

# **Session 5: Implications for Emerging-Market Economies**

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# Exchange Rate Regimes and Economic Growth in Emerging Markets

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## Introduction

The choice of exchange rate regimes in emerging-market economies has generated ongoing interest in the field of economics. This discussion has been rekindled in recent years as a result of a series of economic crises in emerging markets (such as Mexico, Southeast Asia, Russia, and Brazil) in which unsustainable exchange rate regimes were widely perceived to have been a determinant of these crises. As a result, the adequacy of exchange rate arrangements is one of the key issues being discussed in international forums, such as the International Monetary Fund (IMF), the G-7, and the G-20. One aspect of this debate is the notion that in a world of increasing international capital mobility, only polar regimes (i.e., hard pegs—such as currency boards and monetary unions—or floating exchange rate regimes) are likely to be sustainable.<sup>1</sup> This proposition, however, is fairly controversial. Indeed, some believe that intermediate regimes are, and will continue to be, a viable option for emerging markets (for example, see Williamson 2000).

An important question that arises in this debate is whether the nature of the exchange rate regime influences economic performance. While previous research in this area has focused on the possible effect of exchange rate

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1. Eichengreen (1998) and Obstfeld and Rogoff (1995), among others, have made this point.

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regimes on inflation performance and output variability, this paper examines whether the choice of regime can affect a country's growth performance.<sup>2</sup>

Economic theory suggests that the nature of the regime should not affect the long-run equilibrium value of real variables, but that it can influence the adjustment process.<sup>3</sup> One would expect, therefore, that the real exchange rate would eventually return to its long-run equilibrium following an economic shock, regardless of the nature of the regime. The transitional dynamics, however, can vary for different types of regimes. With the price rigidities in the goods and labour markets, for instance, one might expect a smoother transition to the new equilibrium under a more flexible exchange rate regime. A more flexible arrangement is also less likely to generate persistent misalignments in exchange markets, which may result in an economic crisis. On the other hand, many believe that flexible exchange rates are inherently volatile and prone to misalignments.<sup>4</sup> Thus, exchange rate shocks, which are more closely identified with flexible regimes, could affect resource allocation decisions. Furthermore, countries with underdeveloped or weak financial systems are also likely to have problems accommodating large exchange rate movements under flexible regimes. Consequently, the type of exchange rate regime could influence an economy's growth performance through its effects on the adjustment process.

The objective of our paper is to investigate empirically the implications of the exchange rate regime for economic growth. Previous empirical work in this area has failed to identify a robust relationship between the choice of the exchange rate regime and growth. Several authors, including Calvo and Reinhart (2000), have noted that this could be the result of measurement error in the classification of exchange rate arrangements. Most studies are based on the IMF's official exchange rate classification, which is based on self-classification by member countries. In most studies, however, no effort is made to ensure that this *de jure* classification is consistent with actual practice. Our study addresses this issue by using two different classification

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2. See Edwards and Savastano (1999) for a review of this literature, which comprises both individual- and multi-country studies.

3. For instance, Helpman (1981) and Lucas (1982) have shown—in models with perfect foresight—that the nature of the regime does not affect the long-run equilibrium allocation of resources. Others, such as Mundell (1968), have emphasized that, even though the long-run equilibrium is the same, the adjustment process towards the equilibrium will be different in fixed and flexible regimes.

4. Baxter and Stockman (1989) and Flood and Rose (1995) provide evidence of heightened exchange rate volatility after the collapse of the Bretton Woods regime. Caporale and Pittis (1995) show that the nature of the regime can affect the persistence of economic shocks.

schemes: the official designation and a classification based, in part, on the observed degree of exchange rate flexibility.

Our paper also differs from existing work in that we investigate the effect of the exchange rate regime on *medium-term* growth, averaging the data over a five-year period, as opposed to using annual data, as do Ghosh et al. (1997).<sup>5</sup> Using five-year periods is typical in the empirical-growth literature, since this interval is thought to be long enough to eliminate business cycle effects, but short enough to capture important changes that occur over time for a particular country. Another distinguishing feature of our study is that we consider the possibility that the effect of the exchange rate regime on growth may depend on a country's degree of openness to international trade and capital flows and on its level of financial sector development.

We estimate the impact of the type of exchange rate regime on growth using a panel-data set of 25 emerging-market economies over the 1973–98 period in a framework that controls for other determinants of growth, while accounting for country-specific effects and for the presence of global shocks. We find evidence that more flexible exchange rate arrangements are associated with higher economic growth, but only for countries that are relatively open to international capital flows and, to a lesser extent, that have well-developed financial markets. While we originally found a similar result with respect to international trade, this evidence was not robust to the presence of a few outliers. Finally, our results also suggest that a change in the exchange rate regime is associated with lower economic growth.

Our paper is organized as follows. Section 1 reviews the key theoretical arguments that motivate our empirical investigation. In section 2, we outline our exchange rate regime classification schemes. The empirical methodology is described in section 3, and the estimation results are presented in section 4. Conclusions follow.

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5. Ghosh et al. (1997) produced the only other cross-country study that, to our knowledge, has examined the potential implications of exchange rate regimes for growth in an econometric framework that controls for other determinants of growth. Their study, using data on 136 countries over the period from 1960 to 1989, finds no systematic differences in growth rates across exchange rate regimes. The IMF (1997) found a similar result when extending the period of analysis to the mid-1990s. The latter study, however, does not control for other determinants of growth.

## 1 Exchange Rate Regimes and Economic Growth

Although economic theory suggests that the type of exchange rate arrangement may matter for growth, it does not clearly ascertain what type of arrangement would be more likely to promote growth. The theoretical literature on the subject is quite thin and usually derived from studies that are *indirectly* linked to growth, such as export growth or currency crises. Our review of the literature, therefore, is selective and directed at the hypotheses that we wish to test. We consider four hypotheses on how the exchange rate regime could accept growth.

First, we test whether the degree of flexibility of the exchange rate regime influences economic growth. Theory does provide some guidance on how different exchange rate arrangements could influence growth, but it does not yield a clear-cut prediction in terms of whether a flexible regime would be more likely to promote higher growth. It has been argued that a more flexible arrangement may foster growth, since it will enable an economy characterized by nominal rigidities to absorb and adapt to economic shocks more easily, because exchange rate movements can act as shock absorbers. A flexible exchange rate also allows a country to have an independent monetary policy, providing the economy with another means to accommodate domestic and foreign shocks. When the adjustment to shocks is smoother, one would expect productivity growth to be higher, given that the economy is, on average, operating closer to capacity.

Some would contend, however, that a more flexible regime is more prone to exchange rate shocks, which might dampen growth. The point has also been made that many emerging-market economies have not benefited from an independent monetary policy because of poor macroeconomic policy management, and that they are better off fixing their exchange rate to a hard currency. Our first hypothesis, therefore, is that the nature of the exchange rate regime influences economic growth, although it is unclear, a priori, whether a more or less flexible arrangement will tend to be associated with higher growth.<sup>6</sup>

Second, we test for evidence that a change in regime is associated with lower economic growth. As discussed in Masson (2000), countries frequently alter their exchange rate arrangements, voluntarily or otherwise. When a country is forced to abandon its exchange rate regime because it has become unsustainable, a costly crisis can ensue. The 1990s witnessed many

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6. Properly stated, our null hypothesis is that the exchange rate regime has *no* effect on economic growth, since we test for its effect on growth by examining whether the coefficient on the exchange rate regime variable is statistically different from zero. The same applies to the other three hypotheses that we test.

such episodes with countries on fixed, but adjustable, exchange rate arrangements. Some economists, notably Obstfeld and Rogoff (1995), have argued that these regimes have a limited chance of survival in a world of integrated capital markets and that they will eventually break down.<sup>7</sup>

Pegged exchange rates are a form of implicit guarantee and can, therefore, be a source of moral hazard. As such, they may promote unhedged foreign currency borrowing and encourage less than prudent foreign currency exposure by domestic financial intermediaries or non-financial corporations. The main cost of pegged exchange rate regimes follows from their periodic breakdowns.<sup>8</sup> These costs greatly exceed estimates of direct costs of misalignments under either regime, particularly when the currency crisis is associated with a banking crisis.<sup>9</sup> Consequently, the second hypothesis that we test is whether a change in regime is linked to lower economic growth, since such a change is often associated with a costly crisis.<sup>10</sup>

Third, the degree of openness of the economy to international markets, in conjunction with the nature of the exchange rate regime, could affect a country's growth. We test whether the effect of the regime on growth will be more pronounced in countries that are relatively more open to international trade and capital flows. The endogenous-growth literature has established a positive link between openness to international trade and economic growth,

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7. They note that the number of long-lived fixed exchange rate regimes still remaining in the mid-1990s was rather small. Apart from very small open economies, only six important countries had maintained a fixed exchange rate for five years or more: Austria, Hong Kong, Luxembourg, the Netherlands, Saudi Arabia, and Thailand.

8. The link between regimes and currency crashes is not clear-cut. An IMF survey paper notes that of the 116 currency crashes (defined as having a depreciation of at least 25 per cent and a 10 per cent increase in the rate of depreciation over the previous year) that took place between 1975 and 1996, close to half were under flexible regimes (IMF 1997, 91). However, this somewhat counterintuitive observation could also reflect the fact that many exchange rate regimes might have been improperly classified as flexible when they were, in fact, pegged regimes.

9. By one estimate, for instance, the public sector bailout costs of resolving banking crises in developing countries over the 1980–95 period have amounted to around US \$250 billion (Honohan 1997). In more than a dozen of these cases, the public sector resolution costs amounted to 10 per cent or more of the country's GDP and exceeded this level for the main countries affected by the Asian financial crisis (Goldstein, Kaminsky, and Reinhart 2000, 2). The costs of currency crises have also been significant. Goldstein, Kaminsky, and Reinhart (2000, 88) found that it can take between two and three years for economic growth to return to its pre-crisis average.

10. We are not making any assumptions about causality here. Indeed, it is not unreasonable to expect that a change in regime could precede an economic crisis.

since countries that are more open to international trade will tend to grow more rapidly, because they have developed a greater ability to absorb technological advances and can take advantage of larger markets (Edwards 1993; Barro and Sala-i-Martin 1995). Although the link between international trade and growth has received more attention in the growth literature, openness to international capital flows can also be an important engine of growth. As emphasized by Bailliu (2000), international capital flows can promote growth by increasing the domestic investment rate, by leading to investments associated with positive spillovers, and/or by increasing domestic financial intermediation. Thus, to the extent that the nature of the exchange rate regime influences the volume of international trade and capital flows, this could translate into an effect on growth.

The literature suggests that international trade is influenced by the type of exchange rate arrangement, but does not clearly predict which regime is more likely to foster international trade. It has been suggested that trade should be higher under fixed arrangements, since exchange rate volatility and uncertainty will be lower, which will tend to reduce the cost of trade and, hence, increase its volume.<sup>11</sup> But it has also been argued that flexible regimes are more supportive of export growth, because they are less likely to create conditions for persistent misalignments.<sup>12</sup> Regardless of the degree of flexibility of the regime, however, the effects of the exchange rate arrangement on growth through the trade channel are likely to be more pronounced for countries that are more open to international trade. Therefore, we test whether the effect of the exchange rate regime on growth is influenced by a country's degree of openness to international trade.

A similar hypothesis is tested for the link between exchange rate regimes, openness to international capital markets, and growth. We explore the notion that the benefits of international capital flows for growth might be more pronounced for a country with a more flexible exchange rate arrangement. Capital flows could be more likely to promote growth under a flexible regime, because a more fixed arrangement can be associated with an increase in speculative capital flows. Indeed, it has been argued that capital flows to emerging markets in the 1990s were often encouraged by implicit government guarantees, such as a fixed or quasi-fixed exchange rate

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11. Rose (2000) found evidence that currency unions have a positive effect on international trade, and that exchange rate volatility exerts a negative influence. Frankel (1997) has argued that fixed exchange rates promote trade growth, notably in currency unions.

12. Nilsson and Nilsson (2000), using a gravity model and export flows for more than 100 countries, found that more flexible regimes favour export growth and, by implication, output growth.

regime.<sup>13</sup> Capital flows occurring in this context are less likely to foster growth if they are channelled into unproductive investments.<sup>14</sup>

Finally, we test the hypothesis that a country must have fairly well-developed financial markets to benefit from a flexible exchange rate arrangement. Flexible arrangements are generally associated with increased nominal exchange rate volatility, which, in turn, can dampen growth by reducing investment and international trade. Thus, a country is likely to perform better under a flexible regime if it has a reasonably well-developed domestic financial system with the ability to absorb exchange rate shocks and with appropriate instruments to hedge against exchange rate volatility. Aizenman and Hausmann (2000) note that most emerging-market economies have shallow capital markets. Producers rely mostly on domestic credit to finance their capital needs, since the local market is often segmented from the international market owing to country-specific risks. In the model that they develop to reflect these stylized facts, greater exchange rate stability lowers interest rates (i.e., risk premiums), thereby increasing output. However, greater access to global capital markets reduces the real interest rate benefits from exchange rate stability and increases the optimal flexibility of exchange rates. Aizenman and Hausmann suggest that the gains from fixing the exchange rate may be greater for emerging-market economies than for OECD countries.

Although the effects of financial sector development on growth might be more pronounced for countries with more flexible exchange rate arrangements, a sound and well-developed financial sector is important for growth, regardless of the type of arrangement. A large body of work, reviewed by Levine (1997), has shown how the existing level of development of the financial system—reflected in its ability to exercise functions such as mobilizing savings, helping to allocate capital, and facilitating risk management—can promote growth through its effects on capital accumulation.<sup>15</sup> In addition, empirical evidence supports the view that a

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13. Dooley (1994), among others, has made this point.

14. For example, Krugman (1998) and Corsetti, Pesenti, and Roubini (1998) develop models where foreign creditors believe they will be bailed out by the government and, hence, lend to local banks, which then channel these capital flows into largely unproductive investments. The banks have an incentive to engage in *excessive* risky lending, because their liabilities are implicitly guaranteed by the government. (They are also poorly regulated.)

15. A more developed financial system can promote growth by increasing the efficiency with which savings are allocated to investment and/or by improving the allocation of capital.

well-functioning financial system contributes to economic growth.<sup>16</sup> Empirical studies of the contribution of financial systems and financial development to GDP per capita growth generally find a positive association (Goldsmith 1969; King and Levine 1993).

A banking crisis is more likely to occur under a fixed exchange rate regime, particularly if the banking sector is underdeveloped and poorly regulated. Chang and Velasco (2000) argue that a hard peg makes balance-of-payment crises less likely only by making banking crises more likely. In contrast, a flexible exchange rate arrangement may help avoid a crisis, provided that bank deposits are denominated in domestic currency and that the central bank stands ready to act as lender of last resort. Caballero and Krishnamurthy (1999) show that weak financial links, when combined with underdeveloped domestic financial markets, can account for the chief features of recent financial crises.<sup>17</sup>

## 2 Exchange Rate Regime Classification

As noted earlier, few studies have been able to identify a robust relationship between economic activity and the nature of the exchange regime. Several authors note that this could be the result of measurement error in the classification of exchange rate arrangements. We propose to augment our empirical analysis with an alternative exchange rate classification scheme that seeks to more accurately reflect the degree of exchange rate flexibility.

The IMF's official exchange rate classification is based on self-identification by member countries.<sup>18</sup> No effort is made to ensure that this *de jure* classification is consistent with actual practice. It is possible, therefore, to identify instances in which actual regimes differ from the stated arrangements. Levy Yeyati and Sturzenegger (1999) find that of the 35 countries identified in 1998 as free floats, 12 (all of them emerging-market countries) could not, in fact, be considered floaters. Calvo and Reinhart (2000) conclude, more forcefully, that most countries identifying themselves as

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16. Causality in this case is not unidirectional, however. Economic activity and technological innovation affect the structure and quality of financial systems. Moreover, as Levine (1997) points out, other factors, such as a country's legal system and political institutions, drive both financial and economic development at critical junctures in the growth process.

17. Firms in economies with underdeveloped financial markets—denoting a scarcity of domestic collateral in their model—systematically underestimate the social value of their access to international capital markets. As a result, these economies arrive in downturns unprepared, and they experience costly crises. In addition, a fall in asset prices can compromise the banks' balance sheets and result in a domestic credit crunch.

18. The IMF publishes this classification annually in its *Annual Report on Exchange Arrangements and Exchange Restrictions*.

floaters actually follow more rigid exchange rate arrangements. They dub this phenomenon “fear of floating.” The conclusion that countries have through time moved from fixed to more flexible arrangements, is thus debatable, and this clearly has implications for empirical analysis.

The literature on de facto exchange rate classifications is slowly developing. The most important contributions have been those of Levy Yeyati and Sturzenegger and Calvo and Reinhart. These studies focus on the relationship between exchange rate regimes and volatility of the exchange rate and international reserves. In theory, more flexible arrangements should exhibit greater nominal exchange rate volatility and lower international reserve volatility for given terms-of-trade shocks than would more rigid arrangements. Using cluster analysis, Levy Yeyati and Sturzenegger find that 26 per cent of the countries examined follow an exchange rate arrangement that is different from their de jure regime. The majority of these cases were concentrated in emerging markets. Calvo and Reinhart, using more traditional economic analysis and accounting for movements in commodity prices, arrive at a similar conclusion.

Using exchange rate and international reserve volatility as conditioning information for a de facto classification of exchange rate arrangements is a promising avenue. There are, however, two main drawbacks to such an approach. First, as noted by Panizza, Stein, and Hausmann (2000), external shocks can lead to errors in interpreting the true nature of the regime. Large shocks might lead to sharp revaluations of pegged currencies, while floating currencies experiencing limited external shocks might exhibit little volatility. The importance of external shocks in the determination of exchange rate volatility is noted by Calvo and Reinhart. Second, it is not apparent how one can control (apart from through direct observation) for the higher volatility that is associated with fixed regimes undergoing revaluations.<sup>19</sup>

We propose a two-step hybrid mechanical rule (HMR) that classifies exchange rate regimes in terms of their observed flexibility and that takes into account external shocks and revaluations. We adopt the tripartite official classification of Ghosh et al. (1997), in which regimes are classified as fixed, intermediate, or flexible.<sup>20</sup>

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19. Panizza, Stein, and Hausmann propose an interesting indicator of the degree to which countries intervene in foreign exchange markets. It is defined as the ratio of the standard deviation of monthly percentage changes in the nominal exchange rate to the standard deviation of international reserves/M2 for a given year. This methodology, however, is subject to the caveats identified in the text.

20. Single currency and basket pegs are classified as fixed exchange rate regimes. Intermediate regimes include unclassified floats and floats within a predetermined range. Flexible arrangements include those that allow the currency to float without a predetermined range and those that are pure floats.

Our algorithm is based on observed nominal exchange rate volatility, as well as the official classification.<sup>21</sup> In the first step, we classify countries that describe themselves as fixed regimes, since the literature has identified a bias for declaring exchange rate arrangements as being more flexible than they actually are. This rule reduces the probability of identifying currency revaluations in fixed regimes (which induce significant volatility) as representing flexible regimes. We classify as fixed all regimes in which exchange rate volatility is less than 0.45 percentage points over a given year. This threshold, while arbitrary, is broadly consistent with the IMF's survey: most de jure fixed arrangements in our sample show exchange rate volatility of less than 0.45 percentage points. This scheme allows us to classify the following arrangements as fixed: currency boards, straight pegs, crawling pegs, and narrow trading bands.

Identifying intermediate and flexible regimes is based entirely on observed exchange rate volatility. To control for external shocks, which we assume are principally related to terms-of-trade shocks, we group the countries in our sample into regional blocks. We then develop an exchange rate flexibility index based on the degree of exchange rate volatility relative to the regional average for each year of our sample period. Countries whose flexibility index is greater than 1 are considered flexible; the others fall into the intermediate category.

Using the regional average exchange rate volatility as a proxy for terms-of-trade shocks assumes a broad conformity of regional trade patterns. We believe that this is a reasonable assumption, since the countries in the identified regions share characteristics and may often be subject to common shocks, at least to a degree sufficient for the approach to have some merit.<sup>22</sup>

Not surprisingly, the HMR identifies fewer flexible exchange rate arrangements than the official classification. Over 50 per cent of the countries identifying themselves as floaters are found to follow more rigid arrangements (see Table 1), and the HMR shows no generalized movement towards floating regimes (Figure 1). It also points to a more generalized adoption of intermediate regimes, in line with the recent literature on de

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21. We measure exchange rate volatility by the standard deviation of monthly percentage changes in nominal U.S. dollar exchange rates over a given year.

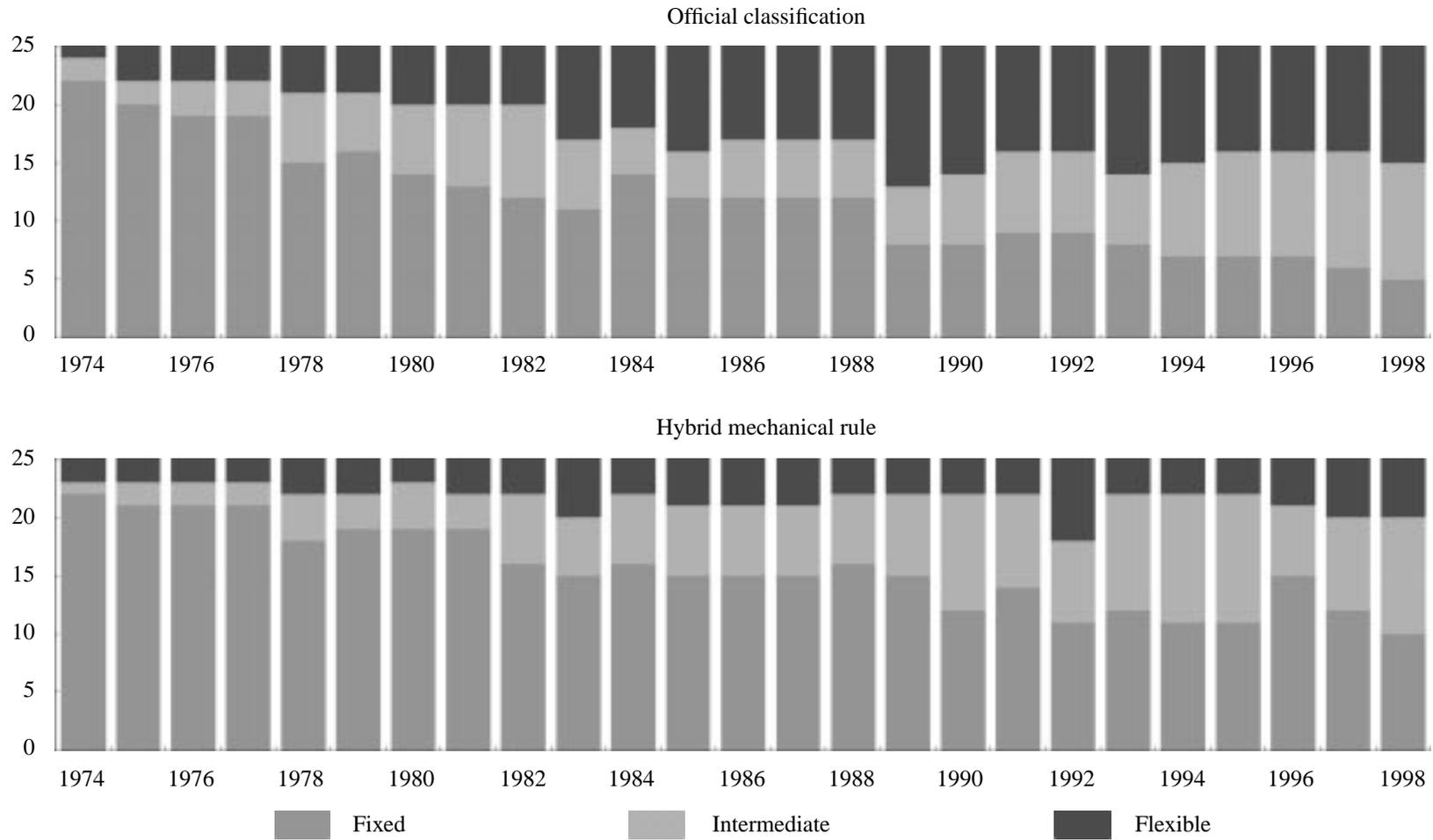
22. An additional caveat should be mentioned. By construction, this method will always identify some regimes as intermediate and flexible. It might, therefore, be more appropriate to view our rule not as a substitute for the official classification, but as a method of ordering regimes by their degree of flexibility.

**Table 1**  
**Classification of exchange rate arrangements**

	1973–77		1978–82		1983–87		1988–92		1993–97	
	Official	HMR								
Argentina	Fix	Fix	Flex	Flex	Flex	Flex	Flex	Flex	Fix	Fix
Bolivia	Fix	Fix	Fix	Fix	Fix	Fix	Int	Fix	Int	Fix
Brazil	Fix	Fix	Int	Int	Int	Flex	Int	Flex	Int	Int
Chile	Fix	Fix	Fix	Fix	Int	Int	Int	Int	Int	Int
China	Fix	Fix								
Colombia	Int	Fix	Int	Fix	Int	Fix	Int	Fix	Int	Int
Costa Rica	Fix	Fix	Fix	Fix	Flex	Int	Flex	Int	Flex	Fix
Ecuador	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Int	Int
El Salvador	Fix	Fix	Fix	Fix	Fix	Fix	Flex	Fix	Fix	Fix
Guatemala	Fix	Fix	Fix	Fix	Fix	Fix	Int	Int	Flex	Int
Guyana	Fix	Fix	Int	Fix	Fix	Fix	Fix	Fix	Flex	Int
Honduras	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Int	Int
Hong Kong	Flex	Int	Flex	Flex	Fix	Fix	Fix	Fix	Fix	Fix
Indonesia	Fix	Fix	Int	Fix	Int	Int	Int	Fix	Int	Fix
Korea	Fix	Fix	Flex	Fix	Flex	Int	Flex	Int	Flex	Int
Malaysia	Flex	Flex	Flex	Int	Flex	Int	Flex	Int	Flex	Flex
Mexico	Fix	Fix	Int	Fix	Flex	Int	Int	Fix	Flex	Flex
Nicaragua	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Fix	Int	Fix
Panama	Fix	Fix								
Paraguay	Fix	Fix	Fix	Fix	Fix	Fix	Flex	Int	Flex	Fix
Philippines	Flex	Int	Flex	Fix	Flex	Flex	Flex	Int	Flex	Int
Singapore	Fix	Fix	Fix	Fix	Fix	Fix	Flex	Flex	Flex	Int
Thailand	Fix	Fix								
Uruguay	Int	Int	Int	Int	Flex	Int	Flex	Int	Int	Int
Venezuela	Fix	Fix	Fix	Fix	Fix	Fix	Flex	Int	Int	Fix

Note: Shaded areas represent periods during which official and mechanical classification differ.  
 Fix: fixed; Flex: flexible; Int.: intermediate.

**Figure 1**  
**Exchange rate arrangements by classification**



facto exchange rate arrangements.<sup>23</sup> Exchange rate regimes tend to be less flexible than advertised for the Asian countries in our sample. In Korea, for instance, we find that, since 1978, the regime has been less flexible than officially stated. As of 1988, Indonesia's exchange rate regime could, for all intents and purposes, be classified by the HMR as a fixed arrangement, even though the regime was officially classified as intermediate. In Latin America, with the exception of Colombia and Costa Rica, there is less systematic divergence between the HMR and the official classification. Note that the HMR finds significantly less flexible exchange rates for Mexico in the period leading up to the peso crisis than the official classification would indicate.

### 3 Empirical Methodology

This study estimates a cross-country growth regression on a panel-data set of 25 emerging-market countries over the 1973–98 period to investigate whether the nature of the exchange rate regime has an effect on economic growth.<sup>24</sup> This section describes the econometric specification used and then discusses the expected signs on the coefficients of the explanatory variables.

The following equation describes the general specification used:

$$GR_{i,t} = \alpha_i + \eta_t + V_{i,t}\beta + X_{i,t}\delta + \varepsilon_{i,t}, \quad (1)$$

where  $GR_{i,t}$  is the growth rate of real per capita GDP in country  $i$  and time period  $t$ ,  $\alpha_i$  is a country-specific effect,  $\eta_t$  is a time dummy,  $V_{i,t}$  is a row vector of growth determinants measured at the beginning of period  $t$ ,  $X_{i,t}$  is a row vector of growth determinants measured as averages over period  $t$ , and  $\varepsilon_{i,t}$  is an error term. As mentioned, five-year periods are used.

The country-specific effect,  $\alpha_i$ , is designed to capture the determinants of a country's growth rate that are not already controlled for by the other explanatory variables. It thus accounts for unobservable characteristics that vary across countries but not over time. The country-specific effect could be either a *fixed* effect (i.e., a constant that varies for each cross-sectional unit), or a *random* effect (i.e., a random variable drawn from a common distribution with mean  $\alpha$  and variance  $\sigma_\alpha^2$ ). We use a Hausmann test to decide whether it is more appropriate to model the country effects as being

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23. This result is in line with Masson's (2000) finding that an intermediate exchange rate regime is not a "vanishing" state. He concludes that the intermediate cases are likely to continue to constitute a sizable portion of actual exchange rate regimes.

24. The cross-country growth regression is the econometric specification typically used in the empirical literature that studies the determinants of growth rates across countries. It is based on work by Kormendi and Meguire (1985) and Barro (1991).

fixed or random.<sup>25</sup> The time dummy,  $\eta_t$ , is intended to capture the effects of global shocks—such as the oil shocks of the 1970s or the debt crisis of the 1980s—on economic growth.

In addition to accounting for country-specific effects and the presence of global shocks, it is also important to control for other determinants of the growth rate to ensure that the estimated coefficient captures the effect of the exchange rate regime on growth and not the influence of some other variable(s). The literature guided us in selecting appropriate control variables.<sup>26</sup>

Two of the variables are measured at the beginning of each period, and they represent initial conditions in a neo-classical growth model. The first is per capita income (in natural log form). According to neo-classical theory, the coefficient on per capita income represents the convergence effect and should be negative.<sup>27</sup> In endogenous-growth models, there is no convergence effect, since economies do not depart from their steady states, and therefore the coefficient is expected to be zero. The second variable is a measure of the stock of human capital.<sup>28</sup> Growth theory, whether neo-classical or endogenous, predicts that the coefficient on the stock of human capital should be positive, since countries that have more human capital will tend to have higher growth rates.

The other control variables are measured as averages over each five-year period and include the real investment rate, the real share of government consumption, measures of openness to both international trade and international capital flows, and a measure of financial sector development.<sup>29</sup> The expected sign on the investment rate is positive, since capital

25. The null hypothesis of the Hausmann test in this context states that there is no correlation between the country effects and the explanatory variables. Rejection of the null hypothesis indicates that modelling the country effects as fixed is more appropriate. See Greene (2000, chapter 14) for more details.

26. Appendix 2 lists sources and describes the variables used in the analysis. Table 2 provides descriptive statistics.

27. If convergence holds, the economy of a country will grow faster with a relatively lower level of initial per capita GDP, since it is that much farther away from its steady state and must catch up.

28. We use average years of secondary schooling in the population 25 years of age and over as a proxy for the stock of human capital.

29. We use imports plus exports over GDP as a measure of openness to international trade. We try three different measures for both openness to international capital flows (i.e., gross and net private capital flows and foreign direct investment inflows—all as ratios of GDP) and financial sector development (i.e., M2/GDP, private sector credit/GDP, domestic credit provided by banks/GDP). We don't, however, report the results from all of these specifications. The full set of results is available from the authors.

**Table 2**  
**Descriptive statistics**

	Mean	Stand. Dev.	Min.	Max.
Growth rate of real per capita GDP	1.65	3.07	-7.34	8.82
Real per capita GDP (in log)	7.54	0.73	5.81	9.15
Average years of secondary schooling	1.12	0.65	0.24	3.93
Investment/GDP	23.39	6.97	11.68	41.11
Government consumption/GDP	12.15	4.51	3.65	34.42
(Exports plus imports)/GDP	57.93	31.92	15.06	221.90
M2/GDP	32.29	16.09	9.74	95.64
Private sector credit/GDP	36.99	23.85	0.00	138.79
Domestic credit by banking sector/GDP	50.11	31.98	0.00	185.97
Gross private capital flows/GDP	9.93	29.75	0.51	213.19
Net private capital flows/GDP	2.97	2.78	-1.13	13.23
Net foreign direct investment/GDP	1.55	2.03	-0.85	14.11
CPI inflation	125.01	570.57	0.87	5,085.74

Notes: Based on five-year averages for the 1973–98 period.  
In percentage points, unless otherwise indicated.

accumulation is expected to lead to higher real per capita GDP growth.<sup>30</sup> The government consumption variable, as Barro and Sala-i-Martin (1995) point out, is intended to capture public expenditures that do not directly affect productivity but could distort private sector decisions. The coefficient on that variable is thus expected to be negative. On the other hand, the effects of international trade, international capital flows, and financial sector development on growth are all expected to be positive, as discussed in section 1.

In addition to these explanatory variables, we include a dummy variable to account for the nature of the exchange rate regime, our main variable of interest. As mentioned in section 2, we use two exchange rate regime classification schemes: the official classification and our HMR. In each case, the dummy variable takes on the value of 0 for a fixed exchange rate regime,

30. In this framework, any effects of the exchange rate regime on growth through the investment channel would be captured by the coefficient on the investment rate. Indeed, it has been argued that a fixed regime could promote growth by increasing investment (see, for instance, Aizenman 1994). However, this is not something that we can test for in our framework, because our dependent variable is growth, not investment.

1 for an intermediate regime, and 2 for a flexible regime.<sup>31</sup> Finally, we include a dummy variable that captures a change in the nature of the regime during the five-year interval.<sup>32</sup>

As outlined in section 1, we test several hypotheses regarding the relationship between the exchange rate regime and growth. First, we test whether the nature of the exchange rate regime influences economic growth, although it is unclear, a priori, whether a more or less flexible exchange rate arrangement will tend to be associated with higher growth. Thus, the expected sign on the exchange rate regime coefficient is ambiguous. Second, we test for evidence to support the notion that a change in regime is linked with lower economic growth, given that such a change is often associated with a costly crisis. The anticipated sign on this variable is therefore negative.

Third, we explore the supposition that the effect of the exchange rate arrangement on growth will be more pronounced for countries that are relatively more open to international trade and capital flows. We test for this by adding interaction terms between the dummy variable for the exchange rate regime and our measures of openness to international trade and international capital flows. Finally, we investigate the idea that a country must have a fairly well-developed financial market to benefit from the growth-promoting attributes of a more flexible arrangement. An interaction term between the level of financial sector development and the exchange rate dummy is included in the regression specification to test for this hypothesis. As discussed in section 1, we would expect the signs on these interaction terms to be positive, except for the one on international trade, which is ambiguous, a priori.

As noted, equation (1) was estimated on a sample of 25 emerging-market countries with data from 1973 to 1998 set up in five-year periods.<sup>33</sup> We selected our sample to generate a wide enough variety of country experiences with exchange rate regimes, without creating a sample where the countries had such dramatically different levels of development that the assumption of common slope parameters would become unreasonable. We

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31. Since we are using five-year periods, this variable captures the average or typical regime during this interval. In cases where the classification changed during the five-year period, the typical regime is the one that occurred most of the time (i.e., at least three out of five years).

32. The dummy variable takes on the value 1 if there has been at least one change in the annual classification of the regime over the five-year period. Otherwise, it takes on the value 0.

33. Not all data series are complete for all countries; the panel-data set is thus unbalanced.

**Table 3****Estimation results****Dependent variable: Growth rate of real per capita GDP****Panel data, fixed-effect estimates for 1973–98 using five-year periods**

<b>ER regime classification</b>	<b>OC</b>	<b>HMR</b>	<b>OC</b>	<b>HMR</b>
Initial real per capita GDP	−0.068*** (0.000)	−0.067*** (0.000)	−0.075*** (0.000)	−0.074*** (0.000)
Average years of schooling	0.006 (0.581)	0.007 (0.561)	0.004 (0.698)	0.005 (0.674)
Investment/GDP	0.053 (0.399)	0.049 (0.428)	0.036 (0.558)	0.033 (0.588)
Government consumption/GDP	−0.246*** (0.006)	−0.254*** (0.004)	−0.257*** (0.003)	−0.263*** (0.002)
(Exports plus imports)/GDP	0.003 (0.840)	0.003 (0.827)	−0.001 (0.948)	−0.001 (0.958)
M2/GDP	0.053* (0.096)	0.049 (0.119)	0.056* (0.072)	0.053* (0.089)
Gross capital flows (GCF)/GDP	0.024 (0.154)	0.025 (0.142)	0.025 (0.124)	0.026 (0.115)
Exchange rate regime	0.000 (0.996)	−0.003 (0.538)	−0.000 (0.974)	−0.003 (0.551)
Exchange rate regime change			−0.010** (0.042)	−0.010** (0.043)
Number of observations	100	100	100	100
Adjusted R-squared	0.68	0.68	0.70	0.70
Hausmann test ( <i>p</i> -value)	0.0002	0.0001	0.0001	0.0000

Notes:

OC = official classification; HMR = hybrid mechanical rule.

The figures in parentheses are *p*-values.

(\*\*\*), (\*\*), and (\*) indicate statistical significance at the 1 per cent, 5 per cent, and 10 per cent levels, respectively.

Period dummies are included in each regression.

therefore chose a group of emerging-market countries in Latin America and Asia (listed in Appendix 1).

## 4 Estimation Results

The estimation results are shown in Tables 3 to 5. They are reported for various specifications using the fixed-effects model, given that the Hausmann specification test suggests that it is more appropriate to model the

**Table 4****Estimation results****Dependent variable: Growth rate of real per capita GDP****Panel data, fixed-effect estimates for 1973–98 using five-year periods**

ER regime classification	OC	HMR	OC	HMR
Initial real per capita GDP	−0.066*** (0.000)	−0.067*** (0.000)	−0.065*** (0.000)	−0.064*** (0.000)
Average years of schooling	0.000 (0.973)	0.004 (0.745)	0.002 (0.880)	0.006 (0.612)
Investment/GDP	0.131** (0.050)	0.144** (0.029)	0.126* (0.056)	0.126** (0.051)
Government consumption/GDP	−0.252*** (0.006)	−0.260*** (0.003)	−0.263*** (0.004)	−0.265*** (0.003)
(Exports plus imports)/GDP	0.011 (0.468)	0.006 (0.678)	−0.004 (0.777)	−0.004 (0.770)
Credit provided by banks/GDP	−0.012 (0.195)	−0.013 (0.148)	−0.009 (0.334)	−0.010 (0.260)
Gross capital flows (GCF)/GDP	0.010 (0.594)	0.013 (0.434)	0.015 (0.373)	0.020 (0.225)
Exchange rate regime	−0.005 (0.241)	−0.010 (0.049)	−0.007 (0.153)	−0.011** (0.043)
(GCF/GDP) X exchange rate regime	0.033* (0.071)	0.059** (0.022)		
(Trade/GDP) X exchange rate regime			0.006* (0.064)	0.007* (0.039)
Number of observations	100	100	100	100
Adjusted R-squared	0.69	0.70	0.69	0.69
Hausmann test ( <i>p</i> -value)	0.0004	0.0001	0.0008	0.0004

See notes for Table 3.

country effects as fixed rather than random.<sup>34</sup> A test for the joint significance of the country dummies reveals that a fixed-effects specification would be preferable to pooled ordinary least squares.<sup>35</sup> As indicated by the adjusted R<sup>2</sup>s, the model explains between 68 and 70 per cent of the variation in the growth rates in our sample.

The signs of the coefficients on the explanatory variables other than the exchange rate regime variables are generally statistically significant and consistent with theory. The coefficients on initial real per capita GDP and the government's share of real GDP are negative, whereas the coefficients on

34. As shown by the reported *p*-values, the null hypothesis of the Hausmann test (i.e., no correlation between the country effects and the explanatory variables) is rejected in all cases.

35. *P*-values are also reported for a test of the joint significance of the time dummies, which suggests that it is appropriate to include them in the regressions.

**Table 5****Estimation results****Dependent variable: Growth rate of real per capita GDP****Panel data, fixed-effect estimates for 1973–98 using five-year periods**

<b>ER regime classification</b>	<b>OC</b>	<b>HMR</b>
Initial real per capita GDP	–0.069*** (0.000)	–0.067*** (0.000)
Average years of schooling	0.000 (0.975)	0.004 (0.709)
Investment/GDP	0.080 (0.212)	0.081 (0.201)
Gov't consumption/GDP	–0.262*** (0.003)	–0.265*** (0.002)
(Exports plus imports)/GDP	–0.005 (0.755)	–0.005 (0.754)
M2/GDP	0.033 (0.321)	–0.029 (0.380)
Gross capital flows (GCF)/GDP	0.014 (0.420)	0.018 (0.281)
Exchange rate regime	–0.009 (0.169)	–0.012* (0.082)
(M2/GDP) X exchange rate	0.027* (0.088)	0.032* (0.086)
Number of observations	100	100
Adjusted R-squared	0.69	0.69
Hausmann test ( <i>p</i> -value)	0.0001	0.0002

See notes for Table 3.

the investment rate and the measure of banking sector development are positive. The coefficients on the proxy for human capital and the measures of international openness are not statistically significant, however.

Table 3 reports the results of the regressions we used to test our first two hypotheses. For each specification, we report the results using both methods of classification. As shown in the first and second columns, the coefficient on our dummy variable for the exchange rate regime—for both classification schemes—is not statistically significant. Thus, we do not find support for our first hypothesis: that the nature of the exchange rate regime influences economic growth. We do, however, find evidence that a change in the regime is associated with lower medium-term growth. Indeed, as shown in the third and fourth columns, the coefficient on the dummy variable capturing a change in the exchange rate regime is negative and statistically significant

for both classification schemes. Moreover, this result is robust to specification changes.<sup>36</sup>

We do find evidence, however, that more flexible exchange rate arrangements are associated with higher economic growth when we allow the effect of the regime on growth to differ based on a country's degree of openness to international trade and capital flows. As shown in Table 4, the interaction terms between the exchange rate regime and the measures of openness to trade and capital flows are all positive and statistically significant, regardless of which classification scheme is used. This suggests that the effect on growth of a more flexible arrangement is more pronounced when the country is more open. Interestingly, the coefficient on the exchange rate regime dummy becomes negative when the interaction terms are included, but only for our HMR classification scheme. Thus, the results with our mechanical rule suggest that flexible exchange rate arrangements will be associated with higher growth *only* for countries that are relatively open to trade and capital flows. For other countries, a more flexible arrangement is actually *detrimental* to growth. Again, we found these results to be robust to specification changes.

Based on the estimated coefficients in the regressions using the HMR in Table 4, we find that a more flexible exchange rate arrangement will be growth-promoting, as long as gross capital flows represent at least 17 per cent of GDP, and as long as trade as proportion of GDP exceeds 157 per cent. We calculated average values for these variables over the sample period to determine which countries, and how many, would be considered open enough to benefit from a more flexible exchange rate arrangement. As shown in Appendix 3, very few countries have variable values that are above the calculated thresholds. We realized, moreover, that these countries had values for the variables that were much higher than in the sample average. We removed them from the sample and re-estimated the regressions to determine whether our results were being driven by these outliers.

Once the outliers were removed from the sample, we found that the results were very similar for gross capital flows when using the HMR to classify regimes, except that the estimated coefficients on both the exchange rate regime variable and the interaction term increased in absolute terms.<sup>37</sup> This resulted in a decline in the calculated threshold for gross capital flows from

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36. This result did not change when we added other variables, such as inflation or population growth, or when we used different measures of financial sector development.

37. The coefficient on the exchange rate dummy becomes  $-0.016$  (compared to  $-0.10$ ) and the coefficient on the interaction term becomes  $0.26$  (compared to  $0.06$ ).

17 per cent to 6 per cent of GDP.<sup>38</sup> It appears that the outliers reduced the size of the coefficient on the interaction term but did not change the basic result. Thus, the result (using our mechanical rule) appears robust not only to specification changes, but also to the presence of outliers. When the official classification was used, however, the coefficient on the interaction term with international capital flows became insignificant.

This was also the case for the evidence we found related to the exchange rate regime and international trade. Once we removed the outliers, the coefficients on the exchange rate variable and the interaction term with international trade both became insignificant. It appears that this result was driven by a few countries that were very open to international trade and that could not be generalized to the rest of the sample countries.

Finally, we found evidence to suggest that a country must have fairly well-developed financial markets to benefit from a flexible exchange rate arrangement. As shown in Table 5, the coefficient on the interaction term between financial sector development and the exchange rate regime is positive and statistically significant for both types of classification schemes. The coefficient on the exchange rate regime is negative, but only when using our mechanical rule to classify regimes. This suggests that more flexible arrangements will have a positive effect on growth for countries that have relatively well-developed financial sectors. For countries that have less developed financial sectors, our results differ depending on the classification scheme used. Results using the official classification suggest that flexible exchange rate arrangements are associated with higher growth for all countries, but that the effect on growth is more pronounced the more developed its financial sector. On the other hand, the results using the HMR suggest that flexible exchange rate arrangements will be associated with higher growth *only* in countries that have well-developed financial sectors. For other countries, a more flexible arrangement is actually *detrimental* to growth. This result, however, was only somewhat robust to specification changes.<sup>39</sup>

Based on the estimated coefficients in the regressions using the HMR in Table 5, we find that a more flexible exchange rate arrangement will be growth-promoting as long as M2 exceeds 38 per cent of GDP. As shown in Appendix 3, eight countries in our sample have average values for M2/GDP

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38. The following seven countries have ratios of gross capital flows to GDP that are higher than the threshold value of 6 per cent: Chile, Korea, Malaysia, Panama, Singapore, Uruguay, and Venezuela.

39. This result held when variables such as inflation and population growth were added, but it did not hold when different measures of financial sector development were tried.

that exceed this threshold value. And, unlike the case for our measures of openness, it does not appear that there are any significant outliers based on this measure of financial sector development.

These results are subject to an important caveat. The methodology that we use does not account for the possibility that some of the explanatory variables might be endogenous. We attempted to address this issue by using a generalized method of moments estimation technique, following Caselli, Esquivel, and Lefort (1996), in which lagged values of the explanatory variables are used as instruments. We do not report these results because they were not very robust, and in some cases, they were significantly different from what has been reported in the literature. We do, however, plan to pursue this issue in subsequent research.

## Conclusion

Using a panel-data set of 25 emerging-market countries over the 1973–98 period, this study found evidence that the nature of the nominal exchange rate regime might matter for economic growth. Two of our estimation results are quite robust. First, we find evidence—using our HMR for classifying exchange rate regimes—suggesting that flexible exchange rate arrangements will be associated with higher growth *only* in countries that are relatively open to capital flows. Second, our results indicate that a change in the exchange rate regime is linked with lower economic growth. We also found evidence, although it is less robust than our other results, that implies that a country must have fairly well-developed financial markets to benefit from a flexible exchange rate arrangement. Further research will need to determine whether these results are influenced by the potential endogeneity of the explanatory variables.

The fact that we found evidence linking the exchange rate regime and growth—where previous work has not—and that our results differ based on the classification scheme used, supports the view that measurement error in the classification of exchange rate arrangements is an important issue. Indeed, our ability to provide conclusive empirical evidence to answer questions such as the one this paper poses is dependent on the development of appropriate exchange rate regime classification schemes. We therefore welcome efforts to develop classification schemes that more accurately reflect reality.

Our findings suggest that we could witness a drift towards more flexible exchange rate arrangements as emerging markets become more integrated with international capital markets, given that there might be benefits in terms of higher growth. However, our alternative regime classification suggests

that the 25 emerging markets in our sample have not generally been moving in the direction of more flexible arrangements. Of course, as our study confirms, exchange rate flexibility is not in itself sufficient to promote medium-term growth. Emerging-market countries may also be reluctant to float, since they may have limited means of conducting their own monetary policy and of dealing with exchange rate volatility. In addition, as Laidler (1999) notes, exchange rate flexibility must be accompanied by a credible nominal anchor, such that a country's monetary policy constitutes, in his terms, a "coherent monetary order." Over the past few years, an increasing number of emerging-market countries have opted to combine a floating exchange rate regime with an inflation-targeting framework. As such regimes become more common in emerging-market countries, we may begin to notice a less pronounced "fear of floating."

## **Appendix 1**

### **List of Countries**

Argentina  
Bolivia  
Brazil  
Chile  
China  
Colombia  
Costa Rica  
Ecuador  
El Salvador  
Guatemala  
Guyana  
Honduras  
Hong Kong  
Indonesia  
Korea  
Malaysia  
Mexico  
Nicaragua  
Panama  
Paraguay  
Philippines  
Singapore  
Thailand  
Uruguay  
Venezuela

## Appendix 2

### Sources and Definitions of Variables

#### *Dependent variable*

1. Growth rate of real per capita GDP over a five-year period (calculated using data on real per capita GDP taken from the World Bank's *World Development Indicators (WDI)*).

#### *Explanatory variables*

2. Real per capita GDP at the beginning of each five-year period (calculated using data on real per capita GDP taken from the World Bank's *WDI*).
3. Ratio of real investment to real GDP measured in five-year averages (calculated using real investment and real GDP data taken from the World Bank's *WDI*).
4. Average years of secondary schooling of the population aged 25 and over at the beginning of each five-year period (taken from the Barro-Lee data set on educational attainment).
5. Real government share of GDP measured in five-year averages (calculated using real government consumption and real GDP data from the World Bank's *WDI*).
6. Ratio of real (exports plus imports) to real GDP measured in five-year averages (calculated using real export, import, and GDP data from the World Bank's *WDI*).
7. Ratio of money and quasi money (M2) to GDP measured in five-year averages (taken from the World Bank's *WDI*).
8. Ratio of private sector credit to GDP measured in five-year averages (taken from the World Bank's *WDI*).
9. Ratio of domestic credit provided by banking sector to GDP measured in five-year averages (taken from the World Bank's *WDI*).
10. Ratio of gross private capital flows to GDP measured in five-year average (taken from the World Bank's *WDI*).
11. Ratio of net private capital flows to GDP measured in five-year averages (taken from the World Bank's *WDI*).
12. Ratio of net foreign direct investment inflows to GDP measured in five-year averages (taken from the World Bank's *WDI*).
13. Dummy variable for type of exchange rate regime (see section 3 for more details).
14. CPI inflation measured in five-year averages (taken from the World Bank's *WDI*).
15. Population growth measured in five-year averages (taken from the World Bank's *WDI*).

### **Appendix 3**

## **Countries Above Threshold Values for Variables in Interaction Terms**

#### **Trade/GDP**

Guyana  
Hong Kong  
Singapore

#### **Gross capital flows/GDP**

Panama  
Singapore

#### **M2/GDP**

China  
Costa Rica  
Guyana  
Hong Kong  
Malaysia  
Panama  
Singapore  
Thailand

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## Discussion

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*Paul Masson*

This is an interesting and well-crafted paper on a topical subject. Since the 1991 Maastricht Treaty to create a monetary union in Europe and the 1994 and 1997 currency crises affecting emerging-market countries, the literature on exchange rate regimes has exhibited explosive growth. Some of it has taken quite a narrow and dogmatic perspective: that currency unions or floating rates must be good because they eliminate exchange rate crises. The authors of this paper rightly expand their focus to determine whether the ultimate objectives of economic policy—in particular, economic growth—are helped or hindered by one exchange rate regime or another. Empirical examination of the optimality of exchange rate regimes has given rise to only a few articles, two of which stand out. Ghosh et al. (1997) find that currency boards lead to lower inflation at no cost to growth, while Rose (2000) finds that currency unions increase the internal trade within the union by a factor of three, after controlling for other determinants in the context of a gravity model. This, and the fact that trade is associated with higher growth (e.g., Frankel and Rose 2000), lead him to link currency unions to higher growth.

The paper by Bailliu, Lafrance, and Perrault takes a different tack and focuses on the growth-enhancing effects of flexible exchange rates. While the authors admit that theory does not suggest any very strong hypotheses concerning exchange rate regimes and growth, it is clear that their priors are that flexibility, by limiting the likelihood and severity of crises, should be positive (or at least neutral) for medium-term growth. They test this by including a dummy for the exchange rate regime in a panel regression for 25 emerging-market countries where growth is regressed on other plausible determinants. Unfortunately, the initial results suggest, if anything, a small negative but insignificant effect of greater flexibility, although a change of regime within the period (in whatever direction) appears harmful to growth.

Subsequent regressions suggest that if the exchange rate regime dummy variable is also interacted with either gross capital flows as a ratio to GDP, trade flows as a ratio to GDP, or M2/GDP, flexibility has the expected positive effect—but only for countries above a certain threshold for those variables. The authors conclude that exchange rate flexibility is a good thing for countries that are sufficiently open or that have a sufficient level of financial development.

As in all such empirical investigations, a crucial issue is the robustness of the results to changes in specification or data sets. To their credit, the authors test whether the result with respect to the interaction of trade/GDP and the exchange rate dummy is due to a few outliers. They conclude that it is. More fundamentally, one could question their choice of 25 emerging-market countries, and whether a larger data set including all countries for which data are available—which, in practice, would amount to well over 100—would have been more relevant. No doubt their motivation was to examine those countries for which high capital mobility makes adjustable pegs fragile, but even among this set of countries, the authors find it necessary to distinguish between various degrees of capital-market openness and financial development.

In fact, it is by no means clear that these 25 countries are the obvious “emerging markets.” In a study of exchange rate regime transitions (Masson 2001), for example, I selected for my set of emerging-market countries those 27 countries included in J.P. Morgan’s Emerging Markets Bond Index (EMBI) Global. This leads to an obvious question: are the authors’ 25 emerging markets all included in the latter? The answer may surprise you: in fact, 13 of them are not on J.P. Morgan’s list. Among these 13 are a number of the smaller Latin American countries (Bolivia, Costa Rica, El Salvador, Guatemala, Guyana, and Paraguay). Conversely, J.P. Morgan’s list includes 14 countries that are not on the authors’ list, among them several important emerging markets in Eastern Europe (Hungary, Poland, and Russia), as well as South Africa and Turkey and a number of smaller countries. Indeed, the authors’ list consists exclusively of Latin American and East Asian countries, while the J.P. Morgan index has a wider geographical representation. Perhaps the existence of only a decade or so of relevant data on transition economies dictated the authors’ omission of them from their panel, but it would have been preferable then to work with an (even more) unbalanced panel to obtain a broader representation. More generally, the authors’ hypothesis (the effect of regime choice on growth) is relevant to all countries, and in any case, their inclusion of a variable capturing the interaction of the regime with financial or trade ratios facilitates including countries at all stages of development.

Another issue raised by the authors is the vexing one of the exchange rate regime classification. Historically, there could be a large gap between how the countries officially classified themselves for the IMF and what they did in practice. This was especially true of some of the Asian-crisis countries that declared themselves as following a flexible rate regime, while their currencies hardly varied against the U.S. dollar. This implicit commitment was well understood by financial markets, and when the central banks were forced by a speculative attack to let go of the peg, a loss of credibility resulted. But the crises also tended to bring actual practice closer to declared regimes, by forcing countries off their *de facto* pegs. In future, a new classification (IMF 1999) should provide a better description of the regimes countries actually follow, but this will not clarify the historical data.

In addition to countries with official pegged rate regimes, the authors include those with annual volatility of less than 0.45 percentage points against the U.S. dollar. The more flexible regimes are then classified into intermediate and flexible rates based on a flexibility index relative to a regional average: those less than unity are intermediate, while those greater than unity are flexible. This gives a tripartite classification that is used to create a dummy variable, with a zero for fixes, a one for intermediates, and a two for flexible rates.

The authors then examine the sign and significance of the coefficient of this dummy variable in panel-growth regressions, as well as the coefficient of a dummy variable created from the official classification. Results are qualitatively and even quantitatively similar for the two classifications. However, I would have liked to have seen more theoretical justification for their classification system, as well as tests of the robustness of results to tweaking the criteria. For instance, the intermediate and flexible categories depend on what regional neighbours are doing—why not a uniform volatility threshold to apply to all countries? Why is there the choice of a cut-off of 0.45 per cent for inclusion among fixed rates, rather than a larger or smaller number?

An alternative approach is to let the data dictate the threshold levels. This is done, for example, by Levy Yeyati and Sturzenegger (1999) in their exchange rate regime classification of 110 countries. They use cluster analysis applied to exchange rate and foreign exchange reserve changes to classify regimes into pegs, crawling pegs, bands, and flexible rates. I compared the 1997 regimes from their classification (lumping crawling pegs and bands together into an intermediate category) with the Bank of Canada classification for 1993 to 1997 for the 17 countries appearing on both lists (ignoring those that Levy Yeyati and Sturzenegger could not classify). Of these 17, 11 of them had different classifications in the Bank of Canada and

Levy Yeyati and Sturzenegger data sets! So the crucial dummy variable in the present paper is by no means free from possible measurement error. Also note that the implicit weighting of intermediate and flexible regimes in the dummy variable is arbitrary, and it implies that whatever effect flexibility has on growth, fully flexible regimes exhibit twice that effect relative to intermediate ones, when compared with fixed rates. A more general (and satisfactory) procedure would be to include two dummy variables: fix versus flex and flex versus intermediate.

I would be remiss in my role as discussant if I did not raise a few other important econometric issues related to the paper. One is of endogeneity, which was touched on but not satisfactorily resolved in the paper. The problem seems especially obvious in the case of the interaction variables: exchange rate regimes are often argued to have an effect on openness (i.e., the extent of trade and capital flows), while openness here is interacted with the dummy variable to gauge the effect of exchange rate regimes. A second issue is the use of five-year averages instead of annual data. This approach tends to throw away information, while not solving endogeneity problems. It also leads to an awkward interpretation of the change in regime variable: this is a dummy “that captures a change in the nature of the regime during the five-year interval (page 332).” One would assume that the timing of the change (beginning or end) should matter for growth—how is this handled? And if the regime change occurs at the end of a five-year period, is it allowed to have any effect on the subsequent period?

I welcome the authors’ serious attempt to address an important issue: the effect of exchange rate regime on things we really care about, such as growth. For the reasons I have outlined, I am not convinced that the answer provided in the paper—that exchange rate flexibility is good for growth in economies with a sufficient level of openness or financial development—will stand up to testing with a wider set of countries, alternative regime classifications, or different estimation techniques. I would encourage the authors to pursue some of these issues in future related work.

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