

TOPICAL ISSUE:

Peg and Control? The Links between Exchange
Rate Regimes and Capital Account Policies

Peg and Control? The Links between Exchange Rate Regimes and Capital Account Policies

In a context of rising risks, choices with respect to exchange rate regimes and capital account policies are of key importance for emerging and developing countries. This essay explores the empirical links between a country's choice of currency regimes and of capital flow measures. The results suggest that developing countries appear to be more likely to have capital flow restrictions if they also have fixed exchange rates. This effect is particularly pronounced for lower-income countries, suggesting complex policy choices with respect to exchange rate regimes and capital flow measures.

Introduction

The outlook for emerging and developing countries is clouded by various downside risks, including a deterioration in global financial conditions, sudden reappraisal by market participants of lingering domestic vulnerabilities, and adverse spillovers from weaker growth (Chapter 1). Should one or more of these risks materialize, they could have significant effects on economic conditions in many emerging and developing countries. These effects may include large currency depreciations in some countries with flexible exchange regimes, reserve losses in some countries aiming to preserve exchange rate pegs, and restrictions on capital mobility in some countries facing capital flight. More generally, how countries fare and how policymakers respond to the realization of these risks will depend on a wide range of factors, but two macroeconomic policy choices play fundamental roles: the exchange rate regime (ERR) and the stance towards capital flows (i.e., the use of capital flow measures, CFMs).

A flexible exchange rate regime can provide greater room for monetary policy to stabilize output fluctuations in countries with open capital accounts, as well as encourage a more proper assessment of currency risk. However, it can sometimes be associated with volatility in currency markets, which can raise financial stability risks in countries with significant currency mismatches on balance sheets. It can also restrict monetary policy

options in countries where exchange rate fluctuations have a rapid impact on inflation or where inter-sectoral factor mobility is limited (Ostry, Ghosh, and Chamon 2012). Conversely, a fixed exchange rate regime can serve as a stabilizing nominal anchor in the presence of financial volatility. It can also boost trade, which may offset weakness in external demand (Rose 2000; Rose and van Wincoop 2001; Frankel and Rose 2002; Klein and Shambaugh 2006). However, in the presence of high capital mobility, a fixed regime may require the central bank to direct monetary policy towards the maintenance of the peg rather than towards the promotion of economic activity (Frankel, Schmukler, and Servén 2004; Shambaugh 2004; Obstfeld, Shambaugh, and Taylor 2010; Klein and Shambaugh 2015).

A country's choice of capital flow measures can affect the performance of asset markets, the cost of capital, and technological progress embodied in foreign direct investment (Henry 2007). More broadly, capital account policies can affect the pace of economic growth (Kose, Prasad, Rogoff, and Wei 2009). Accordingly, there have been extensive discussions about the appropriate role of capital flow measures. In the wake of the global financial crisis, a case has been made for the use of CFMs, recognizing that capital flows can affect the incidence of boom-and-bust cycles in financial markets. The effectiveness of these policies, however, has been the subject of debate.¹

Note: This essay was prepared by Carlos Arteta, Michael Klein, and Jay Shambaugh. It is based on materials compiled from its background paper (Arteta, Klein, and Shambaugh forthcoming).

¹Korinek (2011); Ostry, Ghosh, Chamon, and Qureshi (2011); Jeanne and Korinek (2010); and Jeanne, Subramanian, and Williamson (2012) argue for the use of capital controls. A more skeptical view of the use of capital controls is presented by Klein (2012) and Forbes and Klein (2015).

The joint choice of exchange rate regimes and capital account policies therefore has important implications for macroeconomic outcomes. While some studies have explored the choice of the ERR and others have examined the use of CFMs, there has been little empirical analysis on the links between ERR and CFM choices.² This essay documents the association between the choices of exchange rate regime and capital account policies in emerging markets, frontier markets, and other middle- and low-income countries. While this analysis focuses on emerging and developing countries, it provides some context by including data on advanced high-income economies as well. Specifically, the essay asks three questions:

- What does economic theory say about the choice of ERRs and CFMs?
- What do the data say about ERRs and CFMs?
- What are the main empirical linkages between the choices of ERR and CFM?

For this essay, emerging and developing countries are divided into three groups. The first category is *Emerging Market Economies*—in general, (non-advanced) high-income and middle-income countries with a record of significant access to international capital markets. The second category is *Frontier Market Economies*—generally middle income countries that are usually smaller and less financially developed than emerging market economies and have more limited access to international capital markets. The third category comprises other middle-income countries that are neither emerging nor frontier markets (and therefore have little to no access to international capital markets) along with low-income countries.

²Research on the choice of ERR includes Leblang (1999); Carmignani, Colombo, and Tirelli (2008); Klein and Shambaugh (2010); and Berdiev, Kim, and Chang (2012). Research on the use of CFMs includes Grilli and Milesi-Ferretti (1995); Quinn (1997); Chinn and Ito (2008); Schindler (2009); and Fernández, Rebucci, and Uribe (2014). Von Hagen and Zhou (2007) is one of very few studies that explore the interaction between exchange rate regimes and capital flow restrictions, finding some influences in both directions between *de facto* exchange rate regimes and capital account policies.

What does economic theory say about the choice of ERRs and CFMs?

The choice of a country's exchange rate regime can be based on a variety of theoretical considerations, including the following:³

- *Optimal currency area factors.* Policymakers in some countries may weigh the advantages of pegging—such as more stable trade and investment flows, particularly vis-à-vis a large trading partner—against the disadvantages of forgoing exchange rate flexibility as a stabilizer for external shocks.
- *Sources of macroeconomic shocks.* A small open economy may choose to peg if it is often subject to highly volatile shocks to its asset markets or prices. In the face of such “nominal” shocks, a fixed exchange rate could provide a nominal anchor that stabilizes prices and activity (provided that the shock is temporary). A country may also choose to peg if it faces similar economic shocks to those of the base country. In contrast, a floating exchange rate can provide greater stability if an economy is often facing “real” shocks—that is, disturbances to factors that affect its aggregate demand or supply.
- *Monetary policy independence.* The choice of currency regime may reflect an emphasis on the importance of either monetary autonomy, when the central bank is not obliged to direct its efforts towards the maintenance of a pegged regime, or of importing the monetary-policy credibility of the base country in order to better manage inflationary expectations.

The decision of whether, and how, to control capital flows weighs the benefits of a liberal regime with no capital controls against those of an environment in which the flow of capital is managed:

³The choice of currency regime is, of course, time variant, as there have been numerous instances of countries shifting between peg and float (Klein and Shambaugh 2008; Ghosh, Ostry, and Qureshi 2015).

- *Benefits of freely flowing international capital.* These include the scope for an efficient allocation of capital, risk diversification, and consumption smoothing. Countries with insufficient savings can draw on world savings to finance the expansion of their capital stock. The world capital market can also help countries diversify risk and, in so doing, undertake projects that would otherwise not be financed. Also, borrowing during slowdowns and paying back during expansions can help the residents of a country avoid wide swings in their consumption. Free capital flows may also be welfare-enhancing, as capital controls can generate distortions in real and financial activity if they are not properly designed.
- *Potential downsides of open capital markets.* Open capital markets could allow global financial cycles to adversely affect an economy. In this way, a country could lose control over its macroeconomic outcomes. Capital inflows could contribute to an unsustainable asset price boom and exchange rate overvaluation. Capital outflows, and especially a sudden stop, could be a source of a currency collapse, financial disruption, and a sharp decline in real activity.⁴

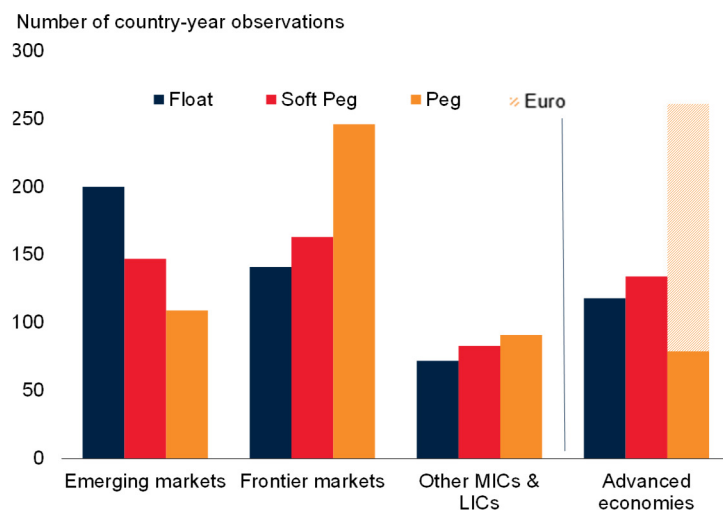
There may be links across the joint choice of ERRs and CFMs. The importance and extent of these links may depend upon other factors, such as financial development, openness to trade, and sectoral diversification (and, therefore, the sensitivity of domestic activity to exchange rate movements). The nature of the interaction between ERR and CFM is shaped by a number of factors, including the following:

- *The trilemma.* Countries can choose only two of the following three objectives: open capital account, independent monetary policy, and exchange rate stability. Thus, countries with fixed exchange rates would have to give up free capital mobility in order to have an independent monetary policy. In other words,

⁴An early theory of sudden stops is presented in Calvo (1998). More recently, Rey (2013) has emphasized the spillover effects of U.S. monetary policy and volatility in U.S. asset markets.

FIGURE 4.2.1 Exchange rate regime categories by country grouping

In emerging markets, floating exchange rates are more common than soft pegs or pegs. In frontier markets, pegged exchange rates are the most common regime. Other middle- and low-income countries have a relatively even distribution across the three regime categories. Advanced economies, excluding euro area countries, have a relatively even distribution of floats and soft pegs, and a lower incidence of pegs.



Sources: Obstfeld, Shambaugh, and Taylor (2010); authors' calculations.

Notes: MICs = middle-income countries. LICs = low-income countries. This ERR classification uses exchange rate behavior to see if a country stays within a +/- 2 percent band over the course of a year against a relevant base currency. If so, it is classified as a "peg." Otherwise, it is a non-peg. To insure the stability is deliberate and not a random lack of volatility, countries that peg for only one year are not coded as pegs. To handle one-off realignments, a country that has zero volatility in 11 out of 12 months is also considered a peg (again, as long as it is also pegged the year before or after). Soft pegs are identified as countries that do not maintain the strict boundary, but stay within 5 percent bands or stay within moving 2 percent bands in every month (that is, the change in any given month is never greater than 2 percent).

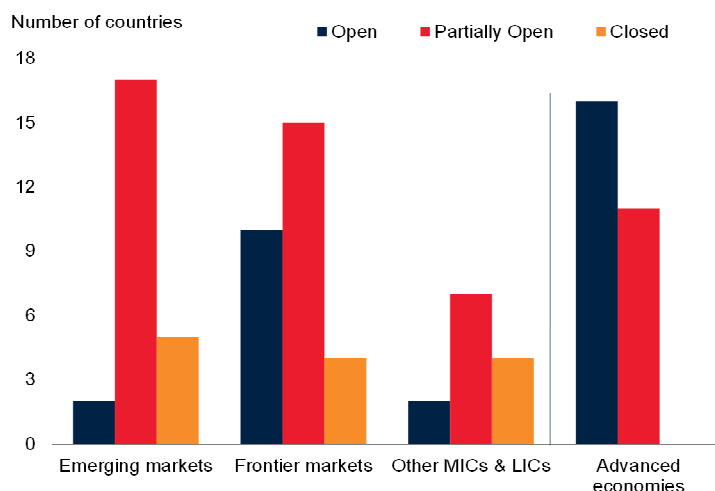
they may choose to use CFMs to stabilize the exchange rate, allowing monetary policy to focus on domestic macroeconomic goals (Shambaugh 2004; Obstfeld, Shambaugh, and Taylor 2010; Klein and Shambaugh 2015).

- *The preservation of a pegged regime.* Capital flows may also make the preservation of a fixed exchange rate more difficult since, under certain circumstances, capital flight could cause a peg to break.⁵ This suggests another

⁵There is a large body of literature investigating why pegged exchange rates collapse (Berg, Borensztein, and Pattillo 2005). Fixed exchange rates should probably be easier to maintain if CFMs dissuade speculative attacks. However, the effectiveness of these policies depends on their credibility. If a pegged regime is perceived to be unsustainable and the exchange rate out of line with fundamentals, capital controls may be of limited effectiveness to ward off financial turmoil.

FIGURE 4.2.2 Capital control categories by country grouping

Most emerging, frontier, and other developing countries have Partially Open capital accounts, with occasional use of capital controls. Advanced economies are far less likely to use capital controls, and none do so in a persistent and systematic way.



Sources: Fernández, Klein, Schindler, Rebucci, and Uribe (2015), authors' calculations.

Notes: MICs = middle-income countries. LICs = low-income countries. This CFM classification divides countries into three groups: "Open," for countries that almost never use capital controls (the average value of the capital control index over the sample period is less than 0.15, the maximum value in any one year is less than 0.25, and the standard deviation of the index across time is less than 0.10); "Closed," for countries that have capital controls in the vast majority of asset categories and for the vast majority of years (the average value of capital controls across the sample period is greater than 0.70, the minimum value is greater than 0.60, and the standard deviation is less than 0.10); and "Partially Open," for countries that make use of capital controls occasionally (i.e., countries that are neither Open nor Closed are classified as Partially Open).

link between ERR and CFM, especially for controls on outflows relative to inflows if there is a greater concern about a devaluation than a revaluation. Controls on inflows could also be important if they drive currency appreciation (with flexible exchange rates) or an asset price boom (with pegged rates).

- *The type of pegged regime.* Some of these issues are conditional on the form of the peg. For example, if the regime is a credible hard peg (e.g., a currency union), monetary autonomy is fully surrendered, and the peg's preservation is generally not a concern. In this case, capital controls may not be as prevalent as in other types of fixed exchange rate regimes.

What do the data say about ERRs and CFMs?

Combining two extensive databases on exchange rate regimes and capital flow measures, this analysis uses data on 93 countries over the period 1995 to 2013. Both the country list and the time period are determined by data availability. The set of emerging and developing countries is divided into three categories: 24 emerging market economies, 29 frontier market economies, and 13 other middle-income and low-income countries. For comparison purposes, a fourth category comprising 27 advanced high-income economies is included. (A listing of the countries in each of these four categories is provided in Annex Table 4.1.)

Exchange rate regimes

The exchange rate regime classification is based on the *de facto* regime classification from Shambaugh (2004) and updated in Obstfeld, Shambaugh, and Taylor (2010) to include a soft peg variable (see Annex 4.2 for details on the classification methodology). These studies use actual exchange rate movements to classify regimes into pegs, non-pegs, and soft pegs. Among emerging market economies, floating exchange rate regimes are more common than soft pegs or tightly pegged exchange rates (Figure 4.2.1). These observations span emerging market economies that have had floating regimes during all or almost all of the 1995-2013 period (e.g., Turkey, South Africa) and those that have had tight pegs during all the period (e.g., Qatar, Saudi Arabia, United Arab Emirates).

The exchange rate regime choice of frontier market economies is the mirror image of emerging market economies, with the highest number of observations being pegs and the fewest number of observations being floats. In this group, relatively few frontier markets have had floating regimes for most of the period (e.g., Paraguay, Zambia), while several countries have had tight pegs for all 19 years of the period (e.g., Bahrain, Cote d'Ivoire, Lebanon, Oman, Panama). Other middle- and low-income countries have an even distribution

across the three exchange rate regime categories, with a few countries exhibiting floating regimes for most of the period (e.g., Algeria, Uganda) and some countries with tight pegs for all 19 years (e.g., Burkina Faso, Swaziland, Togo). For comparison, advanced economies, excluding Euro Area countries, have a relatively even distribution of floats and soft pegs and a lower incidence of pegs.

Capital flow measures

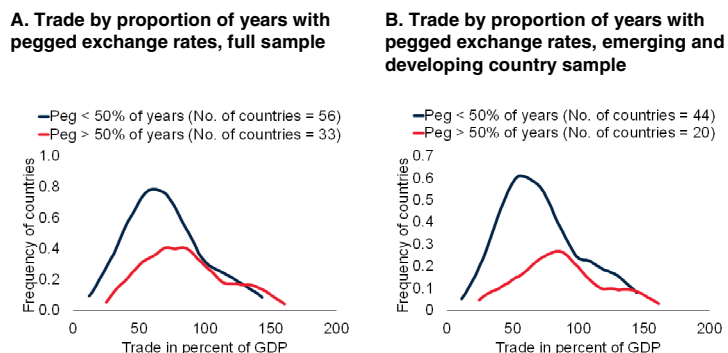
This analysis uses the Fernández et al. (2015) *de jure* capital control data. These data are used to construct an aggregate capital control indicator as the average of nine categories for both inflows and outflows (see Annex 4.2 for details on the classification methodology). For each country and for each year, the average of inflow controls and outflow controls for the nine categories of assets is computed. This aggregate indicator takes a value between 0 and 1, with 0 indicating no controls on any category of assets and 1 indicating controls on both inflows and outflows of all nine categories of assets.

These data can be used to place countries in one of three categories with respect to their use of CFMs (as in Klein 2012). The first category is “Open,” for countries that almost never use capital controls. The second category is “Closed,” for countries that have capital controls in the vast majority of asset categories and for the vast majority of years. The third category is “Partially Open,” for countries that make occasional use of capital controls.

Among emerging and developing countries, the most common classification is Partially Open (Figure 4.2.2). These include 17 out of 24 emerging markets (including Arab Republic of Egypt, Brazil, Chile, Indonesia, Thailand, and Turkey), 15 out of 29 frontier markets (including Argentina, Bahrain, Kazakhstan, Kenya, República Bolivariana de Venezuela, and Vietnam), and 7 out of 13 other middle-income and low-income countries (including Algeria, Burkina Faso, Ethiopia, Kyrgyz Republic, and Uganda). In comparison, advanced countries are far less likely to use capital controls than countries in the other

FIGURE 4.2.3 Trade and exchange rate regimes: Frequency distributions

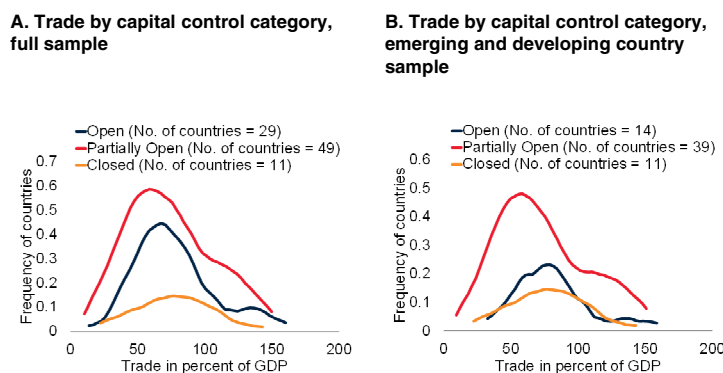
Pegged exchange rate regimes appear to be associated with greater trade openness than flexible regimes. The frequency distributions of trade-to-GDP ratios for economies with mostly pegged currencies lie to the right of those for more flexible currencies.



Source: Authors' calculations.
 Note: These figures present kernel frequency distributions of trade relative to GDP for countries that have pegged exchange rates for less than half the years in the sample (blue lines) and for those that have pegged exchange rates for more than half the years in the sample (red lines).

FIGURE 4.2.4 Trade and capital controls: Frequency distributions

Countries that use capital controls occasionally appear to trade somewhat less than countries that have either no capital controls or those that have pervasive capital controls. The frequency distributions of trade-to-GDP ratios for the Partially Open group lie to the left of those for the other groups.

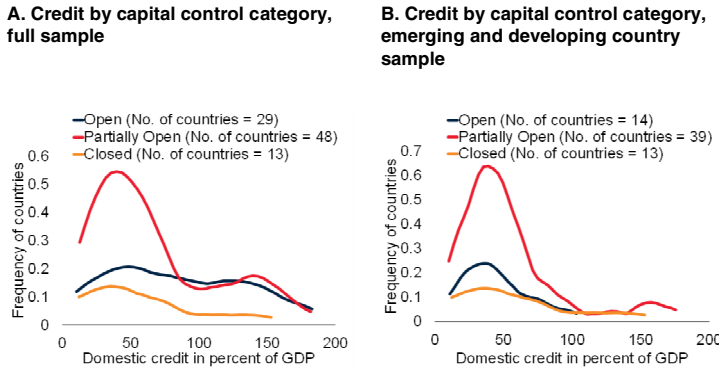


Source: Authors' calculations.
 Note: These figures present kernel frequency distributions of trade relative to GDP for Closed countries (yellow line), Partially Open countries (red line) and Open countries (blue lines).

groups, and none do so in a persistent and systematic way (that is, none are classified as Closed).

FIGURE 4.2.5 Financial development and capital controls: Frequency distributions

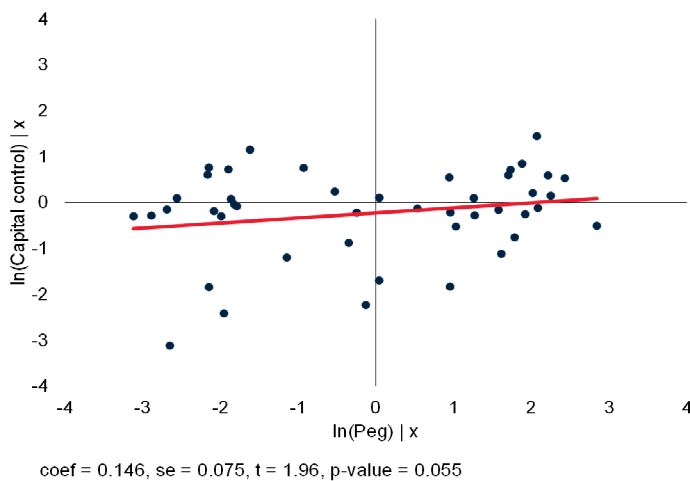
Open countries appear more likely to be financially developed (have larger financial sectors as a share of GDP) than Partially Open and Closed countries. The distribution for the Open group of credit-to-GDP ratios is more skewed to the right than those for the Partially Open and Closed groups for the full sample—but not for the emerging/developing country sample.



Source: Authors' calculations.
 Note: These figures present kernel frequency distributions of domestic credit relative to GDP for Closed countries (yellow line), Partially Open countries (red line) and Open countries (blue lines).

FIGURE 4.2.6 Pegged regimes and capital controls

There is a statistically significant partial correlation between pegged regimes and capital controls among emerging and developing countries.



Source: Authors' calculations.
 Note: Using the emerging and developing country sample, this figure presents the estimate of the partial correlation between the logarithmic transformation of the capital control index and of the peg index, controlling for GDP per capita, GDP, trade share, size of the financial sector, (all of which are expressed as logarithms), and a currency union control. This is the graphical depiction of Column I of Annex Table 4.2.

Trade openness and financial development across ERRs and CFMs

Pegged exchange rate regimes appear to be associated with greater trade openness than flexible regimes, in both the full sample as well as in the sample comprised of emerging and developing countries. That is, the frequency distributions of trade-to-GDP ratios for economies with mostly pegged currencies (red lines in Figure 4.2.3) lie to the right of those for more flexible currencies (blue lines in Figure 4.2.3). In addition, countries that use capital controls from time to time appear to trade somewhat less than countries that have either no capital controls or those that have pervasive capital controls. That is, the frequency distributions of trade-to-GDP ratios for the Partially Open group (red lines in Figure 4.2.4) lie to the left of those for the other groups.

Open countries appear more likely to be financially developed (have larger financial sectors as a share of GDP) than Partially Open and Closed countries. That is, for the full sample, the distribution for the Open group of credit-to-GDP ratios (blue line in the upper panel of Figure 4.2.5) is more skewed to the right than those for the Partially Open and Closed groups. That said, a large literature on financial development and growth suggests that richer countries are more financially developed (King and Levine 1992, Sahay et al. 2015). Since emerging and developing economies tend to have more capital controls than advanced economies, the greater financial development for Open countries may largely reflect the role of advanced economies. Confining the sample to emerging and developing economies, there is indeed no apparent evidence of higher levels of financial development in Open countries—that is, frequency distributions show no discernible difference in the skewness of the Open group (blue line in the lower panel of Figure 4.2.5) relative to the others.

What are the main empirical linkages between the choices of ERR and CFM?

The discussion above suggests that the choice of ERR may predetermine the extent of CFMs. A multivariate regression model, focusing on the sample of emerging and developing countries, is used to estimate the partial correlation between capital controls and pegged exchange rates, while controlling GDP per capita, GDP, trade share, size of the financial sector, and currency union membership (Column I of Annex Table 4.2). The regression estimate shows a positive, statistically significant partial correlation between the extent of capital controls and the propensity to peg (Figure 4.2.6).⁶ It also shows a statistically significant negative correlation between capital controls and income per capita, and a statistically significant positive correlation between capital controls and both income and trade.

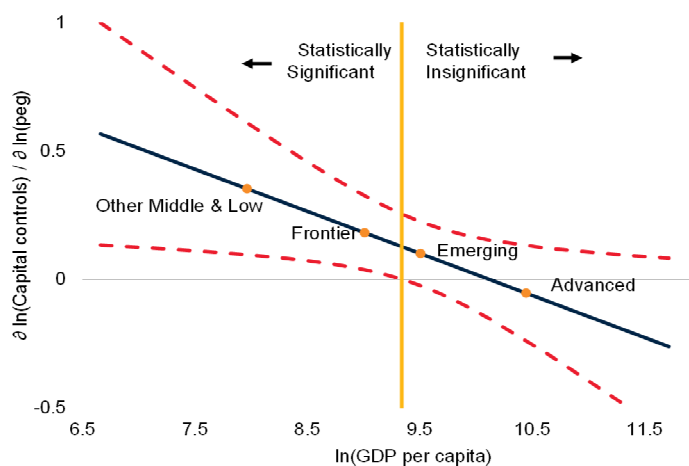
The negative relationship between income per capita and the CFM variable is further explored by estimating a regression that allows the association of the pegged exchange rate on capital controls to vary with the level of income per capita. This is done by including an interaction term between the GDP per capita variable and the peg variable (Column II of Annex Table 4.2). These results also show the effects for the average levels of income per capita for each of the three categories of emerging and developing countries (bottom of Column II). For comparison, the fourth category of advanced economies is also included. This effect is statistically significant for the average income per capita of frontier markets and other middle- and low-income countries, but not for emerging market economies.⁷ It is also insignificant for

⁶These results do not imply causality. And while there are reasons to believe that the ERR may predetermine CFMs, joint determination or reverse causality cannot be ruled out. It may be that countries that peg prefer to have capital controls to make it easier to maintain the peg or to allow for greater monetary autonomy, or it may be that the costs of pegging are lower for countries with capital controls. Alternatively, the positive correlation may reflect ideological views of the acceptability of market intervention in both the price of foreign exchange and the flow of capital.

⁷This association should be interpreted with some care. The results primarily come from the cross section: countries that peg for long

FIGURE 4.2.7 Pegged regimes and capital controls across per capita income levels

The association between pegged exchange rates on capital controls varies with the level of income per capita for frontier markets and other middle- and low-income countries. However, there is no significant association of this kind for emerging markets or advanced economies.



Source: Authors' calculations.

Note: This figure shows the total impact of pegging on the likelihood of capital controls at different income levels using the cross country regression reported in Column II of Table 2, by including an interaction between the logarithm of income per capita and the logarithmic transformation of the peg exchange rate variable. The bottom panel of that table shows the partial derivative $\partial \ln(kci) / \partial \ln(peg)$ for the average levels of income per capita for each of the four categories of countries. In this figure, the thick solid black line shows the estimated value of $\partial \ln(kci) / \partial \ln(peg)$ for each level of income per capita, and the dashed lines show the 95 percent confidence interval of this estimate. The vertical yellow line at 9.34 shows the point after which this partial derivative is no longer significant at the 95 percent level of confidence. The points on the solid line show the average values of income per capita for the four country categories.

advanced economies, providing additional evidence that the effect of peg regimes on CFMs are contingent on income per capita.⁸

Figure 4.2.7 presents the effect of pegged regimes on capital controls as a function of income per capita. The thick solid black line shows the estimated value of the effect of peg regimes on capital controls for each level of income per capita, and the dashed red lines show the 95 percent confidence interval of this estimate. The vertical

periods also seem to have long standing capital controls. There is weak evidence of a link among countries that switch their ERR or CFM within the sample period (Arteta, Klein, and Shambaugh forthcoming). Thus, it is not clear what one should expect if a country frees up its exchange rate peg or dismantles its CFM. In addition, these results might be highlighting heterogeneity across developing regions.

⁸Additional robustness analysis using panel data methods suggests that factors associated with the nexus between ERR and CFM seem to be country-specific and relatively time-invariant (Arteta, Klein, and Shambaugh forthcoming).

line shows the level of per capita income after which this effect is no longer statistically significant. The points on the solid line show the average values of income per capita for the four country categories. The solid line is downward sloping, suggesting that the association between the capital control and peg indices decreases with an increase in income per capita. Moreover, in emerging market economies (as well as in advanced economies), there appears to be no statistically significant association between the choice of exchange rate regime and the choice of capital account policies.

Conclusion

As emerging and developing countries prepare against various risks besetting the global economy, they need to consider policy responses to adjust to external shocks. Among these policy responses, some countries might rely on exchange rate flexibility as a buffer, some might aim to minimize currency fluctuations, and some might consider capital flow measures as they seek to keep some degree of monetary policy control.

Policies concerning the choice of the exchange rate regime and the use of capital flow measures are central to macroeconomic management, especially in emerging and developing countries. An empirical exploration using a comprehensive database of exchange rate regimes and capital flow measures suggests that capital controls are more likely to be present when a country has a fixed exchange rate. Moreover, this correlation is mainly present in countries at lower levels of income per capita. These findings raise a number of policy-related issues:

- At lower levels of economic and financial development—proxied by lower levels of income per capita—policymakers may be constrained to jointly and tightly control both the exchange rate and the capital account. Accordingly, policy choices in developing countries should not be seen in isolation, and policy recommendations need to recognize that policy choices are not independent from each other.
- Higher levels of development may allow greater discretion to implement some variant of these two policies. Alternatively, countries that are more financially developed might find it harder to control the capital account regardless of currency regime given their high level of international financial integration. In this context, attempts to control capital flows would be more likely to fail due to circumventions by market participants.
- In principle, emerging and developing countries that choose to control both the exchange rate and the capital account may still exercise monetary policy autonomy to stabilize economic conditions (Cordella and Gupta 2015). This is only possible, however, if they have the necessary monetary policy space—which has generally been narrowing recently, amid inflation and foreign reserve pressures (Chapter 1).
- These choices could also reflect preferences among policymakers. Those who have a preference for intervening in the market may see both CFM and a fixed exchange rate as desirable, whereas those who prefer to let market forces reign may prefer a floating exchange rate and unfettered capital flows. A preference for greater intervention may be more prevalent at lower levels of development, perhaps reflecting actual or perceived constraints faced by policymakers at such levels.
- Finally, it remains to be established empirically whether the joint choice to control both the exchange rate and the capital account implies welfare gains or losses—for example, in terms of output growth or financial stability—for lower-income countries.

Annex 4.2 Data and Methodology

ERR Data

The exchange regime classification is based on Shambaugh (2004) and updated in Obstfeld, Shambaugh, and Taylor (2010). It uses actual exchange rate movements to see if a country stays within a +/- 2 percent band over the course of a year against a relevant base currency. If so, the country is classified as having a “peg.” Otherwise, it is classified as a non-peg. To insure the stability is deliberate and not a random lack of volatility, countries that peg for only one year are not coded as pegs. To handle one-off realignments, a country that has zero volatility in 11 out of 12 months is also considered a peg (again, as long as it is also pegged the year before or after). Soft pegs are identified as countries that do not maintain the strict boundary, but stay within 5 percent bands or stay within moving 2 percent bands in every month (that is, the change in any given month is never greater than 2 percent). Given the interest in the correlation of ERR and CFM, it is preferable to use a classification that uses only official market exchange rate behavior, not interest rates or black market exchange rates whose behavior may be a function of capital controls.

There are 1765 available observations with ERR data in the sample for 93 countries over 19 years. There are 707 pegs, 527 soft pegs, and 531 non-pegged country-year observations in the data set.

- In emerging markets, there are 109 observations of pegged exchange rates, 147 observations of soft pegs, and 200 observations of floats.
- Among frontier markets, there are 246 peg observations, 163 soft peg observations, and 141 float observations.
- In the other middle-income and low-income group, there are 91 peg observations, 83 soft peg observations, and 72 float observations.
- In the advanced economies group, 182 of the

261 country-year observations with a pegged exchange rate are countries in the Euro Area. After excluding Euro Area members, there is a relatively even distribution of observations among floats (118) and soft pegs (134), and a lower incidence of pegs (79).

Note the persistence of these choices across countries. There is a considerable amount of “flipping” behavior by countries (Klein and Shambaugh 2008). Exchange rate pegs frequently break, but they also frequently re-form, such that some countries flip back and forth from a peg to a float and back. That said, in shorter samples—such as this 19-year period—it is more common to find a country with just one regime (especially if limiting the categorization to the binary peg or non-peg).

In this sample of 93 countries, 30 countries never peg and 16 always do, leaving the remaining 37 countries having some pegged years and some non-peg years. Adding the 9 countries that peg in only 1 or 2 years and 6 countries that float in only 1 or 2 years, one is left with 39 countries that nearly always float and 22 that nearly always peg. The remaining 32 countries flip between floating and pegging, with 8 of these transitioning from one ERR to another only once, but the 14 flipping two or three times, and 10 flipping four or more times.

CFM Data

The capital flow measures classification is based on Fernández, Klein, Schindler, Rebucci, and Uribe (2015). This classification scheme is based on controls and requirements reported in the IMF’s *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER). This data set includes separate indicators for inflows and outflows for ten categories of assets. For this essay, as explained in the text, an aggregate indicator is constructed as the average of nine of these categories for both inflows and outflows, omitting controls on direct investment because these

controls often reflect non-economic concerns, such as national security. For each country and for each year, the average of inflow controls and outflow controls for the nine categories of assets is used. This aggregate indicator takes a value between 0 and 1, with 0 indicating no controls on any category of assets and 1 indicating controls on both inflows and outflows of all nine categories of assets.

- The “Open” category is for countries that almost never use capital controls. For this category, the average value of the capital control index over the sample period is less than 0.15, the maximum value in any one year is less than 0.25, and the standard deviation of the index across time is less than 0.10.
- The “Closed” category is for countries that have capital controls for almost all (or all) categories of assets for almost all (or all) years. For this category, the average value of capital controls across the sample period is greater than 0.70, the minimum value is greater than 0.60, and the standard deviation is less than 0.10.
- The “Partially Open” category is for countries that make occasional use of capital controls. Countries that are neither Open nor Closed are classified as Partially Open.

In the data set of 93 countries, 30 are classified as Open, 13 as Closed, and 50 as Partially Open. In the emerging market group, 17 countries are classified as Partially Open, 5 as Closed, and only 2 as Open. In the frontier market group, 15 are classified as Partially Open, 10 as Open, and 4 as Closed. The other middle- and low-income group includes 7 Partially Open countries, 4 Closed countries and 2 Open countries. In advanced economies, 16 countries are classified as Open, and 11 as using CFM in an occasional fashion.

Regression Analysis in Annex Table 4.2

Annex Table 4.2 presents results of regressions where the dependent variable is a logarithmic transformation of the above-mentioned CFM

measure— $\ln((100 \times kc) + 1)$ where kc is capital control index (average value over sample period), in any one year $1 \geq kc \geq 0$, with larger values representing more controls in place. The main independent variables is a logarithmic transformation of the above-mentioned pegged regime indicator — $\ln((100 \times peg) + 1)$, where peg is proportion of years country had a pegged exchange rate, $1 \geq peg \geq 0$. The other controls are the logarithms of GDP per capita, GDP, trade share, and size of the financial sector, as well as a currency union control dummy. (The regressions in Columns I and II use 64 rather than 66 observations because there are missing values for GDP variables for Argentina and Jamaica.) The plot shown in Figure 4.2.6 suggests that the results in Annex Table 4.2 are not driven by a small set of outliers.

Figure 4.2.7 shows the effect of peg regimes on capital controls as a function of income per capita. The thick solid black line shows the estimated value of the effect of peg regimes on capital controls for each level of income per capita, and the dashed red lines show the 95 percent confidence interval of this estimate (again, all expressed in logarithms). The vertical line at 9.34 means that the partial correlation is significant at the 95 percent level of confidence only for countries with the logarithm of income per capita below 9.34. The four richest countries with a value of the logarithm of income per capita below this cutoff are Algeria, Costa Rica, South Africa, and Thailand. The solid line is downward sloping, suggesting that the association between the capital control and peg indices decreases with an increase in income per capita.

A number of robustness tests using additional panel regressions were conducted and reported in the accompanying background paper (Arteta, Klein, and Shambaugh forthcoming). Those results support the central result above, and also justify the focus on using a cross-country sample rather than a panel consisting of country-year observations.

ANNEX TABLE 4.1 Listing of countries by category

Emerging Market Economies (EMEs) generally include countries with a long-established record of significant access to international financial markets. Frontier Market Economies (FMEs) include countries that are usually smaller and less financially developed than EMEs, and with more limited access to international capital markets. For this essay, EMEs are countries that are classified as such in at least two of the three following stock indexes: S&P, FTSE, and MSCI. FMEs are countries that are classified as such by at least two of the same three indexes. For countries not covered by all of these three indexes, we also include those that are classified as EME/FME by Bloomberg, Citi, and JP Morgan bond indexes, even though these latter lists do not have a break down between EMEs and FMEs. Source of classification: World Bank, IMF, Standard & Poor's, Financial Times Stock Exchange, Morgan Stanley Capital International, JPMorgan, Bloomberg, and Citigroup.

| Categories | Countries |
|--|---|
| Emerging Market Economies (24) | Brazil, Chile, China, Colombia, Czech Republic, Arab Republic of Egypt, Hungary, India, Indonesia, Republic of Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, Philippines, Poland, Qatar, Russian Federation, Saudi Arabia, South Africa, Thailand, Turkey, United Arab Emirates. |
| Frontier Market Economies (29) | Argentina, Bahrain, Bangladesh, Bolivia, Bulgaria, Costa Rica, Cote d'Ivoire, Georgia, Ghana, Guatemala, Jamaica, Kazakhstan, Kenya, Kuwait, Lebanon, Mauritius, Nigeria, Oman, Panama, Paraguay, Romania, El Salvador, Sri Lanka, Tunisia, Ukraine, Uruguay, Venezuela, RB, Vietnam, Zambia. |
| Other Middle and Low Income Countries (13) | Algeria, Angola, Dominican Republic, Kyrgyz Republic, Moldova, Nicaragua, Swaziland, Republic of Yemen (all middle income), as well as Burkina Faso, Ethiopia, Tanzania, Togo, Uganda (all low income). |
| Advanced Economies (27) | Australia, Austria, Belgium, Canada, Cyprus, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Israel, Italy, Japan, Latvia, Malta, Netherlands, New Zealand, Norway, Portugal, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States. |

ANNEX TABLE 4.2 Partial correlation of capital control index with pegged exchange rate and other variables

| Cross country regressions for emerging and developing countries | | |
|---|----------|---------|
| Dependent variable: ln (capital control indicator) | | |
| | I | II |
| ln(peg) | 0.15* | 1.66** |
| (s.e.) | (0.075) | (0.69) |
| ln(peg)×ln(GDP/Cap) | | -0.16** |
| (s.e.) | | (0.073) |
| ln(GDP/Cap) | -0.52*** | 0.075 |
| (s.e.) | (0.16) | (0.32) |
| ln(GDP) | 0.52*** | 0.48*** |
| (s.e.) | (0.11) | (0.10) |
| ln(Dom.Credit) | -0.096 | -0.16 |
| (s.e.) | (0.22) | (0.23) |
| ln(Trade) | 0.95** | 0.89*** |
| (s.e.) | (0.39) | (0.34) |
| Currency Union | -1.25* | -1.40 |
| (s.e.) | (0.72) | (1.43) |
| Elasticity of ln(capital control) to ln(peg) for average values of ln(GDP/Cap) of different country groups ^a | | |
| Other middle and low income | | 0.35*** |
| (s.e.) | | (0.13) |
| Frontier | | 0.18** |
| (s.e.) | | (0.072) |
| Emerging | | 0.10 |
| (s.e.) | | (0.062) |
| Advanced | | -0.054 |
| (s.e.) | | (0.092) |
| R ² | 0.36 | 0.41 |
| No. of Obs. | 64 | 64 |

^aThe values shown are $\beta_{\ln(\text{peg})} + \ln(\text{GDP/Cap}) \times \beta_{\ln(\text{peg}) \times \ln(\text{GDP/Cap})}$ for average ln(GDP/Cap) for each of the four country groups.

Sample based on values in 1995–2013.

Dependent variable: ln(capital control) is $\ln((100 \times kc) + 1)$ where kc is capital control index (average value over sample period); $1 \geq kc \geq 0$ in any one year, with larger values representing more controls in place.

Key independent variable: ln(peg) is $\ln((100 \times peg) + 1)$, where peg is proportion of years country had a pegged exchange rate; $1 \geq peg \geq 0$.

Other controls: Currency Union is proportion of years a country has been in currency union. GDP/capita and GDP are average values of real GDP/capita and real GDP over sample period. Dom. Credit is average of credit-to-GDP over sample period. Trade is average of (exports + imports)/GDP over sample period.

Significance Indicators: *** ≥ 99 percent, ** is ≥ 95 percent but < 99 percent, * is ≥ 90 percent but less than 95 percent.

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