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Evolution and Performance of Exchange Rate Regimes

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Abstract

This Working Paper should not be reported as representing views of the IMF.
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Using recent advances in the classification of exchange rate regimes, this paper finds no support for the popular bipolar view that countries will tend over time to move to the polar extremes of free float or rigid peg. Rather, intermediate regimes have shown remarkable durability. The analysis suggests that as economies mature, the value of exchange rate flexibility rises. For countries at a relatively early stage of financial development and integration, fixed or relatively rigid regimes appear to offer some anti-inflation credibility gain without compromising growth objectives. As countries develop economically and institutionally, there appear to be considerable benefits to more flexible regimes. For developed countries that are not in a currency union, relatively flexible exchange rate regimes appear to offer higher growth without any cost in credibility.

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[1]This paper was prepared while Ken Rogoff was Economic Counselor and Director of the IMF's Research Department. The authors would like to acknowledge contributions from Andrew Berg (Section III.E), Paolo Mauro and Grace Juhn (Appendix II), and Antonio Spilimbergo (Section III.C). They are indebted to Rex Ghosh for providing his dataset, and to Young Kim and Eisuke Okada for valuable research assistance. For many helpful comments on earlier drafts, we would like to thank, without implicating, Tam Bayoumi, Michael Bordo, Agustín Carstens, Barry Eichengreen, Inci Otker-Robe, Jacques Polak, Carmen Reinhart, David Robinson, Miguel Savastano, Federico Sturzenegger, and Lars Svensson.

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I. OVERVIEW

This paper assesses the historical durability and performance of alternative exchange rate regimes, with special focus on developing and emerging market countries. Our study suggests that the popular bipolar view of exchange rates is neither an accurate description of the past nor a likely scenario for the next decade. However, while our study confirms that emerging market countries need to consider adopting more flexible exchange rate regimes as they develop economically and institutionally, we also find that fixed or relatively rigid exchange rate regimes have not performed badly for poorer countries. For countries that have relatively limited financial market development and relatively closed capital markets, fixed exchange rate regimes appear to offer some measure of credibility without compromising growth objectives—with the important proviso that monetary policy must be consistent with avoiding a large and volatile parallel market premium. As countries develop economically and institutionally, there appear to be considerable benefits to adopting a more flexible exchange rate system—although, of course, our analysis only provides a general guide and should not be interpreted as a one–size–fits–all prescription. For developed countries that are not in a currency union (or headed toward one), relatively flexible exchange rate regimes appear to offer higher growth without any cost in anti-inflation credibility—provided they are anchored by some other means such as an independent central bank with a clear anti-inflation mandate. One perhaps surprising finding of our quantitative analysis is the remarkable durability of exchange rate regimes outside emerging market countries, with only 7 percent of all countries changing regimes in an average year over the 1940 to 2001 period.

Debates on the appropriate exchange rate regime for a country are perennially lively. 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 performance of exchange rate regimes. Just when pegged regimes were gaining respectability as providing nominal anchors, several pegs (and crawling pegs) faced speculative pressures from investors skeptical of the regimes' sustainability. Many such episodes were associated with expensive financial crises, especially in emerging markets. An influential view predicted that exchange rate regimes would move in a "bipolar" manner to the extremes of "hard" pegs, which would be relatively immune to speculative pressures, or free floats (Eichengreen, 1994; and Fischer, 2001). An increasing number of countries did announce their intent to allow greater exchange rate flexibility. However, among developing and emerging market economies, the *de jure* announcement to float did not typically translate into de facto fully floating exchange rates. Countries, it appeared, had a "fear of floating" (Calvo and Reinhart, 2002).

These observed trends and policy ambivalence reflected a variety of opposing considerations in the adoption and performance of exchange rate regimes. In their discussions of papers on exchange rate regimes in September and November 1999,[2] Executive Directors concluded

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[2] See the summings up of the Board discussions on "Exchange Rate Regimes in an Integrated World Economy" and "Exchange Rate Regimes in an Integrated World Economy—Further Considerations", which were subsequently published in Mussa and others (2000).

that there were no simple prescriptions for the choice of a country's exchange rate regime. Instead, they emphasized the importance of macroeconomic fundamentals and the consistency of the exchange rate regime with underlying macroeconomic policies. Several Directors also thought that a range of alternatives between the polar extremes of rigidity and flexibility were viable. More recently, however, the Fund has been urged—from outside as well as within—to take a more prescriptive role in its surveillance of members' exchange rate policies and regime choice, underscoring the importance of an improved understanding of the performance of alternate regimes (Calomiris, 1998; International Financial Institution Advisory Commission, 2000; Mussa, 2002; and IMF, Independent Evaluation Office, 2002).

While recognizing the central importance of macroeconomic fundamentals, this paper uses recent advances in the classification of exchange rate regimes to draw new lessons about the performance of alternative regimes. The paper finds that as economies and their institutions mature, the value of exchange rate flexibility increases. This conclusion reflects distinctions made among advanced, emerging, and other developing economies. Emerging markets have stronger links to international capital markets than do other developing economies; but unlike advanced economies, emerging markets face a variety of institutional weaknesses that manifest themselves in higher inflation, problems of debt sustainability, fragile banking systems, and other sources of macroeconomic volatility, which potentially undermine the credibility of policymakers. Thus, while the non-emerging–market developing economies (hereinafter referred to as "developing economies") may gain credibility through pegging their exchange rates, emerging markets find it harder to do so and could benefit from investing in "learning to float." More advanced economies, with their stronger institutions, are best positioned to enjoy the benefits of flexibility without the risk of losing policy credibility.

To be clear—this paper takes as given the current conjuncture of a multiplicity of currencies. As such, the paper's conclusions apply to those countries that have their own currencies. It is possible, however, that the current context may evolve and a sufficiently large number of countries may, in the next decade and beyond, elect to join currency unions, leading to fewer currencies in circulation. This would change the behavior of governments and international business—and, hence, change the economic performance of alternative regimes—in ways that the paper does not attempt to predict.[3]

Since analytical arguments on the economic influence of exchange rate regimes often lead to opposing conclusions, the paper takes the perspective of actual experience. Empirical observations are used to form judgments on how offsetting factors play out in different country groups. However, the simple groupings do not allow for complexities at the level of individual countries, reflecting, for example, their economic size and internal heterogeneity.

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[3] The recent *World Economic Outlook* (IMF 2003a), however, concludes that while Group of Three (G-3) exchange rate volatility has real effects, especially on some countries with high debt ratios and mismatches in trade and financial flows, the overall effects are small.

Empirical analysis of exchange rate regime performance depends, of course, on the classification of regimes. The conclusions of this paper rely on the distinction between de jure and de facto regimes. Owing to recognition of the importance of this distinction, attempts have been made in recent years to characterize de facto regimes using information on the actual behavior of exchange rates, supplemented by data on the movement of foreign exchange reserves and interest rates as well as judgments on the true intent of policymakers. Based on such an effort, the IMF now compiles the de facto exchange rate regimes of its member countries, dating back to 1990 (IMF, 1999 and 2003b). The de facto regime classification principally used in this paper is the Natural classification proposed by Reinhart and Rogoff (2003), which is available from the 1940s for virtually all IMF member countries. Among its distinguishing features is the use of "parallel" market exchange rates to determine the actual operation of an exchange rate regime and the identification of a separate category of "freely falling" regimes that are characterized by high inflation and, hence, implicitly, by weak macroeconomic management.

This paper has two additional mainsections. Section II first discusses the alternative exchange rate regime classification systems and reviews the alternative perspectives they offer. It describes the trends in the distribution of regimes, noting the difference between de jure trends, which show a move to flexibility, and de facto trends, which show that intermediate exchange rate arrangements are still pervasive. The section also examines the transitions between regimes and finds that de facto regimes tend to be long lived. The bulk of the de facto regime transitions in the past half century have occurred in the wake of exceptional events, such as the breakdown of Bretton Woods, the creation of the European Economic and Monetary Union, and the collapse of the Soviet Union. Absent such events, the present global distribution of regimes is not likely to change substantially. Over the longer term, however, political–economy considerations may guide regime choice in some countries, possibly resulting in their election to form or join a currency union. Such transitions, of course, are beyond the scope of this analysis.

Section III studies the performance of exchange rate regimes in terms of inflation and business cycles. It finds that the advantages of exchange rate flexibility increase as a country becomes more integrated into global capital markets and develops a sound financial system. Free floats have, on average, registered faster growth than other regimes in advanced countries, without incurring higher inflation. Conversely, in developing countries with limited access to private external capital, pegs and other limited–flexibility arrangements have been associated with lower inflation, without an apparent cost in terms of lower growth or higher growth volatility. However, in emerging market economies with higher exposure to international capital flows, the more rigid regimes have had a higher incidence of crises. The analysis also indicates that macroeconomic performance under all types of de facto regimes was weaker in countries with dual or multiple exchange rates that deviated substantially from official rates, suggesting important gains from exchange rate unification.

Our analysis and results are subject to a number of qualifications. First, empirical findings may reflect, in part, the influence of economic performance on the choice of regime rather than the other way around. Second, an inherent difficulty arises in classifying regimes in a

fully specified manner. The country's "true" exchange rate regime is, properly speaking, a "super-regime" consisting of a sequence of regimes and not just the regime that prevails at a particular point in time. Thus, the harmful effects of a regime may be observed only when it collapses, leading to misattribution the poor performance to the successor regime. Third, some of the conclusions depend on the choice of the Natural classification. To the extent possible, such conclusions are compared with results obtained with other classifications to assess the robustness of the conclusion or to explain why the differences arise. Fourth, the need for caution arises from the fact that although a country's regime is conventionally classified as fixed if its currency is fixed with respect to a single other currency, performance is a function of multiple relationships with all partner currencies. The suppression of multiple relationships into one has both descriptive and prescriptive consequences. For example, in classifying Argentina as a hard-peg case, one loses sight of the fact that, in relation to the great majority of its trading partners, the peg to the dollar made it a floater. Finally, further analysis is needed to jointly classify exchange rate regimes and capital account openness. For all these reasons, while the conclusions and policy implications drawn in this paper offer new cross-country perspectives on exchange rate regimes, the results should be interpreted with suitable caution, especially for individual cases.

II. THE EVOLUTION OF EXCHANGE RATE REGIMES: A FRESH LOOK

Is there an observed tendency for exchange rate regimes to drift to the polar extremes (hard pegs and freely floating), with a hollowing of the middle in between? Have regime changes become significantly more frequent in the post Bretton Woods era? And have certain regimes historically proven more difficult to sustain, particularly in countries more open to capital flows? Policy debates centered around these questions have forced a growing recognition that the exchange rate regime a country actually operates (its de facto regime) often differs meaningfully from its announced (or de jure) regime. This divergence potentially affects the analysis of historical trends in exchange rate regimes, their macroeconomic performance, and the answers to salient policy questions.

In recognition of the divergence between actual and operational regimes, a number of efforts have been undertaken to develop a classification of de facto rather than de jure regimes. The IMF now publishes regime classifications that take into account the actual functioning of regimes; these are available from 1990 and findings based on this classification are reported in IMF (2003). The "natural" classification, developed by Reinhart and Rogoff (2004), extends back to the 1940s, with significant overlap with the IMF de facto classification in the 1990s. The Natural classification also draws analytically useful distinctions that facilitate the interpretation of countries' economic behavior and performance.

This section describes the evolution of exchange rate regimes across the world using primarily the Natural classification, but providing also comparisons with other, including the de jure, classifications. The main findings are:

- Historically, the actual operation of exchange rate regimes seems to have differed from the announced framework about one half of the time. Many countries have

exhibited "fear of floating"—the actual flexibility of their exchange rate was substantially less than announced.

- Intermediate regimes remain prevalent, especially among emerging markets and other developing countries. The so-called "middle" along the flexibility dimension continues to constitute one half of all regimes, as it has throughout the past three decades. Freely floating regimes remain rare. The moderate increase in the number of pegs in the 1990s related mainly to the euro zone and transition economies.

- The frequency of regime transitions today is similar to what it was fifty years ago. Since 1940, around 7 percent of all countries have changed their regime in a given year, with emerging markets tending to switch regimes more frequently than other countries. Apart from transitions related to major global or regional events, and transitions in economies experiencing severe macroeconomic stress, changes in de facto regimes in the post Bretton Woods period have been about as frequent as during the period of fixed parities.

Following a brief discussion of the different approaches to exchange rate regime classification (Section A), this section documents the evolution of regimes across the world from 1940 (Section B), considers transitions across regimes (Section C), and concludes with the implications of classifications for assessing the performance of alternate regimes (Section D). Throughout the section, differences across economies that are at different stages of development and integration into global capital markets are highlighted by dividing countries into three groups—advanced, emerging market, and other developing economies.[4]

A. New Regime Classifications

Until the late 1990s, most empirical studies of exchange rate regimes relied on the "de jure" regime classification reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions* (AREAER), which was then based on countries' official notifications to the Fund. The de jure classification distinguished between three broad categories—pegged regimes, regimes with limited flexibility (usually within a band or cooperative arrangement),

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[4] Emerging market economies are those that are included in the Morgan Stanley Capital International (MSCI) index, which comprises Argentina, Brazil, Chile, China, Colombia, Czech Republic, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Pakistan, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Turkey, and Venezuela. With the exception of Israel, which is in the MSCI index, advanced economies are those that are classified as upper income economies by the World Bank. All other economies constitute the other developing countries group. Small variations in the composition of the emerging markets group do not alter the thrust of the findings reported below on the evolution of regimes and regime transitions. Recognizing the significant variation in financial integration across countries and over time within the emerging markets group, results are also reported for the 1990-2001 period where relevant.

and more flexible arrangements (those with managed or free floats)—which were divided into 15 subcategories.[5]

Although comprehensive in terms of country and historical coverage, the de jure classification system had a serious drawback—in practice, exchange rate regimes often differed from what they were officially announced to be. For example, some pegged regimes devalued frequently, while many floats typically moved within a tight band. Consequently, the de jure classification inaccurately characterized the distribution of operative currency regimes across the world and over time. Moreover, empirical analyses employing this classification to test theories of regime choice or assess the relationship between regime choice and economic performance risked reaching incorrect conclusions and drawing misleading policy implications.[6]

Recognizing the merits of classifying regimes more realistically, a number of new "de facto" classification systems have been proposed. Ghosh, Gulde, Ostry, and Wolf (1997) classified regimes on a de facto basis using information on actual exchange rate movements. Subsequently, Ghosh, Gulde, and Wolf (2003) reexamined the evidence on macroeconomic performance under alternative de jure regimes by checking the robustness of their results against a hybrid de jure/de facto classification.[7] Another classification system, devised by Levy Yeyati and Sturzenegger (LYS, forthcoming), discarded the de jure classification altogether and instead employed purely statistical techniques to exchange rate and reserves data to determine the de facto flexibility of exchange rate regimes.[8] In addition, the Fund itself moved to a de facto classification system in 1999. The new IMF "de facto" classification combines available information on the exchange rate and monetary policy framework and authorities' formal or informal policy intentions with data on actual exchange rate and reserves movements to reach a judgment about the actual exchange rate regime.[9]

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[5] See Ghosh and others (2003) for a description of the de jure classification system as well as historical data on countries' classification under this system.

[6] For an early recognition of this concern, see Edwards and Savastano (2000).

[7] The hybrid classification—referred to as the "consensus" classification by Ghosh, Gulde, and Wolf—discards observations for which the de jure classification does not match a de facto one based on actual exchange rate movements. Effectively, this procedure narrows the sample by 35 percent over the 1970-99 period.

[8] The Levy Yeyati-Sturzenegger dataset, which goes back to 1974, attempts to classify—on an annual basis—about 180 countries in terms of actual flexibility. However, about one third of the observations in their sample cannot be classified by their algorithm because of missing data or because the regime was a peg to an undisclosed basket.

[9] See IMF (1999), Section IV, for details. The IMF de facto classification is, in effect, a hybrid classification system that combines data on actual flexibility with information on the policy framework. Using historical data and information on countries' exchange

Despite these advances, analysis sometimes requires a more nuanced characterization of regimes. Countries experiencing episodes of macroeconomic instability often have very high inflation rates, which may be reflected in high and frequent exchange rate depreciation. Classification of such regimes as floating, intermediate, or pegged is problematic, since the macroeconomic disturbances could be incorrectly attributed to the exchange rate regime. In addition, in countries with significant parallel foreign exchange markets, with rates that differ substantially from official ones, movements in parallel rates rather than official rates provide a more realistic barometer of underlying monetary policy. In particular, countries with a fixed official rate but high inflation and a rapidly depreciating parallel rate cannot be considered as having a monetary stance that is consistent with a pegged regime. Moreover, to assess the relationship between regimes and longer-term economic performance, it is helpful to identify longer-term "regimes" rather than shorter-term "spells" within a regime, such as the widening of a horizontal band or a one-time devaluation followed by a re-peg. By employing a relatively short horizon over which the de facto regime is assessed, classifications algorithms, such as the one employed by Levy Yeyati and Sturzenegger (forthcoming), can potentially record a large number of regime changes that are, in fact, related to short periods of disturbances—possibly transient economic or political shocks— and do not in fact involve a change in the regime itself.

Reinhart and Rogoff's (2004) "Natural" classification addresses these shortcomings by separating episodes of severe macroeconomic stress and incorporating information on dual/parallel market exchange rates.[10] Their classification distinguishes regimes that are "freely falling" as a separate category and, in cases where the dual/parallel exchange rate differs substantially from the official rate, uses movements in the dual/parallel rate to classify the regime. Also, a five-year horizon is used to gauge the true flexibility of the longer-term exchange rate regime. The Natural classification divides de facto regimes into five "coarse" categories—fixed, limited flexibility, managed floating, freely floating, and freely falling— and 15 "fine" subcategories. The Reinhart-Rogoff dataset is comprehensive, covering virtually all Fund members, in most cases back to 1946. Hence, it facilitates richer historical analysis of regime distributions, transitions, and performance than other de facto classifications.[11]

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arrangements, Bubula and Ötker-Robe (2002) have put together a database containing IMF de facto classifications going back to 1990.

[10] The Natural classification relies on a broad set of descriptive statistics and detailed country chronologies of exchange rate arrangements to group regimes. As noted by Reinhart and Rogoff, this is analogous to natural taxonomic schemes in biology, where species are grouped according to their characteristics.

[11] Technical aspects of the fine and coarse versions of the Natural classification system are described in Appendix I, which also contains a summary comparison of the various regime classification systems.

Some qualifications, however, with respect to de facto classifications, including the Natural classification, should be noted. The absence of exchange rate variability (used to classify regimes) may reflect the absence of real shocks to the economy rather than a fixed exchange rate regime. Reinhart, Rogoff, and Spilimbergo (2003) find, however, that countries that have had relatively stable exchange rates have not been subjected to fewer or smaller terms of trade shocks.[12] Also, de facto classifications are based on past movements of exchange rates (and other variables). Hence, they are backward-looking and do not incorporate information on policy intentions, which may in turn affect economic performance.[13] However, this argument cuts both ways. Stated, and even informal, exchange rate policy intentions may be forward-looking but may also be "misleading."[14] Finally, de facto classifications may result in a high frequency of recorded regime transitions because of changes in the pattern of actual exchange rate movements. The Natural classification addresses this issue by employing a five-year horizon to gauge actual exchange rate flexibility. While this helps to distinguish regimes from spells, it limits the Natural classification's ability to detect short-term currency market pressures—such as those that culminated in the CFA franc devaluation in early 1994—that could have longer-term macroeconomic effects. Hence, the Natural classification is not necessarily appropriate for analyzing specific issues such as the near-term impact of changes in the country's exchange rate spell. From a global perspective, however, the Natural classification—with its special features and rich historical coverage—potentially yields important new insights into the history of regimes and their effect on macroeconomic performance.

B. Divergence Between Stated and Actual Policies

Comparison of the de jure and Natural classifications highlights the divergence between stated and actual policies, particularly at the polar extreme of flexibility. Focusing on the broad classification categories over the period 1973-99 (for which there are overlapping data), Figure 1 documents that only about one half of the observations—where each observation corresponds to a given country's regime in a particular year—were classified in the same broad category under both the de jure and the Natural classifications. The

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[12] In principle, of course, countries with relatively stable exchange rates may have been subject to fewer or smaller other real shocks, including policy shocks, or to other shocks that happened to offset the terms of trade shocks they experienced.

[13] For example, de facto classifications (other than the IMF de facto classification) do not distinguish "unsuccessful" pegs—those regimes where the authorities try to peg the exchange rate but are unable to do so. The IMF de facto classification, by contrast, incorporates information on policy intentions and, in principle, retains a forward-looking element.

[14] This does not mean, of course, that formal announcement of the de facto regime does not affect macroeconomic performance. Indeed, as the results described in Section III indicate, the effect of announcing the true de facto regime has been significant for certain regimes.

divergence was particularly striking among so-called "floating" regimes—only 20 percent were de facto free floats, while 60 percent were either intermediate or pegged regimes, and another 20 percent had freely falling currencies.[15] Although almost all de jure "hard" pegs were in fact operated as hard pegs, fewer than 40 percent of de jure "soft" pegs were de facto pegs, either hard or soft. About 60 percent of de jure intermediate regimes actually operated as intermediate regimes.[16]

In the 1970s and 1980s, the differences between actual and stated policies reflected, to a large extent, the prevalence of dual/parallel foreign exchange markets. In the early 1970s, almost one half of all countries (and one third of advanced economies) had active dual/parallel markets with exchange rates that deviated substantially from official rates (Figure 2). Foreign exchange markets have since been unified in most countries. In emerging markets and other developing countries, the unification occurred mainly in the 1990s, as capital flows to emerging market economies accelerated and efforts were intensified by the international community—including the Fund—to encourage countries to accept Article VIII. As the number of countries with dual/parallel exchange rates that deviated substantially from official rates declined (from 30 in 1995 to 9 in 2001),[17] the number of mismatches between countries' classifications in the de jure and Natural classifications did not. This was due mainly to the increase in freely falling regimes—which included the transition economies of central and eastern Europe and the FSU—in the 1990s and the classification of euro area currency regimes as "intermediate" by the de jure classification until 1999.

The frequency of "freely falling" regimes is also on a declining trend, despite a brief resurgence following the break-up of the Soviet Union. Rogoff (2003) notes that this, in turn, reflects the decline in inflation across the world in recent years. Hence, accounting for dual/parallel markets and free falling regimes, while critical in drawing lessons from the history of regimes, is less likely to be as relevant in the future.

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[15] Unless otherwise noted, all subsequent references to de facto regimes and regimes' actual operation are to the Natural classification.

[16] Surprisingly, during the run up to European Monetary Union, all the euro area countries were listed as "intermediate" regimes in the de jure classification until 1999.

[17] These data are based on Reinhart and Rogoff (2004), and are not identical to the IMF's classification of unified versus dual/multiple rates. By multiple exchange rates, Reinhart and Rogoff refer to cases where one or more rates is market determined, as opposed to cases where multiple official rates are all fixed and simply act as a differential tax on a variety of transactions. Another important difference is that dual/multiple markets are typically legal, whereas parallel markets may or may not be legal.

Differences Across Country Groups

As noted, compared to the Natural classification, the de jure classification significantly overstates the number of true floats and pegs, suggesting that fewer countries are at the polar extremes than implied by their announcements. Figures 3 and 4 show that few countries, especially emerging markets and other developing countries, actually allow their exchange rate to float freely. Among emerging markets, the proportion of de facto free floaters has remained relatively small at 4-7 percent since the mid 1980s (Figure 5).[18] Even among advanced economies, only about 20 percent allow their currencies to float freely, although close to 40 percent state that they have floating regimes. The figures also show that fewer countries actually peg their exchange rate than announcements would suggest. De facto pegs accounted for about one-third of all de facto regimes in recent years, while de jure pegs comprised about one half all de jure regimes. However, the number of "hard" pegs was significantly higher under the Natural classification than the de jure.[19] While the proportion of de facto pegs has increased slightly since the early 1990s, this mainly reflected the monetary union in Europe and the adoption of pegs by some of the countries that were previously experiencing freely falling currency values. Interestingly, hard pegs accounted for most of the recent increase in pegs in other developing countries, while soft pegs accounted for much of the increase among emerging markets.

Intermediate regimes have been and continue to be considerably more prevalent than suggested by the de jure classification. While de jure intermediate regimes rose from around 10 percent of all exchange rate regimes in the mid-70s to about a quarter in the late 1990s, the proportion of de facto regimes with an intermediate degree of flexibility has remained at

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[18] For other developing countries, the increase in de jure floats in the late 1980s and early 1990s was in reality a rise in freely falling regimes, and part of the decline in free floats since the mid 1990s reflected a reduction in freely falling currency values as progress was made in macroeconomic stabilization in many of these countries (e.g., Azerbaijan, Bulgaria, Iran, Kyrgyz Republic, and Ukraine).

[19] The definition of "hard" pegs differs slightly across classifications. In the de jure classification, such pegs constitute monetary unions and currency boards. The Natural classification also includes pre-announced pegs. Of the 43 countries listed as hard pegs by the Natural classification in 2001, only five had pre-announced pegs, of which only one (Malaysia) was in the emerging markets group. Excluding pre-announced pegs from the hard peg category does not affect the finding that hard pegs are more prevalent under the Natural classification than the de jure. However, the finding of a general absence of a bipolar tendency among emerging markets in the 1990s (discussed below) is actually accentuated by such an adjustment.

Figure 1. Natural Classification Regimes by De Jure Category, 1973–99
(in percent of annual observations)
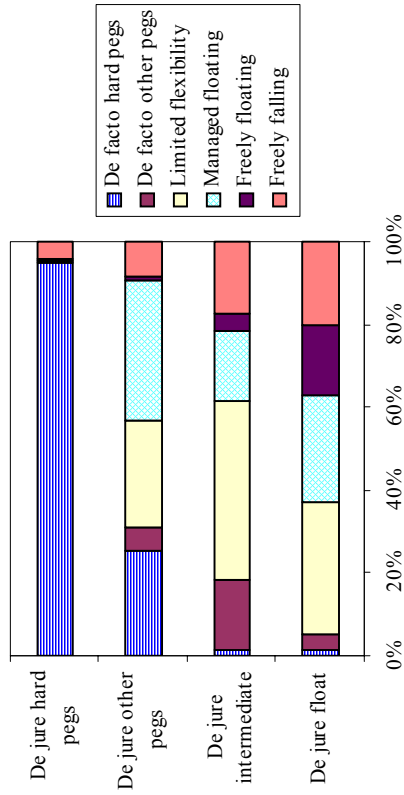
Figure 2. Countries with Dual/Parallel Foreign Exchange Markets, 1973–2001
(in percent of annual observations)

Figure 3. Natural Classification Regime Distribution, 1940–2001
(in percent of annual observations)
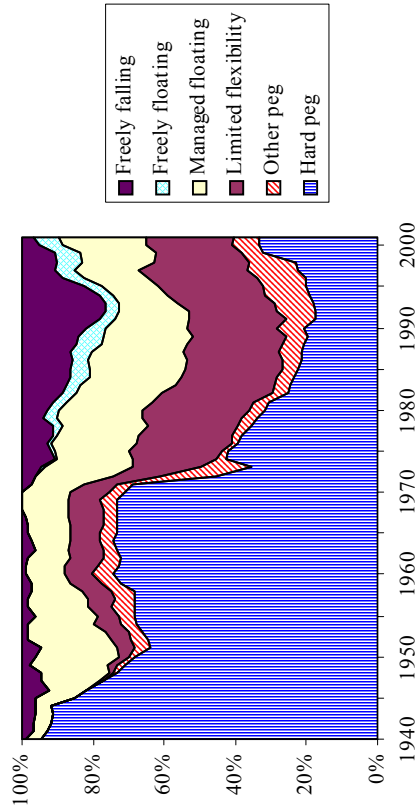
Figure 4. De Jure Regime Distribution, 1973–99
(in percent of annual observations)
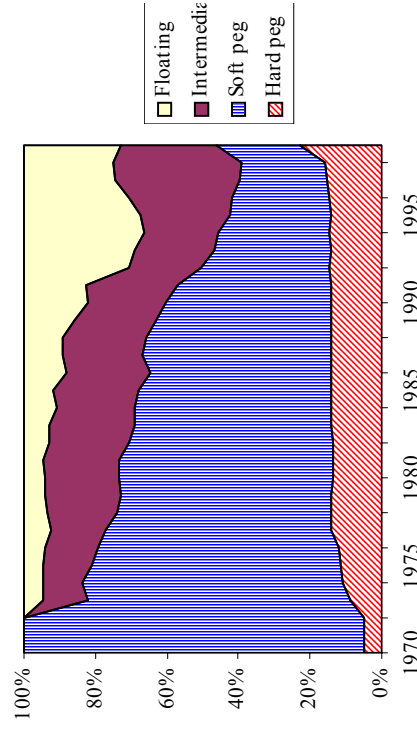
* Sources: Reinhart and Rogoff (2004); Ghosh, Gulde, and Wolf (2003); and IMF staff estimates.

Figure 5. Natural Classification Regime Distribution by Country Group, 1940–2001
(in percent of annual observations for each group)

Advanced Countries

Emerging Markets

Developing Countries

Hard peg Other peg Limited flexibility Managed floating Freely floating Freely falling
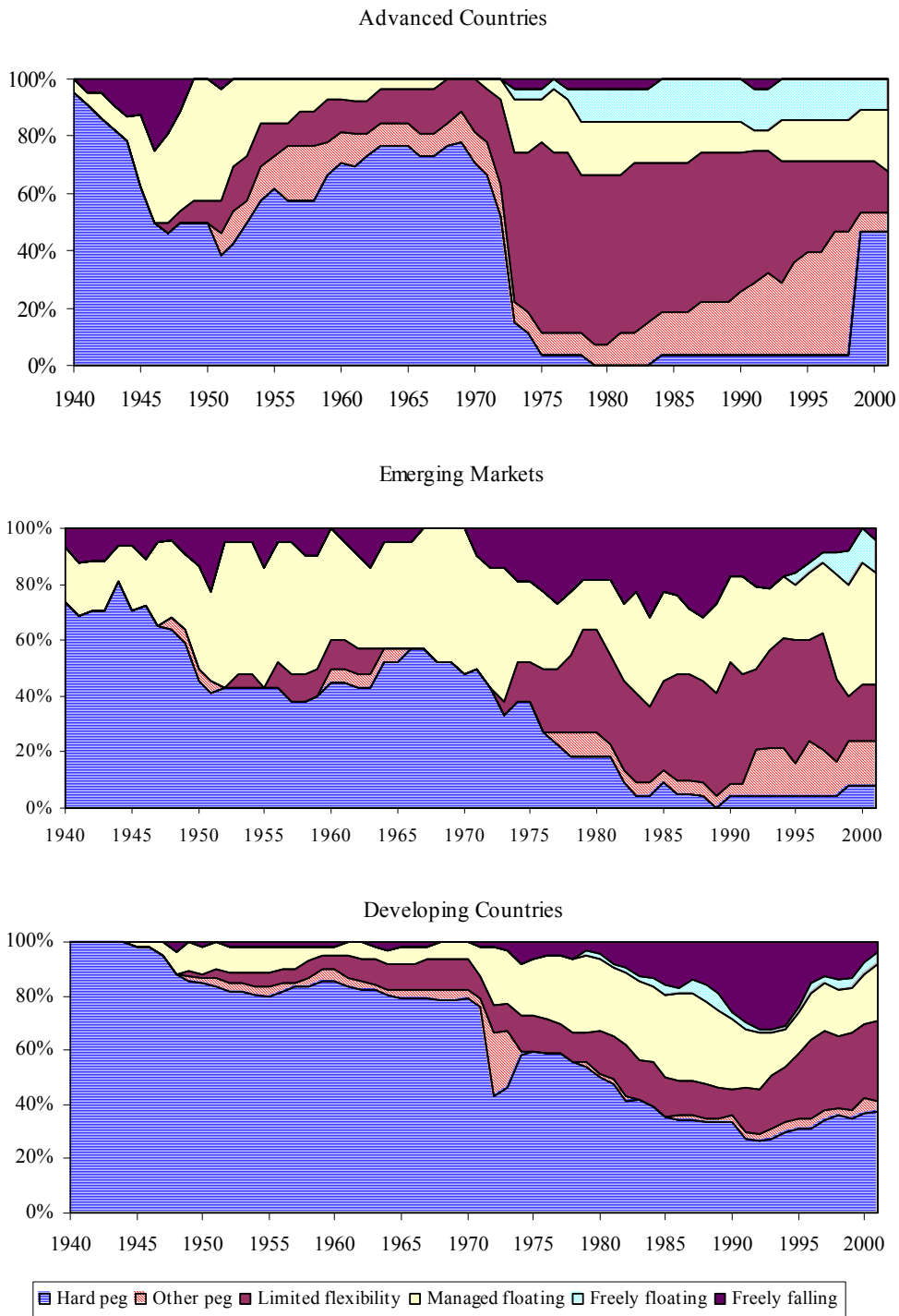
Sources: Reinhart and Rogoff (2004) and IMF staff estimates.

about one half since the mid 1970s.[20] Within intermediate regimes, however, managed floats have become more prevalent in emerging markets over the past decade, while other developing countries have tended to move in the opposite direction toward more limited flexibility.

A historical retrospective using the Natural classification also suggests that the breakup of the Bretton Woods system was much less of a watershed event for emerging markets and other developing countries than for advanced economies. De facto pegs in advanced economies declined sharply as the Bretton Woods system collapsed, while among emerging markets and other developing countries, the decline in pegs was more gradual and continued through the 1980s.[21]

Even when compared with other de facto classifications, the Natural classification records fewer regimes near the polar extremes of full flexibility and rigid pegs. At a broad level, the IMF de facto classification yields similar results to the Natural classification—two thirds or more of Natural classification free floats, pegs, and intermediate regimes are classified the same way by the IMF de facto classification. However, the IMF classification picks up many more free floats than the Natural classification, especially among emerging markets, where as many as one third were listed as freely floating regimes in 2001 (Figure 6).[22] Similarly, the prevalence of pegs is higher than in the Natural classification,

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[20] Among advanced economies, the fraction of intermediate de facto regimes expanded sharply around the time of the collapse of the Bretton Woods system, but shrunk steadily in the 1980s and 1990s as the euro area countries moved toward monetary union. Among emerging market economies and other developing countries, the proportion of intermediate regimes rose markedly in the 1970s, but has remained relatively flat since then.

[21] As the prevalence of de facto pegged regimes has evolved, the choice of anchor currency among peggers has undergone significant change, with virtually all peggers now anchoring to either the dollar or the euro (Box 1).

[22] Of the observations classified as free floats by the IMF de facto regime that were also classified by the Natural classification, only 27 percent were Natural classification free floats, while 18 percent were freely falling regimes, 33 percent were managed floats in the Natural classification, 18 percent were Natural classification limited flexibility regimes, and 3 percent were Natural classification pegs. About 30 percent of the IMF de facto free floats were not classified by the Natural classification, usually because qualitative evidence suggested the presence of a significant parallel market but parallel exchange rate data were not available. That said, Bubula and Ötker-Robe (2002) also find, using the IMF de facto classification, that intermediate regimes have been more prevalent than suggested by the de jure classification.

Box 1. Anchor Currency Choice

While there is a large empirical literature on the conditions under which countries adopt fixed or floating regimes (discussed in Appendix II), less has been written on the determinants of anchor currency choice. The question of interest is: once countries choose to peg their exchange rates to some "anchor currency" (including by means of crawling pegs or bands), what determines the choice of this anchor?

The theory of optimal currency areas suggests that countries benefit from adopting the same anchor as trade partners, since this reduces their bilateral exchange rate variability. Meissner and Oomes (2004) provide empirical evidence of these network externalities. They find that, after controlling for other factors (such as country size, openness, and colonial history), the probability of choosing a particular anchor currency increases with the amount of trade with other countries that use this same anchor. These externalities may explain why virtually all countries that have chosen to peg their exchange rates in some way to another currency have converged over the last fifty years to using either the U.S. dollar or the euro as their anchor currency (see figure).

1940–72

Between 1940 and 1972, the U.S. dollar was the most popular anchor currency chosen by advanced countries, followed by the British pound and the deutschmark. For developing countries, the predominant anchor currencies were the U.S. dollar, the British pound, and the French franc, with the latter choices largely being determined by colonial history.

1973–89

Following the collapse of Bretton Woods, the British pound disappeared entirely from the menu of anchor choices. Pegs to the U.S. dollar declined in popularity among advanced countries as an increased number of free and managed floaters emerged,

Anchor Currency Choices, 1940–2001
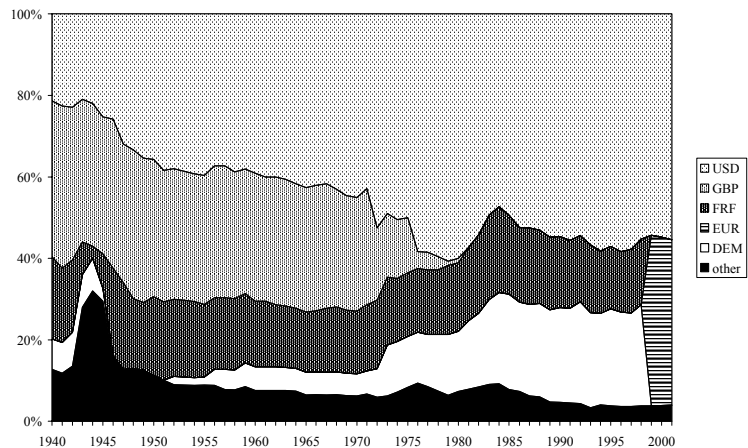
Source: Meissner and Oomes (2004)

and the majority of advanced countries that retained pegs ended up tying their currencies in some form to the deutschmark, and later to the euro. Developing countries largely switched to using the U.S. dollar as anchor, except the group of former French colonies that continued to peg to the French franc.

1990–2001

The overall distribution of anchor currencies did not change much in the 1990s, apart from the introduction of the euro in 1999. However, the behavior of transition economies during this period is illustrative of the dynamics of anchor currency choice. Following the breakup of the Soviet Union in the early 1990s, most transition economies initially fell in the "freely falling" category for several years, and then increasingly started tying their currencies to the deutschmark and the U.S. dollar. Interestingly, the choice of anchor was almost perfectly divided among regional lines: while Central and Eastern European countries chose to anchor to the deutschmark (later the euro), most former Soviet Union republics chose the U.S. dollar as their anchor (with the exception of Estonia, which adopted a currency board arrangement with the deutschmark; and Latvia, which chose the SDR). As Meissner and Oomes (2004) show, this divide between the euro and the dollar cannot be explained solely on the basis of trade flows with Europe or the United States, but is partially the result of network externalities arising from trade partners' anchor currency choices.

Figure 6. IMF De Facto Regime Distribution, 1990–2001
(in percent of annual observations)
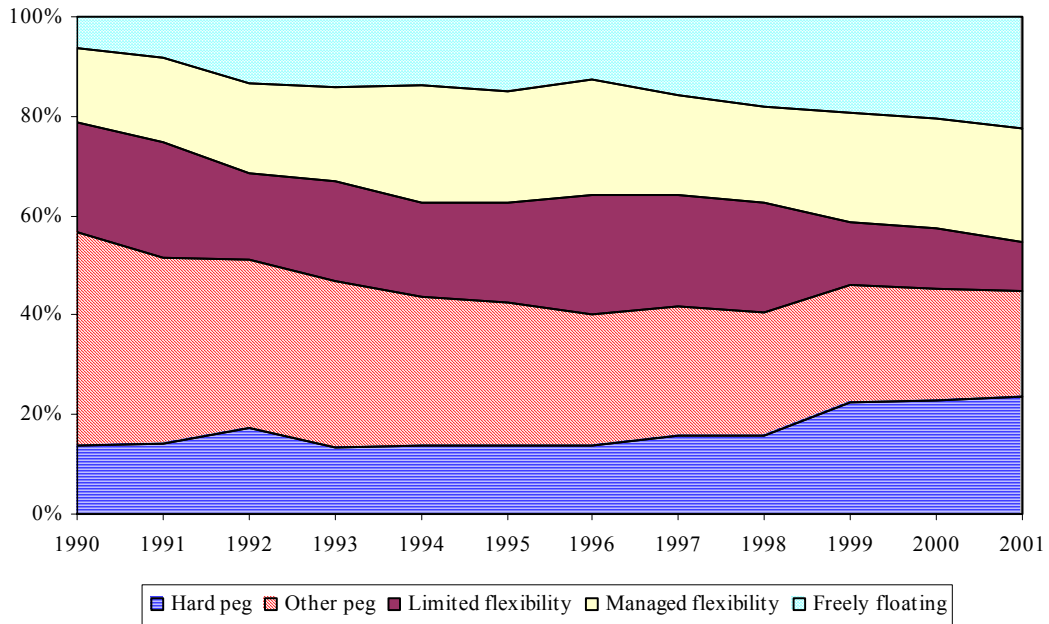
Figure 7. Levy-Yeyati – Sturzenegger Regime Distribution, 1974–2001
(in percent of annual observations)
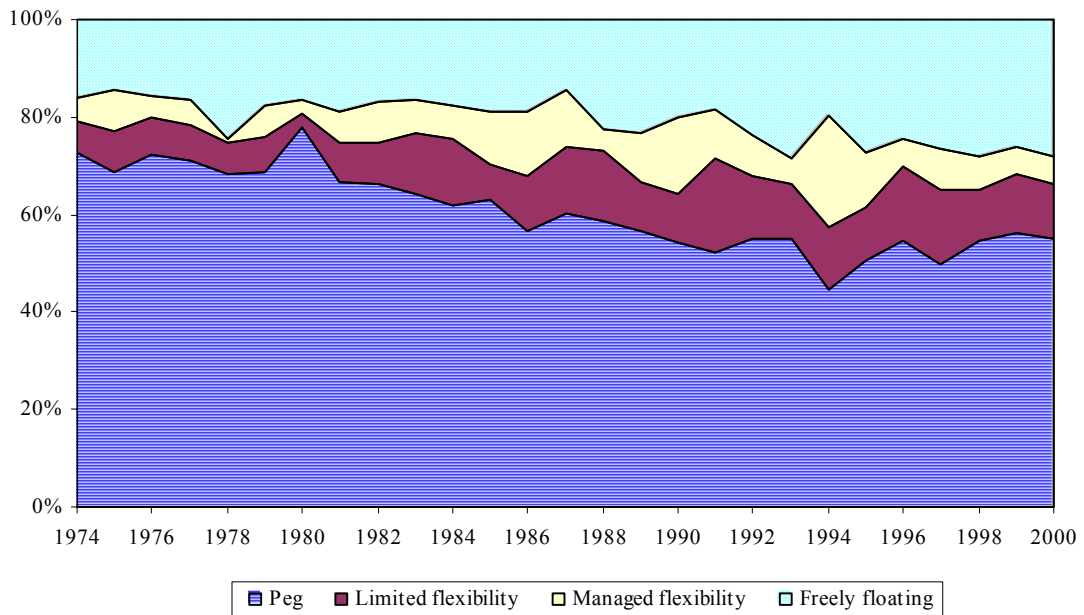
Sources: Bubula and Otker-Robe (2002); Levy-Yeyati and Sturzenegger (2003), and IMF staff estimates.

especially for other developing countries, of which about one half were listed as pegged regimes in 2001.[23] The Levy Yeyati-Sturzenegger (LYS) de facto classification also records many more free floats and pegs and, consequently, many fewer intermediate regimes than the Natural classification (Figure7). Surprisingly, over one half of emerging markets are classified as floats in the LYS classification in the late 1990s, both before and after the Asian crises, and free floats are more prevalent than in the de jure classification, drawing into question the degree to which the former presents a more accurate picture of actual regimes than the latter.

Bipolar Hypothesis and Fear of Floating

The Natural classification raises questions about the general validity of the "bipolar" hypothesis. Starting in the mid 1990s, some observers had predicted that emerging market countries would, over time, move to the polar extremes of exchange rate flexibility, that is they would either adopt freely floating regimes or move to hard pegs [24] That speculative attacks against "hard" pegs were rare and could apparently be warded off, seemed to lend support to the hypothesis.[25] The increase in free floats and hard pegs since 1990 in the de jure and to a smaller extent in the IMF de facto classifications (as illustrated in Figures 4 and 6, respectively) appeared to support the bipolar view. As noted above, however, the Natural classification indicates that there has been no "hollowing of the middle." While a few emerging markets indeed moved in the 1990s to de facto hard pegs (Argentina and Malaysia) or free floats (Indonesia, Korea, and South Africa), just as many transitioned from freely

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[23] Among advanced countries, however, euro area economies are listed as limited flexibility regimes rather than pegs in the IMF de facto classification, as in the de jure classification, until 1999 (until 2001 for Greece).

[24] For example, Eichengreen (1994: 4–5) argued that countries "will be forced to choose between floating exchange rates on the one hand and monetary unification on the other". Obstfeld and Rogoff (1995: 74) claimed that for countries with an open capital account, "there is little, if any, comfortable middle ground between floating rates and the adoption of a common currency". More recently, Summers (2000: 8) argued that, for economies with access to international capital markets, "the choice of appropriate exchange rate regime... increasingly means a move away from the middle ground of pegged but adjustable fixed exchange rates towards the two corner regimes." Fischer (2001: 22) concluded on the basis of the IMF de facto classification that "In the last decade, there has been a hollowing out of the middle of the distribution of exchange rate regimes in a bipolar direction, with the share of both hard pegs and floating gaining at the expense of soft pegs."

[25] According to the Natural classification, Brazil, Korea, and Malaysia had limited flexibility regimes prior to their recent capital account crises, while Mexico, Philippines, and Thailand had de facto pegs (but not hard pegs) before their respective crises. Russia was not classified in 1997-98, while Argentina was classified as a hard peg through 2001. Of all the major recent crisis countries, only Turkey had a managed floating regime prior to its crisis.

falling to intermediate regimes (Brazil, Peru, Poland, Russia, and Venezuela).[26] As a result, the middle remained as large as it was a decade ago. Moreover, transitions since 1990 to de facto pegs among emerging markets have been more in the "soft" (China, Egypt, Jordan, and Peru) rather than the "hard" category.[27]

Countries' tendency to allow less exchange rate flexibility in practice than in policy statements is consistent with the "fear of floating." As Calvo and Reinhart (2002) argue, fear of floating—a reluctance to allow exchange rates to fluctuate freely—could arise for various reasons, including policy credibility concerns, fear of Dutch disease in case of large appreciations, and fear of inflation, currency mismatches, and/or balance sheet effects (on account of high liability dollarization) in case of large depreciations.[28] As Figure 1 indicates, the vast majority of countries that say they float actually do not. Moreover, many countries that say they have intermediate regimes in fact have de facto pegs.

C. Regime Transitions

Major global and regional events have influenced exchange rate regime transitions. The collapse of the Bretton Woods system was, of course, the outcome of pressures built up in a relatively rigid system of exchange rate regimes and was followed by a sharp increase in flexible arrangements (Figure 8). The debt crisis of the 1980s and the transformation of the economies of central and eastern Europe and the FSU in the early 1990s were also accompanied by a relatively high frequency of regime transitions, especially into and subsequently out of the freely falling category. In the latter half of the 1990s, as several large

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[26] Hernandez and Montiel (2001) argue that while several Asian countries have increased the flexibility of their exchange rates in the post-crisis period, they generally have not adopted truly freely floating regimes.

[27] Peru is classified as a de facto soft peg during 1999-2001 by the Natural classification on the basis of a 2-year rather than 5-year window to allow for a possible structural break in the variability of the exchange rate towards the end of the sample period. Peru would fall just short of the criteria for a de facto peg in 1999-2001 if a 5-year window, which would also span the period prior to 1999, were used.

[28] See also Reinhart (2000). Hausmann and others (2001) find that exchange rate volatility decreases with the extent to which countries can borrow internationally in their own currency, which they consider an indicator of a country's ability to avoid currency mismatches. The extent of exchange rate pass-through turns out to be less significant. Alesina and Wagner (2003) identify conditions under which countries declare a de jure float but, because of fear of floating, restrict exchange rate flexibility.

Figure 8. Natural Classification Regime Transitions, 1941–2001
(number of transitions)
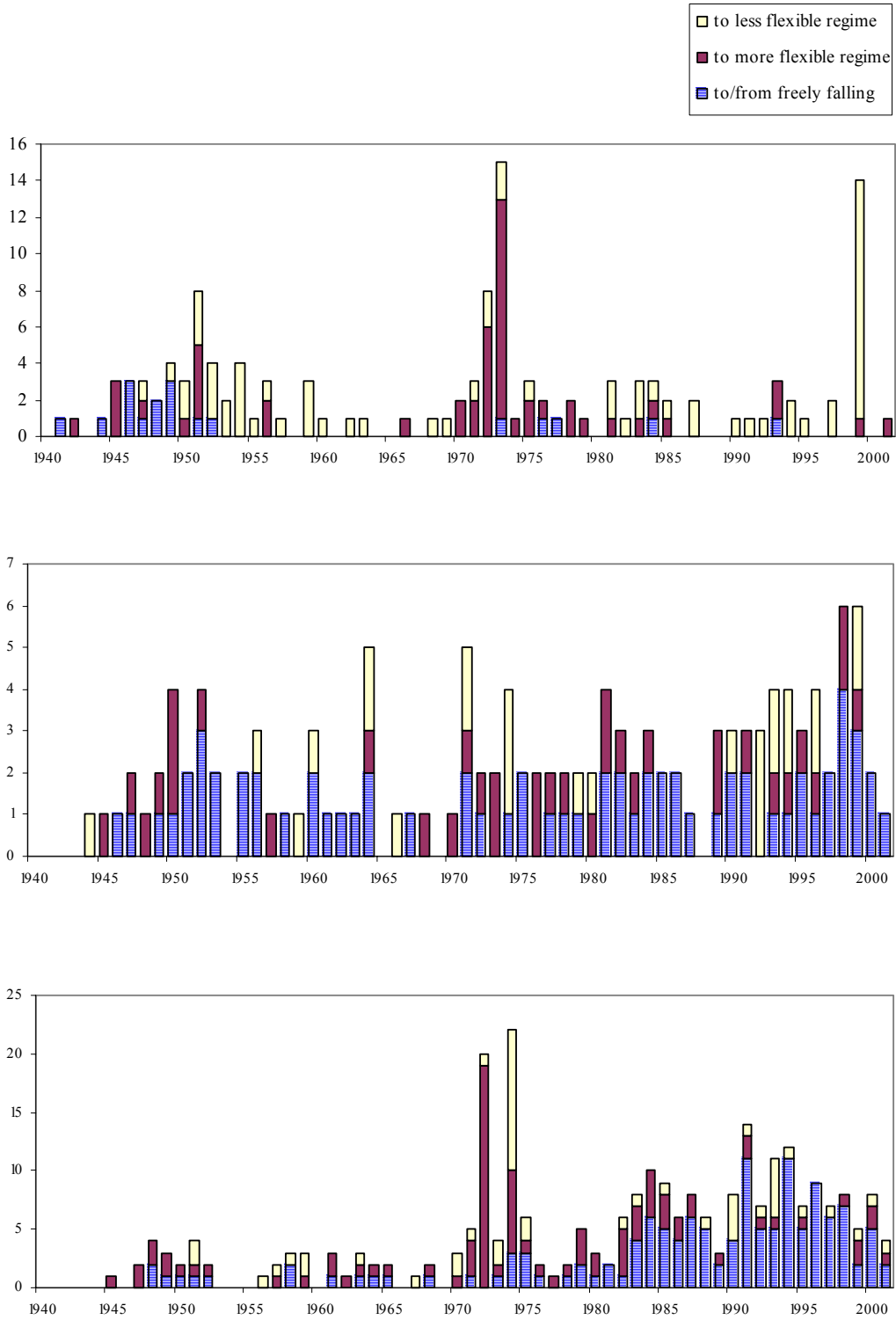
Sources: Reinhart and Rogoff (2004) and IMF staff estimates.

emerging markets faced external financing crises, the frequency of exchange rate regime transitions among the emerging market group rose once again. And in 1999, a major transition occurred among advanced economies with the adoption of monetary union in the euro area.

Once transitions related to global events and into and out of the freely falling category are distinguished, it turns out the frequency of changes in countries' exchange rate regimes today is remarkably similar to fifty years ago. As Figure 8 illustrates, the average number of countries transitioning to a different regime (excluding transitions into and out of the freely falling category) in any given year since the collapse of the Bretton Woods system was about the same as during the Bretton Woods period.

The interesting finding, thus, is that countries have changed their de facto exchange rate regime relatively infrequently. On the basis of data going back to the 1940s, about 7 percent of all countries transitioned to a different regime in an average year, and the typical exchange rate regime had a duration of about 14 years (Table 1). If the 1970-75 period is excluded, and eastern and central European and FSU countries, along with the euro area countries, are removed from the sample, transitions were even less frequent. In the adjusted sample, the average regime duration rises to just over 16 years, while the proportion of countries changing regime in any given year declines to about 6¼ percent.

De facto pegged regimes have tended to change less frequently—and last longer—than other regimes. For all de facto pegs since 1940, the probability of exiting to a different regime in any given year was about 3½ percent.[29] Since the Natural classification classifies only "successful" pegs as pegs, countries that attempt to peg but are able to sustain them only briefly tend not to be classified as pegs. This, together with the fact that the Natural classification does not treat one-time devaluations followed by a re-peg as a change in the longer-term regime,[30] reduces the observed exit rate from de facto pegs. It is also worth

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[29] These conclusions contrast with the results obtained by Klein and Marion (1997); Eichengreen and others (1998); and Duttagupta and Ötker-Robe (2003), among others, who find the longevity of pegs to be much shorter. This is mainly because the Natural classification attempts to identify longer-term regimes rather than short-term "spells," which are analyzed in the other studies.

[30] For example, the Natural classification does not treat the 1994 CFA franc devaluation as a change in regime. By contrast, the LYS classification, which uses a one-year horizon to measure the variability of the official exchange rate, picks up significantly more transitions, including, for example, a switch from peg to "dirty float" for each of the CFA zone countries in 1994, and a switch back to peg in 1995.

Table 1. Annual Transition Probabilities
(Historical rate of regime transitions, in percent)

Natural classification	
All countries, 1940–2001	7.0
Pegs only	3.5
All countries, adjusted sample, 1940–2001 (excluding 1970–75)[1]	6.2
Pegs only	2.5
Advanced economies, 1940–2001	7.0
Pegs only	5.1
Emerging markets, 1940–2001	9.7
Pegs only	6.7
Emerging markets, 1989–2001	14.4
Pegs only	9.8
Developing countries, 1940–2001	6.1
Pegs only	2.4
De jure classification[2]	
All countries, 1973–2001	6.8
Pegs only	4.9

Source: Reinhart and Rogoff (2004); Ghosh, Gulde, and Wolf (2003); and staff estimates.

[1]Excludes euro area and former command economies in Europe and the FSU.
[2]Natural classification transition rates for all regimes and pegs over the same period were 9.3 percent and 5.1 percent, respectively.

noting that regime transitions are less frequent in the de jure classification than in the Natural classification, suggesting that countries tend to change their stated exchange rate policy objectives even less frequently than their de facto exchange rate policies. The average annual exit rates from de facto and de jure pegs during 1973–99 has been about the same, however, partly because the collapse of the Bretton Woods system accounted for a sizable portion of such exits during this period.[31]

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[31] Masson (2001) obtains very similar results for regime transition rates and regime duration using the Ghosh and others (1997) classification, but finds that transitions using the LYS classification are considerably more frequent. Masson suggests that the difference in historical transition rates may arise from sampling problems—a fair number of observations are "inconclusive" in the LYS data and thereby omitted—and methodological differences that tend to accentuate de facto flexibility (and hence transition rates) in the LYS algorithm in periods of heightened exchange market pressures. Using the IMF de facto classification, Bubula and Ötker-Robe (2002) conclude that intermediate regimes are unlikely to disappear in the future.

Emerging markets, however, have tended to switch regimes more frequently, and have gone into the freely falling category more often, than other countries. Since 1940, the annual regime transition rate among emerging markets has averaged about 10 percent, compared with 7 percent for advanced countries and about 2 percent for other developing countries. On average, about 3 percent of all emerging markets, excluding those already in the freely falling category, have transitioned to a freely falling regime every year. By contrast, only 0.5 percent of all advanced countries and less than 2 percent of other developing countries have switched to a freely falling regime in any given year. The transition rate out of pegged regimes among emerging markets has also been higher (about 7 percent) than in advanced and other developing countries (5 percent and 2½ percent, respectively).[32]

If historical transition rates continue and barring major global shocks, intermediate regimes will remain prevalent in the future and the overall distribution of de facto regimes will be similar to that at present. Given the somewhat longer average duration of pegs than other regimes in the past, the historical transition rates imply that the proportion of pegs could increase slightly over time. Similarly, since relatively few countries have had true free floats in the past, especially among developing countries, the historical likelihood of transitioning into a free float has been low, implying that the share of free floats among all regimes is likely to remain modest in the future. However, as other developing countries become increasingly integrated into global financial markets, their regime transitions may well resemble those seen among emerging markets during the 1990s. In that case, the proportion of pegged regimes among developing countries will tend to decline gradually in the future, while managed floats and free floats will gradually increase. Over the longer term, of course, political economy considerations may guide regime choice decisions in some countries. For example, some countries may choose to join currency unions in the not so distant future. Prospects for transitions of that nature cannot be assessed on the basis of historical transition rates, however, and are clearly beyond the scope of this analysis.

D. Implications for Assessing Regime Performance

Empirical analysis seeking to uncover the link between countries' exchange rate regimes and their macroeconomic performance depend critically on how regimes are classified. The wide variation between countries' stated exchange rate regimes and their actual practice suggests that results obtained by employing the de jure classification could be off the mark, and that use of a classification that more accurately captures true regime flexibility can lead to different conclusions. The Natural classification, with its special features and historical coverage, is a promising candidate for such analysis.[33]

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[32] These calculations do not treat switches within the pegged category (e.g., from "hard" to "other" peg) as a transition. The average duration of pegs in other developing countries is strongly affected by the CFA franc zone countries, many of which have retained de facto pegs throughout the sample period.

[33] The issue of causation potentially affects the analysis of regime performance—better macroeconomic performance may be associated with certain regimes because countries with strong performance may systematically choose to adopt those regimes. As discussed in

The persistent popularity of intermediate regimes, especially among emerging markets and other developing countries, as identified by the Natural classification suggests that such regimes may provide important advantages. Indeed, the absence of a general bipolar tendency may be indicative of the possibility that intermediate regimes are able to capture some of the benefits of both extremes while avoiding many of the costs.

Finally, the relatively long average duration of Natural classification regimes may suggest that regime transitions involve significant costs. However, the higher transition rates for emerging markets indicates that either these costs decline as countries experience higher capital flows or, more likely, higher capital flows in the absence of adequate financial infrastructure and safeguards make it harder to sustain regimes, particularly pegged regimes. Again, evidence in support of this channel may potentially be obtained by assessing the (historical) likelihood of crises under alternative exchange rate regimes across different types of economies.

III. REGIME PERFORMANCE: INFLATION AND BUSINESS CYCLES

How does economic performance differ across exchange rate regimes? Since theoretical predictions are varied, and often conflicting, this section explores the question empirically for the period 1970 to 1999 using the Natural classification of de facto exchange rate regimes. Recognizing the limitations of such analyses—in particular, the possibility that economic performance influences the choice of regimes as much as regimes influence performance and that characterizing regimes is inherently difficult because a country's unique history of regimes may be more relevant for economic outcomes than merely the ongoing regime—the section, nevertheless, offers an overarching conclusion. The findings suggest that exchange rate flexibility becomes more valuable as countries mature in terms of their access to international capital markets and as they develop sound financial systems.

- In **developing countries**, with their low exposure to international capital movements, relatively rigid regimes—pegs and intermediate flexibility arrangements—appear to have enhanced policy credibility and thus helped achieve lower inflation at little apparent cost in terms of lost growth, higher growth volatility, or more frequent crises. The superior performance of pegged regimes required commitment shown through public announcement of that goal and was further improved through consistent macroeconomic policies that allowed for longer regime duration.

- In contrast, for **emerging markets**, with their higher exposure to international capital flows, rigidity of regimes was associated, particularly in the 1990s, with more frequent banking and, especially, costly "twin" crises that included both financial

Appendix II, however, it is difficult to find empirical regularities between a large set of potential determinants of regime choice—including standard measures of the broader policy context—and countries' actual regimes.

sector and balance-of-payments turbulence. Moreover, rigid systems were not associated with an obvious gain in terms of lower inflation or higher growth. At the same time, the move to full flexibility was inhibited by the concern that large swings in exchange rates may have adverse consequences. Case-studies illustrate a variety of approaches to achieving greater flexibility.

- In **advanced countries**, free floats registered faster growth than other regimes without incurring higher inflation. This benefit may reflect the typically more pronounced nominal rigidities in mature economies, giving flexible exchange rates an important role in reallocating resources following real shocks. Moreover, with financial maturity, widespread availability of debt denominated in domestic currency and hedging instruments reduces the adverse consequences from currency mismatches that give rise to fear of floating.

Though, on average, the value of exchange rate flexibility was found to increase with financial maturity, the results also suggest that the performance of any regime can be enhanced by consistent macroeconomic management. In particular, unified exchange rate systems have been associated with superior performance and the declining trend, noted in Section II, of regimes with dual exchange rates that depart substantially from official rates is, therefore, a welcome one. Similarly, "freely falling" regimes, characterized by dysfunctional macroeconomic policies, have also been poor performers. The good news, once again, is that the incidence of "freely falling regimes" has declined steadily over the past decade. And, in developing and emerging economies, intermediate regimes—those lying between the two "poles," or the "two corners," of pegs and free floats—have not fared systematically worse than the polar regimes, consistent with their longevity, described in Section II.

A. Introduction and Motivation

In guiding exchange rate regime choice, economic theory has proved to be an insufficient guide to policymakers. Empirical clarification is, thus, crucial. In part, the theoretical ambiguity arises because the effects of particular regimes operate with varying strength in different economies. In empirical analysis, therefore, country types need to be distinguished and this paper contrasts performance of regimes in developing economies, emerging markets, and advanced economies. Emerging markets, the subject of much of the recent policy discussion, differ from developing economies in terms of their higher exposure to international capital flows but continue, nevertheless to exhibit important institutional and financial sector weakness. As a consequence, emerging markets face higher inflation, risk of debt unsustainability, fragile financial systems, and propensity to macroeconomic volatility and are characterized, therefore, by more serious problems of credibility in the formulation of economic policy (see, for example, Fraga, Goldfajn, and Minella, 2003).

A more fundamental ambiguity in evaluating exchange rate regimes arises where theoretical predictions lead to opposing conclusions. Thus, for example, while pegged regimes are generally thought to lower inflation, they may only postpone its manifestation. Growth effects of regimes depend on what is assumed about the shock absorbing capacity of different regimes and how important these shock absorbers are in raising investment and productivity. And, flexible exchange rates may dampen volatility resulting from real external shocks; but

the very flexibility of rates may add to the volatility faced, with adverse economic consequences, leading to a "fear of floating" (Calvo and Reinhart, 2002).

Empirical analysis, however, has not delivered clear results either. In a well-known contribution, Baxter and Stockman (1989) compared the time-series behavior of key economic aggregates during and after the Bretton Woods system and found that, aside from greater variability of real exchange rates under flexible systems, there was little difference in the behavior of key macroeconomic aggregates across different exchange rate arrangements. Mussa (1986) had earlier reached similar conclusions. Indeed, in their review of the literature up to that point, Edison and Melvin (1990) despaired that the empirical effort to contrast economic performance across exchange rate regimes would ultimately prove inconclusive.

A recent generation of papers offers a more nuanced assessment. Using data for the post-Bretton Woods era for over 100 countries, the analysis initiated by Ghosh, Gulde, Ostry, and Wolf (1997) culminated in the comprehensive contribution of Ghosh, Gulde, and Wolf (2003). These authors deal with several empirically difficult issues. While they rely primarily on the de jure regime classification, they do make some effort to distinguish between the regime announced by national authorities and the one practiced by them. They also consider the perennially hard question of the direction of causality: do exchange rate regimes lead to particular macro outcomes or does performance determine the choice of regimes? Another important contribution is that by Levy-Yeyati and Sturzenegger (forthcoming), who develop a different measure of de facto regimes (as discussed in Section II) and also attempt to deal with the causality issue.

The results of these studies, however, continue to conflict, reflecting the differences in their methods of classifying regimes. Ghosh, Gulde, and Wolf (2003) find that inflation under fixed exchange rate regimes is significantly lower than under intermediate or freely floating arrangements, due to greater confidence in the currency (a credibility effect) and lower money growth (a discipline effect), and that the benefit of pegged exchange rate regimes in terms of inflation performance is fairly robust to the endogeneity of regime choice. They do not, however, find evidence of a strong link between exchange rate regimes and economic growth, especially after controlling for country-specific effects and possible simultaneity bias. This result contrasts with Levy-Yeyati and Strurzenegger (2002) who use their de facto classification of regimes and find, for a similar sample, that flexible exchange rates are associated with higher growth in developing countries (which group includes the set of countries referred to in this paper as emerging markets) ; no similar association exists among industrial countries. Both papers find, however, that fixed exchange rate regimes are associated with somewhat higher output volatility.[34]

Against that background, this section re-examines the link between exchange rate regimes and economic performance along four dimensions: inflation, output growth, growth volatility, and the incidence of crises. The assessment is based on the recently constructed

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[34] Several missing and inconclusive observations in the Levy-Yeyati and Strurzenegger (2003) classification raise concerns about their conclusions (see Section II).

Natural classification, which, as noted in Section II, identifies the prevailing de facto exchange rate regime. The relative longevity of regimes under the Natural classification renders the reverse causality problem less serious than, for example, under the Levy-Yeyati-Strutzenegger classification, where regime classifications change as often as every year; nevertheless, the section undertakes supplementary analysis to assess if the findings are robust to the reverse causality concern. Also, to allow for the possibility that the pressures under a particular regime are manifested after its collapse in a new regime, the section examines the lagged influence of regimes so that, in effect, the performance in the first year of a new regime continues to be attributed to the previous regime; this turns out to be important in the analysis of volatility in emerging markets. In addition, regime announcement and duration are considered as factors that may influence regime performance. The analysis covers up to 158 countries from 1970 to 1999. Throughout, developing, emerging, and advanced economies are distinguished. Where appropriate, the 1990s, a period of rapidly rising capital flows, are distinguished from earlier years.

The section is organized as follows. Section B provides a brief summary of the analytical issues to help interpret the results. Section C takes a first look at inflation, growth, growth volatility, and the incidence of crises across different exchange rate regimes, but does so without controlling for other factors that affect economic performance. Section D then controls for other determinants of economic performance and thus attempts to isolate the conditional relationship between exchange rate regimes and economic performance. Section E explores if the credibility underlying different exchange rate regimes can be enhanced through announcement of the regime and through policies that allow for longer regime duration; it also considers case-studies on how emerging markets can enhance their ability to effectively float their currencies. Section F briefly recaps. Appendix III summarizes the data and the econometric results discussed in this section.

B. Analytical Considerations

An important prediction from economic theory is that exchange rate pegs act as a disciplining device, allowing policy makers in countries with a high inflation propensity to import credibility and, hence, lower inflation from abroad (Giavazzi and Giovannini, 1989; and Dornbusch, 2001). As a policy prescription, nominal exchange rate rigidity—or an exchange rate anchor—came back into favor in the late 1980s and early 1990s, especially in Latin America, where exchange-rate based stabilizations were viewed as particularly helpful following a history of high inflation (Edwards, 2001). In this line of reasoning, the harder the peg, the more effective it is in enhancing credibility (Edwards and Magendzo, 2003a).

The proposition that pegs provide an inflation advantage is far from universally held, however. For advanced economies, pegged exchange rate regimes should not be necessary for achieving credibility. Even where they could play a role, achieving and maintaining hard pegs is not straightforward. In particular, as exposure to international capital flows increases, a larger fraction of the monetary aggregates needs to be backed to maintain the peg. Hence, emerging markets are less likely to be able to import credibility than other developing countries where interaction with international capital markets is more limited. Tornell and Velasco (2000) raise the possibility that the inflationary gains from fixed regimes are illusory. No exchange rate system, they argue, can ultimately act as a substitute for sound

macroeconomic policies. Far from exerting discipline, fixed exchange rate regimes may create an incentive for governments with short time horizons to cheat, delivering temporarily higher growth through larger deficits, with the full inflationary cost of such policies borne following the eventual collapse of the peg.

The theoretical implications of exchange rate regimes for economic growth and volatility are similarly murky, with various opposing claims.[35] In favor of pegs, Dornbusch (2001) argues that lower inflation associated with rigid exchange rate regimes would reduce interest rates and uncertainty, spurring investment and growth.[36] Also, where a country ties its currency tightly to that of another through a currency board arrangement, transactions costs may be lowered, increasing trade between the two countries. Frankel and Rose (2002) find that such expansion of trade is not offset by diversion away from other trade partners and, hence, by increasing the openness of the economy, this form of exchange rate rigidity also raises output growth. An argument in favor of exchange rate flexibility is the possibility of rapid resource reallocation following real shocks where short-run price rigidity is significant (Levy-Yeyati and Sturzenegger, 2003). Broda (2001) finds evidence that terms of trade shocks are amplified in countries that have more rigid exchange rate regimes. Edwards and Levy-Yeyati (2003) take that empirical analysis one step further and conclude that the inability of rigid regimes to absorb such shocks translates, in practice, into lower growth. Similarly, Calvo (1999) argues that the need to defend a peg following a negative external shock may result in high real interest rates and also stifle growth.

While flexible exchange rate regimes may, in principle, dampen real shocks to the economy, could the very flexibility of the exchange rate introduce a new element of volatility? As noted above, a robust finding is that nominal exchange rate volatility is associated with high real exchange rate volatility. Rogoff (1999) argues that such variability does not, in practice, have significant effects on output and consumption in advanced economies but may be harmful in developing countries. However, even if the higher volatility has harmful effects, pegged regimes may not be the appropriate policy response since the volatility may only apparently be contained and have real (adverse) effects on private investment due to the greater uncertainty over regime sustainability.

Indeed, just as the inflation-reducing benefits of exchange rate rigidity were being emphasized in the early 1990s, a fundamental reevaluation of the policy prescription was under way following the early crises associated with rigid regimes (for early recognition of this concern, see, for example, Eichengreen, 1994; and Obstfeld and Rogoff, 1995). Obstfeld and Rogoff noted in 1995, following the collapse of the British pound in September 1992 and

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[35] For a useful summary, see Bailliu, Lafrance, and Perrault, 2002.

[36] Such a beneficial outcome may have prevailed in the post-convertibility Bretton-Woods period from 1959-1971 when inflation and exchange rate volatility were low and growth was relatively strong (Bordo, 2002). However, it is not clear whether this was the consequence of the rigidity in exchange rate regimes or the consequence of a generally favorable economic environment.

of the Mexican peso in December 1994, that: "Many recent efforts to peg exchange rates within narrow ranges have ended in spectacular debacles." They went on to conclude: "These events are not unprecedented but their ferocity and scope have called into question the viability of fixed rates among sovereign nations in today's world of highly developed global capital markets." The subsequent fall of tightly managed regimes in East Asia (1997), Russia (1998), Brazil (1999), and Argentina (2002), has served as a continuing warning against pegged regimes, especially in emerging markets subject to volatile capital flows. Pegged exchange rates—or those with limited flexibility—invite speculative activity against the exchange rate and lead to abandonment of the peg, currency overshooting, and large output costs (Larrain and Velasco, 2001). Pegged regimes may also be subject to a higher incidence of banking crises. Under pegs, the exchange rate may become progressively overvalued, weakening the financial system; without (or with only limited) lender of last resort capabilities, authorities may be unable to deal with domestic financial distress.

The table summarizes these predictions for economic performance across regimes.

Economic Performance Across Exchange Rate Regimes				
	Inflation	Growth	Volatility	Crisis
Fixed	May enhance monetary policy credibility and lower inflation. Emerging markets less likely to be able to import credibility. Moreover, inflation may be "bottled up," under weak macroeconomic management.	May reduce transactions costs, raise trade and growth. May also reduce interest rates and uncertainty, also raising investment and growth.	May increase volatility in the presence of real shocks and nominal rigidities.	High risk of speculative attacks against currency, especially when exposed to volatile capital flows. Susceptibility to banking sector distress.
Flexible	The importance of "imported" credibility declines with stronger institutions and financial sectors.	Higher growth due to shock absorbers and fewer distortions following real shocks.	Real exchange rate volatility may spill over into real activity.	Low risk of currency and banking crises.

C. Macroeconomic Performance and Crisis Probabilities: Summary Statistics

Drawing on both the de facto and de jure classifications, this section describes the association between exchange rate regimes and various dimensions of economic performance. No attempt is made in this preliminary description to control for other factors that may also influence economic outcomes. First, a summary of average macroeconomic performance under alternate regimes is presented. Second, since the occurrence of crises has been particularly highlighted in recent policy discussions, the relationship between regimes and the frequency of banking and currency crises is documented.

Regimes and Performance: Summary Measures for Inflation, Growth, and Volatility

Conflicting policy objectives and large macroeconomic imbalances will lead to poor economic performance irrespective of the exchange rate regime. For the purposes of this discussion, there are at least two sets of conditions under which the exchange rate regimes may have no independent influence on macroeconomic outcomes through prevailing severity of economic distortions. First, the prevalence of dual (or multiple) rates—and, hence, potentially a large differential in official and "parallel" market exchange rates—is, as in Reinhart and Rogoff (2003), a consideration in determining the operative regime as well as a factor influencing economic outcomes through prevailing severity of economic distortions. Second, Reinhart and Rogoff (2003) isolate countries with annual inflation rates above 40 percent into a separate "freely falling" category, with the implication that the macroeconomic imbalances in such conditions overwhelm the possible effects of the exchange rate regime.

The evidence suggests that dual exchange rates are associated with significantly worse economic performance. Over the period 1970–99, the average per capita income growth rate in countries with dual exchange rates was about 0.6 percent per year; in contrast, countries with unified rates grew at three times the pace, at about 1.8 percent per year (Table 2). Similarly, annual inflation in countries with dual exchange rates was about 175 percent, while under unified rates it was about 22 percent. These performance differences primarily reflect instances of large departures from official rates—the differences in median performance are less egregious. With increasingly integrated capital markets, large gaps in official and parallel rates have become untenable and the move to unified exchange rates has been almost universal (Section II).

By construction, "freely falling" regimes perform significantly worse than other regimes on all counts: they have higher inflation and also lower growth rates and higher volatility (Tables 3, 4, and 5). With the worldwide decline in inflation, the incidence of freely falling regimes is on the decline (Rogoff, 2003). However, for retrospective analyses, since freely falling episodes are typically classified under other systems as freely floating, their identification as a separate category in the Natural classification can make a significant difference to the relative rankings of regimes. For example, according to the de jure classification (the last column in Table 3), pegs have much lower inflation than floating regimes. Under the Natural classification (the bottom row of Table 3), however, freely floating regimes have, on average, lower inflation than exchange rate pegs. This reversal occurs because, as noted, many freely falling episodes are in the floating regime category

according to the de jure classification. When, in the next section, other influences on inflation are taken into account, the advantage of pegged and intermediate regimes over the floating regime reappears even in the Natural classification; however, not distinguishing the freely falling category renders that advantage much larger.

The performance of intermediate regimes is not especially different from that of other regimes (Tables 3, 4, and 5). This is consistent with the longevity of these regimes, as documented in Section II. If this comparison had revealed consistently poorer performance under intermediate regimes, there would have been greater basis for expecting a shift to the polar extremes of pegs and free floats.

Finally, as documented by Mussa (1986), Baxter and Stockman (1989), and Flood and Rose (1995), real exchange rates are more variable, the greater the flexibility of the regime (Table 6). Exchange rate volatility is considerably higher under managed floating and freely floating regimes than under pegged and limited flexibility regimes. This reflects the fact that real rates tend, at least in the short-run, to move closely with nominal rates. Notably, more flexibility under the de jure classification is not associated with greater variability of the real exchange rate since regimes that are declared flexible are often tightly managed.

Table 2. Average Annual Inflation and Real Per Capita GDP Growth: Comparison of Dual (or Multiple) and Unified Exchange Rate Systems, 1970–99

(Percent)

Regime	Average Annual Inflation Rate	Average Per Capita GDP Growth
Unified exchange rate	22.0	1.8
	(7.7)	(2.1)
Dual (or multiple) exchange rates	175.6	0.6
	(15.1)	(1.4)

Source: Authors' calculation.
Note: Figures in parentheses are medians.

Table 3. Average Annual Inflation Rates Across Exchange Rate Regimes, 1970–99

(Percent)

	Peg	Limited Flexibility	Managed Floating	Freely Floating	Freely Falling	Unknown	Total
Pegged	17.9	9.6	14.2	24.5	391.7	12.4	33.9
	(6.8)	(7.9)	(10.4)	(23.2)	(39.9)	(6.5)	(7.9)
Intermediate	11.2	13.0	16.7	9.2	147.6	25.7	36.0
	(3.5)	(9.1)	(15.1)	(3.8)	(66.1)	(15.9)	(10.8)
Floating	20.3	10.1	11.3	8.1	408.9	445.6	138.5
	(11.5)	(7.5)	(8.4)	(4.5)	(68.6)	(22.2)	(10.8)
Total	17.1	11.1	14.2	9.9	305.3	55.5	49.7
	(6.5)	(8.3)	(10.8)	(4.8)	(57.0)	(7.6)	(8.7)

Source: Authors' calculation.
Note: Figures in parentheses are medians.

Table 4. Average Annual Real Per Capita GDP Growth Across Exchange Rate Regimes, 1970–99
(Percent)

	Peg	Limited Flexibility	Managed Floating	Freely Floating	Freely Falling	Unknown	Total
Pegged	2.0	2.6	1.6	-3.2	-1.1	1.0	1.6
	(2.0)	(2.6)	(1.6)	(0.5)	(-0.7)	(0.6)	(1.6)
Intermediate	2.8	2.6	1.9	2.7	0.0	2.7	2.1
	(2.4)	(2.9)	(2.1)	(2.2)	(0.4)	(2.7)	(2.3)
Floating	3.6	1.7	1.6	2.2	-3.1	-1.6	0.6
	(2.9)	(1.8)	(2.2)	(2.3)	(-1.2)	(-0.3)	(1.7)
Total	2.1	2.4	1.7	1.8	-1.3	0.8	1.5
	(2.2)	(2.6)	(2.0)	(2.0)	(-0.6)	(0.6)	(1.8)

Source: Authors' calculation.
Note: Figures in parentheses are medians.

Table 5. Average Annual Growth Volatility Across Exchange Rate Regimes, 1970–99
(Percent)

	Peg	Limited Flexibility	Managed Floating	Freely Floating	Freely Falling	Unknown	Total
Pegged	4.0	3.8	3.6	5.7	4.3	4.3	4.0
	(2.7)	(2.3)	(2.6)	(3.3)	(3.4)	(2.9)	(2.7)
Intermediate	1.6	2.0	2.6	3.3	3.8	6.1	2.6
	(1.2)	(1.6)	(1.8)	(1.7)	(3.4)	(2.5)	(1.8)
Floating	3.1	2.4	4.1	1.9	6.4	4.9	3.8
	(1.8)	(1.5)	(1.9)	(1.1)	(4.6)	(2.9)	(1.9)
Total	3.7	2.8	3.5	2.7	4.7	4.5	3.7
	(2.4)	(1.8)	(2.3)	(1.3)	(3.7)	(2.9)	(2.4)

Source: Authors' calculation.
Note: Figures in parentheses are medians.

Table 6. Real Exchange Rate Volatility Across Exchange Rate Regimes, 1970–2002

	Peg	Limited Flexibility	Managed Floating	Freely Floating	Freely Falling	Unknown	Total
Pegged	6.3	8.9	25.1	7.0	53.6	6.6	12.7
Intermediate	3.2	4.8	10.5	30.6	42.3	28.4	12.1
Floating	10.5	5.2	11.6	8.4	17.3	14.8	10.4
Total	5.6	6.1	17.9	13.7	37.0	9.2	12.0

Source: Authors' calculation.
Note: Volatility is measured as the three-year centered standard deviation of the annual real effective exchange rate (IFS, line RECZF). Nicaragua is excluded from this table since its exchange rate has been extremely volatile and its inclusion unduly influences the averages.

Regimes and Crisis Probabilities

In the 1990s, several economies with rigid exchange rate regimes were victims of severe economic crises. A concern thus arose, not just for the prospects of the economies directly subject to the crises, but also for the possible "contagion" of crises across countries with similar economic features following a general loss of investor confidence. The occurrence of crises has, therefore, acquired greater prominence in the policy discussions on the choice of exchange rate regimes. Despite the policy interest, few systematic studies have examined the links between crises and exchange rate regimes.

The evidence presented in this section suggests that popular perception in this regard has some statistical basis. While the evidence on currency crises is mixed, the frequency of banking and "twin" crises (where banking and currency turbulence comes together) has been higher under more rigid regimes but mainly for emerging markets and particularly so in the 1990s. As noted in the introduction, emerging markets are more exposed to international capital flows than are other developing economies; but compared to advanced industrialized economies, emerging markets have fragile financial sectors.[37]

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[37] Emerging markets are defined here as those countries classified as emerging markets by Morgan Stanley Capital International on the basis of several factors but including also their access to international capital markets. As discussed in Appendix III, any definition of emerging markets is likely to include and exclude countries on the margin in ways that are more or less appropriate. Extensive robustness tests were undertaken and only the most robust results are highlighted in the text.

Consider, first, the frequency of banking crises.[38] More rigid regimes had a higher likelihood of banking crises, especially in the 1990s. For all countries, for the period from 1980-1997, the probability of a banking crisis in a given year varied between about 3 and 4.5 percent with no clear variation across exchange rate regimes (Table 7).[39] However, the highest probabilities of a banking crisis occurred in the emerging market economies, where the evidence also suggests that the probability of a crisis increased with the rigidity of the exchange rate regime. Moreover, the association between rigidity and probability of banking crises in emerging markets became stronger in the 1990s.

The finding that banking crises are more likely under rigid regimes is in contrast to that of Ghosh, Gulde, and Wolf (2003), who conclude that, if anything, floating regimes are the most likely to experience banking crises. The difference in findings is the consequence of their use of the de jure classification, which has many more countries classified as "floating" than does the Natural classification. As noted in Section II, many of these de jure "floaters" are classified under the Natural Classification as "freely falling;" other "floaters" did not actually float and so were de facto under more rigid regime categories. As a consequence, using the de jure classification leads to an overstatement of the likelihood of banking crises under floating regimes and an understatement of crisis probabilities under more rigid regimes.

Currency crises over the years 1970 to 2000 tended to occur more frequently in intermediate regimes, based on a measure of currency crises employed by Berg, Borensztein, and Pattillo (forthcoming).[40] The evidence for the 1990s is less clear-cut and suggests that among emerging markets pegged regimes had more frequent currency crises. An alternative measure of currency crises, using different thresholds for exchange rate depreciation and loss

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[38] Crisis probabilities were obtained as the ratio of crises episodes under a particular regime divided by the number of regime-years. Each crisis was treated as a single episode even if it lasted for multiple years. The estimates presented drop the year of the crisis itself as well as the years immediately preceding and following the regime change to minimize the influence of the regime transition on occurrence of crises.

[39] The data for banking crises are obtained from Demiriguc-Kunt and Detragiache (1998), who define a banking crisis to have occurred when any one of the following four conditions held: (a) non-performing loans exceeded 10 percent of banking system assets; (b) a bailout cost 2 percent or more of GDP; (c) large scale nationalization occurred; or (d) other emergency measures, such bank holidays, deposit freezes, and special guarantees had to be undertaken.

[40] Berg, Borensztein, and Pattillo (forthcoming) define a crisis as having occurred when the weighted average of one-month changes in exchange rate and reserves is more than three (country-specific) standard deviations above the country average.

Table 7. Probability of Crises During Specific Regimes Using the Natural Exchange Rate Regime Classification
(Percent)

| | Bank Crisis (1980–97) | | | | Bank Crisis (1990–97) | | | |
	Peg	Limited Flexibility	Managed Floating	Freely Floating	Peg	Limited Flexibility	Managed Floating	Freely Floating
All	3.4	4.7	4.5	3.9	3.1	7.1	3.0	3.8
Advanced	0.0	2.7	2.3	4.1	0.0	6.5	0.0	4.2
Emerging	11.4	7.5	7.0	0.0	15.4	8.0	3.8	0.0
Developing	2.8	7.0	3.6	-	2.6	7.1	4.5	-

| | Balance of Payments Crisis (1970–2000) | | | | Balance of Payments Crisis (1990–2000) | | | |
	Peg	Limited Flexibility	Managed Floating	Freely Floating	Peg	Limited Flexibility	Managed Floating	Freely Floating
All	4.1	4.1	9.2	4.6	4.7	5.2	9.2	4.3
Advanced	3.3	3.9	7.1	4.9	3.6	5.8	8.6	4.9
Emerging	4.6	5.6	10.0	0.0	8.8	6.1	6.9	0.0
Developing	5.2	2.0	9.7	-	0.0	2.8	15.4	-

| | Twin Crisis (1980–97) | | | | Twin Crisis (1990–97) | | | |
	Peg	Limited Flexibility	Managed Floating	Freely Floating	Peg	Limited Flexibility	Managed Floating	Freely Floating
All	1.6	1.4	0.8	0.0	3.2	2.6	0.0	0.0
Advanced	0.0	0.7	0.0	0.0	0.0	2.2	0.0	0.0
Emerging	7.7	3.0	1.8	0.0	15.4	4.0	0.0	0.0
Developing	0.0	0.0	0.0	-	0.0	0.0	0.0	-

Source: Authors' calculation.
Note: Probabilities are calculated by dividing the number of occurrences of a crisis under a particular regime by the total number of regime years. Each crisis is counted only once and hence, if it persists over multiple years, the subsequent years are not taken into account for this calculation. Additionally, the years an exchange rate regime transition takes place (i.e., the year preceding, the year during, and the year following the transition) are excluded from this computation. A dash (-) indicates that no crisis data were available for developing countries under freely floating exchange rate regimes.

in reserves (Bordo, Eichengreen, Klingebiel, and Soledad-Martinez, 2000) shows that, for emerging markets, pegs and limited flexibility had significantly higher risk of currency crisis than managed or freely floating regimes.[41]

Finally, "twin crises," when banking and currency crises coincide, have been almost uniquely an emerging market phenomenon: they have never occurred in the group of countries classified as "developing" and rarely in advanced economies. Moreover, the incidence of twin crises in emerging markets is highest under pegged regimes and falls as flexibility in regime increases. Kaminsky and Reinhart (1999) have noted that twin crises have particularly high costs. Such crises typically start with domestic financial distress, which accelerates when a currency crisis also sets in, leading to a "vicious cycle." Costs are high in terms of the bailout costs of the financial sector as well as in terms of reserves lost. Larrain and Velasco (2001) provide a theoretical discussion of why currency boards may be particularly prone to twin crises. Rigid regimes may promote excessive risk-taking during periods of "booms" in capital inflows, when the expectation of an exchange rate guarantee reduces the incentive to hedge foreign currency exposure. The sudden withdrawal of flows leaves the domestic financial sector susceptible to severe distress. At the same time, the commitment to an exchange rate target limits lender of last resort operations. If depositors withdraw domestic currency from domestic banks to buy the foreign reserve currency at the central bank, under a fixed exchange rate, the panic withdrawal can lead to a self-fulfilling crisis as foreign currency reserves are depleted. Argentina's massive collapse is a cautionary tale of how some of these forces can contribute to the unraveling of even a hard peg.

D. Regime Performance and Levels of Development

While the previous section reported correlations, this section takes the more demanding step of attempting to isolate, over the period 1970 to 1999, the association between exchange rate regimes and the performance measures of interest, after controlling for other variables that may also influence performance.[42] But even after such controls are included, reverse

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[41] Bubula and Ötker-Robe (forthcoming) continue to find vulnerability in the intermediate regimes in the 1990s but they do not distinguish emerging markets.

[42] See Appendix III for a detailed discussion of the methodology. In addition to variables that are conventionally used to explain the different dimensions of performance (discussed below), two further sets of controls are used throughout. First, common shocks across countries (such as spikes in oil prices or changes in the volatility of G-3 currencies), influence all economies beyond the effect channeled through observed variables. These are controlled for through the use of time dummies. Second, while an increasing number of country control variables can be added, certain unobserved or difficult to measure country characteristics may reflect important dimensions of institutions and policy credibility. These, in turn, are likely to be correlated with exchange rate regimes; to control for these unobserved characteristics, country dummies are included. The implication of this approach is that regime performance is judged by changes that occur within a country rather than across countries.

causality, or "endogeneity," remains a concern in such analyses: in other words, the observed relationships may reflect the influence of the performance variable on the choice of the regime rather than the other way around. This problem cannot be fully resolved but is mitigated by the relatively long duration of the typical regime under the Natural classification, implying that temporary changes in performance do not influence the choice of regime. The problem is also mitigated by using as an explanatory variable the regime prevailing in the previous one or two years and the results presented are unchanged when that is done, except, as discussed below, in the analysis of volatility in emerging markets.[43]

Inflation Performance Across Exchange Rate Regimes

A wide range of empirical studies have found that fixed exchange rate regimes deliver lower inflation. IMF (1997) found that the median inflation rates for fixed regimes have been lower than that for floating regimes, though the difference declined over time. More rigorous studies that control for other determinants of inflation (e.g., Ghosh, Gulde, and Wolf, 2003; and Edwards and Magendzo, 2003a and 2003b) support this conclusion. It turns out, however, to be important to distinguish between different country types. On average, pegged and intermediate regimes have been associated with significantly lower inflation rates than floating regimes, but this reflects an inflation benefit that accrues primarily to developing economies and not to emerging markets or advanced economies.[44]

Before examining the differentiation across country groups, it is useful to note that the findings with respect to inflation performance across all countries are similar whether the de jure or the Natural classifications are used. Figure 9, which pools all countries, contrasts the results using the de jure classification with those for the Natural classification. The bars in the figure represent the difference in inflation in intermediate and floating rate regimes relative to pegged regimes, after controlling for a variety of factors thought to influence inflation in all

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[43] Moreover, as summarized in Appendix II, it is difficult to identify country characteristics that consistently predict exchange rate regimes. Since regimes are strongly persistent, they are likely to be the best predictors of expected regimes.

[44] This finding is consistent with, but goes beyond, that obtained by Ghosh, Gulde, and Wolf (2003) who, using the de jure classification, find little difference in inflation performance across regimes in upper income (advanced) countries, but do find greater rigidity to be associated with lower inflation in middle- and lower-income countries. Distinguishing further between emerging markets and developing economies shows the latter to be the primary beneficiaries of exchange rate rigidity.

Figure 9. Inflation Performance Across Regimes: Confidence Effect
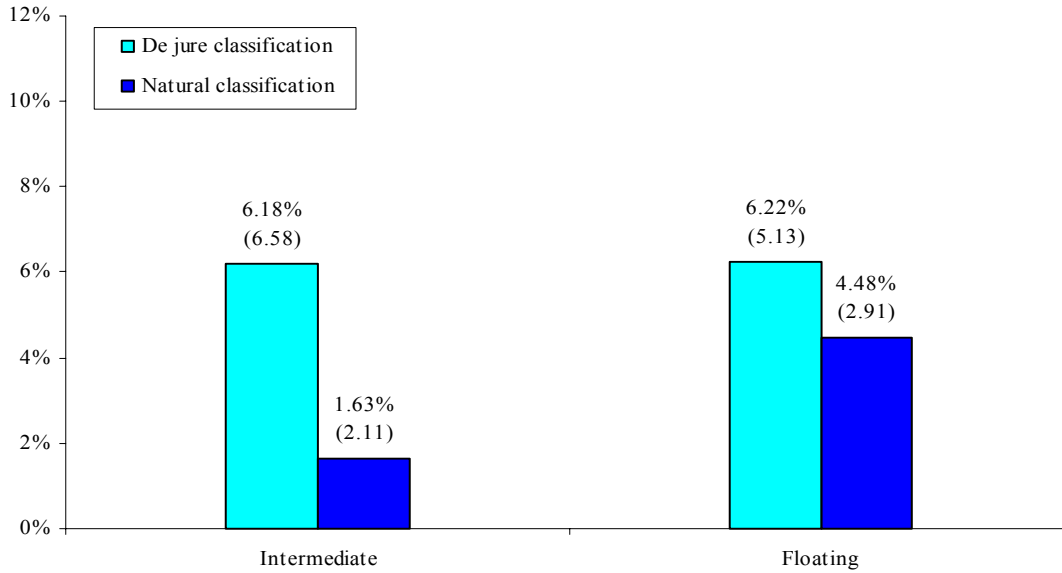
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Figure 10. Inflation Performance Across Regimes:
Confidence and Discipline Effects

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

regimes.[45] Because the regressions control for money growth, they can be thought of as capturing the value of "credibility" rather than greater "discipline" whereby pegs generate lower inflation through control on the growth of money supply, for example. Using the de jure classification, floating regimes are associated with significantly higher inflation than pegged regimes on average (6.2 percent).

For the Natural classification, pegged regimes continue to exhibit significantly lower inflation than freely floating regimes, though the margin by which they do so is smaller (4.5 percent). In addition, intermediate regimes now perform significantly better than floating regimes in terms of inflation (by 2.9 percent). Separating out the freely falling category reduces the average inflation rate for freely floating regimes, thereby reducing the inflation advantage of pegged regimes and giving some inflation advantage to intermediate regimes.

The effect on inflation through potentially greater monetary discipline under restrictive regimes is significantly smaller than that due to enhanced credibility. Figure 10 captures the discipline effect, by attributing differences in rates of money supply growth to the regimes themselves and, thus, imputing additional "discipline" effects based on these differences. Using the de jure classification, the discipline effect adds to the inflation advantage of pegged regimes somewhat. The same holds for the Natural classification, where the inflation advantage attributed to exchange rate pegs and to intermediate regimes relative to floating rises modestly. But overall, these effects are small.

A more differentiated story emerges when inflation performance is distinguished across the advanced countries group, emerging markets, and developing countries (Figures 11 and 12). In developing countries, inflation performance deteriorates with exchange rate flexibility. The results indicate that pegged regimes have the lowest inflation, about 2.5 percent per annum lower than for countries with intermediate flexibility; floating regimes

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[45] The results presented in graphical form are the coefficients on "dummy," or categorical, variables representing the exchange rate regime. These coefficients should be interpreted as a regime's performance (relative to the excluded pegged regime), conditional upon the other included variables in the regression. The two intermediate regimes in the coarse Natural classification have been aggregated to one regime for consistency with the de jure classification. Throughout, when using the Natural classification, we also identify the "freely falling" countries as an additional category. In line with the discussion in Section C above, freely falling regimes perform worse than other regimes in most instances. However, since their performance does not have a direct implication for policy discussion on exchange rate regime performance, the results are not presented in the main text but are included in the tables in Appendix III, which discusses these issues in further detail. All the inflation regressions control for real GDP and money growth, in addition to trade openness, the degree of central bank independence, terms-of-trade shocks and the fiscal balance. In addition, as noted above, each regression has country-specific fixed effects and year dummies.

Figure 11. Inflation Performance in Advanced Countries, Emerging Markets, and
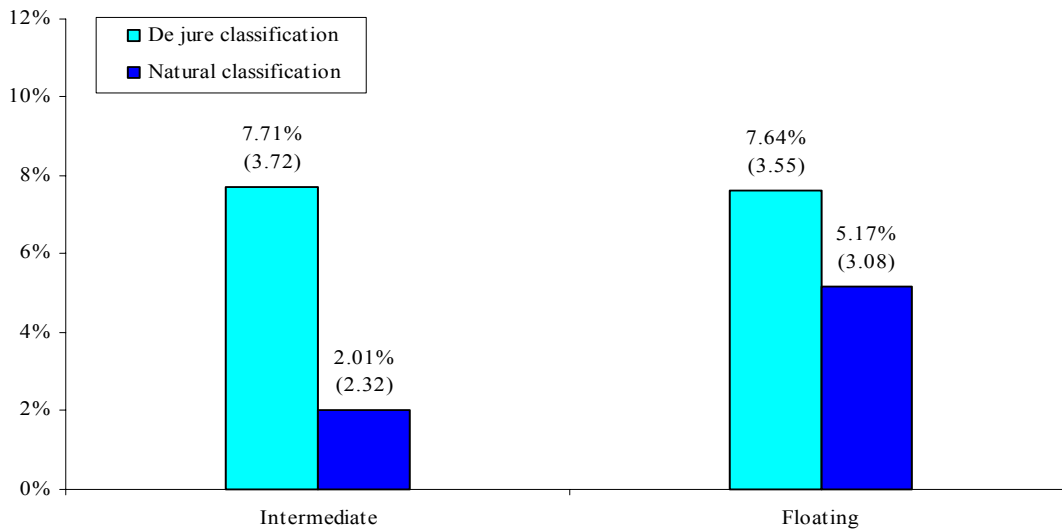Developing Countries: Confidence Effect
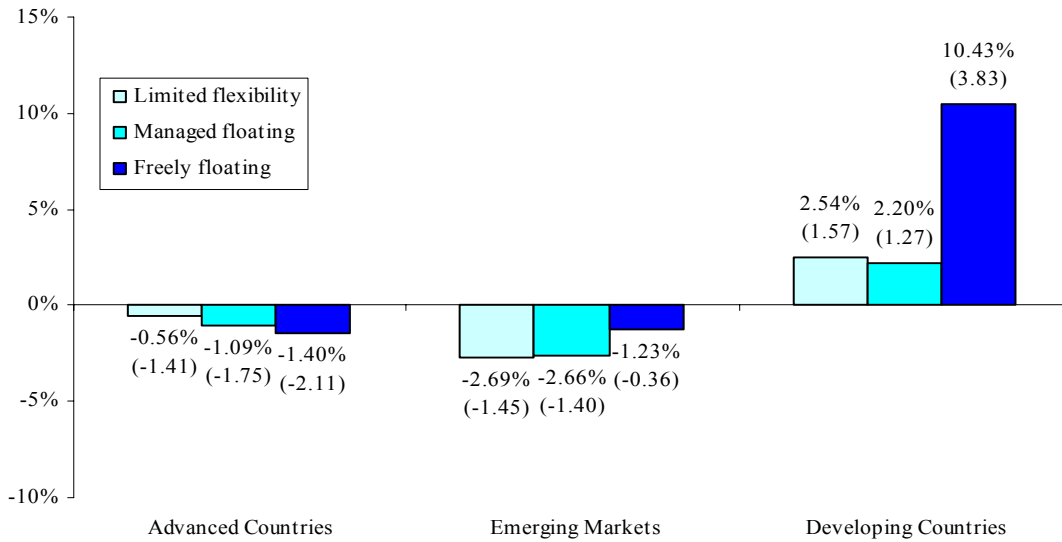
Source: Authors' calculation.
 Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Figure 12. Inflation Performance in Advanced Countries, Emerging Markets, and
Developing Countries: Confidence and Discipline Effects

Source: Authors' calculation.
 Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

experience inflation that is about 8 percent a year more than in regimes with intermediate flexibility. Note that though the difference between pegs and intermediate regimes is not statistically significant, the difference between pegs and floating regimes is highly significant. This result holds up consistently in a variety of empirical specifications (see, for example, Table 17 in Appendix III).

In emerging markets, inflation performance shows no significant relationship with greater exchange rate flexibility. However, when the regime prevailing in the prior one or two years is used as the explanatory variable—to minimize the influence of the relatively high rate of regime transitions in this group of countries—there is some evidence that, as in developing economies, inflation rises with flexibility, possibly explaining the "fear of floating," [46] since the reduction in pass through to domestic prices may take time. For advanced countries, the evidence is that inflation actually declines with increased exchange rate flexibility. While the direction of the results typically favors floating over pegged, the results in alternate specifications are not always so clear and the appropriate conclusion appears to be that floating regimes do no worse than pegged regimes in terms of inflation performance in advanced economies. These differences across advanced countries, emerging markets, and developing countries are similarly apparent in Figure 12, which incorporates the above-mentioned "discipline" effects via monetary policy.

Overall, these results suggest that there may be some merit to pegged and intermediate regimes in developing countries, perhaps reflecting the fact that, in the absence of sound institutions and strong track record, they can enhance policy credibility and discipline monetary policy. This does not, of course, imply a blanket recommendation of pegged regimes since many country specific features would need to be taken into account in making that decision, including the appropriate level at which to peg the exchange rate. As countries gain access to international capital markets, there appears no evidence of inflation reduction through adoption of rigid regimes.

Per Capita Income Growth Across Exchange Rate Regimes

Does the inflation advantage of pegged and intermediate over floating regimes in developing countries help growth (through reduced interest rates and lower uncertainty as Dornbusch, 2001 suggested), does it come at the expense of growth, or does the exchange rate regime make no difference to growth (as Eichengreen, 2001 concludes)?

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[46] See Tables 14 and 17 in Appendix III. Also, "hard pegs" may have better inflation performance in emerging markets relative to other regimes; however, the effect is only marginally statistically significant.

For the full sample of countries (Figure 13), both the de jure and de facto classifications show virtually no relationship between exchange rate flexibility and growth.[47] For developing economies (Figure 14), growth appears to decline with increased flexibility, though the effect is not statistically significant. Thus, the association observed above of lower inflation with greater rigidity apparently does not come at the expense of growth; but neither does lower inflation have a measurable favorable effect through, for example, lower interest rates and reduced uncertainty. For emerging markets, the relationship between growth and regimes is noisy, as with inflation.

In contrast, for advanced countries, free floats do significantly better than other regimes in terms of growth performance. Indeed, the results suggest that for advanced economies exchange rate rigidity is monotonically associated with slower growth (this is even more apparent when regimes are lagged, as reported in Appendix III). Since in the advanced countries no inflation benefit is associated with greater rigidity (indeed, if anything, inflation performance worsens with more rigidity of regime), there appears to be an overall benefit to floating.[48]

The beneficial influence of flexible regimes as countries become more advanced is consistent with a view that floating permits more rapid adjustment following shocks and with stronger institutions—in particular, deep financial sectors—advanced economies are not subject to the offsetting risks of floating. Bordo and Flandreau (2001), in line with Calvo and Reinhart (2002), note that where domestic financial markets are underdeveloped, borrowing in foreign currency creates significant risks of sharp changes in an enterprise's net worth when exchange rates are flexible. As borrowing in domestic currencies becomes a viable

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[47] The results are based on separate panel regressions of real per capita GDP growth on the relevant set of regime dummies, with the pegged regime as the omitted category. Again, the two intermediate categories in the Natural classification have been aggregated for better comparison with the de jure classification. Each regression follows Ghosh, Gulde, and Wolf (2003) in controlling for factor accumulation (investment ratio, education, and population level and growth), trade openness, terms of trade shocks, importance of the government sector (tax ratio and central government balance) and conditional convergence. Finally, each regression includes country-specific fixed effects and year dummies, as above.

[48] Again, this result parallels that obtained by Ghosh, Gulde, and Wolf (2003), who find that free floats register significantly higher growth than pegged regimes in upper- and upper-middle-income countries; they also find little evidence among lower and lower-middle-income countries of a link between regimes and growth performance.

Figure 13. Growth Performance Across Regimes
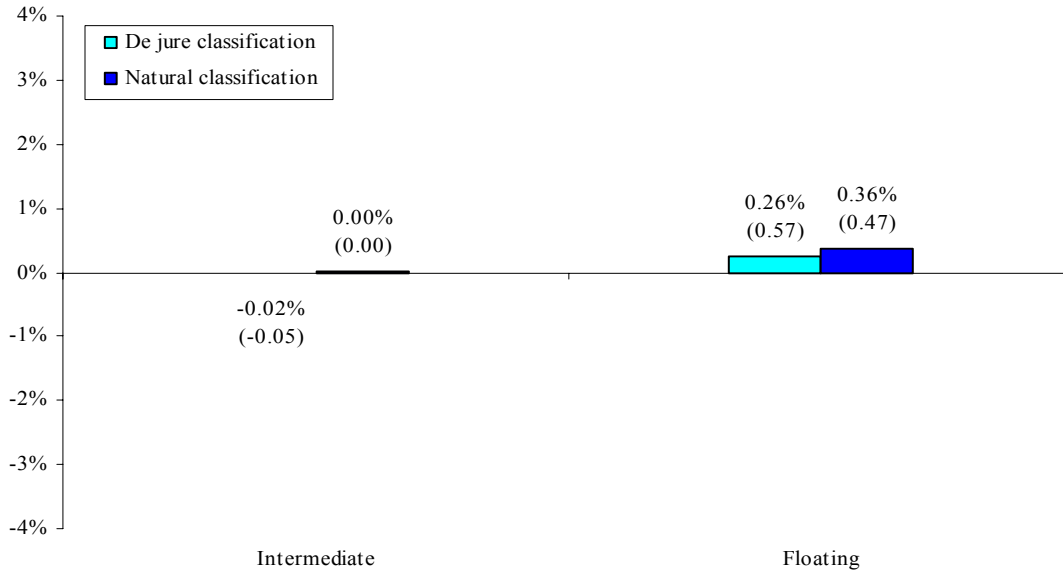
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.
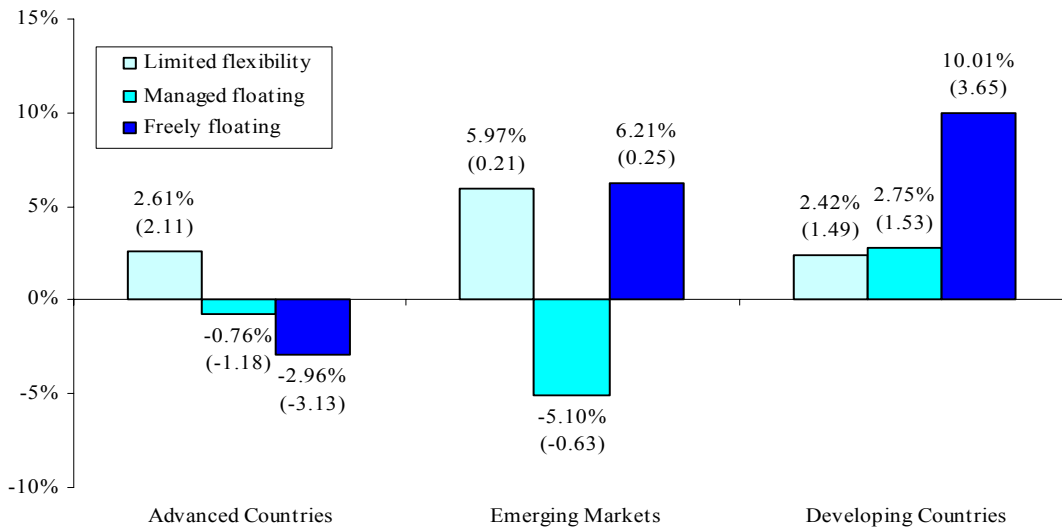
Figure 14. Growth Performance in Advanced Countries, Emerging Markets, and Developing Countries
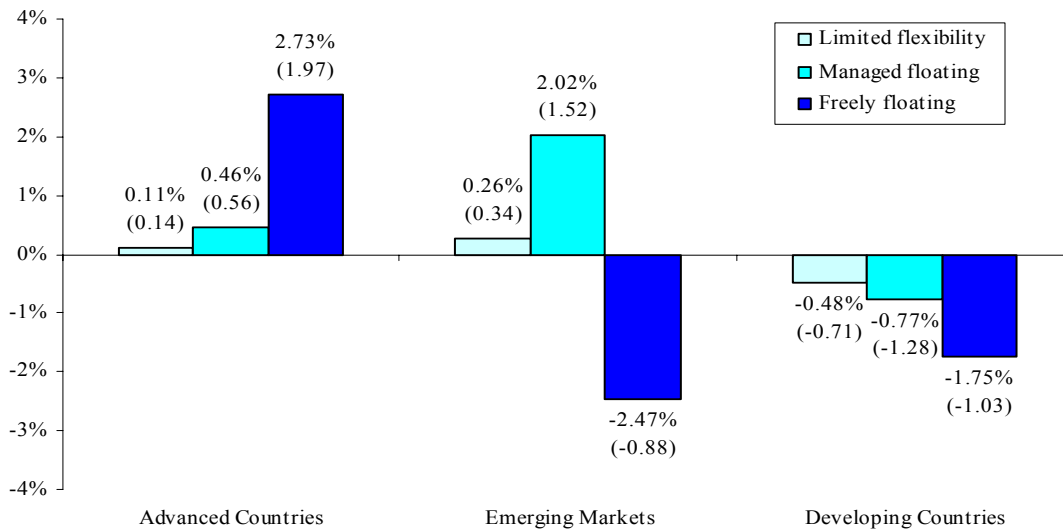
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

option, the costs of flexibility fall.[49] Bordo (2003) makes the further argument that advanced economies have always been more successful in managing the trade-off between achieving credibility and retaining flexibility. He suggests that even during the period of the classical gold standard when exchange rates were "fixed," the margin allowed by "gold points" allowed temporary changes in exchange rates. Of importance is the observation that these exchange rate changes were expected to be temporary—to deal with shocks—and hence a reversion to the parity was expected. In contrast, where credibility is low, deviations can generate the expectation of further deviations.

Growth Volatility Across Exchange Rate Regimes

Finally, consider the relationship between exchange rate regimes and output growth volatility.[50] When using the Natural classification, growth volatility does not appear to vary systematically across regimes across all countries (Figure 15).[51] The overall lack of a relationship between exchange rate regimes and growth volatility masks essentially no relationship for developing countries and increasing volatility with flexibility in the other two groups of countries (Figure 16). Such increase in volatility with flexibility in advanced

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[49] The idea that better institutions are a driving force behind the difference in the results across advanced and developing countries is further supported by the robustness tests reported in Appendix III.

[50] Figure 15 is based on separate panel regressions of the three-year centered standard deviation of real per capita GDP growth on the relevant set of regime dummies, with pegged regimes the omitted category. Again, the two intermediate categories in the Natural classification have been aggregated for better comparison with the de jure classification. Other controls are similar to the growth regressions above. They include factor accumulation (investment ratio, education and population growth), trade openness, terms-of-trade growth and the size of government (tax ratio and central government balance). Each regression also includes country-specific fixed effects and year dummies.

[51] This is in contrast with the outcome under the de jure classification, where, relative to free floats, the standard deviation of real per capita GDP growth is significantly lower for pegged regimes (0.82 percent) and intermediate regimes (0.88 percent). The regressions for the de jure classification are very sensitive to the inclusion of country dummies. Without such fixed effects, growth volatility is greater under pegged than floating regimes, though not significantly so. With country dummies, the opposite is true. This explains the differences in results reported here from those of Ghosh, Gulde, and Wolf (2003) and, presumably, also of Levy-Yeyati and Sturzenegger (2003), since neither study includes country-specific fixed effects. For the Natural classification, there is little discernible pattern or significance with or without country dummies.

Figure 15. Volatility of Real GDP Growth Performance Across Regimes
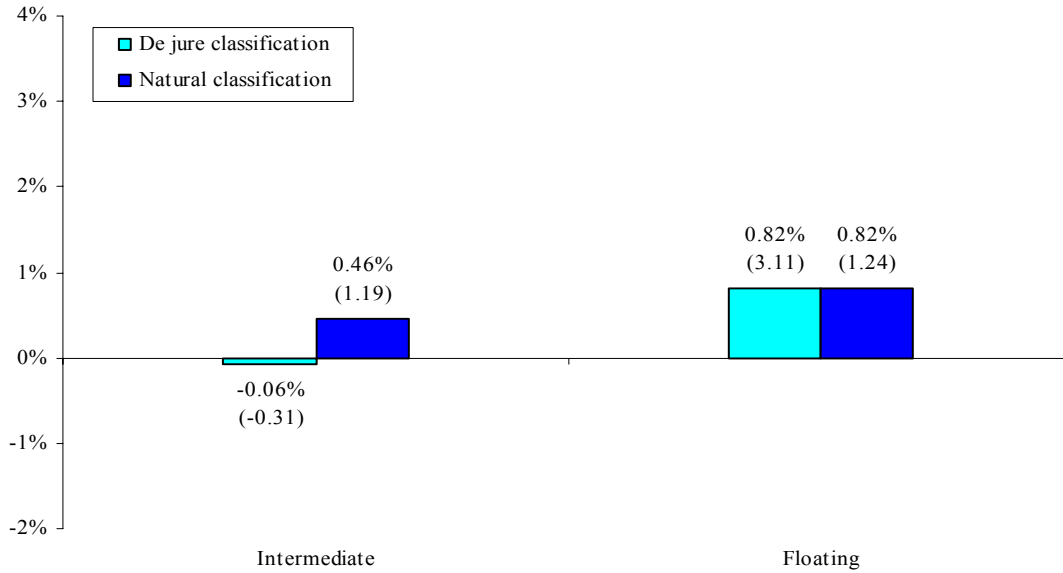
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Figure 16. Volatility of Real GDP Growth Performance in Advanced Countries,
Emerging Markets, and Developing Countries
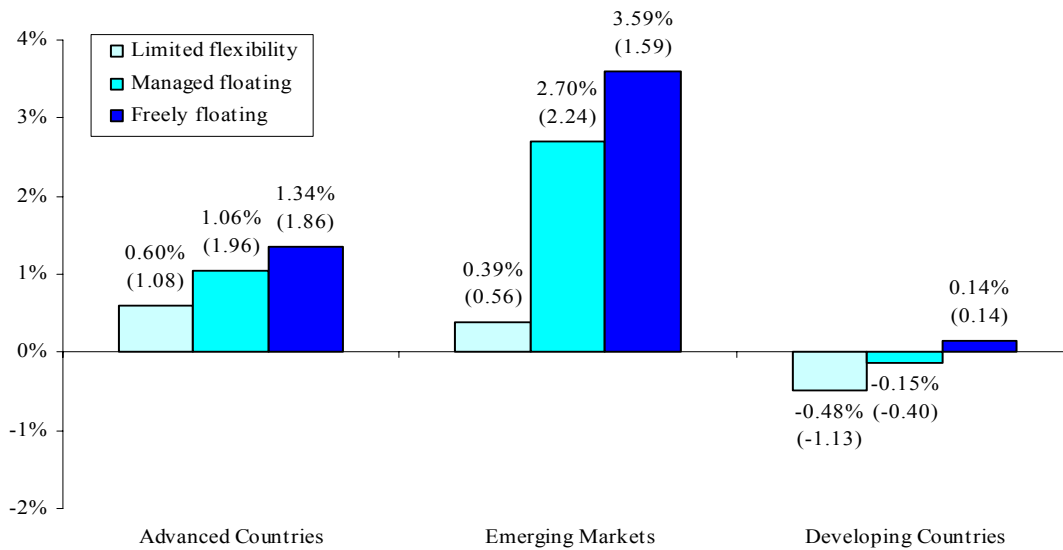
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

economies comes at apparently little or no cost, as Rogoff (1999) suggests, and as implied by the earlier findings that flexibility is associated with higher growth and lower inflation.

For emerging markets, the story is more complex (Figure 16). Here, there appears, at first, higher volatility associated with more flexibility. Two considerations, however, caution against that conclusion. First, the volatility associated with the collapse of rigid regimes is likely to register during subsequent regimes—an important consideration for emerging markets with their relatively high rate of transitions. Figure 17 investigates whether this phenomenon is quantitatively important. It compares the estimated volatility effects of regimes that prevailed in the *previous* one and two years (on the assumption that the spillover effects will be manifested mainly in the first two years of transition to a new regime). Now, the volatility in pegged regimes is actually higher relative to limited flexibility and freely floating (with little difference relative to managed floating). These results are not all statistically significant, but they point to significant spillover effects when transitions from pegged regimes occur. The implication is that the apparent relationship in emerging markets between flexibility and higher volatility is due largely to volatility following the collapse of rigid regimes being attributed to subsequent, more flexible regimes. Second, the transmission of volatility from rigid to flexible regime appears more so the case for the 1990s, when the countries identified here as emerging markets began to tap international capital in a significant manner(Figure 18). Together with their higher likelihood of twin crises, as reported above, this appears to further strengthen the case against rigid regimes for emerging markets.

E. Achieving Credibility in Developing and Emerging Economies

The results in the previous section suggested that, for developing economies, a benefit in the form of lower inflation has been associated with pegged and intermediate regimes and that such a benefit has not come at the expense of lower growth or higher volatility. Moreover, the inflation benefit of these relatively rigid regimes was found to accrue primarily through a credibility effect rather than through greater monetary discipline. This section investigates how developing countries can further enhance the credibility of their exchange rate regimes to improve macroeconomic performance. With respect to emerging markets, which do not seem to derive appreciable benefits from rigid regimes but also fear to float, the section examines if the performance of floating regimes can be improved.

Announcement Effects

Is there an incremental inflation benefit associated with officially announcing an operative pegged regime? The presumption is that announcement implies a stronger commitment to maintaining the peg and hence to policies that are supportive of that regime. To consider the announcement effect, the overlap between de facto and de jure regimes was identified. The statistical task was to determine if the overlap added value to the regime.

Figure 17. Volatility of Real GDP Growth and Contamination Across Regimes:
Evidence from Emerging Markets
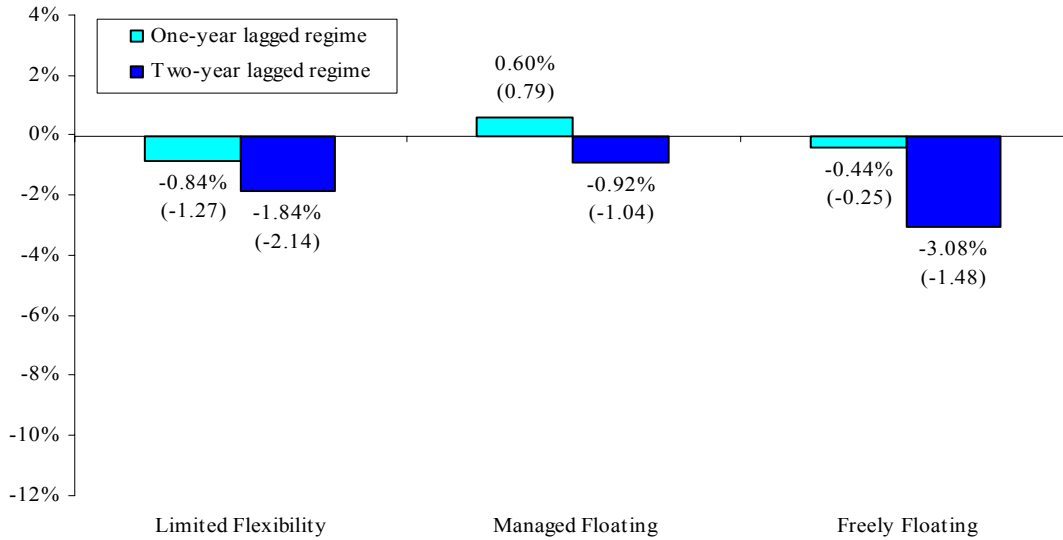
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Figure 18. Volatility of Real GDP Growth Across Regimes: Emerging Markets for
the 1990s Only
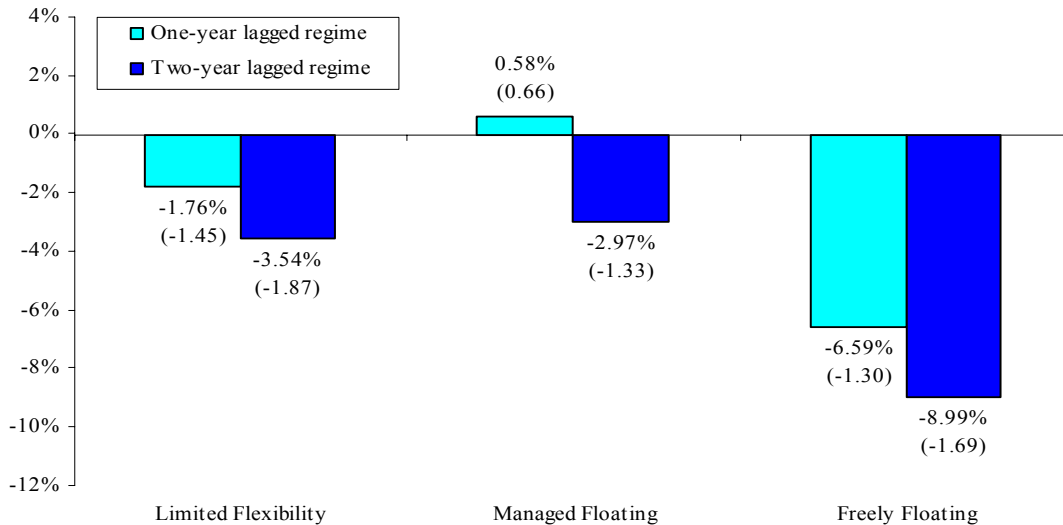
Source: Authors' calculation.
Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Among developing countries, this announcement effect is large and significant for pegged regimes. As Figure 19 shows, once a separate announcement effect is allowed for, the small number of developing countries that pursued exchange rate pegs without explicitly announcing that policy exhibited average inflation that, if anything, was somewhat *higher* than that in other (especially intermediate) regimes. In other words, the inflation benefit of pegged regimes identified above did not derive merely from operating a tightly managed exchange rate. The big gain came only when the peg was official. In Figure 19 it is also interesting to note that the announcement of other regimes had the opposite effect of raising inflation. Thus the announcement benefit differentiated pegs from other regimes in an important way.

Regime Duration

Regimes that last longer presumably do so because macroeconomic policies are maintained in a consistent manner over time. If so, longer duration regimes should add to the regime's credibility and be associated with superior performance. To proxy for the consistency of the macroeconomic stance with respect to the exchange rate regime, the regime's duration (the number of years that a particular regime has been in force) was treated as an additional dimension of its characteristics.

The results imply that in developing countries pegged regimes delivered an inflation benefit even with no track record (i.e., with zero duration). In addition, the duration dimension for pegged regimes was highly significant and negative (–0.2 percent per year). Additionally, the calculations show that countries that maintained pegged regimes over a period of 10 years, for example, could have earned an additional inflation benefit of more than 80 percent over the initial inflation gain (see Figure 20).

Taken together, the lesson appears to be that developing countries that announce their peg and are able to maintain them over longer durations derive greater benefits from the rigidity in exchange rate regimes. While this finding is *prima facie* encouraging, it may be an insufficient policy guide in the context of growing importance of international capital flows. Obstfeld and Rogoff (1995) note that most countries with long-lasting pegs adopted them in times when global capital markets were relatively shallow. Having achieved credibility during that less demanding period, they were often able to maintain it even with greater exposure to international capital. Those seeking to establish credibility in the current context, however, are likely to find that a more challenging task.

Learning to Float

What does the future hold for emerging markets, particularly middle-income open-capital-account countries, where rigid regimes run the risk of triggering crises and where concerns arising from large movements or excessive volatility of the exchange rate limits the extent of flexibility that policymakers are willing to allow? These countries currently manage their exchange rates to varying degrees while at the same time

Figure 19. The Inflation Benefit Associated with Announcement in Developing
Countries
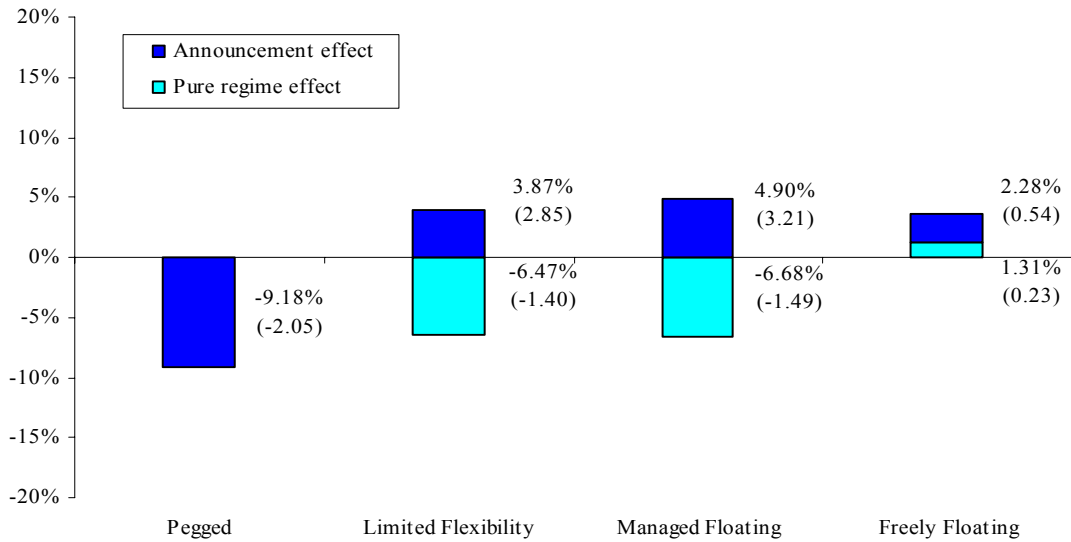
Source: Authors' calculation.
 Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged
exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

Figure 20. The Inflation Benefit Associated with Consistent Macroeconomic
Policies in Developing Countries (Measured as the additional inflation benefit from
maintaining a given regime for 10 years)
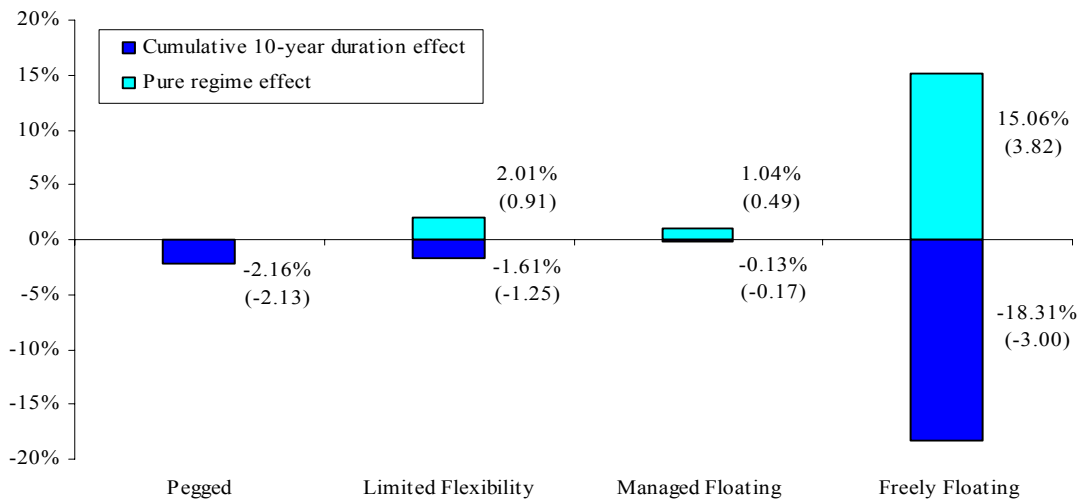
Source: Authors' calculation.
 Note: Figures in parentheses are t-statistics. The bars depict differences in performance relative to pegged
exchange rate regimes, conditioning on a range of other variables. See Appendix III for details.

pursuing domestic monetary policies, increasingly some variant of inflation targeting, to anchor inflationary expectations. The finding reported earlier that floating becomes a superior alternative as institutional capabilities become stronger raises the possibility that the more developed emerging market economies may wish to anticipate a further move to floating and hence begin to invest in learning to float.

There exist opposing views on the feasibility of learning to float. One fairly pessimistic view (Eichengreen, Hausmann, and Panizza, 2002) holds that the risk of a sharp depreciation under floating rates will depress investment activity in most emerging markets since (unhedged) foreign currency borrowing will always be significant. This handicap, they argue, cannot be overcome without coordinated international action to facilitate countries' borrowing in their own currency. As a result, floating exchange rates will, in this view, remain mostly a mirage.

Another perspective starts by noting that floating is relatively new and the experience with it thus far has been fairly positive (Edwards and Savastano, 1999; and Larrain and Velasco, 2001). While emerging market floaters are in practice far from "pure" in that intervention is common and the authorities generally take the exchange rate directly into account in setting monetary policy, there has been meaningful and, in some ways, effective floating. Inflation objectives have been met and countercyclical policy has been possible. Goldstein (2002) summarizes the available evidence as suggesting that emerging markets can conduct floating (in combination with inflation targeting monetary policy and measures to discourage currency mismatch) in a way that credibly achieves low inflation, buffers external shocks such as to the terms of trade, and provides some independence of monetary policy. Ho and McCauley (2003) argue, in their review of recent experience, that where exchange rate considerations have been opposed to inflation targets, inflation has typically been the primary objective of policy.[52]

There is reason to believe emerging market economies can improve the flexibility and effectiveness of their floats over time. Such learning to float could take place through two main channels. First, the authorities themselves need to learn how to conduct a monetary policy appropriate to a flexible exchange rate. It may take time, for example, for the central bank to refine the new internal procedures and communication strategies involved in inflation targeting. Moreover, the authorities may need time and experience to build trust in their own framework and become comfortable with allowing substantial exchange rate flexibility. Second, private agents may adjust their behavior as they observe flexible exchange rates in action and come to appreciate the risks involved in unhedged foreign exchange positions. This adjustment in behavior would, in turn, reduce banking system dollarization as lenders and borrowers appreciate and price the risks involved in currency mismatch (Ize and Levi-Yeyati (2003)). Similarly, expectations that the central bank will in fact allow exchange rate flexibility may diminish incentives to accept excessive foreign-currency-denominated capital

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[52] See also Goldstein and Turner (2003); Berg, Borensztein, and Mauro (2002); Goldfajn and Olivares (2001), and references therein for useful surveys; and Schmidt-Hebbel and Werner (2002) on the experience of Chile, Mexico, and Brazil.

inflows (Caballero and Krishnamurthy (2002)). Finally, as private agents observe that the authorities can keep inflation low in the context of a floating exchange rate regime, their inflation expectations may respond less to movements in the exchange rate, thus reducing the pass-through from exchange rates to inflation. The dynamics associated with learning to float would allow a sort of "virtuous circle," at least for those countries that can demonstrate some initial effectiveness in floating.[53]

The experience of at least three emerging market floaters may be consistent with this dynamic. Consider the case of Chile, which in the late 1990s transited from a framework with both an inflation target and an explicit exchange rate band to a more pure form of floating. Chile went through two episodes of exchange rate pressure, in late 1998 and late 2000. In the first episode, associated with the Russian and LTCM crises, interest rates increased sharply as the authorities defended the exchange rate within the band. Thus, the weakening exchange rate was accompanied by a sharp interest rate increase, as well as a sharp recession. In the second episode of exchange market pressure, in late 2000, the authorities allowed the currency to float, in line with the new exchange rate arrangement introduced in August 1999, according to which the exchange band was discontinued and intervention was limited to extreme circumstances.

 Mexico is another country that has seen inflation come down gradually in the context of a regime that has also become gradually more flexible. Once the immediate post-crisis period was over, in 1995, the authorities paid substantial attention to the exchange rate in the conduct of their monetary policy. Over time, they have adopted more formal inflation targeting and allowed substantial movements in the real exchange rate. Inflation and both nominal and real interest rates have come down fairly steadily. Inflation persistence has declined over time, perhaps suggesting increasing credibility of the monetary authorities.[54] At the same time, Martinez and Werner (2002) conclude that the exposure of Mexican firms to devaluation risk has lessened with the flexible exchange rate regime in place since the 1994/1995 crisis.

Finally, Brazil is a third country that has been floating its exchange rate while, at the same time, building a track record of low and stable inflationary expectations through inflation targeting. Fraga, Goldfajn, and Minella (2003) describe the challenges associated with building credibility in an environment that is characterized by significant volatility. They note that in an emerging market environment, exchange rate policy and inflation targeting cannot be easily dissociated since a poor history of monetary instability tends to make the exchange rate a focal point for inflationary expectations and foreign currency borrowing

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[53] Many authors, including Mussa and others (2000), Goldstein (2002), and Jeanne (2003) have noted that implementing a floating exchange rate regime with a credible monetary policy may in turn increase the effectiveness of floating. Also, as countries are more successful in floating their currencies, there will be less reason to keep exchange controls that are not necessary.

[54] See Carstens and Werner (1999), and Edwards and Savastano (1998).

subjects domestic firms and financial institutions to significant risks. They recommend a gradual learning process that includes high levels of communications and transparency on the part of the central bank.

IV. SUMMARY

For developing economies, the restrictive pegged and intermediate regimes appear to deliver lower inflation, at apparently little cost in terms of lost growth or higher volatility. Thus, it is not surprising that few developing economies truly float, consistent with the Calvo and Reinhart (2002) hypothesis of "fear of floating." In particular, the view that intermediate regimes are an endangered species is belied by their persistence (as discussed in Section II), while, their performance is not dominated by either of the polar regimes.

A strong case emerges for embracing greater exchange rate flexibility as countries grow richer. With economic advancement, the inflation benefit of pegged and intermediate regimes is lost, perhaps because policy credibility and track record are well established. At the same time, the risk associated with exchange rate flexibility declines as it becomes easier for governments and private agents to borrow in their own currencies. And growth performance is substantially superior under free floats.

But while developing and emerging market economies may prepare for the prospect of floating exchange rates as their institutional progress allows them to do so, they can gain more from the regimes that they do adopt. For developing countries, the inflation benefit associated with exchange rate pegs is greatest if it is an explicit, publicly announced policy goal. In addition, pegged regimes benefit from establishing a successful track record over time, which necessitates consistent macroeconomic policies. Case studies from middle-income countries with open capital accounts show that the "fear of floating" can be overcome by an investment in "learning to float." Thus, though history may lead countries to adopt particular regimes, they can improve the performance of those regimes by learning to manage them better over time.

APPENDIXES

I. The Natural Classification

This appendix summarizes the data and algorithm used to construct the Natural classification, and provides a brief summary of the main features of various de facto classifications.

The Natural classification—which classifies exchange rate regimes into fine and coarse categories as summarized in Table 8—employs monthly data on official and "market-determined" exchange rates for the period 1940-2001.[55] The data on market-determined exchange rates are drawn from various issues of *Pick's Currency Yearbook*, *Pick's Black Market Yearbooks*, and *Pick's World Currency Report*, while the official rate data are from the same sources as well as the *IFS*. The quotes are end-of-month exchange rates. Annual classifications are simply the modal monthly classifications for each country in each year.

Table 8. Natural Classification Categories		
Fine	Coarse	Description
1	1	No separate legal tender
2	1	Pre announced peg or currency board arrangement
3	1	Pre announced horizontal band that is narrower than or equal to +/–2 percent
4	1	De facto peg
5	2	Pre announced crawling peg
6	2	Pre announced crawling band that is narrower than or equal to +/–2 percent
7	2	De facto crawling peg
8	2	De facto crawling band that is narrower than or equal to +/–2 percent
9	3	Pre announced crawling band that is wider than or equal to +/–2 percent
10	3	De facto crawling band that is narrower than or equal to +/–5 percent
11	3	Moving band that is narrower than or equal to +/–2 percent (i.e., allows for both appreciation and depreciation over time)
12	3	Managed floating
13	4	Freely floating
14	5	Freely falling
15	6	Dual market in which parallel market data is missing

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[55] While data on market-determined exchange rates are available only for the period 1946-98, Reinhart and Rogoff (2004) were able to classify most countries for the years 1940-1945 and 1999-2001 on the basis of official exchange rate data only, as few countries had active parallel markets in those years. Observations where the parallel market was known to be substantial but parallel rate data were not available are marked "unclassified" by the Natural classification.

The procedure employed by the Natural classification to classify regimes is as follows:

1.   First, a separation is made between countries with either official dual or multiple rates or active parallel (black) markets.

2.   If there is no dual or black market, a check is done to see if there is an official pre-announced arrangement, such as peg, crawling peg, or band. If there is, the announced regime is verified by examining the mean absolute monthly change over the period following the announcement.[56] If the regime is verified (according to rules analogous to those described in step 3 below), it is then classified according to the announcement.[57]

3.   If there is no pre-announced exchange rate path, or if the announced regime fails to be verified by the data (which is often the case), and if the twelve-month rate of inflation is below 40 percent, the regime is classified on the basis of actual exchange rate behavior:

- • If the absolute monthly percent change in the exchange rate is equal to zero for four consecutive months or more, that episode is classified (for however long its lasts) as a de facto peg (if there are no dual or multiple exchange rates in place).[58]

- • If the probability that the monthly exchange rate change remains within a +/- 1 percent band over a rolling 5-year period is 80 percent or higher, then the regime is classified as a de facto peg or crawling peg over the entire 5-year period. If the exchange rate has no drift, it is classified as a fixed parity; if a positive drift is present, it is labeled a crawling peg; and, if the exchange rate also goes through periods of both appreciation and depreciation it is a moving peg.

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[56] The advantage of using mean absolute deviations, rather than variances or standard deviations, is that this minimizes the impact of outliers. For example, when the exchange rate is fixed but subject to periodic large devaluations, the variance or standard deviation would overstate the extent of exchange rate flexibility in the period around the devaluation.

[57] When the announced regime is a peg to an undisclosed basket of currencies, tests are done to see if the "basket" peg is really a de facto peg to a single dominant currency (or the SDR). If no dominant currency can be identified, the episode is not labeled as a peg. While this suggests that the Natural classification could miss some de facto basket pegs, Reinhart and Rogoff (2002: 39) argue that "this is almost certainly not a major issue."

[58] This allows for the identification of relatively short-lived de facto pegs as well as those with a longer duration. For instance, this exercise allowed for identification of the Philippines' de facto peg to the U.S. dollar during 1995-97 in the run-up to the Asian crisis as well as the numerous European de facto pegs to the deutschmark prior to 1999.

- The approach regarding de facto bands (as well as pre-announced bands) follows a parallel two-step process. Thus, if the probability that the monthly exchange rate change remains within a +/-2 % band over a rolling 5-year period exceeds 80 percent, then the regime is classified as a de facto narrow band, narrow crawling band, or moving band over the entire period through which it remains continuously above the 80 percent threshold.

4.   If the twelve-month rate of inflation exceeds 40 percent, the episode is classified as "freely falling."[59]

5.   The remaining regimes (those that have not already been classified by steps one through four) become candidates for "managed" or "freely" floating. To distinguish between the two, the degree of exchange rate flexibility is measured by a composite statistic, $\varepsilon /Pr(\varepsilon<1\%)$, where ε is the mean absolute monthly percent change in the exchange rate over a rolling five-year period, while the denominator flags the likelihood of small exchange rate changes. If this ratio falls inside the 99 percent confidence interval or is in the upper tail of the distribution of the floater's group, the episode is characterized as freely floating. If the ratio falls in the lower one percent tail, the null hypothesis of freely floating is rejected in favor of the alternative hypothesis of managed float.

6.   When dual or multiple rates are present or parallel markets are active, steps two through five above are applied to the market-determined rates instead of the official exchange rates to identify the regime.

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[59] In the rare cases where inflation is over 40 percent but the market rate nevertheless follows a confirmed, pre-announced band or crawl, the pre-announced regime takes precedence.

Table 9. Main Features of Various De Facto Classifications				
	Ghosh et al. (2003)	IMF (1999, 2003); Bubula and Ötker-Robe (2002)	Levy-Yeyati and Sturzenegger (2003)	Reinhart and Rogoff (2004)
Period	1973–99	1990–present	1974–2000	1940–2001
Frequency	Annual	Annual and monthly	Annual	Annual and monthly
Number of countries	165	190	156	153
Number of regime types	25 fine, 9 coarse	15 fine, 8 coarse	4	14 fine, 5 coarse
Advantages	Uses quantitative and qualitative information (survey of IMF desk economists) Fine taxonomy	Uses quantitative and qualitative information (survey of IMF desk economists; discussions with authorities; news articles; press reports) All IMF member countries classified; classification continuously updated	Uses information on volatility of foreign exchange reserves Systematic approach; no judgment needed	Uses dual/parallel exchange rate information Separates "freely falling" episodes Long time series; monthly exchange rate movements to identify regime Systematic approach; no judgment needed
Disadvantages	Relies to large extent on stated policy intentions, which may deviate substantially from actual practice Requires subjective judgment, which may differ across countries and over time Not all countries are classified for all time periods	Requires subjective judgment, which may differ across countries and over time	Exchange rate stability or reserve changes may occur for reasons other than policy intervention Reserves data may not cover derivatives Many observations not classified—only 15 years per country classified on average Other countries affect classification (due to cluster analysis)	Exchange rate stability may occur for reasons other than policy intervention A few countries are not classified for all years

II. Determinants of Exchange Rate Regime Choice

The Natural classification data show some links between de facto regime flexibility and certain macroeconomic and financial variables, such as trade openness and dollarization. However, a review of the literature suggest that it is difficult to find empirical regularities between potential exchange rate regime determinants and countries' actual regimes that hold consistently across all countries, time periods, and regime classifications. Systematic robustness checks of the determinants of regime choice employing the Natural classification support this result.

Macroeconomic and financial characteristics of regimes

Optimum currency area (OCA) theory holds that variables such as large size and low openness to trade are likely to be associated with floating exchange rates. One reason for this may be that trade openness raises the transactions benefits from common currencies, and should be expected to lead, therefore, to a decline in the number of independent currencies. The data appear to support the OCA theory prediction that countries that trade a lot will tend to have less flexible exchange rate regimes. Advanced economies that have a high trade openness ratio have tended to have pegged regimes, while the prevalence of free floats has been notably higher in advanced countries with low external trade ratios, such as Australia, Japan, and the United States. A similar pattern holds among other developing countries, where the prevalence of managed floats has been markedly higher and pegs significantly lower in the countries that rely less on external trade. The pattern among emerging markets has been less clear, although relatively closed economies in this group have had a much higher likelihood of being in the freely falling category.

Higher dollarization appears to be associated with less flexible exchange rate regimes among emerging markets, consistent with "fear of floating." Fear of floating appears to be strongest in highly dollarized emerging markets, where pegged regimes are more prevalent than in less dollarized countries in the group. Conversely, emerging markets with low and medium degrees of dollarization are more likely to have managed or freely floating regimes. However, fear of floating does not explain why other developing countries with high dollarization ratios appear to prefer regimes with limited flexibility to pegs. A possible explanation for this could be that many of these countries became highly dollarized following a "freely falling" episode, and lacked the credibility necessary to defend a peg. A regime with limited flexibility allowed them to obtain the benefits of a relatively stable currency, while at the same time maintaining some ability to adjust to shocks.

There is little systematic relation, however, in the degree of capital account openness across de facto regimes. Emerging markets and other developing countries tend to have more capital controls and lower capital flows, in relation to GDP, than advanced economies. Nevertheless, the variation in capital account openness appears not to be related to the flexibility of countries' currency regimes. Among advanced economies, the volume of capital flows in countries with de facto pegged regimes tends to be higher than in those with intermediate regimes, and significantly higher than for those with freely floating regimes. The relationship

is more mixed, however, for emerging markets and other developing countries, possibly because capital controls are often ineffective, so the expected inverse relation between controls and observed capital flows may not hold.

Empirical findings on factors affecting regime choice

Systematic prediction of exchange rate choice is elusive. A review of a reasonably broad collection of previous studies shows that different empirical studies using the de jure and other de facto regime classifications have often obtained different results, suggesting that it is very difficult to draw general conclusions about how countries choose their exchange rate regimes. Although certain characteristics have been shown to be important in determining exchange rate regime choice in certain groups of countries, and certain characteristics may distinguish countries in certain regimes from those in different regimes, no result appears fully robust to changes in country coverage, sample period, estimation method, and exchange rate regime classification.

Several empirical studies have analyzed the determinants of exchange rate regime choice in a cross section of countries. Among the first studies of this kind are Heller (1978), who analyzed the determinants of exchange rate regimes with data from the mid-1970s, soon after the generalized floating that followed the breakup of the Bretton Woods system, Dreyer (1978), Holden, Holden, and Suss (1979), Melvin (1985), Bosco (1987), Savvides (1990), Cuddington and Otoo (1990 and 1991), Rizzo (1998), and Poirson (2001). Some studies, such as those by Collins (1996), Edwards (1996 and 1998) and, more recently, Frieden, Ghezzi, and Stein (2000), have used random effects panel data to analyze also the determinants of *changes* in exchange rate regime. As such, they can be seen as somewhat related to the recent literature on predicting exchange rate crises. Nevertheless, we include these studies in our review because they report findings on the role of country characteristics that are relatively stable over time (such as openness) in determining exchange rate regime choice. Another recent study, by Berger, Sturm, and de Haan (2000), uses panel data in an attempt to identify the long-run determinants of exchange rate regime choice. Additional studies addressing changes in exchange rate regimes include Masson (2001), Klein and Marion (1994), and Duttagupta and Otker-Robe (2003).

The vast majority of previous studies have attempted to explain countries' de jure exchange rate regime choice. A few studies have constructed and used measures of the degree of de facto flexibility on the basis of the actual observed volatility of exchange rates and reserves, including Holden, Holden, and Suss (1979) and, more recently, Poirson (2001). Table 4 summarizes the approaches and findings of these studies with regard to the impact of several variables on observed exchange rate regime choice. Most studies considered some of the optimum currency area variables, such as trade openness (typically measured as imports plus exports, divided by GDP), the size of the economy (gross domestic product in common currency), the degree of economic development (GDP per capita), and geographical concentration of trade (the share of trade with the country's main partner). Among macroeconomic variables, several studies included inflation (whether the country's own inflation, or inflation in excess of partner countries) and foreign exchange reserves. Many

studies included an indicator of either capital controls (typically also drawn or constructed from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*) or de facto capital openness (e.g., the ratio of foreign assets of the banking system to the money supply). Some studies included measures of volatility of domestic output, exports, domestic credit, or the real exchange rate, although no two studies seem to have looked at the same measure of volatility. A few studies considered variables related to political economy or institutional strength. Most studies analyzed some variables that were not included in any preceding (or subsequent) studies. Collectively, the studies considered more than 30 potential determinants of exchange rate regime choice. (Only the variables considered by more than one study are included in Table 4.)

No result appears to be reasonably robust to changes in country coverage, sample period, estimation method, and exchange rate regime classification. For example, openness—the most frequently analyzed variable—is found to be significantly associated with floating regimes by three studies, significantly associated with fixed exchange rates by three studies, and not significantly associated with any particular exchange rate regimes by another five studies. Per capita GDP is found to be significantly associated with floating regimes by three studies, significantly associated with fixed exchange rates by two studies, and not significantly associated with any particular exchange rate regime by another three studies.

There are a few possible exceptions, notably size of the economy and inflation. Size of the economy turns out to be positively associated with floating in almost all studies, though not always significantly. Inflation is almost always positively and significantly associated with floating. However, in the case of inflation there are serious questions regarding the functional form of the relationship. In a number of studies, the authors use the inflation rate or the inflation differential (rather than their logarithms or similar transformations), leaving open the possibility that the results might be driven by a few influential observations. Morever, Collins (1996) finds that high inflation affects exchange rate regime choice in the opposite direction than low/moderate inflation does, and significantly so.

New empirical tests using the Natural classification confirm that it is difficult to explain how countries choose their exchange rate regimes on the basis of simple empirical regularities. These results are consistent with previous work based on other exchange rate regime classifications (Juhn and Mauro (2002)). For a number of potential determinants of regime choice—including economic size, trade openness, capital controls—the variation across regimes is statistically significant. However, with the possible exception of economic size and trade openness, none of the variables is consistently significant across varying specifications in probit and multinomial logit regression analysis. This suggests that the macroeconomic, structural, and institutional variables postulated in various theories are not robust predictors of exchange rate regime choice. Of course, this does not preclude the potential importance of certain variables for certain groups of countries, in certain time periods, or across some of the regime categories.

Table 10. Studies on Determinants of Exchange Rate Regimes (Likelihood to Float)

Author	Heller (1978)	Dreyer (1978)	Holden, Holden & Suss (1979)	Melvin (1985)	Savvides (1990)	Cuddington & Otoo (1990, 1991)	Honkapohja & Pikkarainen (1994)
Sample	86 countries	88 developing countries	76 countries	64 countries	39 developing countries	66 countries	125 countries
Time-frame	1976	1976	1974-75	1976-78	1976-84	1980, 83, 86	1991
Methodology	Discriminant analysis	Probit	OLS on a continuous measure	Multinomial logit	Two-stage probit	Ordered/non-ord. Mult./bin. logit	Logit and probit
Explanatory variables							
(Optimum Currency Area factors)							
Openness	–	– ^^	– ^^	•	–	+/– ^	– ^
Economic development			+ ^^		+ ^^		– ^
Size of economy	+	+		+ ^^		+	+
Inflation differential	+		+ ^^	+		+ ^	
Capital mobility			–		– ^^		
Geographical trade concentration	–	– ^^	–	–	+		
International financial integration	+						+/–
(Other macro/external/structural factors)							
Growth							
Negative growth							
Inflation							
Moderate to high inflation							
Reserves							
Capital control							
Terms of trade volatility							+
Variability in export growth							
External variability * Openness							
Real exchange rate volatility					+ ^^		
Product diversification		– ^^			– ^^		
Current account							
External debt							
Growth of domestic credit							
Money shocks				– ^^		–	
Foreign price shocks				+ ^^		+ ^	
(Political/historical factors)							
Political instability							
Central bank independence							
Party in office has majority							
Number of parties in coalition							
Coalition government							

+ indicates that the coefficient of explanatory variable is positive and – that is negative.

+/- indicates the coefficient is either positive or negative depending on the specification or method used.

^^ indicates the coefficient is statistically significant in most cases.

^ indicates the coefficient is statistically significant in some specifications.

• indicates not significant but sign not reported by the author.

Table 10. (Concluded). Studies on Determinants of Exchange Rate Regimes (Likelihood to float)

Author	Collins (1996)	Edwards (1996)	Edwards (1999)	Rizzo (1998)	Frieden, Ghezzi & Stein (2000)	Berger, Sturm & de Haan (2000)	Poirson (2001)
Sample	24 Latin American and Caribbean	63 countries	49 developing & middle–income	123 countries	26 Latin American countries	65 developing countries	93 countries
Time-frame	1978-92	1980-92	1980-92	1977-95	1960-94	1980-94	1990-98
Methodology	Probit (panel)	Probit (panel)	Probit (panel)	Probit	Ordered logit (panel)	Probit (panel)	Ordered probit
Explanatory variables							
(Optimum Currency Area factors)							
Openness	+ ^			+ ^	− ^^	+ ^^	−
Economic development	•	+ ^	− ^^	+/− ^			+/−
Size of economy	+ ^^			+ ^^			+ ^
Inflation differential							
Capital mobility							
Geographical trade concentration				− ^^			+
International financial integration							
(Other macro/external/structural factors)							
Growth		+ ^^	+ ^^			+	
Negative growth	− ^						− ^^
Inflation		+ ^^	+ ^^	+ ^^			+ ^
Moderate to high inflation	+ ^^				− ^^		
Reserves		− ^^	− ^	+/− ^^	+ ^^	+ ^	− ^
Capital control	+/− ^				+ ^		− ^
Terms of trade volatility				+ ^^	− ^^		+ ^
Variability in export growth		+ ^^	+				
External variability * Openness		− ^^	− ^^				
Real exchange rate volatility		+ ^	+ ^^				
Product diversification							+ ^
Current account	− ^^			+/− ^^			
External debt					+ ^	+ ^^	
Growth of domestic credit		+ ^^	+ ^				
Money shocks							
Foreign price shocks							
(Political/historical factors)							
Political instability		+ ^^	+ ^^		− ^^	+ ^	+ ^^
Central bank independence					+	+ ^	
Party in office has majority		− ^	− ^				
Number of parties in coalition		+	+				
Coalition government		−	−				

+ indicates that the coefficient of explanatory variable is positive and – that is negative.

+/- indicates the coefficient is either positive or negative depending on the specification or method used.

^^ indicates the coefficient is statistically significant in most cases.

^ indicates the coefficient is statistically significant in some specifications.

• indicates not significant but sign not reported by the author.

III. Data and Regression Results for Economic Performance Analysis

This appendix describes the data used in section III and reports the detailed regression results that lie behind the key findings discussed with respect to economic performance across exchange rate regimes.

Much of the data are taken from Ghosh, Gulde, and Wolf (2003), including the de jure classification of exchange rate regimes, the three measures of economic performance (inflation, growth, growth volatility), and the control (or explanatory) variables used in the regression analysis. Each variable is covered at an annual frequency from 1970 to 1999 for up to 158 countries. The control variables are drawn from the literature and are thought to provide a suitable explanation of the variations in the performance measures. Table 11 provides a detailed description of the data. It lists each variable, provides a brief description, and notes which of the subsequent regressions feature these variables. Using this data has the advantage that the evaluation of performance under the Natural classification can be directly compared to a well-respected baseline that assesses performance across the de jure regime regimes.

Three groups of variables are not covered in the Ghosh, Gulde, and Wolf (2003) data. The first group is the Natural regime classification, available at an annual frequency from http://www.puaf.umd.edu/faculty/papers/reinhart/papers.htm.[60] The second group is the crisis variables. The banking crisis variable is taken from Demirguc-Kunt and Detragiache (1998). They define a banking crisis to have occurred when any one of the following four conditions held: (a) non-performing loans exceeded 10 percent of banking system assets; (b) a bailout cost 2 percent or more of GDP; (c) large scale nationalization occurred; or (d) other emergency measures, such bank holidays, deposit freezes, and special guarantees had to be undertaken. The currency or balance-of-payments crisis variable is taken from Berg, Borensztein, and Pattillo (forthcoming) who define a crisis as having occurred when the weighted average of one-month changes in exchange rate and reserves is more than three (country-specific) standard deviations above the country average.

The final group of variable defines whether a country is classified as an advanced economy, an emerging market, or a developing country. Advanced countries are defined using the World Bank definition for upper income countries, following Ghosh, Gulde, and Wolf, (2003). In dividing the rest of the world into two further groups, the analytical distinction of relevance was their degree of exposure to international capital markets. Those considered to have high exposure were classified as "emerging markets" and the rest were designated

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[60] The data are also available at monthly frequency.

"developing."[61] Table 12 lists the country composition of the advanced, emerging market and developing country groups.

To distinguish between emerging and developing economies, exposure to international capital can be determined either in a de jure sense (the extent of formal capital controls in place) or in a de facto sense (the actual exposure a country faces). In the spirit of this paper, a de facto definition was appropriate, an approach also followed by Prasad, Rogoff, Wei, and Kose (2003). Since there are no well-defined or generally accepted thresholds of exposure to international capital, the cut-off between high and low exposure can be arbitrary and was dealt with by dropping and adding countries on the margin to check the robustness of the results. In this paper, the emerging markets are defined using the Morgan Stanley Capital International classification, which designates a country as an emerging market according to a number of factors: GDP per capita, local government regulations, perceived investment risk, foreign ownership limits and capital controls, and other factors. The main motivation for using this classification is that it captures the notion that these countries have access to international capital markets. See http://www.msci.com/equity/index.html for more information. In checking for the robustness of results presented, India and China (considered to have relatively closed capital accounts) were dropped from the emerging markets sample but the results were unchanged. Countries added to the list included those that are not on the MSCI index but do appear on other international emerging market indices and also such countries as Bahrain, Lebanon, and Tunisia that are not on any list but are thought of as relatively open to international capital markets. Again, the results were robust.

All regressions seek to identify the effects of the exchange rate regime, conditional on (or after taking into account) the influence of the conventional control variables relevant to that performance measure. All regressions also include two additional controls, which are not reported for brevity. First, common shocks across countries (such as spikes in oil prices or changes in the volatility of G-3 currencies) are controlled for through time dummies. Second, to control for unobserved country-specific characteristics that are constant over time, country dummies are included. The implication of this approach is that regime performance is judged by changes that occur within a country rather than across countries. For comparison, however, this appendix also discusses below results without country fixed-effects, hence taking into account differences across countries.

To briefly recap, the figures presented in Section III are based on these regressions. They present the coefficients on "dummy," or categorical, variables representing the exchange rate regime. The dummy variable takes the value 1 if the exchange rate regime prevails in a country in a particular year; otherwise, it is assigned a value of zero. As is well-known, when a set of dummy variables represents the full range of possibilities (in this case, the full range

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[61] Strictly, since all non-advanced (non-upper income) countries are commonly referred to as "developing," the two categories used in this paper could have been referred to as "emerging" and "other developing."

of exchange rate regimes) then regression analysis requires one of the possibilities to be left out. The regime that is left out is the base against which the others are compared. Hence, the coefficients presented in figures are to be interpreted as measures of performance (relative to the excluded pegged regime) and conditional upon the other included variables in the regression.

Table 13 compares economic performance (inflation, growth and growth volatility) across regimes, contrasting the de jure classification with the Natural Classification. Table 14 evaluates inflation performance across all countries, advanced countries, emerging markets and developing countries. Three different specifications are presented: (1) the estimates with country fixed effects (on which the figures in the main text are based); (2) the same specification but without fixed effects; and (3) a specification with fixed effects but with the regime variables lagged by two years. The lagging of the exchange rate regime variables increases the likelihood, though does not ensure, that the results are reflecting the influence of regimes on performance rather than the other way around. Tables 15 and 16 are analogous, except that they examine growth and growth volatility, respectively. The different specifications show that the qualitative direction of the key results presented in the main text hold up with remarkable consistency. Where the results across specifications are not similar—as for inflation in advanced countries or inflation and volatility in emerging markets—these are discussed in the text.

Table 17 reports results for emerging markets in the 1990s to recognize that exposure to international capital markets became widespread mainly in that decade. Table 18 reports the inflation regression results, which include regime-specific announcement and duration variables. Finally, Table 19 summarizes all other robustness tests, which have been omitted for brevity.

Table 11. Variable Description

Variable	Description	Regression Used
IMF de jure regime dummies		
Pegged (de jure)	Pegged regimes	13.1, 13.3, 13.5
Intermediate (de jure)	Intermediate regimes	13.1, 13.3, 13.5
Floating (de jure)	Floating regimes	13.1, 13.3, 13.5
Natural regime dummies		
Pegged (natural)	Pegged regimes (fine classification 1~4)	13.2, 13.4, 13.6, 14.1~18.2
Limited flexibility (natural)	Limited flexibility regimes (fine classification 5~9)	14.1~18.2
Managed floating (natural)	Managed floating regimes (fine classification 10~12)	14.1~18.2
Intermediate (natural)	Limited flexibility or managed floating regimes (fine classification 5~12)	13.2, 13.4, 13.6
Freely floating (natural)	Freely floating regimes (fine classification 13)	13.2, 13.4, 13.6, 14.1~18.2
Freely falling (natural)	Freely falling regimes (fine classification 14)	13.2, 13.4, 13.6, 14.1~18.2
Dependent Variable	Control Variables	
Inflation (scaled consumer price inflation; $p/(1+p)$)		
Money growth	Broad money growth	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Real GDP growth	Real GDP growth	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Trade openness	Exports plus imports of goods and services (percent of GDP)	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Central bank turnover rate	Central bank governor turnover rate (per 5 years)	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Terms of trade growth	Terms of trade growth	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Government balance	Central government balance (percent of GDP)	13.1, 13.2, 14.1~14.9, 17.1, 17.2, 18.1, 18.2
Common pegged	Overlap of natural classification pegged with IMF de jure pegged	18.1
Common limited flexibility	Overlap of natural classification limited flexibility with IMF de jure intermediate	18.1
Common managed floating	Overlap of natural classification managed floating with IMF de jure intermediate	18.1
Common freely floating	Overlap of natural classification freely floating with IMF de jure floating	18.1
Pegged duration	Linear time trend for pegged (natural) that measures regime duration	18.2
Limited flexibility duration	Linear time trend for limited flexibility (natural) that measures regime duration	18.2
Managed floating duration	Linear time trend for managed floating (natural) that measures regime duration	18.2
Freely floating duration	Linear time trend for freely floating (natural) that measures regime duration	18.2
Freely falling duration	Linear time trend for freely falling (natural) that measures regime duration	18.2
Per capita real GDP growth		
Investment ratio	Gross fixed investment (percent of GDP)	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Trade openness	Exports plus imports of goods and services (percent of GDP)	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Terms of trade growth	Terms of trade growth, 3 year backward average	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Average years of schooling	Average number of years of schooling of total population age 25 and older (per 5 years)	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Tax ratio	General government revenue (percent of GDP), 3 year backward average	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Government balance	Central government balance (percent of GDP), 3 year backward average	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Initial income/U.S. income	Ratio of per capita GDP to U.S. per capita GDP in 1970 (international prices)	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Population growth	Population growth, 3 year backward average	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Population size	Population (logarithm)	13.3, 13.4, 15.1~15.9, 17.3, 17.4
Volatility of real GDP growth (3 year centered standard deviation)		
Investment ratio	Gross fixed investment (percent of GDP), 3 year centered standard deviation	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Trade openness	Exports plus imports of goods and services (percent of GDP)	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Terms of trade growth	Terms of trade growth, 3 year centered standard deviation	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Average years of schooling	Average number of years of schooling of total population age 25 and older (per 5 years)	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Tax ratio	General government revenue (percent of GDP), 3 year backward average	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Government balance	Central government balance (percent of GDP), 3 year backward average	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Initial income/U.S. income	Ratio of per capita GDP to U.S. per capita GDP in 1970 (international prices)	13.5, 13.6, 16.1~16.9, 17.5, 17.6
Population growth	Population growth, 3 year backward average	13.5, 13.6, 16.1~16.9, 17.5, 17.6
	Crisis Variables	
Bank crisis	From Demirguc-Kunt and Detragiache (1997)	none
Balance of payments crisis	From Berg, Borensztein and Pattillo (forthcoming)	none

Table 12. List of Countries

Advanced Countries	Emerging Markets	Developing Countries		
Australia	Argentina	Albania	Georgia	Panama
Austria	Brazil	Algeria	Ghana	Papua New Guinea
Belgium	Chile	Antigua and Barbuda	Grenada	Paraguay
Canada	China	Armenia	Guatemala	Romania
Cyprus	Colombia	Azerbaijan	Guinea	Rwanda
Denmark	Czech Republic	Bahrain	Guinea–Bissau	Samoa
Finland	Egypt	Bangladesh	Guyana	Senegal
France	Hungary	Barbados	Haiti	Seychelles
Germany	India	Belarus	Honduras	Sierra Leone
Greece	Indonesia	Belize	Iran, Islamic Republic of	Slovak Republic
Hong Kong SAR	Israel	Benin	Iraq	Sri Lanka
Iceland	Jordan	Bolivia	Jamaica	St. Lucia
Ireland	Korea, Republic of	Bosnia and Herzegovina	Kazakhstan	St. Vincent and the Grenadines
Italy	Malaysia	Botswana	Kenya	Sudan
Japan	Mexico	Bulgaria	Kyrgyz Republic	Suriname
Kuwait	Morocco	Burkina Faso	Lao People's Democratic Republic	Swaziland
Luxembourg	Pakistan	Burundi	Latvia	Syrian Arab Republic
Netherlands	Peru	Cameroon	Lebanon	Tajikistan
New Zealand	Philippines	Cape Verde	Lesotho	Tanzania
Norway	Poland	Central African Republic	Liberia	Togo
Portugal	Russian Federation	Chad	Libya	Tonga
Qatar	South Africa	Comoros	Lithuania	Trinidad and Tobago
Singapore	Thailand	Congo, Rep. of	Madagascar	Tunisia
Slovenia	Turkey	Costa Rica	Malawi	Turkmenistan
Spain	Venezuela	Côte d'Ivoire	Maldives	Uganda
Sweden		Djibouti	Mali	Ukraine
Switzerland		Dominica	Malta	Uruguay
United Arab Emirates		Dominican Republic	Mauritania	Vietnam
United Kingdom		Ecuador	Mauritius	Zaire
United States		El Salvador	Moldova	Zambia
		Equatorial Guinea	Mozambique	Zimbabwe
		Estonia	Myanmar	
		Ethiopia	Nepal	
		Fiji	Nicaragua	
		Gabon	Niger	
		Gambia, The	Nigeria	

Note: Emerging market economies are those that are included in the Morgan Stanley Capital International (MSCI) index. With the exception of Israel, which is in the MSCI index, advanced economies are those that are classified as upper income economies by the World Bank. All other economies constitute the other developing countries group.

Table 13. Comparing IMF De Jure and Natural Classifications

Dependent Variable	Inflation		Per Capita Real GDP Growth		Volatility of Real GDP Growth	
Classification	De jure	Natural	De jure	Natural	De jure	Natural
Regression number	13.1	13.2	13.3	13.4	13.5	13.6
Intermediate (de jure)	0.062		0.000		-0.001	
	(6.58)***		(-0.05)		(-0.31)	
Floating (de jure)	0.062		0.003		0.008	
	(5.13)***		(0.57)		(3.11)***	
Intermediate (natural)		0.016		0.000		0.005
		(2.11)**		(0.00)		(1.19)
Freely floating (natural)		0.045		0.004		0.008
		(2.91)***		(0.47)		(1.24)
Freely falling (natural)		0.218		-0.025		0.012
		(13.51)***		(-3.67)***		(2.69)***
Money growth	0.113	0.132				
	(0.83)	(1.05)				
Real GDP growth	-0.958	-0.555				
	(-3.40)***	(-2.59)***				
Investment ratio			-0.083	-0.090	-0.019	-0.012
			(-2.62)***	(-2.83)***	(-0.27)	(-0.17)
Trade openness	0.022	0.027	0.025	0.029	0.007	0.008
	(1.29)	(1.90)*	(2.47)**	(2.94)***	(1.06)	(1.22)
Central bank turnover rate	0.048	0.026				
	(3.34)***	(2.05)**				
Terms of trade growth	-0.005	0.007	0.030	0.026	0.019	0.019
	(-0.25)	(0.39)	(2.09)**	(1.83)*	(2.02)**	(2.02)**
Average years of schooling			-0.002	-0.002	0.004	0.004
			(-0.83)	(-0.60)	(0.93)	(0.82)
Tax ratio			0.004	-0.006	-0.010	-0.005
			(0.14)	(-0.25)	(-0.76)	(-0.36)
Government balance	-0.361	-0.239	0.008	-0.004	-0.008	-0.003
	(-4.99)***	(-4.07)***	(0.25)	(-0.11)	(-0.40)	(-0.16)
Initial income/U.S. income			-0.063	-0.064	-0.006	-0.008
			(-2.51)**	(-2.39)**	(-0.40)	(0.55)
Population growth			-0.275	-0.321	0.123	0.111
			(-1.68)*	(-1.90)*	(1.02)	(0.91)
Population size			0.013	0.015		
			(1.01)	(1.07)		
Constant	0.366	0.090	0.091	0.093	0.032	0.031
	(7.72)***	(1.51)	(2.14)**	(2.07)**	(3.72)***	(2.53)**
Observations	1946	1946	1762	1762	1878	1878
R-squared	0.58	0.70	0.29	0.31	0.26	0.26

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 14. Inflation Performance Across Country Groups

	Advanced Countries			Emerging Markets			Developing Countries		
	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables
Regression number	14.1	14.2	14.3	14.4	14.5	14.6	14.7	14.8	14.9
Limited flexibility	-0.006	0.008	-0.005	-0.027	-0.029	-0.020	0.025	0.020	0.027
	(-1.41)	(2.22)**	(-1.27)	(-1.45)	(-1.86)*	(-1.28)	(1.57)	(2.34)**	(1.96)**
Managed floating	-0.011	0.008	-0.006	-0.027	0.006	0.023	0.022	0.023	0.037
	(-1.75)*	(1.56)	(-0.89)	(-1.40)	(0.41)	(1.64)	(1.27)	(2.85)***	(2.86)***
Freely floating	-0.014	-0.018	-0.011	-0.012	-0.010	0.059	0.104	0.091	0.065
	(-2.11)**	(-4.52)***	(-1.56)	(-0.36)	(-0.42)	(2.16)**	(3.83)***	(3.87)***	(2.65)***
Freely falling	0.221	0.302	0.139	0.234	0.322	0.244	0.232	0.288	0.149
	(5.87)***	(7.34)***	(5.40)***	(7.61)***	(13.18)***	(9.04)***	(10.80)***	(16.73)***	(7.50)***
Money growth	0.725	0.283	0.088	-0.032	-0.097	-0.011	0.010	0.015	0.011
	(2.65)***	(16.55)***	(5.06)***	(-0.31)	(-1.02)	(-0.10)	(1.14)	(0.97)	(1.14)
Real GDP growth	-0.397	-0.468	-0.205	-1.498	-2.025	-1.656	-0.442	-0.874	-0.640
	(-2.31)**	(-2.33)**	(-1.03)	(-2.13)**	(-2.90)***	(-2.12)**	(-1.58)	(-1.82)*	(-1.69)*
Trade openness	0.008	-0.004	0.000	-0.008	-0.008	-0.003	-0.032	-0.012	-0.033
	(0.87)	(-1.40)	(0.00)	(-1.20)	(-1.04)	(-0.99)	(-2.70)***	(-1.59)	(-2.87)***
Central bank turnover rate	0.006	0.017	-0.017	0.094	0.152	0.148	0.044	0.022	0.063
	(0.48)	(1.85)*	(-1.51)	(2.60)***	(4.76)***	(4.32)***	(3.44)***	(1.66)*	(4.39)***
Terms of trade growth	0.019	0.032	0.013	-0.031	-0.035	-0.037	-0.001	-0.008	-0.009
	(2.13)**	(3.11)***	(1.45)	(-0.79)	(-0.83)	(-0.87)	(-0.06)	(-0.45)	(-0.49)
Government balance	-0.208	-0.188	-0.199	-0.557	-0.175	-0.677	-0.210	-0.221	-0.324
	(-4.42)***	(-4.01)***	(-3.21)***	(-3.74)***	(-1.64)	(-4.75)***	(-2.77)***	(-2.57)**	(-3.63)***
Constant	-0.087	0.025	0.046	0.370	0.445	0.249	0.336	0.069	0.341
	(-1.71)*	(2.91)***	(1.41)	(1.01)	(1.35)	(0.62)	(3.63)***	(2.49)**	(2.30)**
Observations	701	701	701	617	617	617	1401	1401	1401
R-squared	0.82	0.73	0.83	0.73	0.68	0.71	0.67	0.44	0.57

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 15. Growth Performance Across Country Groups

	Advanced Countries			Emerging Markets			Developing Countries		
	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables
Regression number	15.1	15.2	15.3	15.4	15.5	15.6	15.7	15.8	15.9
Limited flexibility	0.001	0.002	0.008	0.003	0.004	-0.007	-0.005	0.014	0.006
	(0.14)	(0.49)	(1.01)	(0.34)	(0.57)	(-0.56)	(-0.71)	(3.54)***	(0.79)
Managed floating	0.005	0.010	0.019	0.020	0.010	0.002	-0.008	0.010	-0.005
	(0.56)	(1.13)	(1.69)*	(1.52)	(1.12)	(0.19)	(-1.28)	(2.42)**	(-0.86)
Freely floating	0.027	0.024	0.021	-0.025	-0.015	-0.020	-0.017	-0.006	0.002
	(1.97)**	(1.93)*	(1.64)	(-0.88)	(-0.85)	(-0.47)	(-1.03)	(-0.43)	(0.15)
Freely falling	-0.029	-0.012	-0.003	-0.045	-0.035	-0.023	-0.032	-0.019	-0.002
	(-1.02)	(-0.54)	(-0.13)	(-3.96)***	(-4.06)***	(-1.24)	(-4.29)***	(-3.21)***	(-0.31)
Investment ratio	0.453	0.265	0.428	-0.048	0.062	-0.037	-0.033	0.039	-0.025
	(1.33)	(1.35)	(1.25)	(-0.51)	(0.76)	(-0.37)	(-0.79)	(1.41)	(-0.58)
Trade openness	-0.016	0.016	-0.013	-0.006	-0.006	-0.013	0.009	0.016	0.006
	(-0.33)	(1.76)*	(-0.28)	(-0.19)	(-0.32)	(-0.35)	(0.73)	(2.39)**	(0.43)
Terms of trade growth	0.305	0.383	0.310	0.011	0.001	0.036	-0.004	0.019	-0.006
	(1.32)	(1.26)	(1.34)	(0.32)	(0.03)	(0.93)	(-0.21)	(0.98)	(-0.31)
Average years of schooling	0.008	0.004	0.009	0.017	0.005	0.015	-0.010	0.001	-0.014
	(1.21)	(1.43)	(1.36)	(1.22)	(1.33)	(1.06)	(-2.02)**	(0.77)	(-2.71)***
Tax ratio	0.079	0.085	0.059	-0.047	-0.010	-0.029	-0.011	-0.028	-0.013
	(1.41)	(1.47)	(1.01)	(-1.02)	(-0.30)	(-0.65)	(-0.84)	(-2.78)***	(-0.94)
Government balance	-0.520	-0.448	-0.526	-0.277	-0.086	-0.233	0.070	0.046	0.073
	(-1.64)	(-1.57)	(-1.64)	(-3.37)***	(-1.34)	(-2.75)***	(1.77)*	(1.62)	(1.78)*
Initial income/U.S. income	0.087	-0.025	0.106	-0.285	-0.059	-0.191	-0.022	-0.034	0.015
	(1.71)*	(-0.91)	(1.96)*	(-2.00)**	(-2.30)**	(-1.67)*	(-0.41)	(-3.11)***	(0.27)
Population growth	1.275	0.716	1.366	-0.196	0.144	-0.255	-0.679	-0.432	-0.680
	(1.04)	(0.84)	(1.08)	(-0.35)	(0.41)	(-0.44)	(-1.95)*	(-2.08)**	(-1.88)*
Population size	-0.412	-0.002	-0.432	0.029	0.003	0.034	-0.020	0.002	-0.003
	(-2.07)**	(-0.85)	(-2.09)**	(0.94)	(0.89)	(0.90)	(-0.84)	(0.83)	(-0.11)
Constant	-0.822	-0.070	-0.865	-0.032	-0.003	-0.074	0.101	0.030	0.070
	(-1.85)*	(-0.77)	(-1.88)*	(-0.27)	(-0.12)	(-0.55)	(1.20)	(2.27)**	(0.76)
Observations	629	629	620	529	529	520	1228	1228	1209
R-squared	0.37	0.28	0.38	0.30	0.20	0.23	0.25	0.15	0.23

Source: Authors' calculation.

Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 16. Volatility of Real GDP Growth Performance Across Country Groups

	Advanced Countries			Emerging Markets			Developing Countries		
	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables	Country fixed effects	No country fixed effects	Country fixed effects with two-year lagged regime variables
Regression number	16.1	16.2	16.3	16.4	16.5	16.6	16.7	16.8	16.9
Limited flexibility	0.006	0.002	0.009	0.004	-0.004	-0.018	-0.005	-0.010	0.002
	(1.08)	(0.52)	(1.72)*	(0.56)	(-1.08)	(-2.14)**	(-1.13)	(-4.28)***	(0.59)
Managed floating	0.011	0.009	0.010	0.027	0.009	-0.009	-0.001	-0.002	0.002
	(1.96)*	(1.85)*	(1.83)*	(2.24)**	(1.29)	(-1.04)	(-0.40)	(-1.03)	(0.63)
Freely floating	0.013	0.011	0.014	0.036	0.012	-0.031	0.001	0.005	-0.002
	(1.86)*	(1.79)*	(1.99)**	(1.59)	(0.84)	(-1.48)	(0.14)	(0.60)	(-0.31)
Freely falling	-0.005	-0.002	0.004	0.021	0.020	-0.007	0.007	0.008	0.004
	(-0.48)	(-0.24)	(0.42)	(3.03)***	(4.16)***	(-0.73)	(1.63)	(2.25)**	(1.00)
Investment ratio	-0.537	0.266	-0.559	-0.148	-0.110	-0.134	-0.049	-0.003	-0.057
	(-1.05)	(0.65)	(-1.10)	(-1.07)	(-0.79)	(-0.98)	(-0.70)	(-0.05)	(-0.82)
Trade openness	0.047	0.018	0.048	0.039	0.024	0.049	0.007	0.000	0.004
	(1.08)	(3.37)***	(1.12)	(2.24)**	(2.57)**	(2.38)**	(0.92)	(-0.01)	(0.47)
Terms of trade growth	0.068	0.145	0.069	0.102	0.066	0.092	0.021	0.018	0.022
	(1.16)	(2.36)**	(1.20)	(3.50)***	(2.14)**	(3.20)***	(1.70)*	(1.42)	(1.73)*
Average years of schooling	0.001	-0.003	0.001	0.012	0.006	0.015	0.000	-0.002	0.000
	(0.31)	(-2.65)***	(0.30)	(1.20)	(2.09)**	(1.51)	(0.03)	(-2.62)***	(-0.05)
Tax ratio	0.013	0.006	0.013	0.032	-0.052	0.052	-0.009	0.018	-0.009
	(0.33)	(0.30)	(0.32)	(1.37)	(-3.04)***	(2.04)**	(-0.98)	(2.48)**	(-0.99)
Government balance	-0.155	-0.103	-0.157	0.001	-0.098	-0.033	-0.022	-0.040	-0.028
	(-1.31)	(-1.13)	(-1.32)	(0.01)	(-1.99)**	(-0.34)	(-0.95)	(-2.34)**	(-1.16)
Initial income/U.S. income	0.137	0.046	0.139	-0.263	-0.037	-0.244	0.013	0.002	-0.001
	(1.94)*	(3.52)***	(1.96)*	(-3.00)***	(-1.65)*	(-2.71)***	(1.21)	(0.31)	(-0.07)
Population growth	-0.013	0.341	0.002	-0.398	0.570	-0.343	-0.089	-0.018	-0.088
	(-0.03)	(0.90)	(0.00)	(-0.72)	(1.40)	(-0.67)	(-0.33)	(-0.11)	(-0.32)
Constant	-0.131	0.007	-0.155	0.029	-0.015	0.034	0.033	0.040	0.048
	(-0.72)	(0.32)	(-0.90)	(1.18)	(-0.76)	(1.40)	(2.17)**	(4.59)***	(3.00)***
Observations	617	617	617	518	518	518	1201	1201	1201
R-squared	0.50	0.40	0.50	0.36	0.20	0.33	0.28	0.10	0.28

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 17. Emerging Markets in the 1990's

Dependent Variable	Inflation		Per Capita GDP Growth		Volatility of Real GDP Growth	
	No lag	2 year lagged regime variables	No lag	2 year lagged regime variables	No lag	2 year lagged regime variables
Regression number	17.1	17.2	17.3	17.4	17.5	17.6
Limited flexibility	-0.028	0.003	0.005	-0.029	-0.011	-0.035
	(-0.74)	(0.11)	(0.38)	(-0.95)	(-1.14)	(-1.87)*
Managed floating	-0.055	0.011	0.008	-0.026	0.024	-0.030
	(-1.25)	(0.34)	(0.54)	(-0.80)	(2.52)**	(-1.33)
Freely floating	-0.036	0.213	-0.039	-0.019	-0.011	-0.090
	(-0.59)	(2.74)***	(-0.92)	(-0.34)	(-0.30)	(-1.69)*
Freely falling	0.137	0.187	-0.056	-0.020	0.023	-0.034
	(1.99)**	(3.46)***	(-3.15)***	(-0.67)	(2.11)**	(-1.55)
Money growth	0.034	0.034				
	(2.24)**	(2.41)**				
Real GDP growth	-1.096	-2.207				
	(-1.10)	(-1.65)				
Investment ratio			-0.781	-0.581	-0.954	-0.622
			(-3.28)***	(-3.00)***	(-1.70)*	(-1.29)
Trade openness	0.229	0.341	-0.053	-0.105	0.067	0.084
	(2.78)***	(3.24)***	(-1.15)	(-2.22)**	(2.47)**	(2.42)**
Central bank turnover rate	0.074	0.067				
	(1.20)	(0.99)				
Terms of trade growth	0.006	0.061	-0.101	-0.062	0.133	0.160
	(0.05)	(0.41)	(-1.11)	(-0.63)	(1.84)*	(2.06)**
Average years of schooling			0.030	0.031	0.049	0.045
			(1.02)	(1.28)	(2.56)**	(2.63)***
Tax ratio			-0.382	-0.278	0.033	-0.088
			(-2.87)***	(-2.01)**	(0.45)	(-1.13)
Government balance	-0.628	-0.624	0.452	0.395	-0.268	-0.326
	(-1.24)	(-1.15)	(2.02)**	(1.90)*	(-1.44)	(-1.46)
Initial income/U.S. income			-1.788	-1.973	-0.555	-0.454
			(-2.67)***	(-3.16)***	(-3.94)***	(-3.87)***
Population growth			-1.418	-1.561	-1.894	-1.613
			(-0.75)	(-0.93)	(-1.44)	(-1.45)
Population size			-0.829	-0.977		
			(-2.82)***	(-3.41)***		
Constant	0.148	0.240	4.027	4.507	-0.099	-0.046
	(1.25)	(1.68)*	(3.06)***	(3.50)***	(-1.64)	(-0.82)
Observations	239	239	230	230	230	230
R-squared	0.80	0.79	0.52	0.47	0.57	0.55

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 18. Inflation Performance in Developing Countries:
Announcement and Duration Effects

	Developing Countries	Developing Countries
Regression number	18.1	18.2
Limited flexibility	-0.065	0.020
	(-1.40)	(0.91)
Managed floating	-0.067	0.010
	(-1.49)	(0.49)
Freely floating	0.013	0.151
	(0.23)	(3.82)***
Freely falling	0.155	0.177
	(3.40)***	(6.15)***
Common pegged	-0.092	
	(-2.05)**	
Common limited flexibility	0.039	
	(2.85)***	
Common managed floating	0.049	
	(3.21)***	
Common freely floating	0.023	
	(0.54)	
Pegged duration		-0.002
		(-2.13)**
Limited flexibility duration		-0.002
		(-1.25)
Managed floating duration		0.000
		(-0.17)
Freely floating duration		-0.018
		(-3.00)***
Freely falling duration		0.013
		(2.79)***
Money growth	0.010	0.010
	(1.13)	(1.15)
Real GDP growth	-0.426	-0.427
	(-1.55)	(-1.56)
Trade openness	-0.032	-0.032
	(-2.73)***	(-2.81)***
Central bank turnover rate	0.042	0.044
	(3.32)***	(3.52)***
Terms of trade growth	-0.004	0.000
	(-0.24)	(-0.03)
Government balance	-0.211	-0.214
	(-2.80)***	(-2.81)***
Constant	0.427	0.334
	(4.24)***	(3.53)***
Observations	1401	1401
R-squared	0.67	0.68

Source: Authors' calculation.
Note: Figures in parentheses are t-statistics; * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 19. Robustness Tests

Robustness Test	Why do it?	Are the results robust?
(1) Drop countries with fewer than 1 million people.	Are small countries driving the results?	Yes.
(2) Lag the regime dummies by one and two years.	Is poor performance after the collapse of regimes attributed to subsequent regimes?	Yes, for inflation. For volatility in emerging markets, lagging the regime dummies eliminates the link between volatility and flexibility of regime, suggesting that the volatility attributed to flexibility is a "spillover" from the rigid regime.
(3) Drop EMU countries for the period 1997-1999.	Are the advanced country results driven by the EMU countries?	Yes.
(4) Run regressions for 1990s only.	Are our results driven by 1970s and 1980s?	Yes, but significance falls sharply because of fewer observations.
(5) Replace country fixed effects with political risk (ICRG) measure.	Are the country dummies capturing differences in institutional development across advanced and developing countries?	The results remain robust with the additional finding that in advanced countries inflation is lower the greater is political stability. In developing countries, ICRG variable matters little.
(6) Use fine instead of course classification for pegged regimes.	Does economic performance vary across different pegged regimes?	Yes. More rigidity associated with lower inflation in developing countries.
(7) Allow for indirect effects on growth via investment and trade openness.	Are pegs associated with more investment and greater trade openness and do they therefore grow faster?	Yes.
(8) Control separately for dual exchange rates in regression with IMF regime dummies.	Are dual exchange rates harmful above and beyond the declared regime?	The inflation benefit of pegs and intermediate regimes is substantially reduced in the presence of dual rates.
All regressions include time dummies to control for global shocks (oil shocks, G-3 currency volatility) and country dummies to control for institutional differences across countries that might otherwise be attributed to the regime dummies.		

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