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**Institutional Development and the Choice of Exchange Rate  
Regime: A Cross-Country Analysis**

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**July 2007**

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# **Institutional Development and the Choice of Exchange Rate Regime: A Cross-Country Analysis**

**Monzur Hossain\***

## **Abstract**

This paper investigates the determinants of exchange rate regime choice during the post-Bretton Woods period. The empirical results show that economic fundamentals, shocks, financial and political institutional variables provide relevant guidance for *de jure* regime choices. However, various shocks lead countries to diverge from the *de jure* fixed or floating regime if they do not have strong financial institutions. During the period of divergence, countries undertake necessary financial reforms that help them converge to the *de jure* regime. This suggests that financial development is crucial for the sustainable choice of a fixed or a floating exchange rate regime.

**Key Words:** *De jure and de facto exchange rate regime, divergence, learning, financial development*

**JEL Classification codes:** F3, G0

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## 1. Introduction

A country with an underdeveloped financial system often faces higher inflation, lack of debt sustainability, a fragile banking system, and macroeconomic and exchange rate volatility. These structural features make it difficult for the country to adopt a floating exchange rate regime as a solution of the classical “trilemma”, but also make fixed exchange rate regimes prone to crises when capital is internationally mobile. In such countries, sharp currency depreciation alters the domestic currency value of their external debt, which increases “liability dollarization” and leads to calamitous real sector effects (the so-called “balance sheet” effect) (Eichengreen and Hausman, 1999). If liability dollarization causes problems under a floating regime, it simultaneously makes fixed exchange rate regimes harder to maintain. The financial fragility arising from unhedged foreign debts exposes fixed exchange rate regimes to speculative attack through a number of channels—one of which is the resulting vulnerability of the banking system to depositor panic.

Therefore, countries with weak financial institutions often face difficulties in choosing and sustaining either a fixed or a floating regime. Moreover, some studies show that poor legal and political institutional quality also creates problems for the same (see, among others, Alesina and Wagner, 2006). This study aims to examine the impact of both political and financial institutions on the choice of a regime.

To properly investigate the determinants of a regime, it is necessary to understand the reasons of divergence and the duration of divergence as well. Because, it is recognized in literature that there has been a considerable amount of divergence between *de jure* and *de facto* regimes (Genberg and Swoboda, 2005). Empirically, one should observe that countries that peg are those that need an anchor and do not have the necessary institutions capable of guaranteeing

macroeconomic stability. These countries deviate from their announcements not only because they cannot maintain conditions compatible with pegs<sup>1</sup>, but they do not have the necessary financial and political institutions as well. The same argument goes for the cases that deviate from floating regime announcement in the face of high nominal volatility. These two situations are described in the literature colorfully as “fear of pegging” (Levy-Yeyati and Sturzenegger, 2002) and “fear of floating” (Calvo and Reinhart, 2000). The credibility concerns may have led policy makers not to change regime declaration instantly when they adopt the regime. These situations are common especially in non-OECD countries.

If divergence happens due to institutional weaknesses, it suggests that these countries may improve the quality of institutions during the period of divergence to converge to the *de jure* regime. According to this interpretation, the period of divergence can be viewed as the period of “learning”<sup>2</sup>. Learning may foster financial reforms through reassessment of the costs and benefits of the *de jure* regime. In this way learning can help reduce the uncertainty in exchange rates under the *de jure* regime being chosen. Thus the possibility of learning implies a dynamic relationship between divergence and subsequent financial policy reforms undertaken in order to return to the *de jure* regime. To identify the determinants of regime choice in a comprehensive manner, this study specifies this dynamic relationship and, within that context, identifies the factors that lead to divergence.

Our analysis is approached from two different angles. First, the determinants of a *de jure* regime choice are investigated, and second, the reasons of divergence from and convergence (or learning) to the *de jure* regime are analyzed. This empirical approach allows for obtaining

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<sup>1</sup> It is not possible for a country to deviate from a currency board, currency union or dollarization without changing declaration. Thus, deviation from fixed regime usually means a deviation from a single currency peg.

<sup>2</sup> Although Rogoff et al. (2003) hint that “learning to float” can increase the effectiveness of floating regime, however, they have not investigated the possibility of learning thoroughly.

consistent estimates of parameters in explaining the choice of a regime. For empirical analysis, the ordered logit model is applied and a wide range of factors which includes economic fundamentals, various shocks, financial and political institutional variables are considered as explanatory variables. The sample consists of 34 countries from the OECD, East Asia, South Asia, Latin America, Africa and Middle East and data spans 1973-1996 (see Appendix I for the list of countries).

The next section provides a discussion on *de jure* and *de facto* regime classifications. Section 3 discusses the data used. Section 4 discusses the empirical results and Section 5 concludes the paper.

## 2. Regime classification and related issues

The empirical analysis of the choice of exchange rate regime depends on the classification of regimes. But explaining the choice of a regime appears to be difficult at the beginning since the classification of a regime is problematic. The IMF has traditionally offered a classification which is “*de jure*”, that is, it is essentially based on what the countries report to the IMF. As a result, it does not reflect the actual regime when countries diverge from their officially announced regime for certain periods of time. “This divergence potentially affects the analysis of historical trends in exchange rate regimes, their macroeconomic performance, and the answers to salient policy questions” (Rogoff et al., 2003; p.7). Thus, many authors cast doubt on the validity of results that are based on the *de jure* regime classification. For this reason, a number of *de facto* classifications have been proposed (see Bubula and Ötoker Robe, 2002; Reinhart and Rogoff,

2004; and Levy-Yeyati and Sturzenegger, 2002)<sup>3</sup>, and these classifications are now widely used in the empirical investigation of various aspects of currency regime choice.

Genberg and Swoboda (2005) have pointed out some problems of devising a correct *de facto* classification. For example, they argue that exchange rate stability in a floating regime is not always a result of intervention; it may be the result of optimally chosen monetary policies. Similarly, countries that actively use monetary policy instruments to stabilize their exchange rate may not want to announce a fixed exchange regime because of the fear of speculative attacks. This implies that we should not ignore *de jure* regime classification in empirical investigation as it in principle reflects countries preferences for a particular regime. Rather, investigating the reasons of gap between official announcement and what countries are practicing is crucial for increasing our understanding of the determinants of regime choice. These insights lead us to investigate the *de jure* regime choice and the reasons of diverging from it in this paper.

Why do certain countries diverge from the *de jure* regime? A few studies attempt to answer this question. For example, according to the *fear of floating* literature (Calvo and Reinhart, 2002; Hausman et al., 2000), countries with high unhedged foreign currency denominated debt or high exchange rate risk exposure have an incentive to peg even if they are officially floating. Inability to hedge, in turn, usually reflects the inability of these countries to borrow abroad in their own currency, also known as the “original sin hypothesis”<sup>4</sup> (Eichengreen and Hausman, 1999). On the other hand, some countries are experiencing *fear of pegging*—a fear that pegging would invite speculative attacks as a result of destabilizing misalignment (Levy-Yeyati and Sturzenegger, 2002; Genberg and Swoboda, 2005). Although these studies point to the

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<sup>3</sup> These *de facto* classifications have been proposed based on the observed behavior of exchange rate movements and subjective assessment of the true intent of policy makers. A *de facto* regime is determined by analyzing mainly three variables: nominal exchange rate, nominal exchange rate volatility and volatility of international reserves.

<sup>4</sup> Although developed countries are able to borrow overseas in their domestic currencies, many developing countries are unable to do so. Any large depreciation of the domestic currency increases ‘liability dollarization’ and leads to calamitous real sector effects (so-called ‘balance sheet’ effects).

weaknesses of the financial sector as the potential reason of divergence, Alesina and Wagner (2006) point to legal and political institutions. They find that countries that announce a fixed exchange rate but float *de facto* have relatively “bad” legal and policy institutions, whereas countries that fix *de facto* but float *de jure* have relatively “good” institutions.

While some authors have argued that financial sector development could be an important determinant of a currency regime choice (Von Hagen and Zhou, 2005; Calvo, 1996), one potential difficulty is how to properly measure financial sector development. The ratio of broad money to GDP, known as *financial deepening* has been frequently used in literature as a proxy for financial sector development. This is a rough indicator since financial development involves the creation of institutions, market deepening and product innovations, which are all difficult to capture in the money-to-GDP ratio. In place of the traditional financial deepening index, a cross-country index of financial liberalization that takes into account interest rate deregulations, removal of credit controls, privatizations, lifting of entry barriers, capital account liberalization etc. may better represent financial sector development. “Financial deepening affects *access* to finance, while liberalization affects the *incentives* with which credit is deployed” (Abiad, Oomes, and Ueda, 2004, p. 3). Financial deepening and financial liberalization are not equivalent but tend to be related. A certain degree of financial liberalization is necessary to ensure adequate competition and efficiency in the financial sector.

Financial liberalization generally modifies the domestic interest rate and alters inter-temporal decisions of firms and individuals and possibly of the public sector. With financial liberalization along with capital account liberalization, a country is expected to deploy a complementary exchange rate policy as suggested by the *impossible trinity doctrine*. This doctrine states that the choice of exchange rate regime cannot be made independently of the choices regarding the



degree of international financial integration and the desired level of monetary autonomy. With capital account liberalization and fixed exchange rate regime, monetary independence is sacrificed. If a country wants to retain monetary independence, it has to accept the flexibility of exchange rates. For countries that are imperfectly integrated into global capital markets, an intermediate regime may be possible while retaining some degree of monetary independence. But some authors argue that countries should avoid unstable combination of capital mobility and exchange rate fixity, particularly when domestic financial markets are underdeveloped (Krugman, 1979; Salant and Henderson, 1978). These concerns have motivated us to investigate the role of financial sector development via the financial liberalization index on the choice of a currency regime.

### 3. Data

Exchange rate regime choice may occur under a rich set of conditions, raising the challenge of sorting out the relative importance of the various stimulating factors. Thus, using both conventional and unconventional variables including more recent cross-country indices of financial and political institutions and various other factors, this study allows for the possibility of obtaining more precise findings.

#### *Dependent variable*

To allow for more systematic presentation, both *de jure* and *de facto* (or divergent) regime choice are analyzed. Thus, regime classification consisting of fixed, intermediate and floating regime is our dependent variable. First, to identify the factors affecting countries' *de jure* regime declaration, the regime classification published in the IMF's *Annual Report on Exchange Rate Arrangements and Exchange Restrictions (ARERAER)* is considered.

Second, to analyze divergence or the choice of a *de facto* regime, a new classification index is constructed which comprises of “consistent” (if *de jure* and *de facto* regime are the same at a certain time point) and “divergent” (if they are not the same) regimes. For this purpose, the *de facto* classification of Reinhart and Rogoff (2004) (RR) is considered.

### *Explanatory Variables*

Traditionally, economists have tried to explain the choice of an exchange rate regime based on economic fundamentals, shocks, financial structure and political ideology. These factors receive considerations over time to guide regime choices. While the literature of the 1970s focused on economic fundamentals, the literature of the 1980s focused on shocks as the potential determinants of regime choice (McKinnon, 1963; Heller, 1978; Boyer, 1978; Melvin, 1985; Savvides, 1990). In the 1990s, a new set of considerations came to the fore, particularly the role played by international capital flows and domestic financial systems in determining the exchange rate regime.

The existing results appear to suffer from omitted variable bias. For example, the “fear of floating” approach does not control for political variables, conversely many political economy approaches often do not control for various economic factors including exchange rate risk exposure. In order to investigate the regime choice more adequately, a set of variables reflecting the influences of SHOCKS, STRUCTURE and POLITICAL IDEOLOGY are included in the empirical analysis of this study. In the category of “shocks”, dummies for balance of payment crises (BOP), banking crises (BANK), recessions (RECESSIONS), high inflation periods (HINFL) and hyperinflation (HYPERINFL) are included. If inflation exceeds 50 percent, it is considered high and if inflation exceeds three-digit level, it is considered as hyperinflation.

In the category of “structure”, both financial and economic structural variables are included. A cross-country financial liberalization index (FLI), developed by Abiad and Mody (2005) is used as a proxy for financial development. The FLI is a measure of the joint liberalization of capital movements and of the domestic financial sector. This study also separately assesses the effects of liberalization of current and capital account (INTL) and liberalization of financial sectors (FIN); both indices are generated from the FLI index of Abiad and Mody (2005).

Additional structural variables, such as trade openness (OPEN) measured as the ratio of the sum of imports and exports to GDP and per capita GDP calculated in PPP terms (GDPPCPPP) are considered. In addition, the influence of international financial institutions on exchange rate regime choice is proxied by an IMF program dummy (IMF). To explore the influence of global factors, world interest rates (USINT) and global capital mobility (CAPFLOW) are included.

“Political ideology” category includes indices of political cohesion (IPC) representing the number of parties in the coalition government, checks and balances (CHECKS), government system (SYST) (either presidential, strong presidential or parliamentary), legislative index of electoral competitiveness (LIEC) and executive index of electoral competitiveness (EIEC). All these political indices are taken from the World Bank’s data on political indices (see Beck, et al. 2001). The description of FLI and political institutional variables is given in Appendix II. Past studies try to relate democratic system, left or right wing government, operational risk index, political risk index, voice and accountability etc. with exchange rate regime choice (see, for example, Alesina and Wagner, 2005; Shambaugh, 2004). Unlike past studies, in this study, the above-mentioned political institutional variables are chosen because they represent political

stability as well as transparency and efficiency in the political system that can be relevant to countries overall financial and economic development as well as to the regime choice.

The sample consists of 34 countries (see Appendix I for the complete list). The sample is restricted to countries for which the relevant indices, particularly financial liberalization index are available and the data spans 1973–1996. Taiwan is discarded from the sample of Abiad and Mody (2005) due to constraints on the availability of regime classification data. Hence, only 34 out of 35 countries can be potentially included in the sample. For the resulting 34-country sample, the RR *de facto* exchange rate regime classifications for Bangladesh and Korea are not available. For these two countries, the *de facto* classification of Levy-Yeyati and Sturzenegger (2002) and the Bubula and Ötoker-Robe (2002) are used whenever necessary.

#### 4. Empirical results

##### *Determinants of de jure regime choice*

Given the discrete ordinal nature of the dependent variable “regime”, the ordered logit method is used to identify the determinants of *de jure* regime choice. The ordered logit model extends the traditional logit to allow for multiple discrete outcomes that can be ranked. The dependent variable ‘regime’ consists of fixed = 1, intermediate = 2 and floating = 3. Thus, a larger value of the dependent variable indicates a more flexible regime is likely to be adopted for the country in the period under consideration.

First, the potential determinants of the *de jure* exchange rate regime choice are examined. The model is specified as follows:

$$DJRegime_{it} = \beta_1 SHOCKS_{it} + \beta_2 STRUCTURE_{it} + \beta_3 POLITICAL IDEOLOGY_{it} + \varepsilon_{it} \quad (1)$$

All the variables enter the regression contemporaneously, except for banking and balance of payment crises dummy variables, which takes the value 1 if crisis occurred within the past two years since these may have prolonged effects.

Table 1 reports the results of the model specification (1) with and without country fixed effects. Banking and balance of payment (BOP) crises are not found significant to the *de jure* regime choice. Other shocks such as recession and high inflationary episodes are found significant to the flexible regimes being chosen. This is expected as countries might opt to pursue expansionary monetary policy at the time of recession to boost output growth. Similarly, to stabilize high inflation, a country is likely to adopt flexible regime to target real variables such as output or balance of payment as an anchor. Exogenous capital flows, world interest rates and oil price are not significant to the choice of a regime.

Liberalization of credit control, interest rate, entry barriers and privatization process, summarized by the variable *FIN* are highly significant to the choice of a flexible regime. The liberalization of domestic financial sector leads to a better allocation of resources and makes the country more attractive to both domestic and foreign investors (Bacchetta, 1992). Thus, intuitively, a more flexible regime is desirable in a more liberalized economy. But capital and current account liberalization, summarized by *INTL*, has not been found significant to the regime choice. This result can be explained from two angles. First, this is possibly because, capital account liberalization and reversals become more likely with speculative attacks brought about by liberalizing capital restrictions. Second, insignificance of *INTL* on the regime choice points to the fact that capital liberalization is possible under both fixed and floating regime.

Among economic structural variables, while trade openness increases the chance for fixing exchange rate, per capita GDP growth, a proxy for economic development, calls for flexible

exchange rate regime. These findings are consistent with many existing studies (see Poirson, 2001; Von Hagen and Zhou, 2005). The IMF dummy has a positive and significant effect, indicating an influence of the IMF for movement toward flexible regime during the period of IMF stabilization programs<sup>5</sup>. The IMF programs often set some conditionality to reform domestic financial sector that the borrowing country must obey. Hence, the relationship between IMF programs and the choice of a flexible regime is consistent from financial liberalization perspective.

From political institutional perspectives, the coefficients on checks and balances (CHECKS) and index of coalition government (IPC) are negative and significant, indicating that they encourage exchange rate fixity. This implies that they increase the stability and predictability of exchange rates and restraint with which governments regulate firms and citizens (North and Weingast, 1989). The coefficient on LIEC is positive and significant, indicating that electoral competitiveness increases the likelihood of flexibility of exchange rates. A competitive electoral system (LIEC) is possible in a country where financial and economic institutions are better, and in this sense (considering the effect of FIN and GDPPCPPP), LIEC is associated with the choice of a flexible regime.

### *Divergence and learning*

In this subsection, the reasons of divergence and the possibility of learning during the period of divergence are investigated. The dependent variable “divergence” represents consistent = 0 and divergent = 1 regimes. The category divergent includes mainly those cases that deviated from either fixed or floating regime. The ordered logit model is used to analyze the divergence.

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<sup>5</sup> This finding supports the argument of Williamson (2000) that countries often move away from soft pegs because of pressure from the IMF and the U.S. Treasury.

Thus, a larger value of the dependent variable indicates that divergence from fixed or floating regime becomes more likely.

In addition to the variables representing SHOCKS, STRUCTURE, POLITICAL IDEOLOGY, the effect of the difference between the desired level of financial liberalization  $FLI_{it}$  and the current level of financial liberalization,  $FLI_{it-1}$ ,  $\Delta FLI_{it} = FLI_{it} - FLI_{it-1}$  is assessed on divergence. This implies the following ordered logit model specification:

$$Divergence_{it} = \beta_1 SHOCKS_{it} + \beta_2 STRUCTURE_{it} + \beta_3 POLITICAL IDEOLOGY_{it} + \beta_4 \Delta FLI_{it} + \varepsilon_{it} \quad (2)$$

The results of the model specification (2) are reported in Table 2. Various shocks such as recession and BOP crises (except banking crisis) are significant to divergence (or *de facto* regime choice), indicating that shocks dislodge status quo. This finding is consistent with studies that assume that optimal stabilization policy depends on the correlations of shocks between goods and money market (Poole, 1970; Boyer, 1978; McKinnon, 1981). That is, countries often take the exchange rate into account in setting monetary policy and therefore, intervene in the foreign exchange market which reinforces a *de facto* regime. Balance of payment crises (BOP) are positive and significant when country dummies are not included, but becomes insignificant when country dummies are added, suggesting that the factors that lead to a balance of payment crisis also lead to divergence.

The IMF dummy is negative and significant to divergence when country dummies are included, implying that the IMF recommends to be consistent in the choice of a regime during the period of program. The coefficients of the global factors such as capital flows and oil price are negative and significant, indicating that high capital mobility and oil price shock decrease the

probability of divergence. The reason is that a *de jure* regime shields economies from these transitory shocks by providing a nominal anchor.

From political economy perspectives, while multi-party parliamentary government system (SYST) increases divergence, electoral competitiveness (LIEC) decreases the likelihood of divergence. That is, greater contests for political office (SYST) increase uncertainty in the foreign exchange market that may lead the central bank to intervene, that ultimately reinforces a *de facto* regime. As discussed above, LIEC represents competitiveness in the electoral process which becomes more likely in a liberalized financial system; and therefore, LIEC works against divergence as FLI does.

Finally, the coefficient on  $\Delta FLI_{it}$  is negative and significant; implying that an increase in financial liberalization can significantly decrease the probability of divergence. That is, countries create necessary financial institutions during divergent period to attain sustainability of the *de jure* regime, which can be perceived as “learning to *de jure* regime”.

To be sure about the relevance of the learning process with divergence, it is necessary to examine whether the distribution of policy changes varies with the level of financial liberalization in a country. This can be possible by estimating the effects of all explanatory variables interacting with the current level of financial liberalization.

Learning may be possible even from external sources. Therefore, the possibility of external learning by revealing regional “diffusion” in the levels of financial development is also examined here. Domestic learning may be supplemented by international “diffusion” as countries move to global or regional norms to compete for international capital (Simmons and Elkins, 2004). If such an influence is important, countries within a region would be induced to catch up with the highest level of liberalization reached within the region (Abiad and Mody, 2005). Catch



up (CATCHUP) is estimated as the gap between the maximum level of liberalization achieved in the region (OECD, East Asia, South Asia, Latin America, Africa and Middle East) and the level of a country's state of liberalization. We assume that the higher the gap, the probability of divergence would be higher. This implies the following specification:

$$Divergence_{it} = \beta_1 \Delta FLI_{it} + \beta_2 CATCHUP * FLI_{it-1} + \beta_3 SHOCKS_{it} * FLI_{it-1} + \beta_4 \\ STRUCTURE_{it} * FLI_{it-1} + \beta_5 POLITICAL IDEOLOGY_{it} * FLI_{it-1} + \varepsilon_{it} \quad (3)$$

The estimates of the model specification (3) are reported in Table 3. The results show that the effect of regional liberalization gap (CATCHUP) is positive and significant to divergence, implying that the regional gap in financial liberalization increases the uncertainty in the exchange rates (or probability of divergence). This finding may point to the fact that countries try to follow the leader in the region in the choice of a currency regime, but in the end they could not sustain this effort due to their underdeveloped financial sector. In other words, this indicates a regional influence on the choice of a currency regime. This is confirmed as the interaction of regional gap (CATCHUP) with the level of a country's liberalization ( $FLI_{it-1}$ ) is negative and significant, which suggests that an increase in the domestic level of financial liberalization could decrease the probability of divergence induced by regional gap (or pressure).

Table 3 also shows that the interaction of the level of financial liberalization with various variables has changed the positive effect of individual variables on divergence into negative effect, indicating that this positive effect falls away as the level of financial development increases. While openness and high inflation are significant to divergence, the interaction of these variables with financial liberalization can significantly reduce the probability of divergence. The implication is that the factors that led to regime divergence due to exchange rate instability in a highly open economy or high-inflation period, necessary steps toward financial

development could reduce exchange rate uncertainty. Although crises, such as BOP crises and recession dislodge status quo, financial reform at the same time can help reduce the risks of these shocks in the *de jure* regime.

Although the effect of the IMF program is negative to divergence, the coefficient on the interaction term  $IMF*FLI_{t-1}$  is positive and significant at 10% level. This suggests that countries often diverge from the imposed regime (e.g floating) under an IMF program with the progress of financial reforms. The countries that seek IMF assistance are usually less developed or financially repressed, and if they are recommended to adopt a fixed or a floating regime before liberalizing financial sectors to a certain extent, these countries are more likely to face exchange rate uncertainty. This finding raises an interesting policy debate: whether a floating or fixed regime should be adopted before financial liberalization. The findings in this study suggest that countries should move toward financial sector development first and only then can they sustain a regime like fixed or floating.

Table 3 shows that with the exception of the structure of government (SYST), the role of other political institutions (CHECKS, LIEC, IPC) become unfavorable to divergence with a rise in the level of financial liberalization. This implies that a strong financial sector base can help policy makers pursue consistent exchange rate policies that are free from the influence of political institutions.

As Greene (2000) argues, there is no widely accepted method for assessing the goodness-of-fit in ordered logit models. Some commonly used measures, such as McFadden's pseudo- $R^2$ , do not have any interpretation for values between 0 and 1. For this reason, the goodness-of-fit of the estimated models is not discussed here.

### *Duration of divergence and the speed of learning*

Boyer (1978) argues that if shocks arise from both goods and money markets and they tend to be correlated, the optimal exchange rate policy should be intermediate between fixed and floating, but if monetary shocks dominate, the optimal policy is to fix exchange rate and if real shocks dominate, it calls for flexibility. This implies that the choice of a *de facto* regime at time  $t$  depends on the choice of a *de jure* regime at time  $t-1$ , which leads to a Markov process indexed by an interventional parameter.

Thus, the multi-state Markov (MSM) model is applied to estimate intensity of divergence as well the duration of divergence. Since the MSM model has the properties of a survival (duration) model, such as Cox's (1972) proportional hazard model, it allows us to estimate the durability of a divergent regime<sup>6</sup>. Again, under the MSM model, the estimated transition intensity between consistent and divergent regimes allowing for the effect of financial liberalization is considered here as the speed of learning (see Norman, 1972). Because, the intuition is that a country will switch to a *de facto* regime in response to different shocks faced in its *de jure* regime and will stay there (*de facto* regime) for the time being to make the environment conducive to return to the initial *de jure* regime. That is, during the period of divergence, perceived payoffs are updated using new information, which may be referred to as "learning". The results from the previous section indicate that learning about the *de jure* regime mainly involves the process of financial reforms undertaken during the period of divergence.

Hence, the transition intensity,  $\theta$ , is estimated in a reduced form specification of the MSM model as follows:

$$\theta_{ij}(t | FLI) = \theta_{ij} e^{\beta_{ij} FLI_t}, \quad i, j = 0, 1. \quad (4)$$

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<sup>6</sup> For details of the MSM model, see Kay (1986), Marshall and Jones (1995).

where  $\theta$  is specified as a non-linear function of financial liberalization. In Eq. (4),  $\theta_{ij}$  represents transition intensities between consistent (0) and divergent (1) regimes, and  $\beta_{ij}$  represents the coefficient of  $FLI_t$  (the details of the MSM model estimation is discussed in Appendix III).

Table 4 (Panel A) reports the estimated rates of divergence and convergence ( $\theta$ ). The estimated rate of divergence is 0.06 and convergence is 0.11, that is, the rate of convergence is relatively higher than the rate of divergence with the effects of financial liberalization. This implies that the authority learns that financial sector development is an important factor for the choice of a fixed or floating regime.

To have an idea about the durability of divergence, the durability of a regime is estimated from the MSM model following the equation:

$$T_s = \int_{t_1}^{t_2} P(t)_{r,s} dt \quad (5)$$

where  $r$  is the regime at the start of the process and  $P(t)$  represents transition probability. The estimated total time a country stays in the divergent regime is shown in Table 4 (Panel B). The estimated total time of divergence is 6.8 years, which is around one fourth of the total period covered. The findings in this section indicate that countries work toward establishing necessary environment that can help them converge to the official exchange rate regime. In essence, these evidences suggest that the countries that diverge from the *de jure* regime remain reasonably close to the *de jure* regime, and thus, credibility concerns lead policy makers not to declare officially when they diverge.

To sum up, the empirical analysis in this section has dealt with two questions: one, what factors can determine a country's *de jure* regime choice? And, two, why do they deviate from the chosen *de jure* regime? The empirical results show that the *de jure* regime choice can be

explained by the traditional variables “shocks” and “economic fundamentals” along with non-traditional financial and political institutional variables. For example, while economic recession, high inflationary episodes, financial liberalization, legislative electoral competitiveness, per capita GDP growth and IMF stabilization program significantly increase the likelihood of choosing a flexible regime, trade openness, checks and balance, multi-party coalition government are significant to the fixed regime choice. On the other hand, various shocks such as balance of payment crisis, recession, high per capita GDP growth (growth shock) and parliamentary government system (political shock) lead countries to diverge from the *de jure* regime. These findings are largely consistent with the predictions of the “fear of floating” (Calvo and Reinhart, 2002) or “fear of pegging” (Levy-Yeyati and Sturzenegger, 2002) literature. However, this study shows that financial reforms can shield economies from the shocks that dislodge status quo.

Hence, the above two sets of findings confirm that if countries choose a fixed or floating regime *de jure* without having strong financial and political institutions, they are more likely to experience various shocks in these regimes that ultimately lead to divergence.

## 5. Conclusion

This study provides a comprehensive analysis on the choice of an exchange rate regime. The empirical results indicate that fundamentals, shocks and political and financial institutional variables provide relevant guidance to the *de jure* regime choice. However, more importantly, by analyzing the divergence this study focuses on the role of institutional aspects in explaining the choice of a regime. The analysis shows that countries with weak financial institutions often diverge from the *de jure* fixed or floating regime in the face of various shocks. But they work

toward increasing the level of financial development (liberalization) during the period of divergence, and in this way they taper off the risks of the initially chosen *de jure* regime. Hence, the period of divergence can be viewed as the “period of learning” as to how to increase the sustainability of the *de jure* regime, in other words, how to reduce the risks associated with the *de jure* fixed or floating regime.

The role of political institutions on the divergence becomes insignificant or unfavorable with the rise of the level of financial development. Therefore, it may be argued that the development of a country’s financial sector is very important for choosing and sustaining either a fixed or a floating regime.

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TABLE 1

*The determinants of de jure regime choice (ordered logit model estimates)*

	With country fixed effect			Without country fixed effect		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
INTL	-0.01	0.13	0.94	-0.01	0.13	0.97
FIN	0.22	0.04	0.00	0.22	0.04	0.00
BANK	-0.37	0.35	0.29	-0.37	0.34	0.28
IMF	0.72	0.22	0.00	0.76	0.22	0.00
SYST	-0.09	0.11	0.44	-0.10	0.11	0.37
IPC	-0.25	0.12	0.03	-0.24	0.11	0.04
CHECKS	-0.15	0.07	0.03	-0.16	0.07	0.02
EIEC	-0.09	0.08	0.25	-0.09	0.08	0.24
LIEC	0.32	0.09	0.00	0.32	0.08	0.00
OPEN	-0.01	0.00	0.00	-0.01	0.00	0.00
CAPFLOW	0.00	0.00	0.94	0.00	0.00	0.74
USINT	-0.05	0.10	0.66	0.00	0.06	0.95
GDPPCPPP	0.00	0.00	0.00	0.00	0.00	0.00
OILPRICE	0.02	0.04	0.62	0.00	0.02	0.99
RECESSION	0.61	0.29	0.04	0.57	0.28	0.05
HINFL	1.15	0.43	0.01	1.17	0.42	0.01
HYPERINFL	-0.81	0.51	0.12	-0.83	0.50	0.10
BOP	-0.15	0.26	0.56	-0.14	0.25	0.58
Log Likelihood		-570.37			-573.26	
Wald test of joint significance (p-val)		0.00			0.00	
Observations		586			586	

TABLE 2

*Determinants of divergence (de facto regime choice)*

	With country fixed effect			Without country fixed effect		
	Coef.	Std. Err.	P>z	Coef.	Std. Err.	P>z
ΔFLI	-0.19	0.10	0.06	-0.15	0.08	0.05
BANK	-0.53	0.45	0.23	-0.20	0.37	0.59
IMF	-0.79	0.30	0.01	-0.04	0.23	0.86
SYST	0.69	0.32	0.03	0.53	0.13	0.00
IPC	0.21	0.18	0.24	0.11	0.12	0.34
CHECKS	-0.23	0.11	0.04	0.06	0.07	0.42
LIEC	-0.01	0.10	0.91	-0.17	0.06	0.01
OPEN	0.00	0.01	0.68	0.00	0.00	0.91
CAPFLOW	-0.01	0.00	0.00	-0.01	0.00	0.00
USINT	0.07	0.08	0.41	0.08	0.07	0.24
GDPPCPPP	0.00	0.00	0.01	0.00	0.00	0.00
OILPRICE	-0.06	0.03	0.02	-0.05	0.02	0.02
RECESSION	0.28	0.35	0.43	0.61	0.29	0.03
HINFL	0.02	0.66	0.97	0.01	0.42	0.99
HYPERINFL	-0.55	0.70	0.43	-0.18	0.52	0.73
BOP	0.32	0.31	0.30	0.50	0.25	0.05
Log Likelihood		-467.64			-572.50	
Wald Test of joint significance (p-val)		0.00			0.00	
Observations		586			586	

TABLE 3

*Assessing learning during divergence*

	Coef.	Std. Err.	P>z
$\Delta$ FLI	-0.18	0.08	0.03
BANK	-0.45	0.75	0.55
BANK*FLI <sub>t-1</sub>	0.66	1.50	0.66
IMF	-0.58	0.38	0.13
IMF*FLI <sub>t-1</sub>	1.62	0.95	0.09
SYST	-0.45	0.26	0.08
SYST*FLI <sub>t-1</sub>	2.39	0.56	0.00
IPC	-0.10	0.24	0.69
IPC*FLI <sub>t-1</sub>	0.51	0.42	0.23
CHECKS	0.42	0.16	0.01
CHECKS*FLI <sub>t-1</sub>	-0.71	0.29	0.02
LIEC	-0.19	0.11	0.08
LIEC*FLI <sub>t-1</sub>	-0.39	0.23	0.09
OPEN	0.06	0.01	0.00
OPEN*FLI <sub>t-1</sub>	-0.08	0.01	0.00
CATCHUP	1.64	0.68	0.02
CATCHUP*FLI <sub>t-1</sub>	-2.95	1.96	0.13
CAPFLOW	-0.01	0.01	0.19
CAPFLOW*FLI <sub>t-1</sub>	0.00	0.01	0.80
USINT	-0.09	0.13	0.47
USINT*FLI <sub>t-1</sub>	0.21	0.23	0.37
GDPPCPPP	0.00	0.00	0.00
GDPPCPPP*FLI <sub>t-1</sub>	0.00	0.00	0.00
OILPRICE	-0.05	0.04	0.18
OILPRICE*FLI <sub>t-1</sub>	0.04	0.08	0.61
RECESSION	0.73	0.31	0.02
RECESSION*FLI <sub>t-1</sub>	-0.96	1.00	0.34
HINFL	2.29	0.89	0.01
HINF*FLI <sub>t-1</sub>	-4.27	1.52	0.01
HYPERINFL	-0.41	1.08	0.70
HYPERINFL*FLI <sub>t-1</sub>	-0.22	2.28	0.92
BOP	1.01	0.46	0.03
BOP*FLI <sub>t-1</sub>	-0.97	0.86	0.26
Log Likelihood		-416.66	
Observations		586	

TABLE 4

*Multi-state Markov model estimates*

A. Estimated transition intensity		
	Divergence from <i>de jure</i>	Convergence to <i>de jure</i>
Estimated transition intensity	0.06 (0.014)	0.11 (0.02)

  

B. Estimated durability		
	In <i>de jure</i> regime	In <i>de facto</i> regime
Total staying time (1973-97)	18.11 years	6.8 years

*Note:* Standard errors are in parentheses

**APPENDIX I**

*List of sampled 34 countries across regions*

OECD countries	East Asia	South Asia	Latin America	Africa and Middle East
Australia	Indonesia	Bangladesh	Argentina	Egypt
Canada	Korea	India	Brazil	Ghana
France	Malaysia	Nepal	Chile	Israel
Germany	Philippines	Pakistan	Colombia	Morocco
Italy	Singapore	Sri Lanka	Mexico	South Africa
Japan	Thailand		Peru	Zimbabwe
New Zealand			Venezuela	
Turkey				
United Kingdom				
United States				

## APPENDIX II

### DESCRIPTION OF INSTITUTIONAL DATA

#### A. Financial Liberalization Index

The financial liberalization index, developed by Abiad and Mody (2005), which considers various financial sector policies in 35 countries over the period 1973-1996 is used in this study. Six policy dimensions are inputs to the creation of an aggregate index of the degree of policy liberalization. These include:

- (a) Credit controls, such as directed credit toward favored sectors or industries, ceilings on credit toward other sectors, and excessively high reserve requirements;
- (b) Interest rate controls, including whether the government directly controls interest rates, or whether floors, ceilings, or interest rate bands exist;
- (c) Entry barriers in the banking sector, such as licensing requirements, limits on the participation of foreign banks, and restrictions relating to bank specialization or the establishment of universal banks;
- (d) Operational restrictions included restrictions on staffing, branching and advertising, and the establishment of securities markets;
- (e) Privatization in the financial sector, and
- (f) Restrictions on international financial transactions, such as on capital and current account convertibility, and the use of multiple exchange rates.

Along each dimension, a country is given a score on a graded scale, with zero corresponding to being fully repressed, one to partially repressed, two to largely liberalized, and three to fully liberalized. Policy changes, then, denote shifts in a country's score on this scale in a given year. In some cases, such as when state-owned banks are privatized all at once, or when controls on all

interest rates are simultaneously abolished, policy changes correspond to jumps of more than one unit along that dimension. Reversals, such as the imposition of capital controls or interest rate controls, are recorded as shifts from a higher to a lower score.

## B. Political Institutional Variables

The following political institutional variables are taken from the data on political indices (DPI) of the World Bank (see Beck et al. 2000).

### 1. SYSTEM

Codes:

Presidential	0
Assembly-elected President	1
Parliamentary	2

Systems with unelected executives (those scoring a 2 or 3 on the Executive Index of Electoral Competitiveness – to be defined below) get a 0. Systems with presidents who are elected directly or by an electoral college (whose *only* function is to elect the president), in cases where there is no prime minister, also receive a 0. In systems with both a prime minister (PM) and a president, the following factors are considered in order to categorize the system:

- a) *Veto power*: president can veto legislation and the parliament needs a supermajority to override the veto.
- b) *Appoint prime minister*: president can appoint *and* dismiss prime minister and/or other ministers.
- c) *Dissolve parliament*: president can dissolve parliament and call for new elections.

d) *Mentioning in sources*: If the sources mention the president more often than the PM then this serves as an additional indicator to call the system presidential (Romania, Kyrgyzstan, Estonia, Yugoslavia).

The system is presidential if (a) is true, or if (b) and (c) are true. If no information or ambiguous information on (a), (b), (c), then (d). Countries in which the legislature elects the chief executive are parliamentary (2), with the following exception: if that assembly or group cannot easily recall him (if they need a 2/3 vote to impeach, or must dissolve themselves while forcing him out) then the system gets a 1.

## 2. Legislative Indices of Electoral Competitiveness (LIEC):

Codes:

No legislature	1
Unelected legislature	2
Elected, 1 candidate	3
1 party, multiple candidates	4
Multiple parties are legal but only one party won seats	5
Multiple parties DID win seats but the largest party received more than 75% of the seats	6
Largest party got less than 75%	7

## 3. Executive Indices of Electoral Competitiveness (EIEC):

This index uses the same scale as LIEC. Executives who are elected directly by population, or elected by an electoral college that is elected by the people and has the sole purpose of electing the executive, are scored on the above scale.

## 4. Index of Political Cohesion (IPC)

In order to devise this index, the criteria are based on Roubini and Sachs (1989). The index takes values 1, 2 and 3 representing number of parties in the coalition government. If there are 3 or more parties ruling the government, IPC takes the value 3.



## 5. CHECKS

CHECKS equals one if LIEC or EIEC is less than 5—countries where legislatures are not competitively elected are considered countries where only the executive wields a check.

In countries where LIEC and EIEC are greater than or equal to 5:

- CHECKS is incremented by one if there is a chief executive (it is blank or NA if not).
- CHECKS is incremented by one if the chief executive is competitively elected (EIEC greater than six).
- CHECKS is incremented by one if the opposition controls the legislature.

In presidential systems, CHECKS is incremented by one:

- for each chamber of the legislature UNLESS the president's party has a majority in the lower house AND a closed list system is in effect (implying stronger presidential control of his/her party, and therefore of the legislature).
- for each party coded as allied with the president's party and which has an ideological (left-right-center) orientation closer to that of the main opposition party than to that of the president's party.

In parliamentary systems, CHECKS is incremented by one:

- for every party in the government coalition as long as parties are needed to maintain a majority.
- for every party in the government coalition that has a position on economic issues (right-left-center) closer to the largest opposition party than to the party of the executive.

In parliamentary systems, the prime minister's party is *not* counted as a check if there is a closed rule in place – the prime minister is presumed in this case to fully control the party.

## APPENDIX III

### The Multi-state Markov model

We have used a continuous time multi-state Markov (MSM) chain model which gives the estimates of transition intensities as a non-linear function of explanatory variables by taking into account the “duration” of a regime explicitly (see Kay, 1986; Marshall and Jones, 1995). Note that the Markov model assumes that transition to an alternative regime depends on the current regime, irrespective of past history. Masson (2001) argues that although this assumption appears to be somewhat restrictive, as a first approximation, the Markov model would seem to be an adequate framework for examining exchange rate regime transitions as “it supposes that a typical currency will face the same likelihood that some shock will push it to an alternative regime” (p. 573).

The model is specified as

$$\theta_{ij}(t/z) = \theta_{ij} e^{\beta_{ij}Z}, \quad (i, j = 0, 1) \quad (\text{A1})$$

where  $\theta_{ij}$  represents baseline parameters (transition intensities),  $Z$  denotes the vector of explanatory variables and  $\beta_{ij}$  denotes the coefficients of explanatory variables on the transition from regime  $i$  to  $j$ . The transition intensities,  $\lambda_{ij}$ , can be defined as

$$\theta_{ij} = \lim_{\Delta t \rightarrow 0} \frac{\text{Pr}\{\text{transition from state } i \rightarrow j \text{ in } (t, t + \Delta t] \mid \text{state } i \text{ at time } t\}}{\Delta t}. \quad (\text{A2})$$

The MSM model considers that countries often make transitions and reverse transitions among two regimes— consistent (0) and divergent (1). It is assumed that there is no absorbing state (i.e. state of death) in the exchange rate regime transition process. The transition intensity matrix is defined as,

$$\Gamma = \begin{pmatrix} -\theta_{01} & \theta_{01} \\ -\theta_{10} & \theta_{10} \end{pmatrix}.$$

The elements of the matrix  $\Gamma$ ,  $\theta_{ij}$ 's are defined in (A2). Assume that the transition intensities i.e. instantaneous rate of transition are independent of time and the intensities follow the property  $\theta_{ii} = -\sum_{i \neq j} \theta_{ij}$ ;  $i, j = 0, 1$  that is, *row sum is zero*.

The relationship between the transition probability matrix  $\mathbf{P}(t)$  and the transition intensity matrix  $\Gamma$  can be established with the Kolmogorov forward differential equation

$$\frac{\partial \mathbf{P}(t)}{\partial t} = \mathbf{P}(t)\Gamma, \quad (\text{A3})$$

where the  $(i,j)$ th element of the matrix  $\mathbf{P}(t)$ ,  $p_{ij}$  ( $i, j = 0, 1$ ) represents the probability of transition from state  $i$  to  $j$  in a time interval  $t$ . Thus the transition probability matrix  $\mathbf{P}(t)$  can be expressed as

$$\mathbf{P}(t) = \begin{pmatrix} p_{00} & p_{01} \\ p_{10} & p_{11} \end{pmatrix}. \quad (\text{A4})$$

The MSM model is estimated in this paper using the “msm” package of **R** software.