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Rounding the Corners of the Policy Trilemma: Sources of monetary policy autonomy

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Rounding the Corners of the Policy Trilemma: Sources of monetary policy autonomy[1]

By Michael W. Klein and Jay C. Shambaugh

Abstract: A central result in international macroeconomics is that a government cannot simultaneously opt for open financial markets, fixed exchange rates, and monetary autonomy; rather, it is constrained to choosing no more than two of these three. This paper considers whether partial capital controls and limited exchange rate flexibility allow for full monetary policy autonomy. We find partial capital controls do not generally allow for greater monetary control than with open capital accounts, unless they are quite extensive, but a moderate amount of exchange rate flexibility does allow for some degree of monetary autonomy, especially in emerging and developing economies.

Policy makers cannot have it all, at least in the sphere of international macroeconomics. This is the idea behind the policy trilemma, a central principle of international macroeconomics that asserts that a country can maintain only two of three policies; a fixed exchange rate, open capital markets, and domestic monetary autonomy. The reason is fairly straightforward. If a country has a credible fixed exchange rate and open financial markets, its interest rate must follow that of the base country, which implies sacrificing monetary autonomy. Otherwise, an effort to independently alter monetary policy while keeping the capital account open would force the peg to break.[2] For example, an increase in

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[2] In this paper, we refer to "capital controls" and the "capital account" to reflect common usage. More precise terms would be "capital flow management measures" and the "financial account."

the base country interest rate that is not matched by the domestic country would lead to investors shifting funds to assets denominated in the higher interest rate currency, which generates a depreciation of the exchange rate. Thus, monetary autonomy requires that a country must either allow the exchange rate to change or shut down the flow of finance across borders.

The policy trilemma is often depicted using the diagram presented in Figure 1. Each of the corners of the triangle represents one of the three policy choices. A government can choose a position represented by one of the sides of the triangle: a floating exchange rate with monetary autonomy and capital mobility (side A); a pegged exchange rate with capital mobility but no monetary autonomy (side B); or monetary autonomy and a pegged exchange rate, but with capital controls (point C). A strict interpretation of the trilemma means that countries are forced to one of these sides. A more tempered view is that the trilemma highlights real-world tradeoffs; if financial markets are open, more autonomy requires more exchange rate flexibility or, conversely, if the exchange rate is to remain stable, more autonomy would require a more closed capital market.

In this paper, we consider these tradeoffs, with a focus on the extent to which monetary policy autonomy can be achieved with temporary or partial capital controls rather than pervasive barriers, or with an exchange rate policy that allows limited currency fluctuations as opposed to a free float. We consider facets of middle-ground policies for both capital controls and exchange rate pegs, and the possible choices that arise along both the dimensions of time and policy intensity. Middle-ground policies arise in the time dimension through blended behavior across years, such as opening and closing the financial account, or flipping back and forth across exchange rate regimes. Policy middle grounds in a particular year are represented by loose pegs and limited capital controls.

Recent experience shows the importance of considering middle-ground policies for exchange rate regimes. While there are some cases of movement towards "bipolar" exchange rate regimes, as suggested by Fischer (2001) more than a decade ago, and as exemplified by the move from the European Monetary System (EMS) bands to a single currency in the euro-zone, there remains an important and empirically relevant middle ground between long-standing pure pegs and floats. One aspect of this is the continued presence of "soft" pegs whereby exchange rates fluctuate within a wider band than with harder pegs. Another is the flipping back and forth between pegs and floats (Klein and Shambaugh (2008)).

Middle ground policies with respect to capital controls have been the subject of increasing theoretical interest and policy debate since the onset of the financial and economic crisis. Many in the international policy making community had been skeptical about using capital controls to generate autonomy. In the wake of the crisis, however, there has been a re-evaluation of the desirability of capital controls, especially those restrictions that are imposed episodically at times of incipient inflow surges. Perhaps most notably, in a reversal from their earlier stance, the IMF has suggested capital controls may be warranted under certain conditions (see Ostry *et al*, 2011). Theoretical work supports these views, with models showing that targeted capital controls, used in a flexible manner, could serve a prudential role and reduce financial fragility (Jeane (2011, 2012), Jeanne and Korinek (2010), Korinek (2011), Bianchi (2011)) or, for countries with pegged exchange rates, could substitute for monetary policy autonomy and provide those countries with some control over macroeconomic policy management (Farhi and Werning (2012) and Schmitt-Grohe and Uribe (2012)). Empirically, we observe some countries having long-standing, pervasive capital controls, but also a substantial subset of countries that use limited controls on an episodic basis. Klein (2012) calls these capital control regimes "walls" and "gates," respectively, and shows that walls are more effective than gates in limiting asset price booms and swings in the value of the real exchange rate. In addition, in any given year, there is a wide range of scope with which capital controls are employed, generating an extensive middle ground between open and closed.

This paper investigates the consequences for monetary autonomy of middle-ground policies, with respect to both the exchange rate regime and capital controls. The analysis builds on the extensive empirical literature that tests the standard policy trilemma. These tests have focused on tightly fixed exchange rates and strongly closed capital markets. Early results in that literature (Shambaugh (2004), Obstfeld, Shambaugh, and Taylor (2005)) established the empirical validity of the policy trilemma. These results countered the notion that countries broadly lacked monetary autonomy, or that there was little difference in monetary autonomy that could be obtained under different exchange rate regimes. Subsequent work supports the relevance of the trilemma. Bluedorn and Bowdler (2010) demonstrate that it holds for identified monetary policy shocks in the base country, not just for actual interest rate movements. Miniane and Rogers (2007) confirm that interest rates in countries that peg follow the interest rate of their base country more closely than do the interest rates of countries that float, but they do not find significant differences across their capital control regime categories. Aizenman, Chinn, and Ito (2010) show that, in this context, movements in one policy require corresponding changes in another policy; for example, more restricted capital flows enable a country to have either more monetary autonomy or greater control over its exchange rate

In this paper, we also find results that are supportive of the basic results of the trilemma for the corner policies of strongly fixed exchange rates or substantial capital controls. We add to those findings by documenting that countries which have floating exchange rates, and do not follow the base-country interest rate as closely as those with fixed exchange rates, tend to use the monetary autonomy that floating provides to pursue domestic inflation and economic growth goals.

The main contribution of this paper, however, is our consideration of partial and temporary capital control and exchange rate regimes that are neither always tightly pegged nor always floating. Our estimates show that gates do not provide the same monetary autonomy as walls, and that the sharp trilemma corner representing capital account openness cannot be rounded by using temporary capital controls unless they are quite extensive. Likewise, moderate capital controls do not provide the autonomy found with extensive capital controls. Similarly, flipping exchange rate regimes does not change the general nature of the trilemma. A country's interest rate moves with the interest rate of its base country when it pegs its exchange rate, and its interest rate does not behave in this way when it does not peg. Thus a temporary float offers monetary autonomy, and monetary autonomy is foregone with a pegged exchange rate, even if it is a temporary peg. However, soft pegs do seem to generate more monetary policy autonomy than hard pegs, but not as much autonomy as floating exchange rates.

Overall, the results presented in this paper confirm the basic message of the trilemma; countries with pegged exchange rates and open capital accounts have less monetary autonomy than those with floating exchange rates or capital controls. We also find that efforts to gain autonomy through middle range policies may be difficult. Thus, the most simple and most certain way to gain monetary autonomy, without strongly closing off the capital account, is to allow more flexibility in the exchange rate.

I. Methodology

The trilemma does not require that countries only occupy polar positions, rather it is an expression of the trade-offs faced by policy-makers, especially as regards the extent of monetary autonomy. The key question in this paper is the extent to which the trilemma trade-offs with respect to monetary autonomy are materially altered by allowing some degree of exchange rate flexibility short of a complete float, or by using limited capital controls episodically rather than erecting longstanding walls against capital flows. We answer this question with modified versions of the approaches used in Shambaugh (2004) and Obstfeld, Shambaugh, and Taylor (2005). The core methodology begins from the simple interest parity equation

(1) $R_{it} = R_{bit} + \%\Delta E^{e}_{it} + \rho_{it}$

where R_{it} represents the nominal interest rate of country *i* at time *t*, R_{bit} is the interest rate of the base country of country *i* at time *t*, $\%\Delta E^{e}_{it}$ is the expected change in the bilateral exchange rate between the base country and country *i* from time *t* to time *t+1*, and ρ_{it} represents the risk premium on the asset in question.

Under a purely credible peg with a very tightly fixed exchange rate, the expected change in the exchange rate is zero. If comparable assets issued in the domestic country and base country currencies exhibit similar risk (which might be the case with assets with relatively low risk premia, such as short term money market instruments, or short term government bonds), then the local interest rate must equal the base-country interest rate. But the local interest rate could differ from the base-country interest rate if the exchange rate is not pegged.

Equation (1) would only hold if money can flow across borders. Impermeable capital controls break the link between R_{it} and R_{bit}, regardless of the expected change in the exchange rate. Alternatively, less binding capital controls, such as a tax on foreign borrowing, could generate a wedge between R_{it} and R_{bit}. With this type of tax, in the presence of net inflows (so the marginal capital came from abroad), we could rewrite (1) as

(2) $R_{it} = R_{bit} + \%\Delta E^{e}_{it} + \rho_{it} + \tau_{it}$

where τ_{it} represents the tax domestic residents pay on borrowing from abroad (that is, a tax on capital inflows), which may vary over time. Raising or lowering τ_{it} allows the government to move R_{it} independently from the value of R_{bit} even if $\%\Delta E^{e}_{it}$ is equal to zero, which effectively provides it with some scope for monetary autonomy (Farhi and Werning (2012), Schmitt Grohe and Uribe (2012)).[3]

Several challenges arise if we base our empirical analysis on equation (2). The interest rates of countries that peg to a base country may move differently than those of the base country because of movements in the expected change in the exchange rate or the risk premium, both of which are unobservable. Furthermore, an extensive literature shows that equation (2) does not hold for countries that do not peg when the realized *ex post* exchange rate change is used as a proxy for the *ex ante* expected change and the risk premium is assumed to be uncorrelated with other variables. Finally, another important consideration is that nominal interest rates exhibit substantial persistence and may be treated as close to a unit root, raising the possibility of spurious regressions if levels are used.[4]

For these reasons, we employ specifications that center on the first difference of equation (2),

(3) $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$

[3] Schmitt-Grohe and Uribe state: "As a result, the government can indirectly affect employment in the nontraded sector by manipulating the intertermporal price of tradables (the interest rate) via capital controls." It should be noted, Schmitt-Grohe and Uribe do not suggest this is a first best policy. They suggest allowing the exchange rate to change is preferable, but study the question of what should be done if that tool is not available. Farhi and Werning, argue: "In response to transitory shocks, however, capital controls now play a more important countercyclical role" when prices are sticky, and "This discussion underscores the fact that capital controls allow the country to regain some monetary autonomy and, with it, some control over the intertemporal allocation of spending."

[4] Shambaugh (2004) discusses the time series properties of the data in detail. One can estimate levels relationships and test the long run relationship and speed of adjustment and use critical values that vary depending on the unit root properties of the data (see Shambaugh (2004) and Frankel, Schmukler, and Serven (2004)), but doing so requires fairly long samples with the same properties. As we want to focus on shifts across exchange rate and capital controls regimes, it is difficult to find long enough episodes to use these techniques.

where $\mu_{it} = \Delta(\%\Delta E^{e}_{it} + \rho_{it} + \tau_{it} + \nu_{it})$, and ν_{it} is any unobserved component other than those specified.[5] One of our empirical strategies involves estimating separate regressions for subsamples of the data, corresponding to different combinations of exchange rate regime and capital controls. For example, if we divided the sample along the dimensions of floats vs. pegs and open capital markets vs. closed capital markets, we would have four categories; floats with open capital markets, pegs with open capital markets, floats with closed capital markets and pegs with closed capital markets. We then compare estimates of β, and R-squared statistics, across these categories

In the simplest interpretation of this equation, under the assumption that $\Delta(\%\Delta E^{e}_{it} + \rho_{it} + \tau_{it} + \nu_{it})$ is uncorrelated with ΔR_{bit} (which would be true, for example if the peg was fully credible, the risk premium was constant, and there was no time-variation in capital controls), β would equal 1 for a panel consisting of observations of open pegs because a country with a fixed exchange rate and open capital markets would need to move its interest rate one-for-one with that of the base country. More generally, in separate panels of data, the estimate of β in a panel consisting of observations of countries with pegged exchange rates and open capital markets should be larger and more significant than the estimate of β in a panel consisting of countries with floating exchange rates and open capital

[5] We also explore a variety of other specifications to ensure that the differences specification with no lags is not giving us a misleading result. We find that examining interest-rate levels (with either a simple levels specification or if one includes time and year fixed effects) generates results quite similar to those found with interest rate changes, despite concerns about possible spurious results. Also, we find virtually no change in the coefficient on the base country interest rate when including the lag of the own interest rate as a regressor and also that the coefficient on the lag is effectively zero (at higher frequencies, the lag may be significant due to smoothing of interest rate changes, but at the annual frequency, no lag of the dependent variable is needed.) Finally, in regressions in which we include the lag of the change in the base interest rate we find that the coefficient on this variable is often statistically significant, but it is small and there is no change in the coefficient on the contemporaneous change in the base interest rate. Countries switch exchange rate and capital control regimes, therefore multiple lags would require restricting our data set to long lasting pegs and capital control regimes. To avoid this limitation, we report the core results with no lags.

markets, or in a panel consisting of countries with fixed exchange rates and closed capital markets. Thus, β serves as an estimated measure for a lack of monetary autonomy.

We can consider the implications for $\hat{\beta}$, the estimate of β in equation (3), of a correlation between the base country interest rate and the regression error, μ_{it}. Note that the formula for $\hat{\beta}$ can be written as

$$(4)\ \hat{\beta} = \beta + \frac{Cov(\Delta R_{bit},\ \mu_{it})}{Var(\Delta R_{bit})}$$

Based on the theory, and under the assumption that $Cov(\Delta R_{bit}, \mu_{it})$ equals zero, the estimate of β should equal 1 for open pegs and 0 for other observations. But this will not be the case if there is correlation between R_{bit} and any of the elements of μ_{it}.

There are a number of plausible scenarios in which $Cov(\Delta R_{bit}, \mu_{it})$ could be expected to be nonzero. For example, a common shock that cause similar responses of interest rates across countries ($Cov(\Delta R_{bit}, \Delta v_{it}) > 0$) would increase the value of $\hat{\beta}$ but not represent any true loss of monetary autonomy for countries that peg.[6] Also, there would be a bias towards finding a difference between the estimates of $\hat{\beta}$ for countries that peg and those that float if there is an increased likelihood that a peg is broken when the base country raises its interest rates ($Cov(\Delta R_{bit}, \Delta(\%\Delta E^{e}_{it})) > 0$), or if the effects of an increase in the risk premium associated with an increase in base country interest rates ($Cov(\Delta R_{bit}, \Delta\rho_{it}) > 0$) are more strongly felt among countries that are pegging than those that are floating.[7]

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[6] Results in section IV which use local conditions as a control help to address this issue. Also, Shambaugh (2004) provides a number of tests looking at trade shares and other reasons a country may follow the base and finds that the core results regarding exchange rate regime and capital control regime still hold.

[7] A global increase in the risk premium (due to a general increase in uncertainty) would be captured by time fixed effects, but fixed effects can only be used when there are multiple base countries because otherwise the fixed effects are collinear with the single base country's interest

In contrast, there is a bias away from finding a difference in the estimates of $\hat{\beta}$ for pegged and floating countries if the base country cuts interest rates during a worldwide economic crisis when there is also increased concern about the countries maintaining their pegs to that base country ($Cov(\Delta R_{bit}, \Delta(\%\Delta E^e_{it})) < 0$), or if a decrease in the base country interest rate induces domestic countries to impose or raise taxes on capital inflows ($Cov(\Delta R_{bit}, \Delta\tau_{it}) < 0$).[8]

An important case in which $Cov(\Delta R_{bit}, \mu_{it})$ is nonzero is when the exchange rate operates within a credible target zone. Theory shows that, with a credible target zone, expected depreciation decreases with an increase in the foreign interest rate that moves the exchange rate closer to the reflecting upper barrier of the band (Krugman, 1991). This negative correlation between R_{bit} and $\Delta(\%\Delta E^e_{it})$ lowers the value of $\hat{\beta}$. Along these lines, Obstfeld, Shambaugh, and Taylor (2005) demonstrate, using simulations, that if a country is allowed some small amount of exchange rate flexibility within a band and its monetary policy leans against the wind, the value of $\hat{\beta}$ should be in the neighborhood of 0.5 rather than the value of 1.0 that is implied in the simplest framework in which $Cov(\Delta R_{bit}, \mu_{it})$ is zero.

These examples show that 0 and 1 do not serve as true benchmarks for the estimated coefficient in equation (3) across exchange rate regimes (due to the possible correlation between R_{bit} and $\Delta(\%\Delta E^e_{it})$ or , $\Delta\rho_{it}$) or across capital control

rate. But, even with multiple base countries, time fixed effects soak up a fair bit of information, especially to the extent that there is a correlation across base countries' interest rates. Therefore, with a limited number of bases, the use of time fixed effects may be problematic. Throughout this paper we report estimates without these fixed effects, although we occasionally note the results obtained when using time fixed effect results (and some tables in the appendix include these results). The inclusion of country fixed effects is generally not relevant because fixed effects that differ from zero imply that a country is constantly raising (if positive) or lowering (if negative) its interest rate. Thus, including them is not justified and, as a practical matter, rarely has any effect on the results.

[8] As discussed in the next section, capital control data shows the presence of controls, but not their intensity nor the extent to which they are enforced, so it is not possible to include, in the regressions, a specific measure of τ_{it}.

regimes (due to the possible correlation between R_{bit} and $\Delta(\tau_{it})$). Thus, we do not necessarily expect $\hat{\beta}$ to equal these polar values. A more relevant analysis compares $\hat{\beta}$ across subsamples or, as described below, tests for differences in $\hat{\beta}$ in a pooled sample, in order to gauge differences in monetary autonomy across exchange rate and capital control regimes.

An alternative way to consider the extent of monetary policy autonomy across exchange rate and capital control regimes, using the framework of equation (3), is to compare the R^2 statistic for a panel consisting of fixed exchange rates and open capital markets to the R^2 statistic in panels with floating exchange rates or limited capital mobility. A high R^2 shows that little else drives the local interest rate other than the base interest rate. A low R^2 shows that many other factors may drive the local interest rate. Again, Obstfeld, Shambaugh, and Taylor (2005) provide a benchmark for the R^2 statistic in the case of a country with a narrow target zone (which, in our empirical analysis, would be coded as a peg), which follows a monetary policy of "leaning against the wind." In this case, simulations suggest an R^2 of only 0.1 or 0.2.

The tests on separate samples described above do not allow for an explicit test of differences in the estimates of $\hat{\beta}$ across exchange rate and capital control regimes. We can test for the statistical significance across these samples by pooling the data and using a regression that includes the interactions of the change in the base interest rate with the exchange rate regime and an indicator of capital account controls. For example, in the case of peg vs. non-peg, the equation would be

(5) $\Delta R_{it} = \alpha + \beta_R \Delta R_{bit} + \beta_{RP} P_{it} \Delta R_{bit} + \beta_P P_{it} + \mu_{it}$

where the dummy variable P_{it} equals 1 for an observation representing a pegged exchange rate for country *i* in year *t*, and is otherwise 0. In this equation, the effect of a change in the base country interest rate on the local interest rate is β_R

for a country that does not peg its exchange rate in year *t*, and $\beta_R + \beta_{RP}$ for a country that does peg its exchange rate in year *t*. A positive value of the coefficient β_{RP} reflects the fact that the domestic interest rate follows the base interest rate more closely when the country pegs, and a test of the significance of this coefficient offers a straightforward test for the difference between pegged and non-pegged observations. This equation can be augmented with other interactions, in particular, measures of a country's capital control regime (in this case, the coefficient on the variable representing the interaction of the base-country interest rate and an indicator of capital account openness, say β_{RK}, is expected to be positive). This specification can easily be extended to include three categories of capital controls (e.g. walls, gates and open) and/or three categories of exchange rate regimes (peg, soft peg, and float).

II. Data

A crucial aspect of any empirical test of the trilemma is identifying indicators of monetary policy, exchange rate regime and capital controls. Typically, research on this topic requires a division of observations into the two categories of fixed and non-fixed exchange rates, as well as the two categories of an open or closed capital account. But in this paper we focus on the extent of monetary autonomy in the mid-range between fixed and floating, and when capital accounts are neither fully open nor fully closed. In this section, we describe the categories we employ for the exchange rate regime and the openness of the capital account. We also demonstrate the empirical relevance of mid-range policies by presenting statistics on the distributions across exchange rate regimes and capital control categories.

II.A Exchange Rate Regimes: Pegs, Soft Pegs, and Floats

The core measure of the exchange rate regime that we use is derived from the methodology introduced in Shambaugh (2004). This approach focuses solely on actual exchange rate behavior. As is well documented, a *de facto* classification like this one is preferable to a *de jure* one based on governments' declarations of their exchange rate regimes because there is often a disconnect between these declarations and actual exchange rate behavior. This method, of focusing on the exchange rate alone, is better suited to our analysis than other *de facto* classification schemes which include other considerations such as the stance towards capital controls or the use of international reserves. [9]

The Shambaugh (2004) classification scheme focuses on the bilateral exchange rate between a country and its base country, that is, the country to which it does peg, or would peg, its exchange rate. The determination of each country's base reflects its declared intent with respect to pegging, its historical experience, or an analysis in which a variety of potential base countries are considered.[10] The appendix supplies a list of countries and base countries. A country is coded as pegged in a particular year if its bilateral exchange rate with its base country stays within a +/- 2 percent band over the course of that year. This choice of the band width is based on the fact that through history, ranging from the arbitrage bands of the gold standard to Bretton Woods, to the EMS, bands of roughly 2 percent

[9] There are two other popular choices of exchange rate regime classification. The Reinhart and Rogoff classification codes countries as pegged if the black market exchange rate is stable, but that in some sense mixes two aspects of the trilemma – financial controls and exchange rate stability. For the purposes of examining the trilemma, a pure focus on the exchange rate is more appropriate. Similarly, Levy Yeyati and Sturzenegger use data on reserves volatility to see if a country is intervening to maintain its peg. But, the index subsequently must add other pegs that do not intervene but that are clearly low volatility options. Furthermore due to the greater data needs, the index is available for a smaller sample of observations. See Klein and Shambaugh (2010) for an extensive discussion of the coding of exchange rate regimes, and the different types of classifications that have been used.

[10] We will also need to know the base country for non-pegged countries. The base in a floating period is the currency the country would peg to if it were pegging. This is revealed based on who a country pegs to when it does peg. 97 percent of the countries in the sample peg or soft peg at some point, in effect revealing the relevant base.

have often been allowed in fixed exchange rate systems. Countries are also considered pegged if their exchange rate is constant in 11 of 12 months but has a discrete devaluation or revaluation in the other month of that year. To avoid misclassifying a country that simply has low volatility in a given year, single year pegs are not included as pegs. There appear to be no cases in which countries are spuriously coded as pegged due to a random lack of volatility. Klein and Shambaugh (2010) document that the division of observations into fixed versus non-fixed using this classification scheme is highly correlated with the fixed / non-fixed categorization in other *de facto* classification schemes and with the *de jure* classification of countries' declaration of their exchange rate regime to the IMF.

The mid-range policy along this dimension reflects the category of *soft pegs*, as in Obstfeld, Shambaugh, and Taylor (2010). A soft peg is defined as occurring when a country-year observation is not classified as a peg, but the bilateral exchange rate with the base country fluctuates by less than +/-5 percent in a given year, or when there is no month where the exchange rate changed by more than 2 percent up or down (as a practical matter, almost no observations met the latter criterion without also meeting the first one). As with the peg classification, a country may not be considered as having a soft peg in a particular year if it floats in both the previous and the subsequent year, a rule that we impose in an effort to reduce the likelihood of spuriously coding soft pegs.[11] Henceforth, *peg* refers to a +/- 2 percent band and *soft peg* refers to the +/- 5 percent band, and *float* refers to all other observations. In our binary coding, we will refer to *pegs* and *nonpegs* where the latter includes both floats and soft pegs.

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[11] A country can have a soft peg for only one year, since it could move from a peg to a soft peg to something other than a soft peg, or from a something other than a soft peg to a soft peg to a peg. Only soft pegs that are bordered on either side by a float are considered spurious.

The statistics in Table 1A show that the mid-range policy of a soft peg is sufficiently represented to warrant investigation. This table presents statistics on the exchange rate regime for the two data sets used in the analyses in this paper, the 1973 to 2011 data set and the shorter 1995 to 2011 data set. (The two data sets reflect differences in the available samples for the two different capital control measures discussed below, with fewer countries in the shorter data set than in the longer data set.) In the shorter-sample Gates and Walls data set, there is a roughly even division across the three exchange rate regime categories of peg, soft peg, and floating. In the longer-sample Chinn-Ito data set, there is a relatively higher proportion of pegs, a relatively lower proportion of soft pegs, and a slightly smaller proportion of floating exchange rate observations. This difference across the data sets reflects a difference in country coverage more than a difference in sample periods. There is almost no difference, in the longer data set, in the peg / soft peg / float division between the full sample and its post 1995 subsample.[12]

Because our focus is on mid-range policies, it is worthwhile to justify the characterization of the soft peg category as a policy choice rather than just as a situation where there happened to be a lack of volatility for observations that would otherwise be categorized as floating. In a specific example, the dollar/DM and dollar/euro are never classified as a soft peg because neither meets the exchange rate criteria for two years in a row. Beyond this feature of our definition of a soft peg, a consideration of the classification outcomes also demonstrates that the lack of exchange rate movement is not spurious. Of the 804 soft peg observations, 369 occur within five years of a country being classified as having a

[12] See also Popper, Mandilaras, and Bird (2012) and Williamson (2000) among other studies for a discussion of the fact that the middle ground does appear occupied. It is worth noting that even conventional pegs differ from the hard pegs (e.g. currency unions and currency boards) that Fischer suggested would be the logical endpoints. Roughly half of the pegs are not pure pegs but have some movement within the 2 percent bands.

peg. These 369 cases can be reasonably interpreted as instances in which a country was either preparing to peg by narrowing the band in which the exchange rate moves, or had decided to allow more exchange rate movement than its prior peg, as opposed to just a random lack of exchange rate volatility. Another 74 observations represent a string of years in which a country had a soft peg that either began after a peg, or ended with a peg, but some of these years were more than five years away from the peg. Countries in this group include those like Sweden and Norway that followed the Deutsche Mark or, subsequently, followed the euro closely but are not tight pegs, a set of Asian countries that track the dollar but not within 2 percent bands (which include, at times, India, Korea, and Indonesia), and smaller countries that follow, within the wider band, the exchange rate of a former colonizer (for example Tunisia). Another 44 soft peg observations come from countries that were in the European Monetary System which had exchange rate bands of +/-2.25 percent, allowing for the possibility that a member country could, in a particular year, be classified as having a soft peg rather than a peg. Furthermore, there were a number of realignments within the EMS that would be still be classified as a soft peg observation. Yet another 95 soft peg observations represent countries that gear monetary policy to targeting inflation. These are generally small, open economies for which the exchange rate importantly impacts the price level. Exchange rate stability is an important goal for these countries in their broader efforts to target inflation.

The remaining 222 soft peg observations follow no obvious pattern. Over 80 percent (179) of these observations come from a group of 24 countries that had at least 5 years as soft pegs. These countries, while not fitting one of the neat categories described above, still appear to be deliberately controlling the exchange rate based on how frequently it stays within the 5 percent bands. This includes countries like Sri Lanka which sometimes pegged directly, but at other times had long stretches of years with bands in the 2-5 percent range, former

Soviet Republics like Armenia, Georgia, and the Kyrgyz Republic that traced the dollar closely, and countries that tried to keep the exchange rate stable against a former colonizer, but did not stay directly pegged (such as Algeria to France and Mauritius to the UK). This consistency in soft peg outcomes, even in the absence of periods with a tighter 2 percent band, suggests deliberate policy to restrict exchange rate movements.

Finally, other statistics also suggest that soft pegs represent efforts to limit exchange rate fluctuations rather than instances where a floating exchange rate just happened not to move much. Of the total 804 soft peg observations, 117 are cases where the exchange rate stayed with a 2 percent band, but for only one year, and the exchange rate was in a 5 percent band in either the year before or after this. Because these cases do not display two years in a row of staying within 2 percent bands, they are not considered pegs. Given that they stayed within 5 percent bands for 2 or more years, though, these observations are classified as soft pegs. Of the 222 soft peg observations that follow no obvious pattern, 40 are cases where the exchange rate stayed within 2 percent bands for only one year (as described above). More than half of these 222 soft peg observations represent at least 4 years duration of a soft peg to the same base country, but were not bounded by a peg on either side, did not occur close to a peg observation, and were not EMS countries or inflation targeters. Staying within such relatively tight bands for long stretches of time just because of a randomly quiescent bilateral exchange rate with the base country seems quite unlikely.

II.B Capital Control Regimes Beyond "Open" and "Closed"

Capital controls are generally taken to mean the existence of a differential treatment between residents and non-residents with respect to the purchase or sale of assets traded internationally. Theoretical models that incorporate capital controls tend to treat these as a tax on the international sale of an asset that drives a wedge between the expected return received by a resident and that received by a non-resident (Korinek (2010), Farhi and Werning (2012), Schmitt-Grohé and Uribe (2012)). In practice, capital controls can take a number of different forms, including market-based controls like a "Tobin tax" on international transactions or a requirement that a percentage of a cross-border asset purchase is deposited in a non-interest bearing account, or administrative controls such as outright bans on certain types of transactions.

This variety of types of capital controls makes it difficult to construct an empirically-based *de facto* indicator of capital account restrictions. This difficulty is compounded by the general absence of data on gross capital flows and, even if these data were available, the lack of a clear benchmark with regards to the level of gross flows consistent with free capital mobility. Similarly, it would be difficult to determine the extent of *de facto* controls by considering whether rates of return are equalized across countries since this assumes efficient markets, knowledge of investors' expectations of the future value of the exchange rate, information on investor preferences and correlations of returns with other measures of risk. Thus, virtually all empirical research on capital controls uses *de jure* rather than *de facto* indicators. The most consistent source of *de jure* cross-country data on capital controls, and the one with the most comprehensive country coverage, is the *Annual Report on Exchange Arrangements and Exchange Restrictions* (*AREAER*) published by the IMF.

The Chinn-Ito index (first presented in Chinn and Ito, 2006) takes the first principal component of the *AREAER* summary binary codings of controls relating to current account transactions, capital account transactions, the existence of multiple exchange rates, and the requirements of surrendering export proceeds. This index covers a wide set of countries over a long time period. The annual Chinn-Ito data we use in this paper covers the 1973 to 2011 period and includes up to 126 countries. A score is generated for each country in each year, which allows for a change in a country's status with respect to this indicator across time.

As shown in Figure 2, the distribution of these scores is close to tri-modal. Accordingly, we use this series to create three dummy variables, one for open capital accounts, one for closed capital accounts, and a third for an intermediate level of openness.[13]

Our other capital control indicators use information from the *AREAER* beginning in its 1995 volume, when the yearbook switched from presenting binary codes that simply indicated the presence or absence of controls across a limited number of categories to reporting separate indicators on controls on inflows and outflows across a much wider range of assets. These indicators are based on an approach originated by Schindler (2009), and extended by Fernandez, Klein, Rebucci, Schindler and Uribe (2014) to a set of 91 countries for the period 1995 to 2011. Our primary indicator uses ten categories of capital flows; inflows and outflows across the five asset categories of money market instruments, bonds, equities, financial credits and collective investments. There is a determination of whether or not capital flows were impeded in each of these ten categories through a careful analysis of the narrative description of the stance of the country in each year's volume of the *AREAER*.[14] This information on the presence or absence of capital controls across ten categories is then used to distinguish between the 29 countries that persistently had open capital accounts (*Open*), the 15 countries that persistently had closed capital accounts (*Walls*), and the 47 countries that used

[13] Comparing these cuts in the index to the old binary coding of the IMF yearbook (for the years where available), we found that the open country-year observations were always open according to the yearbook, the closed country-year observations were always closed, and those that are in the middle ground based on the Chinn-Ito index were sometimes coded as open and sometimes coded as closed.

[14] For example, this approach records the presence of a capital control if the *AREAER* narrative says that certain transactions are prohibited, or if the transaction requires government approval, authorization or clearance, or if there is a quantitative limit on the amount that can be purchased by a non-resident. In contrast, the mere requirement that the government be notified of a transaction is not gauged to constitute a capital control. We do not consider controls on direct investment since these may arise due to issues related to national security, intellectual property, or many other factors that unrelated to impeding capital flows for macroeconomic purposes. See Fernandez, Klein, Rebucci, Schindler and Uribe (2014) for details.

capital controls episodically (*Gates*), as in Klein (2012).[15] Thus, in this scheme, a country does not change categories across time, although a *Gate* can be open or closed in a particular year, depending upon the absence or presence of controls at that time.[16]

The fact that capital controls vary across time in the *Gates* category allows us to further subdivide this set of country-year observation into the categories of *Open Gates*, for those observations in which there are no restrictions across any of the asset categories, and *Closed Gates*, which have some restrictions. The average value of restrictions (where 1 signifies a restriction and 0 the absence of a restriction) is 0.57 for the *Closed Gates* set.[17] The *Closed Gates* set is further subdivided into the categories of *Limited Gates* (if fewer than half the categories have controls in place, with an average value of restrictions of 0.27) and *Comprehensive Gates* (if half or more of the categories have controls in place, with an average value of restrictions of 0.77). Thus, while the *Open Gates* observations look very much like the *Open* countries in general (in that there are no restrictions), *Closed Gates* observations are different from *Walls*. Even though *Comprehensive Gates* are more similar to *Walls* in the scope of their

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[15] A country is placed in the Wall category if 90 percent or more of the asset categories are restricted, on average, over the 17 year sample period (e.g. India and Malaysia), or if only one category is open throughout the period and the other categories are closed throughout (Pakistan). A country is in the Gate category if it has more than one asset category open for more than one year each but it is not in the Open category (e.g. Brazil, Cyprus, Korea). A country is in the Open category if it has less than 3 percent of the asset categories are restricted, on average, over the sample period (e.g. Canada, Japan, the United Kingdom), or the average is greater than three percent but there are restrictions in no more than one category over the full sample (e.g. Italy, Yemen) or if it has restrictions in more than one category, these restrictions in all but one category are only for one year each (e.g. Bolivia). See the Appendix Table A4 for a list of countries by category.

[16] Consistent with Klein (2012), in which 44 countries were in the data set, there is a relatively straightforward separation of countries into these three categories since there are a set of countries for which capital controls were imposed for long duration and over a majority of categories (countries in the *Walls* category), and another, distinct, set of countries for which capital controls were almost entirely absent (countries in the *Open* category).

[17] In contrast, the average values of restrictions are 0.02 for countries in the *Open* category and 0.96 for countries in the *Walls* category.

restrictions on asset transactions than other *Gates* observations, *Walls* may be still be more impermeable than *Comprehensive Gates* because they are more longstanding and cover an even wider set of assets.[18]

Table 1B reports the number of observations in each category for the two main classification schemes. As mentioned above, the Chinn-Ito (CI) classification allows for a country to be in different categories across time. This classification puts 37 percent of the 1973 – 2011 observations in the closed category, 31 percent in the mid-range of capital controls category, and 32 percent in the open category. The five-asset Gates-Walls-Open (GWO) classification schemes divide the sample by country, not by country-year observation. Half of the observations are in the *Gates* category, with the next largest category being *Open* (32 percent), and the smallest number in the *Walls* category (18 percent).[19] Table 1C compares the Chinn-Ito (CI) and five-asset Gates/Walls/Open (GWO) indicators for the 1995 to 2011 sample. This table shows that there is a broad coherence across these two classification schemes. Almost three-quarters of the observations coded as open in CI are coded as either *Open* or *Open Gates* in GWO. Likewise, over half of the observations coded as *Closed* in the CI classification are coded as *Walls* in the GWO classification, and, when *Comprehensive Gates* observations are also included, this proportion rises to 95 percent. About 70 percent of the CI *Mid-Range* observations are classified as

[18] A similar, but alternative, classification scheme exploits the detailed nature of the Fernandez, Klein, Rebucci, Schindler and Uribe (2014) data set by focusing only on restrictions on the asset categories of money market instruments and bonds, the categories that may be the most important when considering the implications of capital controls for the conduct of monetary policy. Only a few countries are in a different category in this two-asset scheme as compared to the scheme based on the five asset categories. Countries are in the *Gates* classification in this scheme if they have at least two consecutive years open in at least one of the four asset categories (otherwise they are in the *Walls* classification) and at least two consecutive years closed in at least one category (otherwise they are in the *Open* classification). See Appendix Table A4 for details.

[19] For the two-asset Gates/Walls/Open classification based on restrictions only in the money market instrument and bond categories, 30 percent of the observations are in the *Open* Category, 50 percent in the *Gates* category, and 20 percent in the *Walls* Category.

Gates in the five-asset GWO classification, with all but four of these observations recorded as *Limited* or *Comprehensive Gates*.

These statistics show that there is an empirically relevant number of observations that represent neither fully open nor fully closed capital accounts and, as with the exchange rate regime, the middle ground is a common enough outcome that it warrants investigation. We next turn to the question of whether these middle ground policies, for both exchange rate regimes and capital controls, allow for more monetary autonomy than a peg, or than a fully open capital account.[20]

III. Results

This section presents results for both a data set using the Chinn-Ito capital control data, which covers the period 1973 – 2011, and one using the gates, walls, and open division of countries, which covers the period 1995 – 2011.

III.A Core evidence on the Trilemma

Table 2 presents subsample regressions using the longer (Chinn-Ito) data set. This first table of results presents estimates for binary classifications that distinguish pegs from non-pegs, (grouping soft pegs and floats together), and open capital accounts (as indicated by the Chinn-Ito variable) from those with any controls (middle closed or closed capital markets). Each of the four central cells of table 2 presents estimates based on a subsample representing one of the four archetypal trilemma categories; open pegs, open nonpegs, closed pegs, and closed nonpegs. Each cell in the central part of this table represents the results from a regression that takes the form of equation (3) and includes the $\hat{\beta}$ coefficient (the

[20] The other data used in the analysis (interest rates, reserves, etc) are from standard sources and are described in the data appendix.

coefficient on the base-country interest rate), the standard error associated with that coefficient, the number of observations, and the R^2 statistic.

Table 2 shows that the value of $\hat{\beta}$ for the open pegs subsample is 0.68 and the R^2 statistic indicates that the base interest rate movements explain 28 percent of local country interest rate movements.[21] The coefficient in the closed pegs sample is 0.40 and also different from zero at a high level of statistical significance, but, in this case, the R^2 statistic is only half as big as in the open peg sample. Thus, despite the closed financial markets, these pegs still move in conjunction with the base interest rate, but the correlation is much less than in the case of open financial markets. Interest rates in open float countries are also not completely uncorrelated with those of the base countries. The coefficient in this group is 0.23 and is significantly different from zero.[22] Finally, interest rates in the closed nonpegs countries show almost no relationship with their respective base country interest rate.[23] The coefficient is close to zero (0.09), though it is significantly different from zero at the 90 percent confidence level.[24]

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[21] Standard errors are clustered at the country level so as to allow for an unstructured covariance matrix within a set of observations for a country (controlling for serial correlation in the panel as well as the possibility of different size errors across countries). One could alternatively control for correlation within a given year across countries, the standard errors are nearly identical across the two choices. Both clustering methods yield standard errors considerably larger than a simple heteroskedasticity correction or uncorrected errors.

[22] It is worth noting that incipient pegs do not drive the positive coefficient. Dropping countries that are floating but will peg sometime soon does not change the coefficient or the significance level.

[23] Crises do not explain the low coefficient for nonpegs. Eliminating countries that pegged the year before or two years before does not change the result.

[24] Appendix table 2A replicates these results including year effects. If the base countries' interest rates are correlated, or if particular subsamples have one dominantly used base country, the results would be pushed towards zero since much of the variation in the base rate would be captured by the fixed effects. Additionally, if a country is not really following the base country, but its interest rate simply moves with those in the rest of the world, we would also see the β moved towards zero. But the results in Table 2a show that there is little change in the coefficients in the open pegs and closed pegs subsamples when year fixed effects are included, suggesting that the significant coefficients for the pegged samples are not generated by global shocks. In contrast, coefficients for both nonpeg samples move towards zero, suggesting that the nonzero β may in fact be simply driven by common shocks for the nonpeg samples.

The marginal column and row of Table 2 presents results from the interaction regression, which takes the general form of equation (5) but also includes an interaction for capital controls. These results allow us to test the significance of the difference in the coefficients between pegged and nonpegged observations, and also the difference in the coefficients on open and closed capital account observations. In this row and column, and in all presentations of the tests of the differences across samples based on interaction regressions, results are presented as most open minus less open, or more exchange rate fixity minus less exchange rate fixity, so the expected value of all the differences in coefficients is positive. For example, the difference in the effect of the base interest rate on pegs versus nonpegs is 0.33 while the difference in the effect of the base interest rate on open versus closed is 0.27, and both of these differences are statistically significantly at the 99 percent confidence level. These results are consistent with those of Shambaugh (2004) and Obstfeld, Shambaugh, and Taylor (2005), even though the data sets used in those papers are shorter by ten years.

We also investigated whether interest rates in countries that peg in a particular year are following the interest rate of the base country, and not just moving with major country interest rates. We did this by including both the United States and the base country interest rates in a subsample of countries whose base country is not the United States (these results are not presented in a table). In the pegged sample of this subset, the coefficient on the base (non-U.S.) interest rate is 0.67 but the coefficient on the United States interest rate is 0.25, a value very close to that of the coefficient on the United States interest rate in the nonpeg subsample. This shows that countries that peg in a particular year are specifically reacting to their own base country interest rates rather than to world shocks that move all base countries' interest rates.

The four panels of Figure 3 illustrate the results presented in Table 2. Each panel shows the scatter plots of one of the four subsamples, along with the regression line. The line is steepest, and the scatter of observations is clearly tightest around the regression line, for the open peg subsample. The flat regression line and the wide scatter of observations in the panel representing the closed nonpegged sample illustrates the result that there is virtually no correlation between local and base rates in this subsample. The spread of data points around the regression line in each of the other two samples, closed pegs and open nonpegs, is between what is observed in the open peg and the closed nonpeg subsamples.

Note that the coefficients in the off diagonal cells of Table 2 are statistically significant. This might be interpreted as indicating that complete monetary autonomy is obtained only with a floating exchange rate and a closed capital account.[25] This result would be at odds with a basic interpretation of the trilemma, that suggests that countries with an open capital account which do not peg (corresponding to the sample in the upper right cell) and those which peg and have a closed capital account (corresponding to the lower left cell) should have monetary autonomy. But another interpretation is that we may need a more fine gradation of policies to understand the sources of monetary autonomy. We next turn to this point.

III.B Rounding the Corners

One possible reason that the interest rates of countries that are classified as not pegging follow the interest rate of the base country, as shown in the upper right cell of Table 2, is that floats may not purely float, as suggested by Calvo and Reinhart (2002). Likewise, a possible reason for the significant correlation of interest rates between the base countries and the countries that peg and have closed capital accounts, as shown in the lower left cell of Table 2, is that these

[25] These results are consistent with results in Obstfeld, Shambaugh, and Taylor (2005) and Bluedorn and Bowdler (2010).

countries do not really close their capital accounts. Our discussion of the data supports these interpretations of the estimates presented in Table 2 since the definition of nonpeg includes soft pegs as well as pure floats, and the binary coding for capital accounts is generated from a continuous index. In this section we test the implications of the policy trilemma when accounting for finer gradations of policy choices than simply peg or nonpeg, or open or closed. These refinements of the categories enable us to consider whether the source of significant $\hat{\beta}$ coefficients in the off diagonal cells in Table 2 is an artifact of using too broad a classification scheme for the exchange rate and capital account regimes.

Table 3 presents estimates that are based on three categories of exchange rate regime (peg, soft peg, and float), and three categories of the Chinn-Ito measures of capital account controls (open, mid-level, and closed). The 3x3 matrix in bold font presents estimates from the subsamples. One way to consider these estimates in light of the policy trilemma is to compare coefficients across rows in order to look at differences across exchange rate regimes, and down columns in order to look at differences across capital account control regimes. The marginal columns and rows present estimates from the interaction regression, with the marginal columns at the right of the table presenting the estimates of the differences across capital control regimes and the marginal rows at the bottom of the table presenting the estimates of the differences across exchange rate regimes (as in Table 2, the numbers reported in these columns represent more open minus less open, and those in the rows represent more exchange rate fixity minus less exchange rate fixity, so the expected values of these estimates are positive).

The estimates in Table 3 support the implications of the policy trilemma with respect to the three exchange rate regimes. The first row shows that the coefficient on the base country interest rate for the open peg sample (0.68) is larger than the coefficient for the open soft peg sample (0.32), which is itself larger than the coefficient for the open float sample (0.17). This pattern also holds for the mid-level open subsamples, as shown in the second row, and the closed subsample, as shown in the third row. In addition, the coefficients for each of the pegged subsamples are statistically different from zero at a 99 percent confidence level while we cannot reject the null hypothesis that the coefficients for each of the floating samples are equal to zero. The marginal rows at the bottom of the table show that there is a statistically significant difference between the coefficients on pegs and soft pegs, between pegs and floats, and between soft pegs and floats.

Thus, the estimates in this table are consistent with the predictions of the trilemma along the dimension of exchange rate regime in a way that is not apparent from the results in Table 2. The coefficient on the base country interest rate for each of the three floating exchange rate subsamples (across the three capital control regimes) are close to zero and not statistically different from zero. This contrasts with the estimates in the non-peg column in Table 2, and suggests that the set of soft pegs observations is the source of the significant coefficients in that table. Moreover, the estimates in Table 3 suggest that soft pegs achieve the goal of affording some monetary autonomy, at least relative to instances of pegged exchange rates (though not as much as would be the case if the currency floated), while maintaining some exchange rate stability (though not as much as would be the case if there was a hard peg).[26]

Looking down the columns allows comparisons of the financial openness regimes. Within each column, the open financial market subsamples (in the top row) always have higher coefficients than the closed subsamples (the bottom row), but for the case of mid-open soft pegs. The test across the capital control

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[26] There is some difference across level of economic development, as coefficients for advanced economy soft pegs are closer to those of pegs than is the case in the emerging and developing sample. Year effects, however, lower the coefficients more for advanced soft pegs so the high coefficients may reflect common shocks. This issue is explored further in section IV.

categories (reported in the far right column) shows that the difference between the effect of the base interest rate on the domestic interest rate is 0.29 when comparing open and closed financial markets, and this difference is statistically significantly different from zero at better than the 99 percent confidence level. The gap between mid-open and closed is also highly statistically significant, but is somewhat smaller (0.22). We cannot reject the hypothesis that mid open country year observations have the same $\hat{\beta}$ coefficient as open ones, with a difference of only 0.06 that is not significant. Thus, these estimates suggest that policy autonomy is only generated by the strongest types of capital controls, and that little is gained in terms of monetary autonomy with mid-open capital controls. [27]

Considering the question posed in the introduction, these results show that there is some rounding of the corner of the policy trilemma that relates to exchange rate management; the policy interest rate of a country with a soft pegs is less correlated to the base country interest rate than is the case with pegs, but it is more correlated than is the case with a floating exchange rate. But there is less evidence that the mid-level capital controls afford policy autonomy, and that this corner of the policy trilemma remains sharp, with a distinction between closed capital accounts and the other two categories.

III.C Temporal Changes in the Exchange Rate Regime

Soft pegs are not the only source of a middle ground in exchange rate regimes. There is also the tendency of countries to shift back and forth between pegged and floating exchange rates (Klein and Shambaugh (2008)). In this section we examine whether there are differences in the extent of monetary

[27] These gaps across softpegs and other regimes or mid-open countries and other regimes are quite similar and retain the same level of significance if year effects are included. See the results presented in Appendix Table 3A.

autonomy across pegged categories when we take into account this temporal behavior.

Previous work has suggested that the impact of a peg may grow over time; for example, pegs in place for a long time matter more for trade than do pegs that are relatively new (Klein and Shambaugh (2006)). This difference may reflect the effect of the current length of a peg on the expectation that it will continue. Klein and Shambaugh (2008) show that the conditional likelihood that a peg will last one more year rises with the length of time on the peg. Does the impact of this durability translate to the extent of monetary autonomy? One may expect this to be the case if the durability of the peg affects the unobserved expected change in the exchange rate. Conversely, to the extent that the limits on monetary autonomy are effectively an arbitrage condition, and changes in the base interest rate transmit to changes in the domestic interest rate immediately, there may not be a temporal middle ground between long-lived pegs and long-lived floats.

We investigate this question in Table 4. This table presents regressions of the form of equation (3) for different categories of exchange rate regime over the 1973 – 2011 period (but without distinguishing across capital control categories). Column 1 presents the estimates for the peg subsample as a whole. Columns 2 and 3 include observations for either long pegs (the pegs last for at least 5 years) or short pegs (less than 5 years). There appears to be no difference with regards to monetary autonomy across this division with regards to the coefficient on the base rate or its statistical significance.[28] The R^2 statistics on the much smaller short peg samples are lower, perhaps because there is more volatility in the local rate in the early years of a peg as it is establishing credibility.

[28] Note that there are far more long pegs observations than short peg observations. As noted by Klein and Shambaugh (2008), this is because, with annual data, longer pegs are sampled far more often than shorter pegs, not because there are more episodes of long pegs than episodes of short pegs.

It may be the case that the relevant consideration is not the eventual duration of the peg, but the time spent in an existing peg. We investigate this in Columns 4 and 5 which present results for subsamples that are based on the current length of a peg, regardless of the eventual duration of the full peg episode. The sample in Column 4 includes pegs in existence for 5 years or more while the sample in Column 5 includes pegs in existence for 4 years or less. It turns out that this distinction, like that of the eventual duration of the peg, does not generate significant differences with respect to monetary autonomy. The coefficients on the change in the base interest rate are virtually the same across these two subsamples.[29] These results suggest that the "temporal" middle ground is not distinct from the general fact that a country pegs its currency, without regard for the length of time the peg has been in place or for the eventual duration of the peg. The monetary policy of a country with a pegged exchange rate significantly follows that of the base country.

Klein and Shambaugh (2008) show that nonpegs can be just as ephemeral as pegs, with nonpegged episodes often lasting just 2 or 3 years as a country flips back and forth from pegging and not pegging. Using the same categorizations for short and long nonpeg episodes, the coefficient on the base rate is between 0.1 and 0.2 (see columns 6 and 7). This suggests that temporary floating can in fact generate monetary autonomy – something of a contrast to the result that many gates are ineffective (shown below).

III.D Gates and Walls

The results presented to this point, which use the Chin-Ito definition of capital controls, do not support the idea that limited capital market interventions provide monetary autonomy. An alternative indicator of capital account controls

[29] The value of these coefficients are also very similar to those for a subsample of pegs in place for only 2 years or less, and a subsample of peg episodes lasting two years or less.

relies on the post-1995 data that distinguishes across controls on a range of asset categories, the open-gates-walls data set. The first results using these data are presented in Table 5A which uses an interaction regression for the peg variable, as in equation (5), across capital control categories subsamples. The regressors include the change in the base interest rate, a peg dummy variable, and the interaction of the peg dummy and the change in the base country interest rate. The table reports the coefficient on the change in the base interest rate, β_R (which represents monetary autonomy for countries that do not peg), the linear combination of this coefficient and the interaction, $\beta_R + \beta_{RP}$ (which represents monetary autonomy for countries that peg), and the coefficient on the interaction, β_{RP} (which represents the difference in monetary autonomy between peggers and non-peggers).

The first column of Table 5A shows that pegging significantly limits monetary autonomy for the set of countries with open capital accounts, and that there is a significant difference between peggers and non-peggers for this subset. The coefficient on the base interest rate for observations representing pegged exchange rate is 0.69 and it is statistically significantly at better than the 99 percent level of confidence. In contrast, the coefficient for nonpeg observations is 0.10, with a t-statistic of less than 0.6. The difference in the coefficients between pegs and nonpegs is statistically significant at better than the 99 percent level of confidence.

The last column of Table 5A shows that at the other polar extreme, countries with pervasive and longstanding capital controls (that is, *Walls*), the coefficient on the base country interest rate for peg observations is 0.45 and there is no significant difference in the coefficients for peggers and nonpeggers; the peg coefficient minus the nonpeg coefficient equals 0.10 and this difference is not statistically significant. This result differs from results using the Chinn-Ito data set in which there are marked differences in $\hat{\beta}$ between peg and nonpeg observations for observations with non-open capital accounts (0.40 vs. 0.09 in Table 2) and between peg and float observations for the closed category (0.25 vs. -0.06 in Table 3). This most likely reflects the fact that the *Walls* categorization better captures the set of countries that have truly closed capital accounts than does the set of observations in the category of "most closed" in the Chinn-Ito classification.

The middle four columns of Table 5A present results for the *Gates* countries. The first two of these columns presents the estimates for *Open Gates* and *Closed Gates*, with coefficients on the base country interest rate for peg observations of 0.51 and 0.54, respectively, and in both of these coefficients are significantly distinct from the respective coefficients for the nonpeg observations. This suggests that *Closed Gates* generally provide almost no monetary autonomy and, in this way, are indistinguishable from open gates. But there is a distinction in the partial correlation of domestic and base country interest rates between cases of *Limited Gates* and *Comprehensive Gates*, as shown in the fourth and fifth columns of Table 5A. There is a large and statistically significant partial correlation of interest rates for peg observations when countries have in place limited gates (that is, when half or fewer of the asset categories are closed) which implies that a limited imposition of capital controls does not afford monetary autonomy for pegged countries. Also, in this case, there is a statistically significant difference in the correlation between countries that peg and countries that do not peg. In contrast, the correlation between base country and domestic interest rates is only 0.26, and not statistically significant, for the sample of observations that represent comprehensive controls on capital flows. Comprehensive episodic controls act more like walls than do limited controls.

Table 5B repeats this analysis for the classification scheme based on only two categories of assets (money market instruments and bonds) rather than five asset categories. As mentioned above, there are some differences in the set of countries that are in each category between the two-asset and five-asset classification schemes (see Appendix Table 4A). Despite the differences across these two types of open-gates-walls classification, the estimates are broadly the same. There is a close correspondence between the values of coefficients that are significant in Table 5A and the respective coefficients (which are also significant) in Table 5B. Like the results in Table 5A, those in 5B also show that the coefficient is larger for *Limited Gates* than for *Comprehensive Gates*. One difference between Tables 5A and 5B is that, in the latter, the coefficient on the base country interest rate for peggers in the *Wall* category is insignificant for both peg and nonpeg observations. A possible reason for this is that the indicator based on money market instruments and bonds alone, assets most directly affected by changes in monetary policy, may better capture the effect of capital controls on monetary policy than a broader index that includes the other three asset categories as well. This result is consistent with the view that broad, longstanding capital controls on money market at bond instruments are truly effective in providing monetary autonomy.

Table 6 present estimates of the differences in the coefficients across five-asset gates-walls-open categories based on a pooled regression with interaction terms (an expanded version of equation (5)). The upper diagonal elements of these tables represent differences between capital control categories across coefficients for peg observations, and the lower diagonal represents differences between capital control categories across coefficients for non-peg observations (once again, the expected sign of all of these estimates is positive, since the cells represent the more open capital account category minus the less open capital account category). The estimates in the upper diagonal cells, representing peg observations, show a statistically significant difference in the correlation between the changes in the domestic and base interest rates between *Open* and *Comprehensive Gates*, *Comprehensive Gates* and *Limited Gates*, and between

Limited Gates and *Walls.* In contrast, there are no instances of significant difference for nonpegs between different capital control categories.

These estimates based on the open-gates-walls classification suggest that countries can generate monetary autonomy with broad, longstanding controls on international financial transactions. The estimates also suggest that more episodic efforts to gain monetary autonomy by closing the financial account can only be successful if controls cover a wide array of measures rather than a limited intervention. But, given the political economy difficulties often associated with making changes to capital control regimes, changes across a wide set of assets to adjust policy in response to economic conditions could be difficult.

IV. Is There Really Autonomy?

Throughout this paper, we have argued that a failure to follow the base country interest rate (as reflected in a relatively low value of $\hat{\beta}$) represents realized or potential monetary autonomy. The first part of this section supports this contention by demonstrating that interest rate behavior in countries with low $\hat{\beta}$s is consistent with typical monetary policy rules. The second part of this section further builds the case that the results presented in Section III are not simply reflecting changes in other factors by considering a number of robustness checks, including controlling for local conditions and controlling for the possibility that global shocks are driving the results.

IV.A. Is it Autonomy?

A basic Taylor monetary policy rule, where the policy interest rate is a function of a constant, the output gap, and the gap between the current inflation rate and the preferred inflation rate, is

$$(6)\quad R_{it} = \alpha + \gamma(Y_{it} - Y_{it}^*) + \sigma(\pi_{it} - \pi_{it}^*).$$

Assuming no changes in the optimal inflation rate, π^*, or potential output, Y^*, the change in the policy rate is[30]

(7) $\Delta R_{it} = \gamma(\Delta Y_{it}) + \sigma(\Delta\pi_{it})$.

In this framework, the change in the policy interest rate is a function of the growth rate in the economy and the change in the inflation rate.

The predictions from this relationship are straightforward and intuitive. A country that has rapid GDP growth rate or rising inflation raises its policy interest rate. A more complete picture would take into account the fact that policy is forward looking and based on higher frequency data, that the changes in GDP and inflation respond contemporaneously to changes in the policy rate, and that changes in inflation are volatile. Thus, we are not suggesting that estimates of γ and σ are the actual coefficients used in a policy reaction function. Rather, we investigate whether the change in the policy rate reacts to local growth and inflation at all or, instead, whether the policy rate is constrained by the requirements to peg the exchange rate, as suggested by the trilemma.[31]

We use equation (7) in conjunction with our format for testing the trilemma across exchange-rate regime subsamples, to motivate the estimation of

(8) $\Delta R_{it} = \alpha + \beta\Delta R_{bit} + \gamma(\Delta Y_{it-1}) + \sigma(\Delta\pi_{it-1}) + \mu_{it}$.

This equation includes lagged, rather than contemporaneous, GDP growth and change in inflation to capture lags in information availability as well as the fact that the policy rate affects current growth and inflation.[32] We focus on the F-test

[30] Potential output is likely to be growing as well, so the reaction function likely includes ΔY^*, but as long as ΔY^* is a constant, it will be absorbed in a constant in the regression.

[31] Clarida, Gali, and Gertler (1998) offer a test similar in spirit to this exercise to examine the extent to which the United States, Germany, and Japan follow an inflation targeting type rule, as well as the extent to which the monetary policies of the United Kingdom, Italy, and France are influenced by Germany's monetary policy. They find that the three EMS countries operate differently from the other three countries, with their monetary policies meaningfully influenced by the German interest rate. Their analysis employs forward looking rule monetary policy rules whose weights on growth and inflation can differ across countries.

[32] The fact that local conditions may respond contemporaneously to the local interest rate would in fact bias the coefficients towards zero since higher interest rates depress growth and lower

for the joint significance of coefficients on these two variables. The simplest form of the trilemma suggests that there is no significant effect of these variables on the domestic policy interest rate for a country that has sacrificed monetary autonomy in order to peg its currency. In contrast, for a country that has monetary autonomy and can respond to its own shocks, the base interest rate should have a zero coefficient and the local conditions should explain the interest rate change.[33]

Our analysis focuses on the advanced and emerging economy samples since they are the ones most likely to have a monetary policy consistent with a Taylor rule, if their policy is unconstrained by maintaining an exchange rate peg. We split the sample between these two groups since they likely have different policy reaction functions. We limit the sample period to 1990 to 2011 because policy rules were most likely different during this period of the "Great Moderation" as compared to, in particular, the 1970s, but also, to a lesser extent, the 1980s. The subsamples reflect different exchange rate regimes (peg, soft peg, and float). In this restricted sample, there are not enough observations for separate estimation of closed economies, so we present results for a combined sample of open and mid-open observations since previous results suggest these two groups are similar with respect to the relative lack of monetary autonomy they afford.[34]

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inflation, reflecting negative correlations rather than the positive ones in the reaction function. In practice, using current GDP growth and changes in inflation rather than their lagged values does not substantially change the F-statistic on the joint significance of GDP and inflation.

[33] It should be noted that the familiar problem of identifying the effect of monetary policy holds here to a certain extent. If a central bank perfectly stabilizes the economy, it will appear that its policy has no effect, as gauged through the estimation of a monetary response function whose arguments are output growth and inflation, since these arguments are unvarying.

[34] The sample differs from that used in Section III for two reasons. First, some countries lack inflation or real GDP growth data (in the WDI database). Second, large outliers have been excluded, as we have done earlier. In this case, we trim 1 percent outliers on either side for both changes in inflation and GDP growth. Since the large outliers in interest rate changes are already

Table 7 reports, for each subsample, the coefficients on the base interest rate changes, GDP growth and changes in inflation as well as an F-test for the joint significance of the domestic variables. Results for the advanced economies are in the upper panel. Estimates in the first column of this panel show that when a country has a fixed exchange rate, its policy interest rate does not respond to either changes in its inflation rate or its GDP growth rate. The coefficient on the base rate, though, is nearly 1 and highly significant. This shows that the results presented in Section III are not driven by a happenstance correlation between the policy goals of a base country with those of advanced countries that are pegging their exchange rate. For advanced countries in years in which they have a soft peg, there is a positive and statistically significant response to lagged GDP growth, and the F-statistic on the joint significance of inflation and growth is 6.93, implying significance at better than the 99 percent confidence level. The coefficient on the base interest rate, 0.78, is still quite high, but it is lower than the coefficient for pegs. For observations representing advance countries that have a floating exchange rate, there is a positive statistically significant coefficient on lagged GDP growth, and the F-statistic on the joint significance of inflation and growth is 4.27, implying the local variables have a significant impact on changes in the policy rate. The estimates drawn from this set of observations include a positive coefficient on the base country interest rate ($\hat{\beta}$ is .54), but also a significant response to local conditions.

The lower panel of Table 7 reports a similar set of tests for the emerging market sample. Open and mid-open pegs respond to the base rate strongly (the coefficient is 0.72), and do not respond to their own economy (the F-statistic is insignificantly different from zero). This coefficient on the base rate is lower than the one in the advanced country sample, and the F-statistic is marginally larger

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excluded, many of the most volatile economic outcomes have already been excluded from the sample.

(and the coefficient on lagged GDP is statistically significant at the 95 percent level of confidence) suggesting a somewhat larger response to local conditions than is the case in advanced economies. The estimates for the subsample of soft pegs among this group of countries have effectively a zero coefficient on the base interest rate, suggesting substantial monetary autonomy, and a large, positive coefficient on local lagged GDP growth, with an F-statistic of 4.27, which indicates jointly significant coefficients on GDP growth and the change in inflation at the 95 percent level of confidence. Finally, in the subsample of countries that float, the coefficient on the base rate is not statistically significant. This subsample does, however, offer a significant coefficient on lagged local GDP growth, and an F-statistic that indicates joint significance of GDP growth and the change in inflation at the 99 percent level of confidence. The R^2 statistics for estimates using the emerging market sample are lower than the respective ones for the estimates for the advanced country sample, which reflects differences in the relative extent to which the specified policy rules capture actual behavior. Also, the $\hat{\beta}$ coefficients are larger for the advanced countries than for the emerging market sample across respective exchange rate regime subsamples, perhaps because of more limited capital mobility in the latter case. Nevertheless, the expected pattern of higher values of the coefficient on the base country interest rate with subsamples with greater exchange rate fixity holds across both the advanced country and emerging market country groups.

In general, the results in table 7 support the notion that a set of observations that offer an estimate of a lower value of $\hat{\beta}$ can be interpreted as reflecting a situation in which countries have more monetary autonomy than when a set of observations is characterized by a higher $\hat{\beta}$. A notable pattern in these estimates is that higher values of the coefficient on the base country interest rate are associated with lower F-statistics on the joint significance of local economic conditions. This result is especially striking because these tests are somewhat coarse, using annual data, rather than data at a higher frequency, and imposing the condition that coefficients are the same across countries and across time.

IV.B. Robustness

The results reported in the previous subsection are of interest both for what they say about monetary autonomy and also because they offer one set of robustness tests to the results presented in Section III. These results show that the basic message from Section III is not altered by including local GDP and inflation variables in the regression. However, these results are based on a smaller sample than those in Section III because of data limitations regarding the availability of inflation and growth variables as well as concerns about the stability of the monetary policy rule over time. In this section we offer further robustness tests for the full sample used in Section III as well as through the inclusion of other control variables. Estimates in this section employ the interaction equation (equation 5), which makes it easier to see the effects of different control variables. The focus in this section is whether the values of the coefficient on the interaction between the exchange rate regime and the change in the base rate, and the coefficient on the interaction of the capital control measure and the change in the base rate, are robust to the inclusion of other regressors.

The results of these robustness exercises are presented in Table 8. Column 1 shows the baseline regression. Consistent with the estimates presented in Section III, this regression shows that the interest rate of countries follow the base country interest rate more closely when the exchange rate is pegged (the coefficient on the peg – base rate interaction variable is 0.41), and to a lesser extent when the exchange rate is a soft peg (the coefficient on the relevant interaction variable is 0.22). Likewise, a country's interest rate follows that of the base country more closely in years in which the capital account is open or mid-open than in years in which the capital account is gauged to be closed, but the difference between open and mid-open is not substantial (the coefficients on the respective capital control regime - base rate interactions are 0.29 and 0.22).

These results are not an artifact of the tendency of the interest rates in advanced countries to be more tightly linked to the respective base country interest rates across exchange rate regime categories. This tendency may reflect the fact that advanced countries (which include most of the base countries) are more integrated in the global economy than other countries. This tendency is empirically verified by the inclusion of an interaction term between a dummy for advanced economy and the change in the base rate in the regression. The results presented in Column 2 show that the coefficient on this interaction term is large (0.33) and statistically significant. But, more to the point, the inclusion of this term does not alter the conclusions that are presented in Section III; coefficients on the interactions with peg and softpeg are largely unaffected while coefficients on the openness of the capital account shrink slightly towards zero (since openness and advanced country status are correlated).

Monetary autonomy could also be obtained through the use of reserves to stabilize the exchange rate. If this policy is effective, then the interest rate could be devoted to stabilizing GDP growth or inflation even if the country pegs (see Aizenman (2011). We explore this possibility as well in Column 2 by using a variable reflecting high reserve holdings, which serves as a proxy for a capacity to engage in foreign exchange intervention, and interacting this variable with the change in the base rate. The coefficient on this interaction variable is insignificant, and the inclusion of this variable in the regression does not alter the coefficients on the other variables.

Columns 3 and 4 further explore the robustness checks offered in the immediately preceding subsection by including contemporaneous and lagged GDP growth and change in inflation. The results in Column 3 show that the coefficient on the contemporaneous change in inflation is positive and significant, but the coefficients on the other variables in are virtually unchanged from those in column 1. Likewise, in Column 4, both the lagged change in inflation and lagged GDP growth rate have positive and statistically significant coefficients, but again there is no substantial change to the exchange rate regime or capital control interaction measures, but for the result that the coefficients on open and mid-open are even closer to each other in these estimates than in those presented in Column 1.

As noted earlier in the text, year fixed effects could control for a host of global factors such as shocks to the global risk premium, global economic activity or global inflation (but, as also noted earlier, the inclusion of these depends upon differential experiences across base countries). Column 5 presents estimates that include year fixed effects.[35] The results still follow the same pattern as those in Column 1. There is no difference in coefficients or significance levels if we drop the years of the recent financial crisis (2008-2011) to eliminate observations when many countries all dropped rates towards zero at once due to a global shock.

Finally, Column 6 includes all the control variables; advanced country status, reserves holdings interacted with base interest rate changes, lagged GDP growth, lagged changes in inflation to control for local conditions, and year fixed effects to control for global factors. The estimates presented in this column, with respect to exchange rate regime and capital controls, are very close to those in Column 1. The only impact of all these controls is that the advanced country dummy slightly lowers the coefficients on open financial markets. The exchange rate regime variables maintain their coefficients.

V: Conclusion

Concerns with international capital flows have once again raised the topic of whether capital controls offer an attractive policy option. An important aspect

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[35] A more complete investigation if presented in Appendix tables 2A and 3A which repeat tables 2 and 3 with year effects.

of that debate is whether targeted, temporary capital controls offer some degree of monetary autonomy. Likewise, in the wake of difficulties associated with fixed exchange rates, questions are being raised, yet again, about the desirability of limited exchange rate flexibility.

The results presented in this paper suggest one should consider these middle-ground policies with some caution. We present evidence that soft pegs allow for greater scope over monetary policy than pegs, in particular in emerging and developing countries. But there is less evidence that narrowly targeted, temporary capital controls, like those advocated in the theoretical literature, enable monetary authorities to gain autonomy when exchange rates are pegged. Episodic controls are only effective if they are targeted to a wide set of assets, and even here, their effects are uncertain. That is, gates only work if they are much like walls, but, of course, broad capital controls may introduce costly distortions.

Thus, the main message of our paper is the re-affirmation of the standard result from international macroeconomics; the simplest and most certain means for achieving some measure of monetary autonomy is to allow the exchange rate to float or to institute broad longstanding capital controls.

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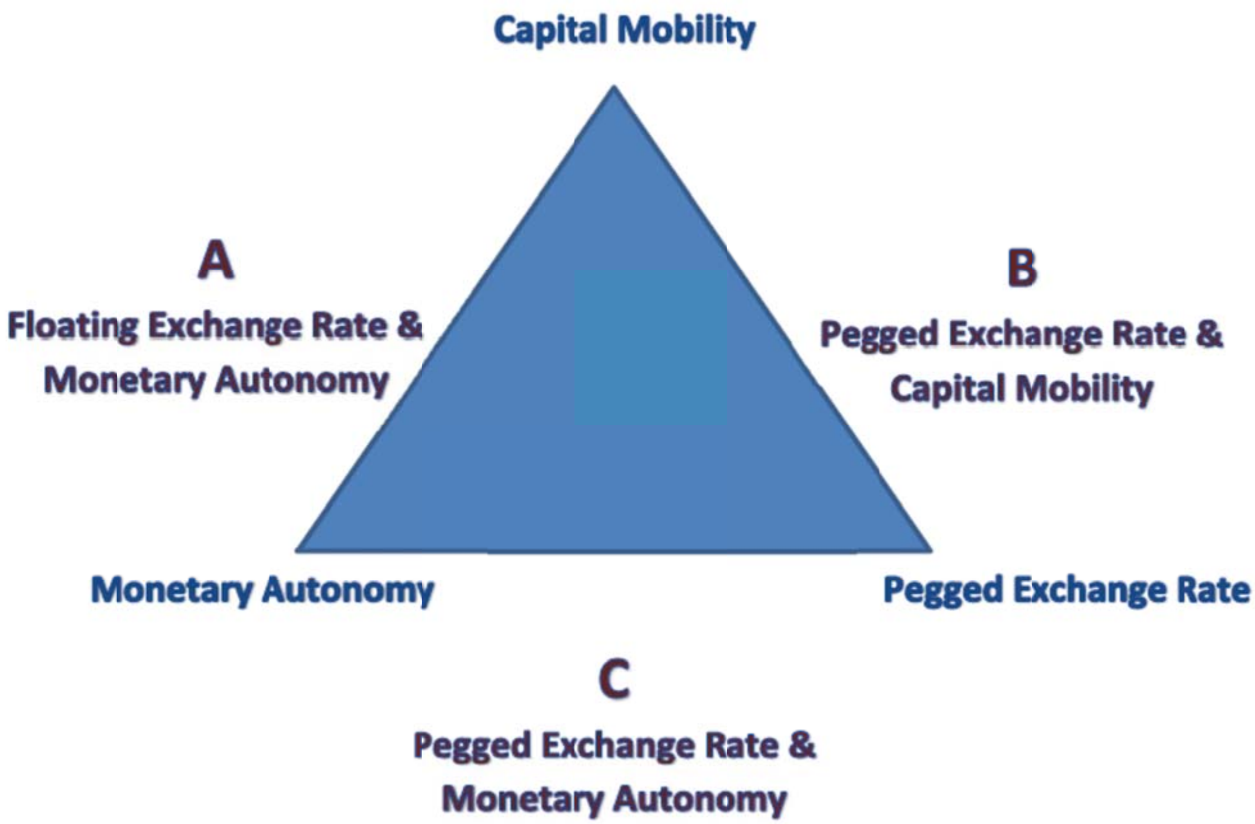
Figure 1: The Open Economy Policy Trilemma



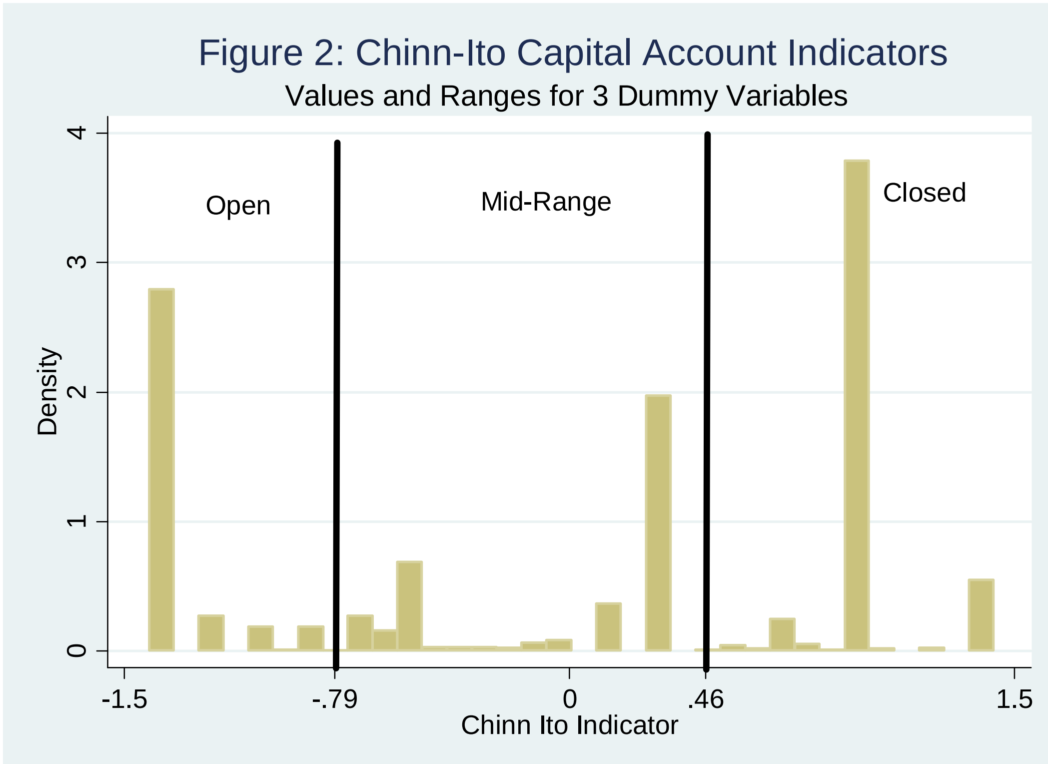
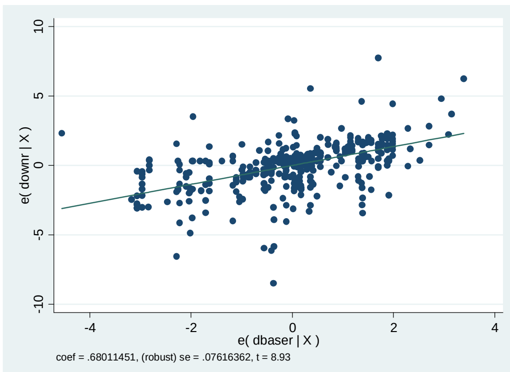
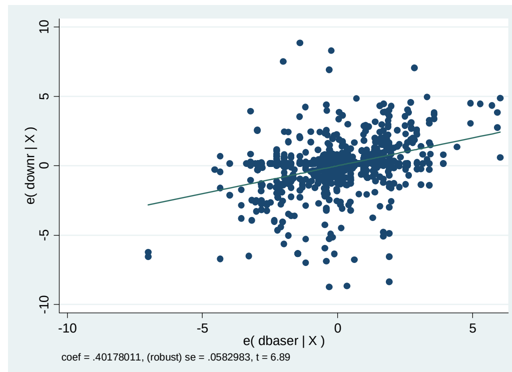


Figure 2: Chinn-Ito Capital Account Indicators
Values and Ranges for 3 Dummy Variables
Open
Mid-Range
Closed
Density
0
1
2
3
4
-1.5
-.79
0
.46
1.5
Chinn Ito Indicator

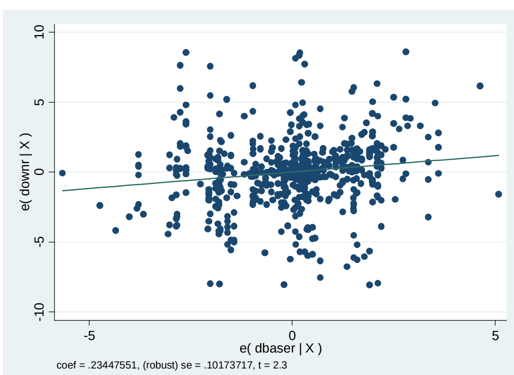
Figure 3: scatters of change in own interest rate and change in base interest rate across samples



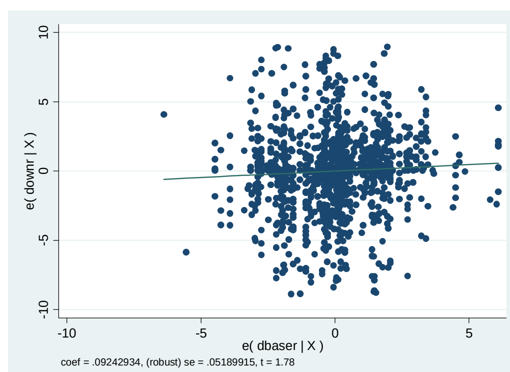
Open pegs



closed pegs



Open non pegs



closed nonpegs

Table 1A: Exchange Rate Categorization				
	Peg	Soft Peg	Float	Total
Chinn-Ito Data Set	1,400	804	922	3,126
1973 – 2011	45%	26%	29%	
Gates Walls Data Set	480	401	395	1,276
1995 – 2011	38%	31%	31%	

Table 1B: Capital Control Indicators		
Chinn-Ito		
Open	Mid-Range	Closed
1,014	961	1,151
32%	31%	37%
Gates-Walls: 5 Asset Categories Classification		
Open	Gates	Walls
410	632	234
32%	50%	18%

Table 1C: Comparison of Two Capital Control Indicators (1995 – 2011)					
		Chinn-Ito Indicators			
		Open	Mid-Range	Closed	
Gates-Walls Indicators (Five Asset Categories Classification)	Open	381	26	0	407
	Gates Country Obs.	283	213	133	629
	• Of which				
	• Open	101	4	0	105
	• Limited	142	48	15	205
	• Comprehensive	40	161	118	319
	Walls	1	63	170	234
		665	302	303	

Note: there are 6 observations in the GWO data set that are not in the Chinn-Ito data set, so the totals do not match across table 1B and 1C.

Table 2: 2 x 2 Classification of Exchange Rate and Capital Control Regimes (OLS)			
	Peg	**Non-Peg**	Open vs Non-Open
Open	**0.68*** 433** **(0.08) [0.28]**	**0.23** 581** **(0.10) [0.02]**	0.27*** (0.07)
Non-Open	**0.40*** 967** **(0.06) [0.14]**	**0.09* 1,145** **(0.05) [0.00]**	
Peg vs. Non-Peg	0.33*** (0.06)		
KEY	**Coef. N** **(s.e.) [R^2]**		

Sub-Sample regressions of the form: $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$
Chinn-Ito trivariate classification for capital controls. Sample: 1973-2011
Entries in marginal column and row based on an interaction regression
*** p<0.01, ** p<0.05, * p<0.10

Table 3: 3 x 3 Classification of Exchange Rate and Capital Control Regimes (OLS)					
	Peg	**Soft Peg**	**Float**	vs. Mid-Open	vs. Closed
Open	**0.68*** 433** **(0.08) [0.28]**	**0.32** 301** **(0.13) [0.04]**	**0.17 280** **(0.14) [0.01]**	0.06 (0.08)	0.29*** (0.09)
Mid-Open	**0.54*** 438** **(0.06) [0.22]**	**0.38*** 273** **(0.08) [0.05]**	**0.07 250** **(0.08) [0.00]**		
Closed	**0.25*** 529** **(0.07) [0.07]**	**0.18* 230** **(0.10) [0.01]**	**-0.06 392** **(0.11) [0.00]**	0.22*** (0.06)	
vs. Soft Peg	0.19*** (0.07)		0.22*** (0.08)		
vs. Float	0.41*** (0.07)			**KEY**	**Coef. N** **(s.e.) [R^2]**

Sub-Sample regressions of the form: $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$
Chinn-Ito trivariate classification for capital controls. Sample: 1973-2011
Entries in marginal columns and rows based on an interaction regression
*** p<0.01, ** p<0.05, * p<0.10

Table 4: Peg Subsamples by Duration of Spell and Years in Spell							
	All Pegs	**Long Pegs**	**Short Pegs**	**Later Years of Long Pegs**	**Early Years of Pegs**	**Long Nonpegs**	**Short Nonpegs**
$\Delta R_{bi,t}$ (s.e.)	**0.46*** (0.05)**	**0.46*** (0.05)**	**0.48*** (0.12)**	**0.47*** (0.05)**	**0.47*** (0.09)**	**.14*** (0.05)**	**.13 (0.09)**
Constant (s.e.)	**-0.15*** (0.04)**	**-0.09*** (0.03)**	**-0.49** (0.19)**	**-0.01 (0.03)**	**-0.52*** (0.13)**	**-0.14*** (0.05)**	**0.59*** (0.20)**
R^2	**0.17**	**0.22**	**0.08**	**0.25**	**0.10**	**0.01**	**0.01**
N	**1,400**	**1,181**	**219**	**1,000**	**377**	**1609**	**117**

Sub-Sample regressions of the form: $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$
Sample: 1973-2011
*** p<0.01, ** p<0.05, * p<0.10
Long Pegs – peg spells with duration greater than or equal to 5 years
Short Pegs – peg spells with duration less than or equal to 4 years
Later Years of Long Pegs – Years 5 and following for Long Peg Spells
Early Years of Pegs – First 4 years of Peg Spells

Table 5A: Subsample Regressions by Open / Gates / Walls Capital Controls Classification Based on 5 Asset Categories						
	Open	**Open Gates**	**Any Closed Gates**	**Limited Gates**	**Compre-hensive Gates**	**Walls**
$\Delta R_{bi,t}$ (peg) (s.e.)	**0.69*** (0.08)**	**0.51** (0.23)**	**0.54*** (0.15)**	**0.93*** (0.11)**	**0.26 (0.20)**	**0.45** (0.19)**
$\Delta R_{bi,\,t}$ (non-peg) (s.e)	**0.10 (0.17)**	**0.08 (0.31)**	**-0.05 (0.13)**	**0.09 (0.17)**	**-0.14 (0.16)**	**0.35** (0.16)**
Peg Minus Non-Peg	**0.56*** (0.19)**	**0.51** (0.23)**	**0.58*** (0.17)**	**0.84*** (0.24)**	**0.40* (0.20)**	**0.10 (0.24)**
R^2	**0.06**	**0.03**	**0.02**	**0.09**	**0.01**	**0.07**
N	**410**	**105**	**527**	**205**	**322**	**234**

Subsample regressions of the form: $\Delta R_{it} = \alpha + \beta_R \Delta R_{bit} + \beta_{RP} P_{it} \Delta R_{bit} + \beta_P P_{it} + \mu_{it}$ for 1995-2011
Coefficient listed for $\Delta R_{bi,t}$ (peg) is $\beta_R + \beta_{RP}$ and coefficient for $\Delta R_{bi,\,t}$ is β_R
*** p<0.01, ** p<0.05, * p<0.10.
Open Gates – Gate countries with no controls in that year.
Any Closed Gates – Gate countries with any controls in that year.
Limited Gates – Gate countries with half or fewer categories controlled in that year.
Comprehensive Gates – Gate countries with more than half of categories controlled in that year

Table 5B: Subsample Regressions by Open / Gates / Walls Capital Controls Classification Based on 2 Asset Categories (Money Market Instruments and Bonds)						
	Open	**Open Gates**	**Any Closed Gates**	**Limited Gates**	**Compre-hensive Gates**	**Walls**
$\Delta R_{bi,t}$ (peg) **(s.e.)**	**0.69***** **(0.09)**	**0.77***** **(0.18)**	**0.59***** **(0.16)**	**0.97***** **(0.25)**	**0.50***** **(0.187)**	**0.32** **(0.21)**
$\Delta R_{bi,t}$ (non-peg) **(s.e)**	**0.08** **(0.19)**	**0.19** **(0.23)**	**0.01** **(0.13)**	**0.08** **(0.29)**	**0.10** **(0.15)**	**0.02** **(0.22)**
Peg Minus Non-Peg	**0.61***** **(0.21)**	**0.57*** **(0.29)**	**0.49**** **(0.20)**	**0.88*** **(0.47)**	**0.39*** **(0.22)**	**0.30** **(0.26)**
R^2	**0.07**	**0.05**	**0.03**	**0.11**	**0.02**	**0.01**
N	**377**	**177**	**466**	**71**	**395**	**256**

Subsample regressions of the form: $\Delta R_{it} = \alpha + \beta_R \Delta R_{bit} + \beta_{RP} P_{it} \Delta R_{bit} + \beta_P P_{it} + \mu_{it}$ for 1995-2011
Coefficient listed for $\Delta R_{bi,t}$ (peg) is $\beta_R + \beta_{RP}$ and coefficient for $\Delta R_{bi,t}$ is β_R
*** p<0.01, ** p<0.05, * p<0.10.
Open Gates – Gate countries with no controls in that year.
Any Closed Gates – Gate countries with any controls in that year.
Limited Gates – Gate countries with half or fewer categories controlled in that year.
Comprehensive Gates – Gate countries with more than half of categories controlled in that year

Table 6: Narrow Gates, Broad Gates, Walls, Open (Classification based on 5-Asset Categories)
Comparison of Coefficients Across Capital Control Categories from an Interaction Regression

	Open	Open Gates	Limited Gates	Comprehensive Gates	Walls
Open		**0.19** (0.23)	**-0.25*** (0.13)	**0.43**** (0.20)	**0.24** (0.20)
Open Gates	**0.00** (0.34)		**-0.44*** (0.25)	**0.24** (0.29)	**0.05** (0.28)
Limited Gates	**0.01** (0.24)	**0.01** (0.34)		**0.68***** (0.22)	**0.49**** (0.21)
Comprehensive Gates	**0.24** (0.24)	**0.23** (0.34)	**0.23** (0.23)		**-0.19** (0.26)
Walls	**-0.25** (0.34)	**-0.25** (0.34)	**-0.26** (0.23)	**-0.48** (0.23)	

Expected values of differences represented in cells is positive.
*** p<0.01, ** p<0.05, * p<0.10.
Off Diagonal Cells Represent Differences of More Open Minus Less Open
Upper diagonal cells are associated with peg country sample.
Lower diagonal are associated with non-peg country sample.

Table 7: Autonomy for What? Advanced Country Subsamples			
	Peg	**Soft Peg**	**Float**
$\Delta R_{bi,t}$	**0.94*** **	**0.78*** **	**0.54*** **
	(0.10)	**(0.11)**	**(0.14)**
$\Delta\pi_{t-1}$	**0.10**	**0.09**	**0.12**
	(0.07)	**(0.07)**	**(0.09)**
$\Delta \ln Y_{t-1}$	**-3.72**	**14.37*** **	**15.48** **
	(4.47)	**(4.74)**	**(5.38)**
F-stat	**1.69**	**6.93*** **	**4.27** **
N	**171**	**127**	**123**
R^2	**0.55**	**0.43**	**0.27**
Emerging Market Subsamples			
	Peg	**Soft Peg**	**Float**
$\Delta R_{bi,t}$	**0.72*** **	**0.06**	**0.10**
	(0.18)	**(0.19)**	**(0.16)**
$\Delta\pi_{t-1}$	**0.02**	**-0.10**	**-.22**
	(0.06)	**(0.07)**	**(0.09)**
$\Delta \ln Y_{t-1}$	**13.82** **	**24.61*** **	**26.59*** **
	(6.35)	**(8.56)**	**(7.95)**
F-stat	**2.46**	**4.27** **	**10.97*** **
N	**101**	**130**	**111**
R^2	**0.29**	**0.09**	**0.20**
***** p<0.01, ** p<0.05, * p<0.10**			

Note: subsamples for 1990-2011 for open and mid-open capital accounts based on Chinn-Ito trivariate classification. Regression takes the form: $\Delta R_{it} = \alpha + \beta\Delta R_{bit} + \gamma(\Delta Y_{it-1}) + \sigma(\Delta\pi_{it-1}) + \mu_{it}$

Table 8: Robustness Checks in interaction regressions						
	1	**2**	**3**	**4**	**5**	**6**
$\Delta R_{bi,t}$	-0.10 (0.08)	-0.17** (0.08)	-0.15* (0.09)	-0.12 (0.09)	-0.21** (0.09)	-0.31*** (0.11)
Peg x $\Delta R_{bi,t}$	0.41** (0.07)	0.48*** (0.07)	0.42*** (0.08)	0.43*** (0.08)	0.37*** (0.07)	0.45*** (0.08)
Softpeg x $\Delta R_{bi,t}$	0.22*** (0.08)	0.23*** (0.08)	0.28*** (0.09)	0.27*** (0.09)	0.21** (0.08)	0.28*** (0.09)
open x $\Delta R_{bi,t}$	0.29*** (0.09)	0.18* (0.09)	0.27*** (0.10)	0.25*** (0.09)	0.31*** (0.09)	0.17* (0.10)
mid open x $\Delta R_{bi,t}$	0.22*** (0.06)	0.13* (0.07)	0.28*** (0.07)	0.24*** (0.07)	0.20*** (0.07)	0.15* (0.08)
advanced x $\Delta R_{bi,t}$		0.33*** (0.07)				0.23*** (0.08)
High reserves x $\Delta R_{bi,t}$		0.03 (0.07)				0.03 (0.08)
Peg	-0.32*** (0.09)	-0.27*** (0.09)	-0.21** (0.10)	-0.23** (0.10)	-0.29*** (0.10)	-0.20** (0.10)
softpeg	-0.55*** (0.12)	-0.53*** (0.12)	-0.45*** (0.14)	-0.52*** (0.13)	-0.49*** (0.11)	-0.49*** (0.12)
open	-0.17** (0.08)	-0.19* (0.10)	-0.1 (0.085)	-0.15* (0.09)	-0.07 (0.07)	-0.07 (0.09)
midopen	-0.16 (0.10)	-0.19* (0.11)	-0.11 (0.10)	-0.14 (0.10)	-0.19** (0.10)	-0.22** (0.10)
advanced		0.08 (0.09)				0.04 (0.08)
high reserves		-0.08 (0.08)				0.02 (0.09)
$\Delta\pi_t$			0.08*** (0.01)			
$\Delta \ln Y_t$			0.06 (1.28)			
$\Delta\pi_{t-1}$				0.04*** (0.01)		0.03*** (0.01)
$\Delta \ln Y_{t-1}$				6.83*** (1.49)		5.67*** (1.40)
Constant	0.26** (0.09)	0.24* (0.10)	0.11 (0.11)	-0.07 (0.12)	0.18* (0.09)	-0.1 (0.12)
Observations	3,126	3,126	2,697	2,704	3,126	2,704
R-squared	0.07	0.08	0.11	0.09	0.14	0.16
fixed effects	none	none	none	none	year	year

Note: full sample interaction regressions. *** p<0.01, ** p<0.05, * p<0.10

APPENDIX TABLES

Appendix Table 2a:
2x2 Classification of Exchange Rate and Capital Control Regimes: Year Fixed Effects

	Peg		Non-Peg		Open vs Non-Open
Open	**0.64*** **	**435**	**0.02**	**579**	-0.27***
	(0.10)	**[0.45]**	**(0.10)**	**[0.16]**	(0.07)
Non-Open	**0.36*** **	**969**	**-0.06**	**1,143**	
	(0.07)	**[0.26]**	**(0.08)**	**[0.09]**	
Peg vs. Non-Peg	0.29***				
	(0.06)				
KEY	**Coef.**	**N**			
	(s.e.)	**[R^2]**			

Sub-Sample regressions of the form: $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$
Chinn-Ito trivariate classification for capital controls. Sample: 1973-2011
Entries in marginal column and row based on an interaction regression
*** p<0.01, ** p<0.05, * p<0.10
Fixed Effects

Appendix Table 3a: 3 x 3 Classification of Exchange Rate and Capital Control Regimes Year Fixed Effects

	Peg		Soft Peg		Float		vs. Mid-Open	vs. Closed
Open	**0.64*** **	**435**	**0.07**	**300**	**-0.15**	**279**	-0.11	-0.31***
	(0.11)	**[0.40]**	**(0.15)**	**[0.22]**	**(0.17)**	**[0.24]**	(0.08)	(0.09)
Mid-Open	**0.41*** **	**439**	**0.18**	**273**	**-0.31**	**249**		
	(0.08)	**[0.42]**	**(0.14)**	**[0.34]**	**(0.23)**	**[0.22]**		
Closed	**0.38*** **	**530**	**-0.14**	**230**	**-0.08**	**391**	0.20***	
	(0.07)	**[0.19]**	**(0.16)**	**[0.16]**	**(0.13)**	**[0.14]**	(0.07)	
vs. Soft Peg	0.16**				0.21**			
	(0.07)				(0.08)			
vs. Float	0.37***						KEY	**Coef. N**
	(0.07)							**(s.e.) [R^2]**

Sub-Sample regressions of the form: $\Delta R_{it} = \alpha + \beta \Delta R_{bit} + \mu_{it}$
Chinn-Ito trivariate classification for capital controls. Sample: 1973-2011
Entries in marginal column and row based on an interaction regression
*** p<0.01, ** p<0.05, * p<0.10 **Fixed Effects**