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Capital Controls and Currency Crises: A More Disaggregated Political Economy Analysis

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Abstract

With the recent currency and financial crises consideration of capital controls is back in vogue as possible anti-crisis measures. Empirical studies have reached mixed results on their effectiveness with some finding that controls are positively rather than negatively associated with currency crises. We argue that this relationship is likely to depend both on whether controls are primarily on capital inflows or outflows and on the quality and strength of the government imposing them. These factors may also interact. In particular, we hypothesize that controls on capital outflows are more likely to increase the probability of crises than those on inflows and that there are important interactions with the strength of the government in question. Using the newly constructed data set on measures of capital controls developed by Schindler 2009 at the IMF, we test these hypotheses using a panel probit analysis on a sample of 42 middle-income and 14 low-income countries over the period 1995-2005. We find strong support for the proposition that controls on outflows have a positive association with crises, especially when imposed by weak governments and find some support for the view that controls on capital inflows tend to reduce the frequency of crises.

Keywords: capital controls; government strength; currency crises.

Word count: 10,432

1. Introduction

There has been a good deal of literature on the political economy of international finance. Much of this has focused on the determinants of the choices by national governments about international financial policies such as exchange rate policies and capital controls and of the behavior of international financial institutions such as the IMF and World Bank (Cohen 1996; Andrews and Willett 1997; Stone 2002; Eichengreen and Leblang 2008; Frieden, Leblang and Valev 2010; Stone 2011). Also important, but having received less attention by political scientists, is the effectiveness of alternative international financial policies in dimensions such as avoiding currency crises.

There is, of course, an enormous literature on these topics but it has primarily been written by economists and with focus on technical economic and financial considerations. These studies by economists on the relationships between capital controls and currency crises have produced some quite interesting findings. Several of these studies have found that on average not only have capital controls been ineffective in avoiding currency crises, but they have actually been associated with more frequent crisis (Glick and Hutchinson 2000). Such studies, however, have generally failed to consider the role of political factors in determining the success of alterative international financial policies. With respect to our area of focus – the

effectiveness of capital controls in avoiding currency crises – an important exception is an early study by David Leblang (1997, 2002).

This paper explores whether the analysis of political considerations can help explain these results. Several economists have hypothesized, but not systematically tested, that a major channel for explaining why capital controls may be associated with more frequent crises is that even if capital controls have some effectiveness in making capital flows more difficult, this effect is dominated by adverse signaling effects (Bartolini and Drazen 1997; Wihlborg and Willett 1997).

In this story the adoption or strengthening of capital controls signals to the market that such controls are needed to offset the effects of poor economic and financial policies such as loose monetary and fiscal politics and excessive government restrictions on the domestic economy. Such signaling naturally increases the incentives for domestic capital flight and discourages capital inflows from abroad. Where the capital controls imposed are not highly effective in constraining capital flows than the effects of the increased incentives for greater net capital outflows can dominate. These outflows in turn make crises more likely.

A basic proposition in political economy is that where the threat of political instability is high, the adoption of poor economic and financial policies is more likely. And where the competence of government official is low, then so is the likely

effectiveness of capital controls. This suggests not only that weak governments make crises more likely but also the additional effect that weak governments will affect the relationship between capital controls and the frequency of currency crises. In other words we should not only include measures of political weakness in our equations for currency crises but also test for interaction effects between the political weakness and capital control variables.

The signaling hypotheses has another important implication – that controls on capital outflows should give more unfavorable signals than controls on capital inflows. Most previous empirical studies on the relationships between currency crises and capital controls have only had available measures of the overall levels of capital controls. Recently, however, new data sets have become available that distinguish between controls of capital inflows and controls on outflows. A recent study by Potchamanawong, Denzau, Rongala, Walton and Willett (2008) uses a data set developed by Potchamanawong (2007) and found that while greater controls on capital outflows were associated with more frequent crises, as a number of the earlier studies had found for the overall levels of controls, controls on capital inflows were on average associated with fewer frequencies of crises. This study does not consider the role of political factors, however.

Even more recently a larger on controls on both capital inflows and on outflows

that covers more countries and a longer time period than Potchamanawong has been produced by Martin Schindler at the IMF (Schindler 2008). We use this data set to investigate how measures of the strength of governments affect the relationship between currency crises and the levels of controls on capital inflows and outflows. We find further evidence that there are major differences in the effects of controls on capital inflows and outflows and that a key factor in determining the effectiveness of such controls is the political strength and stability of the governments that enact these measures.

This paper is organized as follows. Section 2 provides a brief summary of relevant literature and explains the hypotheses to be tested. Section 3 describes the data and methodology used to test these hypotheses. Section 4 presents our core results on the relationships among political strength, capital controls, and currency crises. Several robustness checks are discussed in this section as well. Section 5 concludes.

2. Theoretical Framework and Review of the Literature on Capital Controls and Currency Crises

2.1 Linking Politics, Capital Controls, and Currency Crises

As noted in the introduction there are many different factors that may influence the effects of capital controls. Thus it is not surprising that the empirical results on the

role of capital controls and currency crises are mixed. Contrary to what used to be conventional wisdom that capital controls help prevent crises, some studies have found positive rather than negative relationships between controls and crises (Leblang 2003; Glick and Hutchison 2005).[1] Glick and Hutchison, for example, find that after controlling for a number of factors the probability of a currency crisis is almost twice as high for countries with capital controls than those without (Glick, Guo and Hutchison 2006).[2] Thus they conclude that there is "a statistically significant and economically meaningful negative link between liberalization and the likelihood of a currency crisis (Glick, et al. 2006, 397)." On the other hand a recent empirical analysis by Sebastian Edwards (2006) found a negative, albeit small, effect of capital controls on the probability of currency crises while Caramazza, Ricci and Salgado (2000) found no significant relationship. As we will discuss below, the earlier studies in this area suffered from severe limitations on the data available to construct proxies for capital controls and this may have had a substantial influence on the results of some of these studies. With the improved measures now available we have better possibilities for discriminating among some of the ways in which controls and currency crises may interact.

2.1.1 Controls on Capital Outflows

The traditional arguments that capital controls would reduce the probability of currency crises were straight forward and focused on stopping capital flight. Based heavily on the experiences of the 1930s at the time of the Bretton Woods negotiations, international financial flows were widely viewed as being highly unstable and consequently there was strong support for capital controls. The chief negotiators at Bretton Woods, John Maynard Keynes for the UK and Harry Dexter White for the US, both strongly held such views and believed that controls could effectively limit destabilizing capital flows without substantially interfering with international trade. Indeed the adjustable peg exchange rate regime adopted at Bretton Woods was based on the assumption that capital controls could effectively deal with the problem of the one way speculative option.[3]

Over time it became increasingly recognized that comprehensive capital controls interfered with the financing of trade while selective controls were often of quite limited effectiveness (Cohen 1996; Andrews and Willett 1997; Ries and Sweeney 1997; Wihlborg and Willett 1997; Eichengreen, Mussa, Dell'Ariccia, Detragiache, Milesi-Ferretti and Tweedie 1999; Kaplan and Rodrik 2002; International Monetary Fund 2005; Abdelal 2007; Edwards 2007).[4] Combined with general shifts in views about the efficiency of financial markets and benefits of financial liberalization it had led to a general movement away from the use of capital controls. This started in the

advanced economies, but spread to the developing countries as well.[5]

Apart from questions about the effectiveness of capital controls in limiting outflows and their potential efficiency costs it was also noted that controls on capital outflows could also act to reduce capital inflows because of concerns about repatriation and hence reduce the net positive effects of controls on the balance of payments. Of course not all scholars and governments adopted these negative views of the effectiveness of capital controls. The various possible ways of circumventing the effects of controls on capital outflows such as by false invoicing could easily explain why controls may have only limited effectiveness, but explaining actual positive correlations between such controls and the frequency of crises is not so straight forward.

The most obvious explanation is that the positive correlations between controls and crises are generated by the difficulties in fully controlling for factors that cause both crises and the adoption of controls. Poor economic policies and political instability come to mind as obvious possibilities. While studies such as Glick and Hutchison (2005) attempt to control for both of these types of influences it is doubtful that the available data allow us to fully account for such influences.

There also may be direct causal links. As suggested by Bartolini and Drazen (1997) and Wihlborg and Willett (1997), capital controls may also be taken as signals

about future policies and/or conditions. While the imposition of stronger capital controls could signal determination to defend a currency peg, it could also be taken as a signal that the government thinks that the situation is even worse than the market expected or that the government is unwilling or unable to make needed macroeconomic policy adjustments. For example Edwards (2006) found in a large sample of developing countries that there was a strong tendency for counties to tighten controls shortly before devaluations. Given these conflicting considerations there is no clear theoretical presumption on the sign of the relationship between controls on capital outflows and the probability of currency crises. The relationship seems likely to depend in part on political strength and weakness of the government.

It has been often argued that political instability as well as weak political institutions contribute significantly to the likelihood of currency crises (Bernhard and Leblang 1999; Bussiere and Mulder 2000; Chiu and Willett 2009; Frieden, Ghezzi and Stein 2001; Méon and Rizzo 2002; Alesina and Wagner 2006; Edwards 2006; Shimpalee and Breuer 2006; Willett 2007). In general, a politically weak government tends to create uncertainty about the government's willingness and ability to implement necessary to avoid the need for exchange rate adjustments. Since such policy actions generally impose upfront costs in order to avoid the later costs of a crisis, governments are faced with a classic time inconsistency problem. Politically

weak governments tend to be forced to operate with short time horizons and hence feel more pressure to avoid politically costly economic policy adjustments (Bird and Willett 2008; Chiu and Willett 2009; Walter and Willett 2012). From this perspective capital controls can often appear more attractive than monetary or fiscal tightening. Perceptions that authorities might not carry through with adjustment strategies heighten uncertainty and therefore generate turbulence in financial markets.

A priori it seems likely that weak governments also would be both less effective in enforcing controls and more likely to suffer from adverse signaling effects from tightening controls. For these reasons we hypothesize that the weakness or instability of governments would interact negatively with the likelihood that controls would help reduce the incidence of currency crises. Stated alternatively, we argue that controls on capital outflows are more likely to have a positive impact on the probability of crises, the weaker is the government in question. These two main hypotheses can be summarized as follows:

H_1: Weak governments make currency crises more likely.

H_2: There is also an interactive effect with controls on capital outflows such that the weaker the government, the more likely are strong controls on capital outflows to have a positive association with currency crises.

There are of course a number of different concepts of strong and weak governments and a number of available empirical proxies. We will discuss this issue in subsection 2.2 below.

The first hypothesis has already received empirical support. It was found to be the case in the study of the interactions between exchange rate regimes and political strength on the likelihood of currency crisis (Chiu and Willett 2009). Glick and Hutchison (2005) also included measures of government strength in their regressions as a control variable and found that weak governments were more likely to suffer currency crises. To our knowledge no previous studies have directly investigated empirically the interactive effects of political factors and capital control measures as we do here to test our hypothesis H_2.

2.1.2 Controls on Capital Inflows

Negative signaling effects seem much less likely for controls on capital inflows. Generally large capital inflows indicate that the market thinks the country in question is following sound economic policies and has good economic prospects. An important exception, however, is where these inflows are largely to directly or indirectly help finance large budget deficits. Even when primarily a reflection of market responses to expectations of improving fundamentals large inflows of financial capital can also

increase the vulnerability of a country, however, as illustrated by the frequency with which surges of capital inflows are followed by sudden stops and capital flow reversals (Calvo 1998; Edwards 2004; 2006; Sula and Willett 2009; Bordo, Cavallo and Meissner 2010; Agosin and Huaita 2011; Efremidze, Schreyer and Sula 2011; Forbes and Warnock 2012; Ahmed and Zlate 2013; Calderón and Kubota 2013). Indeed the high frequency in recent years of such capital surges followed by sharp reversals has had a major impact on the thinking of many economists, national policy officials and the International Monetary Fund who now view large inflows of financial capital as possibly being too much of a good thing.

While many critiques of the operation of international financial markets focus on the belief that the markets overreact to negative developments, we believe that as or more important has been the frequent tendency of markets to fail to give early warning signals of worsening fundamentals (Willett 2000; Willett, Nitithanprapas, Nitithanprapas and Rongala 2004; Willett, Chiu, and Walter forthcoming). Thus due to some combinations of doing insufficient homework, focusing on the wrong things and over optimism large capital inflows cannot always be taken as a good indicator of strong fundamentals as would be the case in efficient markets theory.

Furthermore large capital inflows can themselves worsen a country's fundamentals by generating real exchange rate appreciation and larger current account

deficits. This can occur with nominal exchange rate appreciation under flexible rates or by more rapid money and credit expansion generating higher inflation under pegged rates. The latter case is particularly conducive to asset bubbles. Large inflows of financial capital can also make a country more vulnerable to shocks from abroad and to shifts in the attitudes of international investors from optimism to pessimism. When combined with substantial current account deficits a rapid reduction in net capital inflows could generate a currency crisis even in the absence of domestic capital flight. (Reductions in capital inflows from abroad and increases in outflows by domestic residents are on average positively correlated, however).

Given the substantial variability that capital flows sometimes display a number of economists have come to believe that some aspects of capital controls on inflows are better thought of as macro prudential financial regulations than as traditional capital controls. (Eichengreen 1999; Ostry, Ghosh, Habermeier, Laeven, Chamon, Qureshi and Kokenyne 2011; Rey 2013). Thus there are reasons to believe that controls on capital inflows could be associated with a lower probability of currency crises (Eichengreen 1999).[6] Therefore our third hypothesis to test is

H_3: Controls on capital inflows are associated with fewer currency crises.

Unlike our H_2 hypothesis about the weakness of governments and the effects of outflow controls on crisis frequency we do not have strong priors on the sign of the

interaction between the strength of government and the effects of capital inflow controls on the likelihood of currency crises. There may be some systematic relationship, however, so we also test for this possibility.

2.2 Measures of Government Strength

As noted above there are many different concepts and measures of political instability and government strength and weakness (Walton, Angkinand, Arbetman, Besançon, Chiu, Danis, Denzau, Feng, Kugler, Johnson and Willett 2008). As a proxy for measuring a type of strength of governments relevant for our hypotheses, we believe that the government stability index of the *International Country Risk Guide (ICRG)* is particularly useful. A major advantage of the ICRG index over other available indices is the fact that it is available for a long time period and for a large sample of countries. Government stability is defined as a government's ability to carry out its declared program, and its ability to stay in office. The degree of government stability is measured as the sum of three subcomponents, each running from 0 to 4 points. A score of 4 point equates to "very high stability" and a score of 0 point to "very low stability". The three subcomponents are:

1. Government Unity (0-4)
2. Legislative Strength (0-4)

3. Popular Support (0-4)

Therefore, the ICRG index ranges from 0 (the lowest level of government stability) to 12 (the highest level). For the purposes of this paper we use the terms government strength and stability interchangeably as the ICRG measure includes elements of both. The data is available for a large set of countries over a substantial time period. There are of course many dimensions to the political strength or weakness of governments and different dimensions may have different implications for economic policies. In this initial study we treat political weakness. As unidimensional as is discussed in the conclusion unbundling various aspects of political weakness should be an important type for further analysis.

2.3 Measures of Capital Controls

There are two main categories of capital control measurements: *de jure* and *de facto* measurements. *De jure* measurements are based on reports of legal restrictions and are widely used (Quinn 1997; Johnston and Tamirisa 1998; Miniane 2004).[7] While scholars have used various sources to construct measures for particular countries or small sets of countries all of the large N studies draw the data from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER), which has been published by IMF annually. A recent popular set

provided by Chinn and Ito (2002) is constructed from calculations of the principal components of several control measures. Such data sets generally measure the extensivity of controls, i.e., how many categories of capital flows are subject to controls. A few studies also attempt to measure the degree of restrictiveness or intensity of controls based on the work by Quinn (1997).[8] The second type of measurement, the *de facto* method, uses an instrumental variable and/or actual capital flow data to proxy for controls by looking at measures of actual capital mobility Such measures suffer from the problem that capital flows are determined by a number of factors in addition to capital controls.

These large N data sets generally do not distinguish between controls on inflows and outflows and thus cannot be used to test our hypotheses. However, there is a new data set that makes this distinction. It was constructed at the IMF by Martin Schindler (Schindler 2008; Binici, Hutchison and Schindler 2010). It is derived from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions and distinguishes capital controls both by asset category and by the direction of flows. This more disaggregated type of measure allows us to differentiate between high and low levels of capital controls as well as between controls on inflows and outflows. We should stress that this type of measure captures only the extensiveness of controls, not the degree of their intensity as explored by Quinn (2003). Potchamanawong, et al.

(2008) also constructed an index which combines measures of both the extensiveness and intensity of controls but only for a limited set of countries.

Here we rely on the larger data set of Schindler which covers 91 countries during 1995-2005. The main categories covered in this data set are as follows:

(1) Shares or other securities of a participating nature

(i) purchase locally by nonresidents

(ii) sale or issue abroad by residents

(iii) purchase abroad by residents

(iv) sale or issue locally by nonresidents

(2) Bonds or other debt securities

(i) purchase locally by nonresidents

(ii) sale or issue abroad by residents

(iii) purchase abroad by residents

(iv) sale or issue locally by nonresidents

(3) Money market instruments

(i) purchase locally by nonresidents

(ii) sale or issue abroad by residents

(iii) purchase abroad by residents

(iv) sale or issue locally by nonresidents

(4) Collective investments

(i) by residents to nonresidents

(ii) by nonresidents to residents

(5) Financial credits

(i) by residents to nonresidents

(ii) by nonresidents to residents

(6) Direct investment

(i) outward investment

(ii) inward direct investment

(iii) liquidation of direct investment

In Schindler's data set, the *de jure* capital control restrictions are coded at the level of individual types of transactions. By taking unweighted averages of the appropriate subcategories, a continuous variable between 0 and 1 is created accordingly for measuring both restrictions on inflows and outflows. A higher value indicates more restrictive controls in the sense that more items are subject to restrictions.

3. Data, Methodology and Design

3.1 Data and Variables

The data set for this paper comprises annual observations from 1995 to 2005 on 56 countries, including 42 middle-income economies, and 14 low-income countries.[9] This is the time period for which the new IMF data on capital controls is available. Our dependent variable is *Currency Crises*, based on the exchange market pressure indices (EMP) proposed by Eichengreen, Rose and Wyplosz (1996). They use the weighted averages of the depreciation of the domestic currency, the loss of international reserves, and the increase in interest rates with the weights based on the inverse of the variability of each series. Currency crises are identified if the EMP index exceeds the pooled mean by a given number of standard deviations, frequently two or three (Eichengreen, et al. 1996; Kaminsky and Reinhart 1999; Kamin, Schindler and Samuel 2001). For sensitivity tests, as suggested by Willett, et al. (2004), an equal weighted index is also tested. As is common in the literature we use a threshold of two standard deviations

As was discussed above, for our measure of government strength and stability we use the government stability index of the *International Country Risk Guide*. Data on economic variables is taken from the *International Financial Statistics* (IFS) database. Drawing from the literature on determinants of currency crises, we control for a standard set of macroeconomic variables (Abiad 2003; Angkinand, Chiu, and Willett 2009; Bordo et al. 2001; Corsetti, Pesanti and Roubini 1999; Frankel and Rose

1996; Glick and Hutchison 2005; Radelet and Sachs 1998; Willett, et al. 2004). These are the ratio of money and quasi money (M2) to international reserves, the rate of domestic credit growth, current account deficit/surplus as a share of GDP, real GDP growth, and real effective exchange rate appreciation.

Lastly, we also include elections as a political control variable as there is a large literature relating elections to economic outcomes (Lobo and Tufte 1998; Leblang and Bernhard 2000; Frieden, et al. 2001; Leblang 2002; Leblang 2003; Walter 2006). While the electoral effect is not the primary focus of this paper, we include it in our model because it helps control for problems of time-inconsistency and short run political pressures.[10] We measure the electoral dates using data from *Database of Political Institutions* and create an election dummy coded as one if there is an election for either the legislature or executive branch in that year.

3.2 Some Patterns in the Data

There are some quite interesting patterns in the data on controls and government strength. As shown in table 1 and figure 1 in general, for individual countries the levels of controls on inflows and outflows are fairly highly correlated, giving rise to potential difficulties with the reliability of our estimates of the separate effects of each type (Potchamanawong, et al. 2008). Our results turn out to be sufficiently strong and

robust, however, that we do not believe that this is a major problem. Controls on capital outflows are typically somewhat stronger than on inflows.

[Table 1 and figure 1 about here]

We devided the measures of the extent of capital controls into quartiles. Tables 2-4 show the frequencies of capital controls on outflows and inflows and the distribution of the government stability variable respectively. In general we find that in our sample there are roughly as many countries with loose controls on outflows (0-0.25) as countries with tight controls (0.76-1), nearly 40 percent in each with fewer countries in the middle. For controls on inflows, approximately half of our sample countries have loose controls on capital inflows (49%). Tight controls represent only 21% of the sample while the proportions for the two intermediate levels are 15.6% and 14.4%, The frequency distribution for government stability is slightly skewed toward stable governments, where more than 80% of our observations fall within stability levels 7 through 11 (table 4).

As shown in table 2, control levels tend to cluster in the highest and lowest quadrants, with over 40% of the observations lying in each of these quadrants. The two middle quadrants account for only 10% and 6% respectively. While there has been much discussion and debate over the vanishing middle hypothesis with respect to exchange rate regimes, there appears to also be a strong vanishing middle with

respect to levels of controls on capital outflows. [11]

The pattern of controls on capital inflows differs substantially from those on outflows, as shown in table 3 and figure 2. Almost half (49%) of the observations fall in the lowest quadrant. While the highest quadrant has the next largest frequency, it is much lower than with capital outflows, accounting for only 21% of the observations. The second and third quadrants account for 15.5% and 14% respectively.

[Table 2, table 3, and figure 2 about here]

Turning to the relationships between strength of governments and levels of controls we find the curious result in table 1 that the levels of controls on both inflows and outflows are the highest at the extremes of the measure of government strength in our sample, 3 and 12.[12] We should not make much of this, however, since these are very thinly populated cells, accounting for only 2% of the observations (see table 4 and figure 3). Roughly two thirds of the observations on the strength of governments fall within the range of 9 to 11 and over three quarters fall within 8 to 11, so these are the levels of government strength or stability that are of most relevance for our econometric analysis.[13] Over the 9 to 11 range we find a surprising result, the levels of controls on both inflows and outflows rise as government stability rises, going from .48 to .71 for outflows and from .40 to .57 for inflows.

[Table 4 and figure 3 about here]

3.3 Model Specification

In order to assess the interactions among political variables, capital controls, and the probability of currency crises, several rounds of probit regressions are undertaken by applying an interaction dummy regression model. We follow the previous literature and use the controls measure in level form.[14]

Our probit panel model is defined as:

$$prob[Crisis_{i,t} = 1] = \Phi[\beta_1 + \beta_2 Strength_{i,t-1} + \beta_3 KCout_{i,t-1} + \beta_4 KCin_{i,t-1}$$

$$+ \beta_5 (Strength_{i,t-1} \cdot KCout_{i,t-1}) + \beta_6 (Strength_{i,t-1} \cdot KCin_{i,t-1}) + \beta_7 X_{i,t-1} + \varepsilon_{i,t}]$$

$Crisis_{i,t}$ is a currency crisis dummy variable taking a value of 1 in a crisis year for any country *i* at time *t*, and 0 if there is no crisis. Φ is the standard cumulative normal distribution. *Strength* refers to our primary political variable: government stability (STAB). *KCin* and *KCout* are capital controls on both inflows and outflows, respectively. The control variables X are a set of standard economic and financial variables, and $\varepsilon_{i,t}$ is the error term. To reduce the problem of reverse causality, all of the independent variables are lagged by one year. Lagging the independent variables deals with the problem of a crisis forcing a change in capital controls. Of course, there is the potential for our approach to suffer from omitted variable bias and deeper endogeneity problems.[15] Thus we prefer to use the language of association when discussing our results.

4. Empirical Analysis

4.1 Descriptive Statistics and Probit Panel Analysis

Table 5 provides a summary of the descriptive statistics.

[Table 5 about here]

Regression results are presented in Table 6. There are four equations. Equations (1) and (3) only consider the impacts of capital inflows and outflows on the likelihood of currency crises using pooled precision weights and equal weights system, respectively. Restrictions on capital outflows are significantly positively associated with the occurrence of currency crises. Restrictions on capital inflows have a negative association with the crisis probability but the estimated coefficient is not statistically significant (Equation (1)). This result holds up across different crisis measures, as shown in Equation (3), and is consistent with our hypothesis H_3, suggesting that controls on capital outflows tend to be less effective in terms of crisis prevention than controls on inflows.

[Table 6 about here]

Equations (2) and (4) are our benchmark models, which include our key political variable, government strength, and its interactions with controls on capital inflows and outflows. The estimated coefficients of *Strength* are negative and significant,

suggesting that a stronger government tends to be less likely to have currency crises. This offers further support for our H_1.

Especially interesting is that when the political strength variable is added and interacted with capital controls the coefficients for controls on both *KCin* and *KCout* become significant, and keep the positive sign for controls on outflows and negative sign for controls on inflows. This supports our presumption that the relationship between controls on capital outflows and the probability of currency crises depends at least in part on the quality and strength of the government.

Next we compute the probability of currency crises across different levels of government stability and controls on capital inflows/outflows.[16] This exercise allows us to see the influence of changes of government strength on the probability of currency crises, holding other variables constant. A significant coefficient estimate on an interaction term is "neither a necessary nor sufficient" condition for establishing the existence of an interactive relationship (Berry, DeMeritt and Esarey 2010, 25). In order to appropriately account for the coefficients of the interaction terms, we follow (Brambor, Clark, and Golder 2006) and interpret interactive effects in our models through the graphical presentation of the relationship between changes in the variables of interest. For both analytical and graphical purposes, therefore, we break both *KCin* and *KCout* into five different subgroups with 0.25 intervals. This will give

us a picture of how the crisis probabilities change at different degrees of government strength and various levels of controls on capital flows over time. Computed probabilities are reported in Tables 7 and 8 along with figures 4 and 5. These give the probability of crisis during a given year.

[Table 7 and Figure 4 about here]

Table 7 shows that for any level of controls on capital outflows the probability of crisis falls as the level of government strength or stability increases. The probability of crisis with no controls falls below one percent when the stability variable rises to 8 while with the highest level of restrictions this does not occur until the stability measure rises to its maximum of 12. Not surprisingly, the effects of weak government on the probability of crises are particularly strong if there is the highest level of restrictions on capital outflows (*KCout* = 1), as shown in Figure 4. The crisis propensities decrease with the loosening of capital controls on the outflows. For the bottom end of government strength in our sample these crisis probabilities are quite high, ranging from 62.5%, at the highest level of controls to 7.40% with no controls *KCout* = 0). This pattern holds, although less dramatically, at all levels of government strength. For example at the strength level of 8, the probabilities drop from almost 11 % at the highest level of controls to just over 0.5% at the lowest. These estimates are consistent with the "signaling hypothesis" which suggests that a tightening of controls

on outflows by politically weak governments would be seen as sending an adverse signal to the markets and would therefore increase the likelihood of currency crises.

On the inflows side, we have a different story. As shown in table 8, the most crisis prone scenario occurs when a very weak government has absolutely no controls on capital inflows (*KCin* = 0). The estimated probability is 17.90% and is gradually decreased to 8.35%, 3.28%, 1.05% and 0.28% as the controls on the inflows are tightened. This pattern of lower probabilities of crisis as controls on inflows are tightened continues until the stability measure rises to 9, with the differences between high and low levels of controls diminishing as government strength rises. At strength levels of 9 and above, however, the pattern reverses with the probabilities of crises rising as controls on inflows are tightened as also shown in Figure 5. This is discussed below.

[Table 8 and Figure 5 about here]

At low levels of controls crisis probabilities continue to fall, albeit from already low levels, as government stability increases throughout the whole domain; while at high levels of controls, *KCin* = 0.75 and 1.0, the probabilities start to rise again when the stability measure exceeds 5 or 6.

Comparing tables 7 and 8 we see that for given levels of government strength the crisis probabilities for a particular level of restrictions on outflows are generally

higher than for the same level of restrictions on inflows as we would expect from the estimated coefficients in table 6. However at higher levels of government strength this relationship is reversed, with the reversal coming at lower levels of government stability, the lower are the levels of restrictions. The magnitudes are small, however. We are not sure what to make of this finding. We suspect that these relationships are likely to be spurious, resulting from the extremely small number of observations in these cells. Likewise great confidence should not be placed on the exact levels at which the patterns are found to reverse.

On the other hand we believe that there is something to the qualitative finding that at lower levels of government stability greater controls on capital inflows reduce the probabilities of crises. A possible explanation is that weak governments tend to lack the means to effectively offset the effects of large capital inflows in increasing vulnerability to crises while strong governments are able to better handle such inflows. Such a conclusion would still leave open the possibility that macro prudential type regulations on capital inflows such as Chile taxes could prove useful in reducing the danger of sudden stops and currency crises. Unfortunately the large N proxies for capital controls now available are not yet refined enough for us to test this hypothesis in our sample. The findings for higher levels of stability seem less clear cut. More controls on inflows are found to be associated with modest increases in the

probabilities of crises. We think that the strong conclusion to draw from this is that at high levels of government stability controls on inflows do not appear to have been effective in reducing the frequency of crises. This might be because strong governments have already developed other mechanisms for dealing safely with capital inflows.

4.2 Robustness Testing

As shown in table 6, we found that the results were generally robust to substituting equal weights for pooled precision weights in our calculations of the crisis index. We also tested for the effects of deleting the low income countries from our sample since previous studies have often found substantial differences in behavior between middle and lower income countries (Rogoff et al. 2003). The results reported in table 9 are generally similar, although surprisingly the stability variable losses its significance. The general pattern of coefficients remains the same, however, and the coefficients on the capital control variables retain their significance.

We also checked the effects of incorporating government stability without interacting it with different types of capital controls. The results, as shown in table 10, are in general consistent with our hypothesis H_1. Government stability (STAB) enters into the equation with significant negative signs across the different crisis measures.

This effect is stronger, however, when using equal weights system than the pooled precision weights. The coefficients on the controls variables retain their signs but fall in magnitude and significance. These results support the importance of interacting government strength with controls.

[Table 9 and 10 about here]

5. Concluding Remarks

Capital flow surges and sudden stops have become a major problem for the global financial system. Our results are broadly consistent with the emerging view that it is important to distinguish between controls on capital inflows and outflows and that measures to limit surges of inflows may be useful at times to reduce the incidence of currency crises. Thus we believe that the IMF's recent move to reconsider these issues is highly desirable.

Despite substantial improvements in recent years the available large N measures of capital controls are still far from perfect. Thus we put little weight on our exact estimates of the associations between capital controls and currency crises. We do believe that our results are sufficiently strong, however, to uphold our initial expectations of the importance of distinguishing between the effects of controls on capital outflows and on inflows and of taking levels of government strength or

stability into account.

Not only does government weakness increase the probabilities of currency crises directly, but it also interacts with the effects of controls. Strengthening controls on capital outflows are estimated to increase the probabilities of crises. These increases are particularly large when governments are weak. On the other hand stronger controls on capital inflows are found to reduce the probabilities of currency crises for weak governments. This does not carry over to the case of strong governments, however. The results suggest that increasing controls on capital inflows does not reduce the probability of a crisis. Indeed our estimates find a slight increase in the probabilities of crises. Given the small size of these increases we would not conclude from these results that putting controls on inflows would actually make these countries more crisis prone.

Capital flow surges and sudden stops have become a major problem for developing economies. Our results are consistent with views that measures to limit surges of inflows may be useful. Thus we believe that the IMF's reconsideration of these issues is well justified. While we agree with the view that efforts to deal with strong inflows in countries with strong governments would better focus on prudential measures rather than direct controls our data set does not allow us to investigate this question.

There are a number of directions in which this type of research can be extended and our initial findings suggest that additional research in this area is justified. One important direction is to unbundle the broad concept of government strength and weakness into separate dimensions that might have different effects on various types of economic policies. There is now available a considerable variety of measures of various aspects of government strength and political institutions as number of veto players, rules of law, effectiveness of government, and quality of financial supervision and regulation to explore the use of other measures of government strength and weakness. The inclusion of measures of the quality of institutions seems likely to be particularly worthwhile.

Another direction involves linking the analysis directly to the behavior of capital flows. An initial effort has been made by Binici, et al. (2010) who use the same set of capital control measures to look at effects on capital flows. They find that controls on capital outflows do tend to reduce these outflows while controls on inflows have no effect, which is somewhat at odds with our results. Further investigation of the relationships among controls and actual capital flows is needed.[17]

Others directions include looking at the effects of particular types of controls, investigating interrelationships with exchange rate regimes and degree of domestic financial liberalization, exploring associations with financial as well as currency

crises, and consideration of the effects of changes in controls rather than just the levels as has been done in most studies. Thus we see a rich agenda for further research.

[1] At the time of these studies data was not available to distinguish between controls on capital inflows and outflows for a large set of countries.

[2] This finding is further supported by Glick, Guo, and Hutchison 2006, where they use a matching and propensity score methodology to address the issue of selection bias in a panel analysis of developing countries and find that, after controlling for sample selection bias, countries with liberalized capital accounts experience a lower likelihood of currency crises.

[3] Under the adjustable peg speculators do not know whether a parity will be changed over a particular time period but it is clear from balance of payments trends in what direction it will move if there is a change. Hence the one way bet.

[4] By the early 1990, there had been a strong movement away from the use of controls, but the rash of currency crises in the mid and late 1990s, especially the Asian crisis of 1997-98, led to a resurgence of support for capital controls and their desirability once again became a major topic of debate as witnessed by the controversy about the effects of the capital controls adopted by Malaysia during the Asian crisis. Despite a number of studies on episode it is still difficult to judge the net effects were positive or negative, but it is clear that the net effects were much smaller than both the strong advocates and the strong critics anticipated.

[5] While we have no doubt that changes in ideas or mental models had a strong impact on these policy changes, lobbying by financial interests clearly also played a role. The role of the IMF in this process has been the subject of considerable debate. For example, see International Monetary Fund (2005); Abdelal (2007); Chwieroth (2007).

[6] As has been emphasized recently by a number of economists and officials in emerging market economies facing strong inflows of financial capital, some types of limitations on capital inflows should be treated more as an aspect of macro prudential regulation than as traditional capital controls.

[7] Johnston and Tamirisa's (1998) measure is the most disaggregated measure of capital controls since it combines all the classifications of the IMF's AREAER. It also distinguishes capital flows from outflows and inflows. Unfortunately this data is available only for 1996.

[8] For reviews of various large N measures of capital controls see Potchamanawong, et. al. 2008 and Clark et al. 2012.

[9] See the appendix for the sample countries.

[10] Government officials with short-time horizons (as in the run-up to an election) in general tend to be biased toward generating expansionary macroeconomic polices for the short-run benefits (e.g. to increase domestic output and win the election) at the expense of the long-run costs (e.g. increased inflation), as suggested by the traditional political business cycle literature. Also see Walter and Willett (2012) for a discussion of the relationship between short time horizons and the tendency for governments to delay adjustments until crises erupt.

[11] For analysis and references to the literature see Angkinand, Chiu and Willett 2009.

[12] For example, the level of government strength in Bangladesh in 1995 was registered at 3, and the level of controls on both inflows and outflows was 0.6. Another example is Kenya in 1995, where the level of government strength was 5.50, and the level of controls on both inflows and outflows was 0.4 and 0.33, respectively.

[13] Likewise, the level of government strength in Thailand in 1998 and 1999 was quite high at 9.25 and 9.83, respectively, and the level of controls on both inflows and

outflows was 0.5 and 0.92, respectively. This indicates that Thai government imposed a strict restriction on capital outflows to prevent capital flight during the crisis period, while the level of controls on inflows was relatively moderate.

[14] There are also interesting hypotheses to study about the effects of changes in the levels of controls that should be the subject of future research.

[15] One way to deal with endogeneity problems with a dichotomous dependent variable and endogenous explanatory variables is to use two stage probit least squares (2SPLS) (Maddala 1983; Achen 1986). However, as pointed out by Timpone (2001), even if we obtain a consistent estimator via this two stage approach, the standard errors remain inaccurate and their correction is extremely difficult in practice.

[16] The reported probability is generated from the authors' own calculation via Excel. Since the distribution is the standard normal cdf Φ, we have the Probit link. That is,

$$P_r(y_i = 1 \mid x_i) = P_r(u_i \le x_i b \mid x_i) = \Phi(x_i b \mid x_i) = \int_{-\infty}^{xb} \frac{1}{\sqrt{2\pi}} \quad e^{-\frac{t^2}{2}} \quad dt$$

To obtain the predicted probabilities, we go back to our link functions and fill in the values of our *X*'s and Betas from our equation. From these we plot $P_r(y_i = 1)$ against X_1 (e.g., government stability) to show the effects of changing different levels of X_1, while holding other variables constant. We use our baseline model in section 3.3 to generate these results.

[17] An initial inquiry along this line has been made by Sompornserm (2010) where he tests an array of relationships between financial liberalization policies and the behavior of international capital flows, and finds that domestic financial liberalization and capital account liberalization are crucial factors in determining the direction and volume of capital inflows.

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Appendix: List of Sample Countries in the Estimation

Sample for 42 middle-income countries:

Angola	Dominican Republic	Kazakhstan	Oman	Sri Lanka
Argentina	Ecuador	Latvia	Panama	Thailand
Bolivia	Egypt	Lebanon	Paraguay	Tunisia
Brazil	El Salvador	Malaysia	Peru	Turkey
Bulgaria	Georgia	Mauritius	Philippines	Uruguay
Chile	Guatemala	Mexico	Romania	Venezuela, Bolivarian Republic of
China,P.R	Hungary	Moldova	Russia	
Costa Rica	Indonesia	Morocco	South Africa	
Czech Republic	Jamaica	Nicaragua	Swaziland	

Sample for 14 low-income countries:

Bangladesh	Ghana	Kyrgyz Republic	Togo	Yemen, Republic of
Burkina Faso	India	Pakistan	Uganda	Zambia
Côte d'Ivoire	Kenya	Tanzania	Uzbekistan	

Table 1 The Mean of KC, KCin, and KCout under various levels of government strength

stabs	KC	KCin	KCout
3	0.60	0.60	0.60
4	0.21	0.18	0.25
5	0.37	0.31	0.42
6	0.31	0.26	0.36
7	0.34	0.32	0.37
8	0.50	0.46	0.54
9	0.44	0.40	0.48
10	0.52	0.47	0.58
11	0.64	0.57	0.71
12	0.83	0.75	0.92

Table 2 Frequency of Controls on Outflows (KCout)

	Freq.	Percent	Cum.
$KCout_1$ (0-0.25)	262	42.53	42.53
$KCout_2$ (0.26-0.5)	64	10.39	52.92
$KCout_3$ (0.51-0.75)	38	6.17	59.09
$KCout_4$ (0.76-1)	252	40.91	100
Total	616	100%	100%

Table 3 Frequency of Controls on inflows (KCin)

	Freq.	Percent	Cum.
$KCin_1$(0-0.25)	302	49.03	49.03
$KCin_2$ (0.26-0.5)	96	15.58	64.61
$KCin_3$ (051-0.75)	87	14.12	78.73
$KCin_4$ (0.76-1)	131	21.27	100
Total	616	100%	100%

Table 4 Frequency Distribution of Government Strength (stabs)

stabs	Freq.	Percent	Cum.
3	1	0.18	0.18
4	2	0.36	0.54
5	6	1.09	1.63
6	39	7.1	8.73
7	54	9.84	18.57
8	72	13.11	31.68
9	100	18.21	49.89
10	148	26.96	76.85
11	120	21.33	98.18
12	10	1.82	100
Total	549	100%	100%

Table 5 Descriptive Statistics

	Mean	*St dev.*	*Min*	*Max*
Stab	8.77	1.67	3	12
KCout	0.49	0.42	0	1
KCin	0.41	0.36	0	1
m2/reserves	3.85	3.21	0	31.13
Lending boom	35.18	32.09	0	165.72
CA/GDP	-2.85	6.78	-28.97	43.40
REER	101.94	19.32	55.85	160.20
Real GDP	4.30	4.39	-13.13	41.34
Election	0.24	0.43	0	1

Table 6 Government Strength, Controls on Capital Outflow/Inflow, and Probability of Crises

	(1) Pooled	(2) Pooled	(3) Equal	(4) Equal
Stab $_{t-1}$	-	-0.221**	-	-0.229*
		(-2.05)		(-1.78)
KCout $_{t-1}$	0.945**	2.032*	1.290*	1.608
	(2.12)	(1.65)	(1.99)	(1.04)
KCin $_{t-1}$	-0.555	-2.821**	-1.578	-4.907**
	(-0.91)	(-2.05)	(-1.58)	(-3.16)
Stab*KCout $_{t-1}$	-	-0.0893	-	-0.0428
		(-0.87)		(-0.27)
Stab*KCin $_{t-1}$	-	0.323*	-	0.410**
		(1.87)		(2.30)
m2/res $_{t-1}$	0.0115	0.0169	-0.0123	-0.0110
	(0.56)	(0.88)	(-0.51)	(-0.48)
Lending boom $_{t-1}$	-0.000571	0.00158	0.00299	0.00450
	(-0.18)	(0.59)	(0.80)	(1.27)
Ca/GDP $_{t-1}$	-0.0143	-0.0138	0.0181	0.0104
	(-0.60)	(-0.71)	(0.76)	(0.47)
REER $_{t-1}$	0.0142**	0.0198**	0.0224**	0.0234**
	(2.05)	(2.62)	(3.23)	(3.21)
Real GDP growth $_{t-1}$	0.00957	-0.115**	-0.0201	-0.0905*
	(0.34)	(-2.67)	(-0.73)	(-1.94)
Election $_{t-1}$	0.0346	0.0928	0.550*	0.510*
	(0.15)	(0.41)	(-1.92)	(-1.76)
_cons	-3.606***	-2.659**	-4.007***	-2.230*
	(-5.10)	(-2.85)	(-4.72)	(-2.07)
N	475	463	441	426

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 7 Government Strength, Capital Outflows, and Probability of Currency Crises

	KCout = 0	*KCout = 0.25*	*KCout = 0.5*	*KCout = 0.75*	*KCout = 1*
STAB = 3	7.40%	15.79%	28.71%	45.18%	62.54%
STAB = 4	4.80%	10.64%	20.40%	34.14%	50.39%
STAB = 5	2.97%	6.83%	13.73%	24.31%	38.20%
STAB = 6	1.76%	4.17%	8.73%	16.28%	27.09%
STAB = 7	1.00%	2.42%	5.23%	10.18%	17.88%
STAB = 8	0.54%	1.33%	2.95%	5.95%	10.94%
STAB = 9	0.28%	0.69%	1.56%	3.24%	6.18%
STAB = 10	0.14%	0.34%	0.78%	1.64%	3.22%
STAB = 11	0.07%	0.16%	0.36%	0.77%	1.54%
STAB = 12	0.03%	0.07%	0.16%	0.34%	0..68%

Table 8 Government Strength, Capital Inflows, and Probability of Currency Crises

	KCin = 0	*KCin = 0.25*	*KCin = 0.5*	*KCin = 0.75*	*KCin = 1*
STAB = 3	17.90%	8.35%	3.28%	1.05%	0.28%
STAB = 4	12.72%	6.40%	2.84%	1.11%	0.38%
STAB = 5	8.69%	4.83%	2.48%	1.18%	0.51%
STAB = 6	5.69%	3.58%	2.16%	1.25%	0.69%
STAB = 7	3.58%	2.61%	1.88%	1.32%	0.91%
STAB = 8	2.16%	1.87%	1.61%	1.40%	1.20%
STAB = 9	1.24%	1.31%	1.39%	1.47%	1.55%
STAB = 10	0.69%	0.91%	1.20%	1.55%	2.00%
STAB = 11	0.36%	0.62%	1.02%	1.64%	2.55%
STAB = 12	0.18%	0.41%	0.87%	1.73%	3.22%

Table 9 Sensitivity test: probability of crises for middle-income countries

	(1) Pooled	(2) Pooled	(3) Equal	(4) Equal
Stab $_{t-1}$	-	0.0329	-	0.0505
		(0.31)		(0.36)
KCout $_{t-1}$	0.0479	1.665**	0.673**	5.122**
	(0.16)	(1.95)	(2.11)	(2.14)
KCin $_{t-1}$	-0.305	-2.521**	-2.053***	-3.549***
	(-0.70)	(-2.34)	(-5.10)	(-3.21)
Stab*KCout $_{t-1}$	-	-0.236**	-	-0.527**
		(-2.19)		(-1.90)
Stab*KCin $_{t-1}$	-	0.341**	-	0.221
		(2.63)		(1.59)
m2/res $_{t-1}$	0.00977	0.0191**	0.000219	-0.00820
	(1.56)	(2.56)	(0.03)	(-0.72)
Lending boom $_{t-1}$	-0.0918	0.191	0.397	0.553*
	(-0.25)	(0.71)	(1.10)	(1.65)
Ca/GDP $_{t-1}$	0.000208	-0.000619**	0.000564**	0.000541**
	(0.89)	(-2.38)	(2.25)	(2.52)
REER $_{t-1}$	0.0242**	0.0279**	0.0339***	0.0327***
	(2.78)	(2.63)	(3.19)	(3.13)
Real GDP growth $_{t-1}$	0.0563*	-0.0841***	0.0454	0.0541
	(1.63)	(-3.01)	(1.19)	(1.39)
Election $_{t-1}$	-0.0538	0.121	-0.722**	-0.890**
	(-0.17)	(0.39)	(-2.00)	(-2.50)
_cons	-4.101***	-1.850**	-4.805***	-5.188**
	(-4.29)	(-2.07)	(-4.14)	(-2.56)
N	336	278	316	258

t statistics in parentheses * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 10 Sensitivity test: Probability of crises without interaction effect

	(1) Pooled	(2) Equal
Stab $_{t-1}$	-0.187*	-0.391***
	(-1.69)	(-2.97)
KCout $_{t-1}$	0.778	2.257**
	(1.16)	(2.07)
KCin $_{t-1}$	-0.365	-3.286
	(-0.40)	(-1.41)
m2/res $_{t-1}$	0.00278	-0.142*
	(0.12)	(-1.74)
Lending boom $_{t-1}$	0.00456	0.0268**
	(1.31)	(2.64)
Ca/GDP $_{t-1}$	0.0134	0.0236
	(0.63)	(0.65)
REER $_{t-1}$	0.0229**	0.0364**
	(3.01)	(2.04)
Real GDP growth $_{t-1}$	-0.0215	-0.200**
	(-0.72)	(-2.41)
Election $_{t-1}$	0.219	0.792**
	(0.82)	(-2.50)
_cons	-2.935**	-3.237
	(-3.04)	(-1.47)
N	471	464

t statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1. Capital Controls and Government Strength

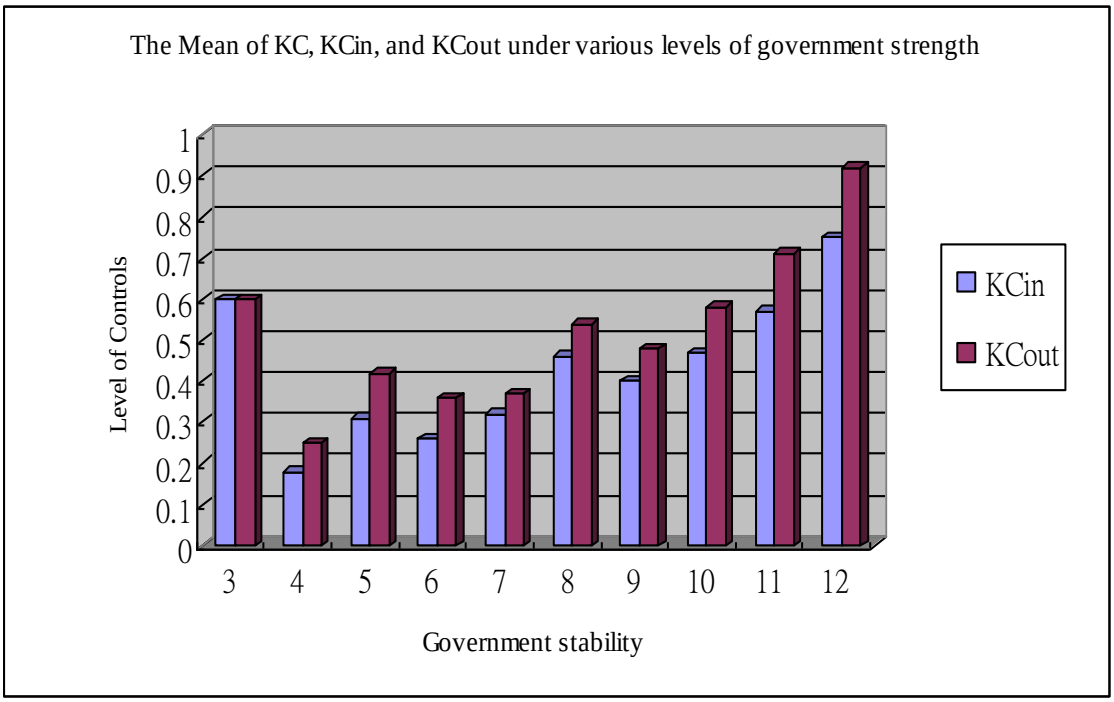

Figure 2. Frequency of Capital Controls

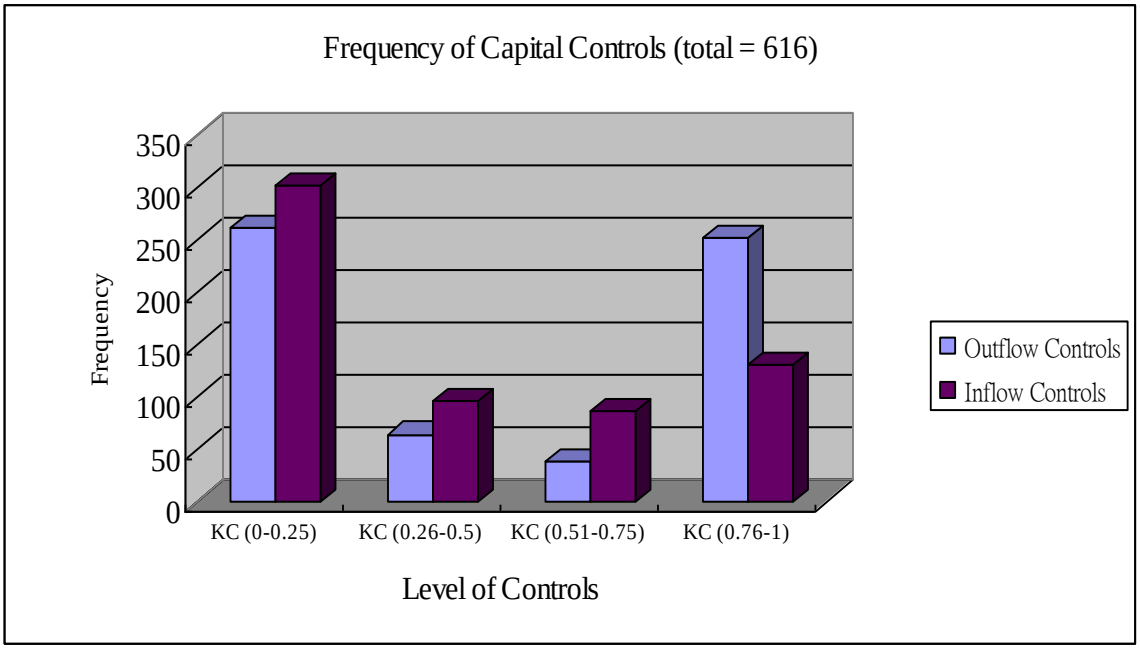

Figure 3. Frequencies of Government Strength

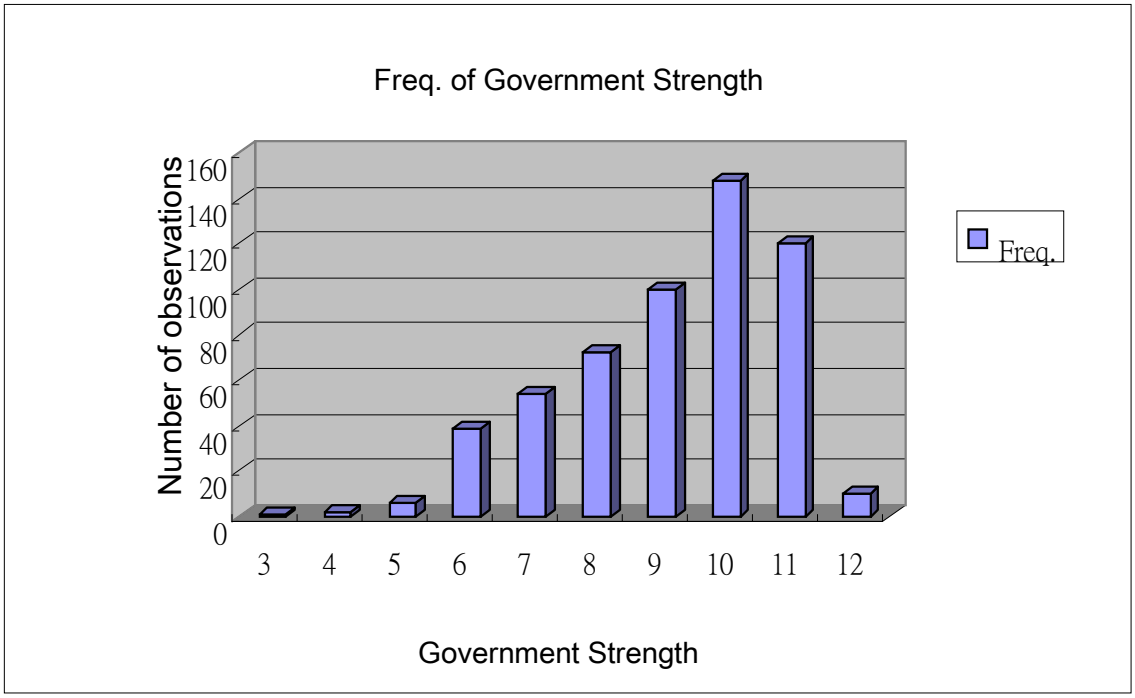

Figure 4. Probability of Crises under Different Levels of Government Strength Given Outflow Controls

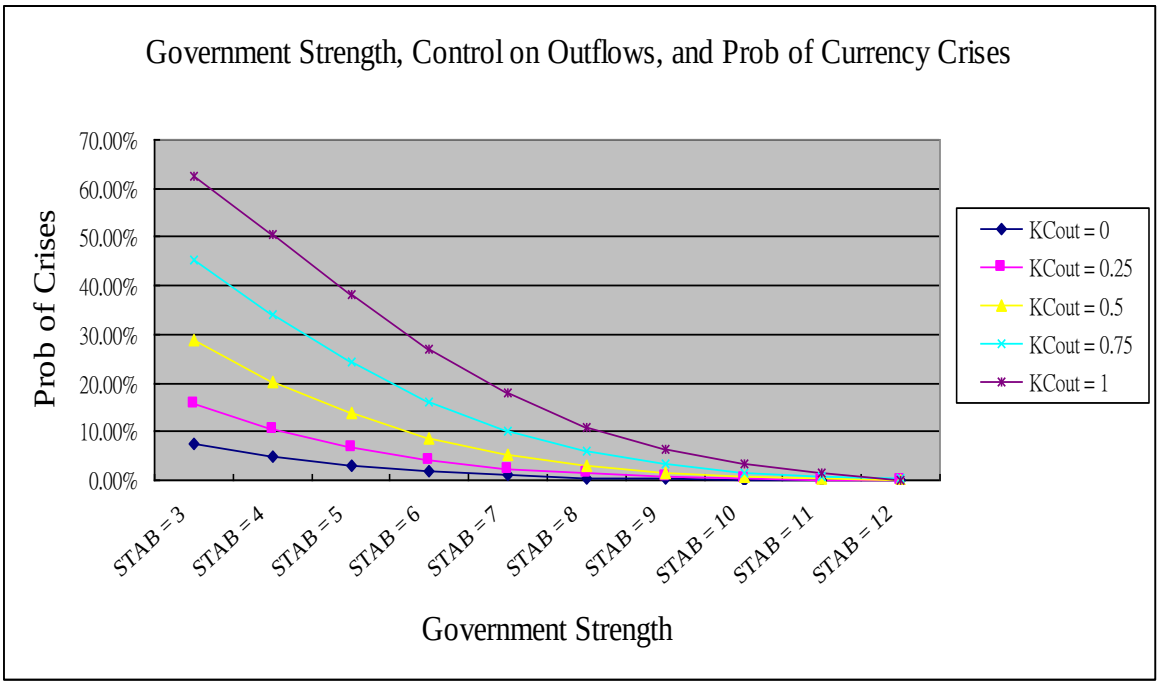

Figure 5. Probability of Crises under Different Levels of Government Strength Given Inflow Controls