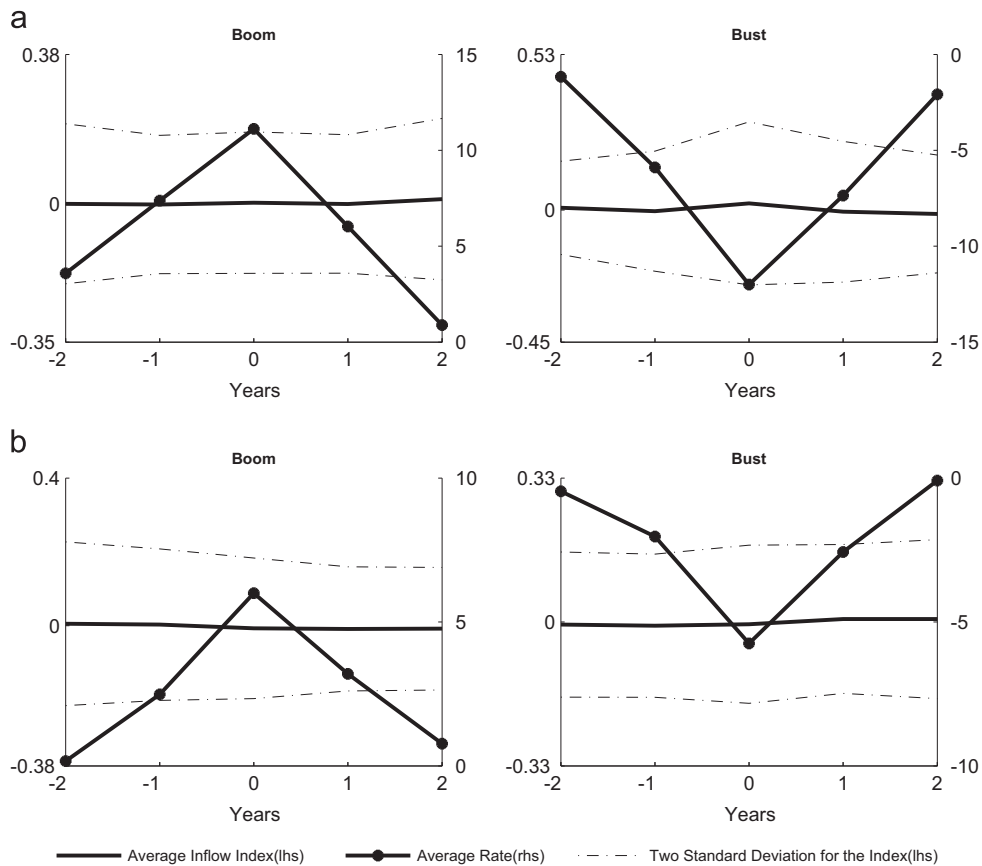
Fig. 6. Capital controls during booms and busts in the real exchange rate and the current account note. See note in Fig. 3.

## 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 a particular measure of intensity that indicates how the number of asset categories and subcategories that are affected by regulation varies over time. This section presents three sets of results. First, it provides evidence on the ability of our index to capture direct measures of intensity in the use of capital controls. Specifically, we compare our index with actual capital-control taxes in Brazil during the late 2000s. Second, the section tests the robustness of our results using two alternative indexes that aim at capturing the intensity with which capital controls are used. And third, the section analyzes the cyclicality of capital-flow restrictions within the subgroup of countries that actively changed capital controls over time. Here, the aim is to ascertain whether the average acyclicality detected in the whole sample is due to countries choosing not to change restrictions over time or to not having a systematically countercyclical purpose in mind.

7.1. The case of Brazil

The Brazilian case during the late 2000s 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.

The left panel of Fig. 8 displays with a hollow-circled line the IOF tax rate on cross-border equity transactions and with a solid-circled 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.[12] The Schindler index tracks well the behavior of the more direct measures of

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[12] The Online Appendix displays disaggregated information across asset categories of inflow restrictions in Brazil over the sub-sample 2008–2011.
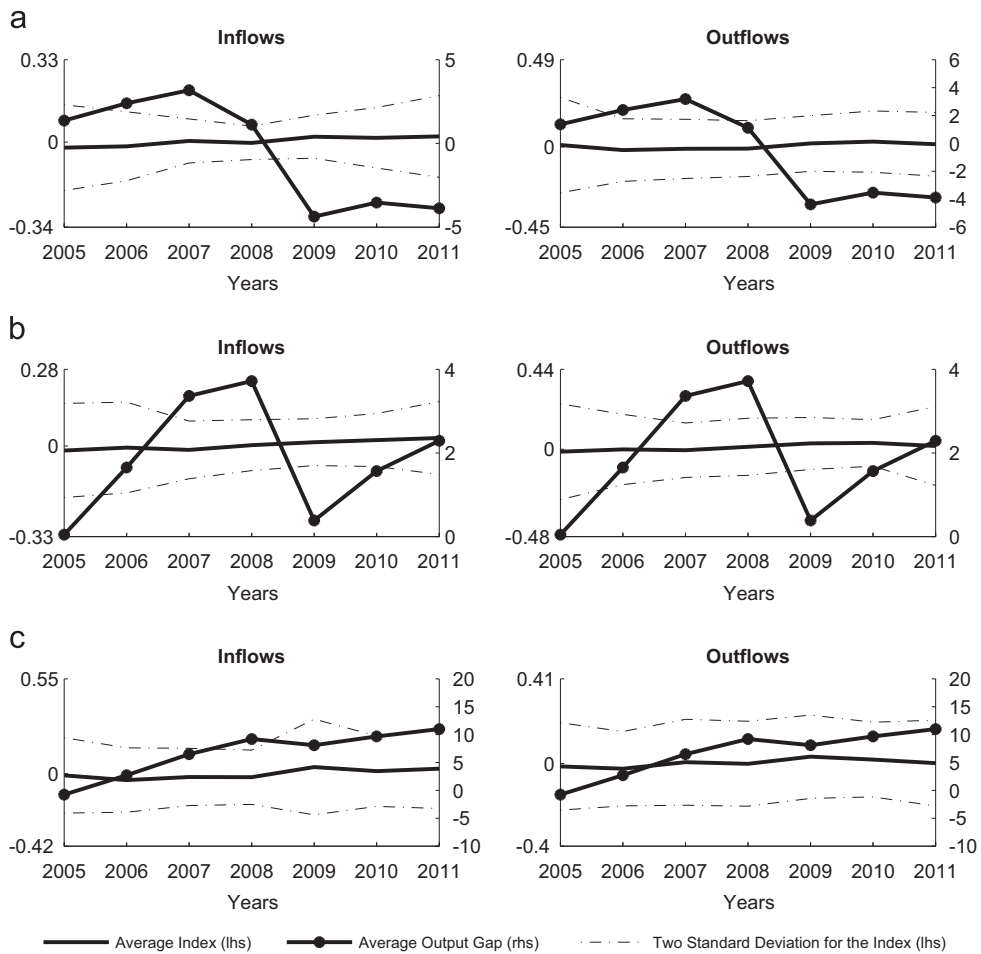
Fig. 7. Capital controls around the great contraction by impact level. *Note*: Each impact group contains one third of the total number of countries in the panel. The low impact group contains the countries with the least negative output gaps in 2009. The high impact group contains countries with the most negative output gaps in 2009. All other countries are placed in the medium impact group.

controls around the 2008–2009 crisis. This evidence suggests that the aggregation of binary indices across a number of finely defined asset categories in our index effectively captures the use of controls along the more direct intensive margin.

A natural question is whether the behavior of capital controls in Brazil during the 2000s, and particularly around the great-contraction years is representative of other countries or at least of other emerging countries. The right panel of Fig. 8 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 (hollow-circled line) and the average index over all emerging countries in the sample excluding Brazil (solid-circled line) between 1995 and 2011. Unlike Brazil, on average, other countries did not increase capital controls in 2008 and 2009. Indeed, the correlation between the cyclical components of GDP and capital-inflow controls Brazil for the sub-period 2002–2011 increases to 0.82 and is statistically significant at 1 percent. In all other countries and for the same subperiod, that correlation is only 0.08 and not statistically significant at 10 percent. The early 2000s were also characterized by significantly larger capital-inflow restrictions in Brazil than elsewhere. 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. The AREAER report also provides descriptive evidence that the use of varying tax rates in Brazil during the great recession was atypical. After a careful review of the written descriptions of restrictions across all 21 asset categories and across all 91 countries for the year 2009, we found only 18 specific allusions to the use of tax rates in the context of capital control policy. From these, 13 belonged to Brazil.

7.2. The Quinn and Chinn–Ito indices

At the granular level (i.e., for a particular asset, type of transaction, and location) our capital-control index is based on a binary coding of the text in the AREAER describing the type of restrictions affecting international transactions. One way to
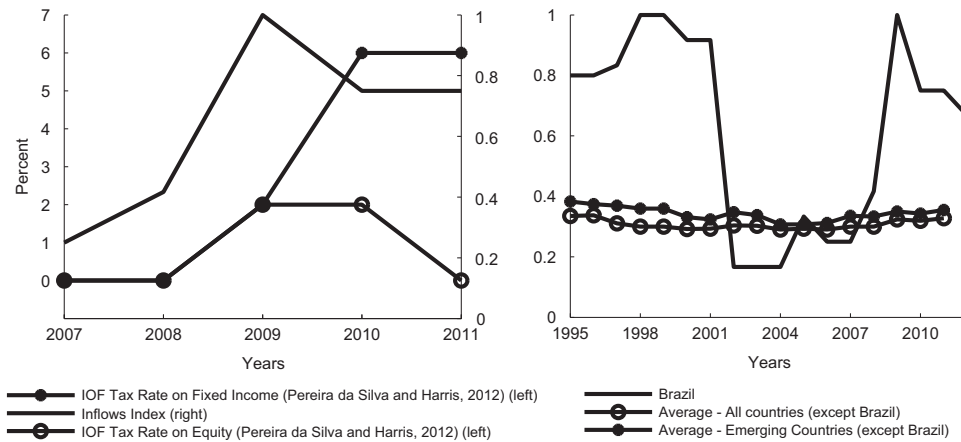
Fig. 8. Capital-inflow controls in Brazil: The Schindler index and actual tax rates.

enhance the ability of the index to capture intensity is to use more than two levels in the coding of the AREAER text. 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. By analyzing the text attached to each granular type of transaction, Quinn extracts information about the level of severity of the restriction, yielding a granular index with more than two values. In addition, Quinn's index utilizes information from the section "Changes During Year" of the AREAER reports, which further reflects the intensity of restrictions at the granular level. Quinn's index covers 64 countries over the period 1950–1994. More recently, Quinn et al. (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 controls on capital outflows. The first row of Fig. 9 displays the average comovement of the cyclical component of the Quinn index with the output gap during boom and bust episodes observed in 68 countries over the period 1995–2007.[13] The results are consistent with those obtained using the Schindler index. The Quinn index is virtually flat across booms and busts in aggregate activity.

Another 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, it includes four binary indicators: (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 index is given by 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.[14] According to Chinn and Ito (2006), one of the merits of this index is that it attempts to measure the intensity of capital controls, insofar as the intensity is correlated with the existence of other restrictions on international transactions. The middle row of Fig. 9 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.[15] 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 countercyclical.

7.3. Gates and walls

Here, we analyze the cyclical behavior of capital controls in countries that actively change this type of restriction over time. This exercise is motivated by the work of Klein (2012) who 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 countercyclical, since, by definition, they do not change over the business cycle. A natural question, then, is whether episodic capital controls behave in a countercyclical manner.

To address this question, we now restrict the analysis to the group of episodic countries listed in Klein (2012, Table 2).[16] The average standard deviation of the cyclical component of capital controls across episodic countries is 0.10 for inflows and 0.09 for

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[13] To 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 et al. (2011). We thank these authors for sharing their data.

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

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

[16] We eliminated the Czech Republic and Hungary because they do not satisfy our requirement of at least 25 years of output data. We also eliminated Poland, as this country is not included in our data set.
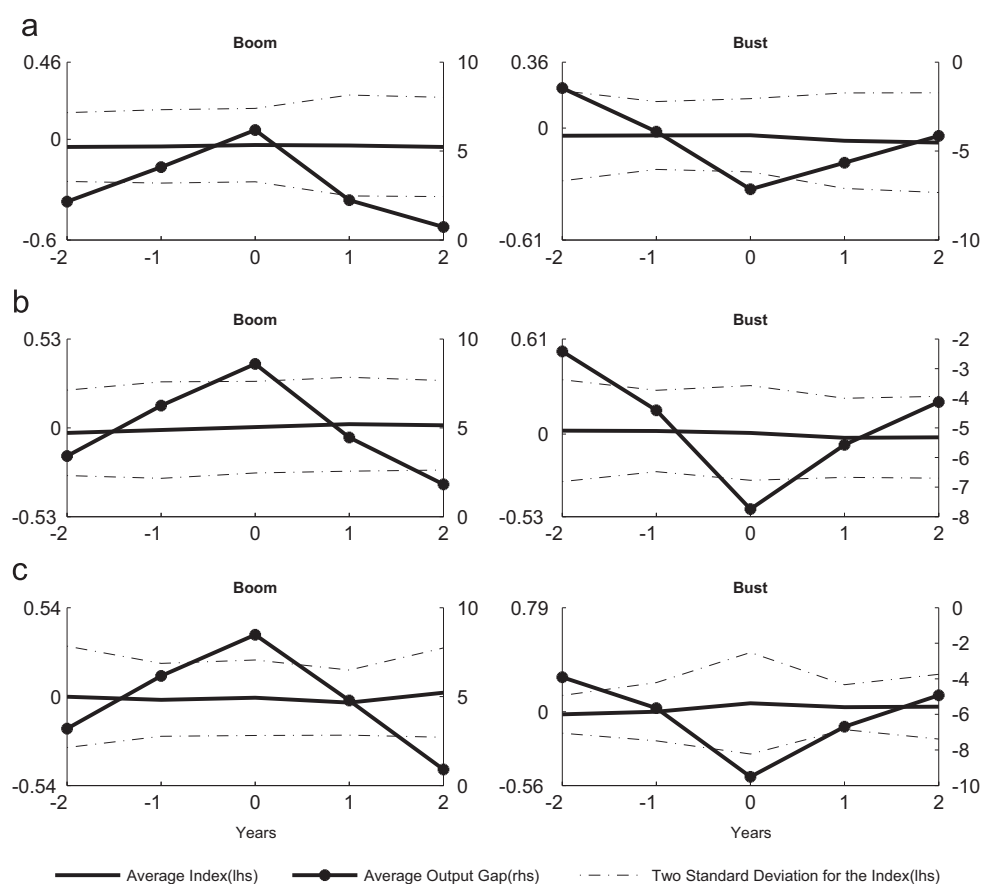
Fig. 9. Alternative measures of capital-inflow controls. *Note*: Averages across boom or bust episodes. Capital control indices are linearly detrended at the country level.

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 each of the two indices. This means that even episodic capital controls move little over the business cycle. The bottom panel of Fig. 9 displays for the group of countries that change capital restrictions frequently (or episodic countries) the behavior of capital controls on inflows during booms and busts. As in the entire sample, capital controls on inflows or outflows are virtually unchanged during booms or busts. This result suggests that even among countries that actively change capital controls over time, on average, restrictions on international financial transactions do not seem to be driven by a countercyclical motive. This result extends to restrictions on capital outflows (see the Online Appendix).

8. Conclusion

A growing theoretical literature argues that booms in aggregate activity carry the seeds of economic crises. Therefore, these theories suggest that capital-control policy 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 countercyclical manner during the past decade and a half.

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, and asset types. We also document a quasi-perfect acyclicality of capital controls during the Great Contraction of 2007–2009. Finally, our results are robust to alternative measures of intensity in the use of capital controls.

In recent years, policymakers have adopted more eclectic positions with respect to the use of capital-account restriction for stabilization purposes. The IMF endorsement of this type of policy 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.

Acknowledgments

Appendix A. Supplementary data

Supplementary data associated with this paper can be found in the online version at http://dx.doi.org/10.1016/j.jmoneco.2015.07.001.

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