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Exchange Rate Regimes and Economic Performance

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This paper studies the impact of exchange rate regimes on inflation, nominal money growth, real interest rates, and GDP growth. We find that, for nonindustrial economies, "long" pegs (lasting five or more years) are associated with lower inflation than floats, but at the cost of slower growth. A similar trade-off between inflation and growth is still present in the case of "hard" pegs (currency boards and economies without separate legal tender), whose growth performance does not differ significantly from that of conventional pegs. In contrast, "short" pegs clearly underperform floats, as they grow slower without providing any gains in terms of inflation. [JEL E31, E52, F41, F43]

The proper assessment of the costs and benefits of alternative exchange rate regimes has been a hotly debated issue and remains perhaps one of the most important questions in international finance. The theoretical literature has concentrated on the trade-off between monetary independence and credibility implied by different exchange rate regimes, as well as in the insulation properties of each arrangement in the face of monetary and real shocks.[1] Recent episodes of financial distress have refocused the discussion by introducing the question of which

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[1]References on this issue would be too numerous to cite here. A general discussion on some of these issues is given in Obstfeld and Rogoff (1996).

exchange rate regime is better suited to deal with increasingly global and unstable world capital markets.[2] In particular, given the increasing importance of international capital flows and the predominance of external over domestic monetary shocks, the traditional trade-off has narrowed down to a price stability-growth dilemma, according to which fixes are expected to enhance the credibility of noninflationary monetary policies, reducing inflation and the volatility of nominal variables, while floats are seen as allowing the necessary price adjustments in the face of external (real and financial) shocks, reducing output fluctuations and improving growth performance.

The terms of the debate about exchange rate regimes and the views prevalent in policy circles have evolved over time, as they have rarely been independent from the characteristics of international financial markets. In the 1980s, in a context of relatively closed capital markets, external shocks were less relevant and, with many countries struggling with disinflation policies, monetary aspects appeared to be much more important than today. The issues stressed in the academic literature have changed accordingly: while economists in the 1980s concentrated on studying the implications of exchange rate regimes as stabilization instruments (or as credibility enhancers), today the debate focuses on how different regimes may act as absorbers of external shocks or provide a shield against speculative attacks.[3]

The lack of consensus on the subject has been paralleled by recent developments in the real world. Recent years have witnessed an unprecedented number of changes of exchange rate regimes, in a way that seems to provide partial support to almost any view about the long-run trends in the choice of regimes. Thus, while the inherent vulnerability of intermediate exchange rate arrangements to sudden aggregate shocks revealed by the notorious collapses of pegs or managed floats in Southeast Asia and Latin America have suggested to some observers the convenience of more flexible regimes, a number of countries have taken the opposite path, moving toward monetary unions or unilateral dollarization, as was the case in Europe in the aftermath of the European Monetary System (EMS) crisis of 1992, or in Ecuador with the recent adoption of the U.S. dollar as legal tender.

The debate is further complicated by another important consideration: Characterizing the exchange rate regimes actually in place in different countries is not a trivial task. Calvo and Reinhart (2000), for example, have pointed out that many countries that claim to be floaters intervene heavily in exchange rate markets to reduce exchange rate volatility, suggesting a mismatch between de jure and de facto regimes. Similarly, Levy-Yeyati and Sturzenegger (2000a) highlight the recent increase in what could be labeled "fear of pegging": countries that run a de facto peg but avoid an official commitment to a fixed parity.[4]

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[2]Recent contributions include Calvo (1999), Eichengreen (1994), Frankel (1999), Larraín and Velasco (1999), and Rose (2000).

[3]Compare, for example, the literature on the role of exchange rates for stabilization following the seminal contribution of Calvo and Végh (1994) with more recent papers like Broda (2000) on the relevance of exchange rate regimes as a shock absorber, or Domac and Martinez Peria (2000) about the impact of regimes on the likelihood of banking crises.

[4]These mismatches between de jure and de facto regimes have been pointed out repeatedly in the literature. See, for example, Frankel (1999) and Quirk (1994). Frieden, Ghezzi, and Stein (2001) and Ghosh and others (1997) make partial attempts at correcting this problem in their empirical work.

With all this in mind, in this paper we revisit the inflation-growth trade-off, using an extensive database that includes 154 countries and covers the post–Bretton Woods era. We deliberately ignore the Bretton Woods period in which fixes were dominant, largely for political reasons, to concentrate in the recent period of increasing financial integration, in which, we believe, the linkage between exchange rate regimes and the real economy better reflected the choice of individual countries' monetary authorities.

Several new aspects are introduced in our analysis. First, we use a de facto classification, described in detail in Levy-Yeyati and Sturzenegger (2000a) (henceforth denoted LYS), that groups exchange rate regimes according to the actual behavior of the main relevant variables, as opposed to the traditional classification compiled by the IMF based on the de jure (i.e., legal) regime that the countries' authorities declare to be running.[5] By doing this, we refine the analysis substantially. On the one hand, we avoid the misclassification of pegs that pursue independent monetary policies (and eventually collapse) and floats that subordinate their monetary policy to smooth out exchange rate fluctuations, which may bias the statistics of the tests toward lack of significance or incorrect interpretations. On the other hand, the new classification makes a distinction between high and low volatility economies, providing a natural way to discriminate the impact of the regime in tranquil and turbulent times.

Second, we distinguish between "long" and "short" pegs; long pegs are defined as those in place for five or more consecutive years and short pegs as those in place for less than five years. We find the distinction useful at least in two respects. On the one hand, it allows us to determine whether the impact on macroeconomic variables is a product of the regime in place or rather the result of the short-run effect of a regime switch. On the other hand, our focus on long pegs addresses the concern that the poor showing of many conventional pegs may be mainly attributable to countries with weaker macroeconomic and political fundamentals that are forced to implement ultimately unsustainable fixed exchange rate regimes.

Third, in addition to looking at the inflation-growth trade-off, the paper examines the impact of exchange rate regimes on the cost of capital, as measured by the real interest rate, something that has not been done yet in the literature, to our knowledge. The issue has important policy implications inasmuch as lower interest rates are typically invoked as a key argument in favor of fixed exchange rates and, more recently, of the full adoption of a foreign currency as legal tender.

Fourth, we conduct a "deeds vs. words" comparison that makes use of both the LYS and the IMF-based classification, which sheds light on a number of issues. For example, it allows us to test the extent to which economic performance is determined by the actual (as opposed to the reported) exchange rate policy, as well as the "announcement" value of a de jure peg, above and beyond the actual behavior of the regime.

Finally, we test whether fixed exchange rate arrangements that imply a harder commitment, such as currency boards or currency unions (a group usually referred

[5]A detailed description of both classifications is provided in the next section.

to as "hard" pegs), are different from (and better than) conventional fixes and other regimes in general. This increasingly popular hypothesis stresses that the stronger commitment embedded in a hard peg reduces the vulnerability of the regime to speculative attacks (thus enhancing growth) while reaping all the benefits in terms of lower inflation.[6]

The main findings discussed in the paper are the following:

1. For industrial countries, we find no significant link between regimes and economic performance.
2. For nonindustrial economies, a robust association between fixed regimes and lower inflation rates appears only when we focus on long pegs. This link seems to work both through its influence on monetary growth and through its impact on expectations. Moreover, deeds rather than words matter for inflation: The announcement of a fixed exchange rate regime has an impact on inflation only in the case of long pegs.
3. Real rates appear to be lower under fixed exchange rate regimes than under floats only according to the de jure classification, suggesting that the result is mostly due to the role of unanticipated devaluations. Interestingly, for de facto pegs, we find that the announcement of a fixed regime has a negative effect on real interest rates only for short pegs, possibly because short pegs, while effective in reducing inflation expectations (and thus nominal interest rates), are not effective in reducing actual inflation (point 2 above).
4. Within the group of nonindustrial countries, pegs (both short and long) are significantly and negatively related to per capita output growth. Thus, the inflation-growth trade-off implicit in the choice between fixed and floating regimes seems to apply only to long pegs. In contrast, short pegs clearly underperform floats: they grow more slowly without providing significant gains in terms of inflation.
5. Hard pegs deliver better inflation results than conventional pegs, but they do not eliminate the inflation-growth trade-off, as they still display significantly smaller growth rates than floating exchange rate arrangements.
6. Compared with de facto floats, de facto pegs that shy away from legally committing to a fixed exchange rate benefit from higher growth performance, providing a justification for the "fear of pegging."

The plan of the paper is as follows. Section I succinctly describes the LYS and IMF classification used in the econometric tests. Section II presents the data. Section III shows the main empirical findings for inflation and money growth. Section IV discusses the impact of regimes on real interest rates. Section V looks at the relation between regimes and growth. Section VI explores whether hard pegs behave differently from conventional pegs. Section VII outlines some areas for future research and concludes.

[6]Besides proponents of the bipolar view like Eichengreen (1994), Summers (2000), and Fischer (2001), who regard intermediate regimes (and, in particular, conventional pegs) as inherently unsustainable in a context of integrated international capital markets, hard peg advocates include, most notably, supporters of full dollarization like Calvo (1999) and Eichengreen and Hausmann (1999). For a thorough presentation of the full dollarization debate, see also Levy-Yeyati and Sturzenegger (forthcoming).

I. Exchange Rate Regime Classification

LYS Classification

The LYS de facto classification[7] that we used in this paper is based on three variables closely related to exchange rate behavior: (1) *exchange rate volatility* (σ_e), measured as the average of the absolute monthly percentage changes in the nominal exchange rate during the year; (2) *volatility of exchange rate changes* ($\sigma_{\Delta e}$), measured as the standard deviation of the monthly percentage changes in the exchange rate; and (3) *volatility of reserves* (σ_r), measured as the average of the absolute monthly change in international reserves relative to the monetary base in the previous month.[8]

Underlying the LYS classification is the idea that, according to the behavior of these three variables, we should be able to identify the exchange rate regime that a country is actually following. For example, a textbook flexible exchange rate regime is characterized by little intervention in the exchange rate market together with high volatility of exchange rates. Conversely, a fixed exchange rate regime should display little volatility in the nominal exchange rate while reserves fluctuate substantially. Finally, an intermediate regime corresponds to the case in which volatility is relatively high across all variables.[9] Table 1 summarizes the patterns that, a priori, should be expected for the different regimes in terms of the three classification variables.

Note that countries that do not display significant variability in either variable are denoted "inconclusive." Two reasons underlie this label. The first relates to the fact that it is virtually impossible, in the absence of shocks, to assess how exchange rate regimes will actually behave when put to a test. The second derives from the hypothesis that countries that do not face sizable shocks should be less informative about the real impact of the regime, and that their inclusion in our econometric tests may bias the regime coefficients downward.

Once the three classification measures are computed for our universe of countries, the points corresponding to each country-year observation are assigned to the different groups of Table 1 using K-Means Cluster Analysis.[10] Finally, countries grouped in the "inconclusive" category are reclassified in a second round using exactly the same procedure.[11] This two-stage procedure allows us to differentiate

[7]This section borrows from Levy-Yeyati and Sturzenegger (2000a), which provides a detailed explanation of the classification procedure.

[8]Computing the change in reserves relative to the monetary base is a way of assessing the monetary impact of the exchange rate intervention. However, external liabilities and government deposits need to be netted out from the reserves data, to capture only those changes that have a counterpart in monetary aggregates. More precisely, the variable is calculated using line 11 from the International Financial Statistics (IFS), net of lines 16c and 16d, and dividing its change by line 14 (or 14a if line 14 was not available) lagged one month.

[9]Within this group, the classification distinguishes between dirty floats and crawling pegs, the latter corresponding to the case of significant changes in the nominal exchange rate coupled with relatively stable increments and active intervention. In the empirical analysis conducted in this paper, however, both types are subsumed in the intermediate group.

[10]For a discussion of cluster analysis techniques, see, for example, Anderberg (1973) and Norusis (1993).

[11]"Inconclusives" from the second-round classification are left unclassified. We use them, however, in several robustness checks below.

Table 1. LYS Classification Criteria

	σ_e	$\sigma_{\Delta e}$	σ_r
Flexible	High	High	Low
Intermediates	Medium/High	Medium/High	Medium/High
Fixed	Low	Low	High
Inconclusive	Low	Low	Low

first- and second-round regimes, in turn associated with high and low volatilities in the underlying classification variables.[12]

IMF Classification

As we mentioned above, we also conduct our tests using an IMF-based classification for the purpose of comparison with previous work, as well as to address issues related to the announcement value of an exchange rate regime, particularly in the case of pegs.[13] The IMF has changed the way it classifies exchange rate regimes over the years. Before 1998, the IMF grouped countries into three basic categories: pegs, limited flexibility, and more flexibility, in turn divided into several subgroups. After 1998, the IMF moved to an eight-way classification: no separate legal tender, currency boards, conventional fixed, horizontal bands, crawling pegs, crawling bands, dirty float, and free floats. In general, however, the categories can be readily mapped on a simpler grouping that includes different forms of pegs (to a single currency, or to a disclosed or undisclosed basket), intermediate regimes (crawling pegs, bands, managed floats, cooperative arrangements), and pure floats.

Levy-Yeyati and Sturzenegger (2000a) discuss at length the nature of the mismatches between both classifications. In particular, they show that their number for any given year hovers around 50 percent of all cases. The IMF has recently started to acknowledge the difference between deeds and words by reporting, in some cases, countries with a formal regime and a different de facto one. These regimes are identified by the superscript 6 in IMF (1999). In what follows, we deliberately ignore this distinction when considering the IMF classification and assign countries according to their "legal" arrangement.

II. The Data

Our sample covers annual observations for 154 countries over the period 1974–99. A list of countries, as well as the definitions and sources of the variables used in the paper, is presented in Appendix I. With the exception of the political instability and secondary school enrollment variables used in the growth regressions, all of

[12]The complete database is available at http://www.utdt.edu/~ely or http://www.utdt.edu/~fsturzen.

[13]The details of the classification appear in the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions. A summary of the classification is included in the *International Financial Statistics* volumes.

Table 2. Distribution of Exchange Rate Regimes

Regime	First Round	Second Round	Total	IMF
Float	473	186	659	459
Intermediate	261	334	595	801
Fix	418	512	930	924
Total	1,152	1,032	2,184	2,184

our data come from the IMF and the World Bank. Data availability varies across countries and periods, so the tests in each subsection were run on a consistent subsample of observations (which is reported in each case along with the results).

The LYS de facto classification covers a sample of 2,825 observations, of which 637 are labeled inconclusive in the second round. Table 2 shows the distribution of the remaining 2,188 observations, along with the alternative IMF-based classification for the same group of observations.

III. Inflation and Money Growth

A First Pass at the Data

The typical association of fixed exchange rates with lower inflation rates is based primarily on the belief that a peg may play the role of a commitment mechanism for monetary authorities, inasmuch as an expansionary monetary policy is inconsistent in the long term with a fixed exchange rate, and that the failure to comply with the commitment entails some political cost to the authorities (Romer, 1993, and Quirk, 1994). To this effect, which should work entirely through the behavior of the monetary aggregates, the literature adds the potential impact of a credible peg on inflation expectations, which might stabilize money velocity and reduce the sensitivity of prices to temporary monetary expansions. In this way, a fixed exchange rate regime is expected to affect the link between money and prices. Similarly, particularly in those cases in which dollar indexation is widespread, a credible peg may help reduce inertial inflation by placing a limit to devaluation expectations.

Table 3 provides a first pass at the data. The table shows the means and medians of inflation for each of our control groups, namely, the floating, intermediate, and fixed exchange rate regimes according to the IMF and the LYS classification (the latter being further disaggregated into first and second rounds). For consistency, the sample of 1,925 observations comprises all countries and years classified by LYS (see Table 2) for which data on inflation and monetary growth are available. Because the sample includes many countries that exhibit extraordinarily high inflation, it seems reasonable to concentrate the analysis in the medians, which are less affected by such extreme values.

For both classifications, the intermediate regimes are the ones that fare the worst in terms of inflation. However, important differences emerge when comparing fixes and floats. Whereas the IMF index seems to indicate, quite

Table 3. Inflation and Money Growth

	IMF			LYS			LYS (First Round)			LYS (Second Round)		
	FLOAT	*INT*	*FIX*	*FLOAT*	*INT*	*FIX*	*FLOAT*	*INT*	*FIX*	*FLOAT*	*INT*	*FIX*
Observations	425	740	760	610	548	767	434	236	356	176	312	411
INFLATION												
Means	22.3	20.2	16.7	14.2	38.3	9.7	16.1	75.3	11.8	9.4	10.3	7.9
Medians	8.3	9.9	8.7	9.4	12.7	7.4	10.3	40.1	8.5	8.0	7.6	6.4
$\Delta M2$												
Means	24.9	26.3	20.4	19.1	40.6	15.1	21.0	72.3	17.8	14.4	16.7	12.8
Medians	13.8	16.9	14.6	14.9	20.2	12.9	16.3	41.9	14.6	14.0	14.9	11.8

Source: IMF's *International Financial Statistics.*
Note: Exchange rate classifications: IMF de jure from IFS, LYS de facto from Levy-Yeyati and Sturzenegger (2000a).

surprisingly, that fixes are associated with slightly higher inflation levels, the result reverses when we group observations according to the LYS classification. This is a logical consequence of the fact that the IMF classification does not distinguish between successful and collapsing pegs, and thus includes within the fix group countries that displayed high inflation levels as a result of inconsistent monetary policies that eventually led to a currency crisis.[14]

The table also shows that, as expected, second-round observations correspond to lower inflation rates, indicating that this group captures country observations with relatively less volatility. Within this group, inflation decreases monotonically as we move to regimes with less flexibility.

As mentioned above, one way a regime (and particularly, a peg) may influence inflation is by imposing discipline on the dynamics of money creation. As expected, the numbers for money growth presented in the table mirror those for inflation. While the IMF index, if anything, seems to indicate that the rate of money growth ($\Delta M2$) tends to increase more rapidly under fixed than under floating exchange rates, the LYS classification finds the opposite result. Again, in both cases intermediate regimes stand out as the most expansionary, which is consistent with the numbers for inflation.

Inflation

These results have to be confirmed by a more careful analysis where we control for relevant additional variables that may also be affecting both inflation and money growth. We start from a standard money demand equation to obtain

$$\pi = \Delta m - \alpha \Delta GDP + \beta i + \Delta v. \quad (1)$$

Here, π represents the inflation rate, Δm is the rate of growth of broad money, ΔGDP is real output growth, i is the nominal interest rate, v is money velocity, and α and β

[14]Note also that the ranking between fixes and floats under the IMF classification changes according to whether the analysis focuses on means or medians.

are positive constants. As mentioned, the exchange rate regime may affect inflation indirectly through its disciplinary effect on Δm, as well as directly through lower inflation expectations. While it is not completely clear how this last channel may be modeled, a first assessment of this "credibility" effect may be obtained by including regime dummies in the money demand equation (1). More precisely, we use a dummy *IMFINT* (*IMFFIX*) that takes the value of one when an observation is classified as an intermediate (fixed) regime by the IMF. The dummies *LYSINT* and *LYSFIX* are constructed in a similar way from the LYS classification.

As additional explanatory variables, we include a measure of the openness of the economy (*OPEN*) to control for the potential disciplinary effect elicited by international arbitrage, three regional dummies corresponding to Latin American (*LATAM*), sub-Saharan African (*SAFRICA*), and transition economies (*TRANS*), and year dummies.[15] Finally, we add the lagged dependent variable (*INF1*) as a regressor to capture for the effect of past policies on current expectations, as well as to control for the possibility of backward-looking indexation. To reduce the influence of outliers in the econometric test, the sample excludes high-inflation countries, defined as those with annual inflation rates above 50 percent.

The results, presented in Table 4, are largely consistent with those sketched in the previous discussion.[16] The coefficients for real GDP, money, openness, and interest rate growth (respectively, ΔGDP, $\Delta M2$, *OPEN*, and $\Delta INTRATE$), as well as lagged inflation, are all highly significant and of the expected sign.

Regarding the regime effect, both classifications yield the same result when applied to the whole sample (columns 1 and 2, indicating no significant difference between fixes and floats in terms of inflation rates. However, once we exclude high-inflation countries (defined as those with annual inflation rates above 50 percent), the fix dummy becomes negative and significant (and under the de facto classification, highly so), as shown in columns 3 and 4.[17] This finding is confirmed when we exclude intermediates from the sample (column 5). Both results seem to imply that, for low- to moderate-inflation countries, fixed regimes appear to be associated with inflation rates about 1.8 percent lower than floats. Intermediates, on the other hand, display significantly higher inflation.

This association, however, does not apply evenly to the sample. In particular, the beneficial influence of fixed regimes on inflation appears to be significant only for low-volatility and nonindustrial countries (columns 7 and 8).[18] In short, while there is some evidence of a link between regimes (in particular, pegs) and the inflation rate, this link appears to be more limited than is typically assumed.

[15]On the inclusion of openness, see Romer (1993).

[16]Here, as well as for the tests in the remaining sections of the paper, the coefficient of the year dummies are omitted for conciseness. Standard errors reported in the paper are corrected by heteroscedasticity, whenever a White-test rejects the null hypothesis of homoscedasticity.

[17]The result disappears when we use the alternative (and less stringent) cut-off points for outliers of 100 and 200 percent annual inflation. This may be due to the potential nonlinearities in the relationship between variables.

[18]See Appendix I for a list of industrial countries. The previous finding is confirmed by splitting the first- and second-round samples into industrial and nonindustrial countries: the regime is significantly and negatively related to inflation only for second-round nonindustrial countries. The results, omitted here, are available from the authors on request.

Table 4. Inflation

	(1) IMF	(2) LYS	(3) IMF[a]	(4) LYS[a]	(5) LYS[a] (*LYSINT* = 0)	(6) LYS[a] First round	(7) LYS[a] Second round	(8) LYS[a] Industrials	(9) LYS[a] Nonindustrials	(10) LYS[a] High credibility nonindustrials
Δ*GDP*	–0.76***	–0.75***	–0.22**	–0.20**	–0.22*	–0.08	–0.15*	–0.10	–0.26***	0.29***
	0.14	*0.14*	*0.09*	*0.09*	*0.10*	*0.13*	*0.08*	*0.09*	*0.10*	*0.09*
Δ*M*2	0.66***	0.65***	0.14**	0.14**	0.14*	0.10	0.18***	0.02	0.12*	0.14*
	0.08	*0.08*	*0.07*	*0.07*	*0.08*	*0.07*	*0.04*	*0.03*	*0.07*	*0.07*
Δ*INTRATE*	5.41***	5.20**	3.45**	3.23**	2.84**	2.18*	3.30***	1.22**	3.13*	2.71
	1.98	*1.96*	*1.36*	*1.35*	*1.38*	*1.15*	*0.98*	*0.49*	*1.87*	*1.96*
INF1	0.31***	0.31***	0.20**	0.19**	0.16**	0.17	0.21***	0.84***	0.17**	0.19**
	0.07	*0.07*	*0.08*	*0.08*	*0.08*	*0.10*	*0.05*	*0.04*	*0.08*	*0.08*
OPEN	–1.58	–0.03	–4.28***	–5.30***	–4.20***	–2.93	–6.22***	–0.02	–7.73***	–7.14***
	1.77	*1.98*	*1.50*	*1.39*	*1.39*	*1.78*	*1.33*	*0.73*	*1.91*	*1.74*
LATAM	0.36	0.93	5.16***	5.15***	4.37***	9.12***	2.89***		4.79***	3.16***
	1.07	*1.04*	*0.88*	*0.83*	*0.78*	*1.56*	*0.67*		*0.82*	*0.68*
SAFRICA	0.40	1.42	6.43***	6.15***	5.35***	6.83***	3.56***		5.65***	3.90***
	1.49	*1.20*	*1.19*	*1.12*	*1.04*	*1.49*	*1.02*		*1.05*	*0.89*
TRANS	3.29	3.07	3.19	4.00	4.52	9.44**	–5.59		5.14	7.78**
	3.91	*3.95*	*4.38*	*4.26*	*3.83*	*3.77*	*7.28*		*3.80*	*3.16*
IMFINT	–0.59		1.12**							
	1.03		*0.48*							
IMFFIX	0.30		–1.62*							
	1.53		*0.83*							
LYSINT		2.12**		1.75***		7.36***	0.09	–0.04	1.98**	1.71**
		0.92		*0.60*		*1.65*	*0.51*	*0.27*	*0.84*	*0.83*
LYSFIX		–1.30		–1.83***	–1.77***	–0.66	–2.03***	0.06	–2.95***	–2.77***
		0.85		*0.48*	*0.47*	*0.71*	*0.61*	*0.25*	*0.74*	*0.71*
*LYSFIX*INCONC*										–0.54
										0.78
Observations	1,269	1,269	997	997	733	504	493	368	629	778
R^2	0.901	0.902	0.518	0.526	0.510	0.582	0.561	0.877	0.475	0.476

Notes: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.
[a]Sample includes only low- to moderate-inflation countries (annual inflation below 50 percent).

The final column of Table 4 addresses an additional issue raised by our exchange rate classification procedure. The de facto methodology leaves unclassified a number of countries that display very little variability in both the nominal exchange rate and reserves. It could be argued that credible fixes are less likely to be tested by the market (hence exhibiting a lower volatility of reserves) and, possibly for the same reason, more likely to exhibit lower inflation rates. If so, by leaving out the so-called "inconclusives," we would be ignoring this credibility dimension and discarding "good pegs," thus biasing the results toward underestimating the beneficial effects of fixed regimes on inflation.

A natural way to address this concern is to include these "high credibility" pegs in our regressions. Because the de facto approach is silent as to the regime to be assigned to these observations, we simply added to the group of fixers all those de facto inconclusives that did not exhibit changes in their exchange rates. The last column of Table 4 reports the results of our baseline regression, where *LYSFIX* now represents the expanded group of pegs, and the dummy *INCONC* takes the value of one whenever an observation was originally classified as inconclusive. A simple comparison of these results with those in regression (4) indicates that the introduction of high credibility pegs does not alter the previous conclusions: all coefficients remain virtually unchanged and, in particular, the coefficient of *INCONC*, which should capture any additional credibility effect associated with the new pegs, is not significant.

Along the same lines, we further refine the tests in Table 4 by distinguishing between long and short pegs, according to whether or not they have been in place for at least five consecutive years. More precisely, we rerun regressions (4)–(9) of Table 4, splitting the fix group into long and short pegs (respectively, dummies *LONG* and *LYSFIX–LONG*). As mentioned in the introduction, this enables us to isolate the short-run impact of the implementation of a peg from the effects associated with the permanence of the regime, as well as to focus our attention on those countries capable of implementing sustainable pegs. As Table 5 shows, the distinction is highly relevant. A significant link with low inflation is found only for the group of long pegs, with the exception of industrial countries, for which, as before, regimes exhibit no significant impact.

Endogeneity

Underlying the previous tests was the presumption that the adherence to a fixed regime may lead to a lower average inflation rate. However, it is easy to conceive a different argument by which countries with greater price stability have better chances to implement a sustainable peg and, for this reason, are more likely to choose one in the first place. Thus, the finding that pegs are associated with lower inflation, at least for some groups of countries, is subject to a potentially serious endogeneity problem.

To address this issue we use a feasible generalized two-stage IV estimator (2SIV) suggested by White (1984), which allows us to correct simultaneously for endogeneity and heteroscedasticity.[19] The results are presented in Table 6, where

[19]The methodology and the additional controls used in the first stage of the estimation procedure are described in detail in Appendix II.

Table 5. Inflation: Long vs. Short Pegs

	(1)	(2) *LYSINT* = 0	(3) First Round	(4) Second Round	(5) Industrials	(6) Nonindustrials	(7) High Credibility
Δ*GDP*	–0.21**	–0.22**	–0.07	–0.15*	–0.10	–0.27***	–0.23***
	0.08	*0.10*	*0.13*	*0.08*	*0.09*	*0.09*	*0.08*
Δ*M*2	0.14**	0.14*	0.10	0.18***	0.02	0.12*	0.16**
	0.06	*0.07*	*0.07*	*0.05*	*0.03*	*0.07*	*0.06*
Δ*INTRATE*	3.18**	2.82**	2.21*	3.23***	1.22**	3.09*	2.97**
	1.33	*1.33*	*1.16*	*0.99*	*0.49*	*1.82*	*1.40*
INF1	0.19**	0.15**	0.16	0.21***	0.84***	0.17**	0.20**
	0.08	*0.07*	*0.10*	*0.05*	*0.05*	*0.07*	*0.08*
OPEN	–4.06***	–2.46**	–1.60	–5.53***	0.11	–6.00***	–3.98***
	1.25	*1.20*	*1.65*	*1.41*	*0.74*	*1.70*	*1.15*
LATAM	5.45***	4.76***	8.83***	3.34***		5.28***	4.28***
	0.85	*0.79*	*1.47*	*0.75*		*0.86*	*0.76*
SAFRICA	6.33***	5.55***	6.75***	3.80***		5.96***	5.22***
	1.12	*1.02*	*1.42*	*1.02*		*1.08*	*1.00*
TRANS	3.43	3.87	8.73**	–5.69		4.55	7.32**
	4.18	*3.75*	*3.80*	*7.21*		*3.75*	*3.31*
LYSINT	1.67***		7.36***	0.07	–0.05	1.94**	1.58***
	0.59		*1.65*	*0.51*	*0.27*	*0.84*	*0.59*
LYSFIX–LONG	0.47	0.79	1.90	–0.71	0.24	0.13	0.67
	0.81	*0.83*	*1.34*	*0.76*	*0.43*	*1.19*	*0.72*
LONG	–3.25***	–3.45***	–2.26***	–2.96***	–0.08	–4.76***	–3.16***
	0.62	*0.59*	*0.71*	*0.80*	*0.21*	*0.88*	*0.64*
Observations	997	733	504	493	368	629	1146
R^2	0.537	0.533	0.593	0.568	0.878	0.491	0.528

Notes: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.
Sample includes only low- to moderate-inflation countries (annual inflation below 50 percent).

Table 6. Inflation: Accounting for Endogeneity[a]

	(1)[b]	(2)[c] Long Pegs
Δ*GDP*	–0.26***	–0.25***
	0.10	*0.09*
Δ*M*2	0.18**	0.17**
	0.08	*0.08*
Δ*INTRATE*	3.48**	3.07**
	1.49	*1.47*
INF1	0.19**	0.18**
	0.09	*0.08*
OPEN	–5.99***	–3.59***
	1.56	*1.18*
LATAM	*2.07****	*2.84****
	0.63	0.72
SAFRICA	*3.22****	*4.02****
	0.87	*0.96*
TRANS	6.12*	6.80**
	3.30	3.20
LYSFIX	*1.06*	
	0.87	
LONG		–2.13**
		0.97
Observations	851	851

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

[a]The sample includes high credibility pegs.

[b]Instruments: *FIXFIT*, where *FIXFIT* is the estimate of *LYSFIX* in a logit model over the sample excluding intermediates.

[c]Instruments: *LONGFIT*, where *LONGFIT* is the estimate of *LONG* in a logit model over the sample excluding intermediates.

we apply this correction, in turn, to assess the inflation effect of conventional fixed regimes and long pegs. As can be seen from the table, only the impact of long pegs on inflation survives the endogeneity correction. This confirms that the negative link between inflation and pegs is weaker than casual observation seems to reveal, and appears to be largely confined to the case of long-standing pegs.

Money Growth

At the beginning of this section we mentioned that a typical argument supporting the connection between pegs and inflation points to the presence of a disciplinary effect on monetary policy. According to this view, de jure pegs, inasmuch as failing to comply with the legal commitment entails a significant political cost, should result in lower rates of money growth. The same can be said of de facto pegs.

To test this hypothesis, we run cross-section regressions of money growth on the regime dummies and the following additional explanatory variables: real GDP

Table 7. Money Growth

	(1) IMF	(2) LYS	(3) *LYS* Long pegs	(4) LYS Industrials	(5) LYS Nonindustrials
SUPGDP	–29.59**	–28.65*	–26.88*	–17.74	–20.21
	14.14	*14.75*	*14.75*	*11.04*	*17.40*
Δ*GDP1*	0.44***	0.44***	0.44***	0.50**	0.09
	0.11	*0.12*	*0.11*	*0.24*	*0.12*
Δ*M21*	–3.90	–3.89	–4.32	28.97***	–11.25
	14.32	*14.40*	*14.39*	*8.38*	*14.87*
OPEN	–9.12***	–9.69***	–8.48***	5.53	–18.42***
	3.14	*2.46*	*2.80*	*5.80*	*4.22*
LATAM	10.91***	10.86***	11.07***		7.10***
	1.88	*2.13*	*2.10*		*1.76*
SAFRICA	8.54***	7.71***	7.83***		3.13**
	1.67	*1.45*	*1.42*		*1.57*
TRANS	13.17**	14.59**	13.88**		12.11*
	6.64	*6.67*	*6.87*		*6.54*
IMFINT	4.05***				
	1.52				
IMFFIX	–0.10				
	1.66				
LYSINT		2.75***	2.67***	0.34	2.41*
		1.00	*1.01*	*1.45*	*1.42*
LYSFIX		–1.74			
		1.29			
LYSFIX–LONG			0.40	0.81	–0.71
			1.94	*1.64*	*2.68*
LONG			–3.05**	–0.80	–3.77*
			1.47	*1.38*	*2.09*
Observations	997	997	997	368	629
R^2	0.141	0.137	0.141	0.247	0.149

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

growth (Δ*GDP1*, lagged to reduce potential endogeneity problems), openness (*OPEN*), the ratio of the fiscal surplus to GDP (*SUPGDP*), the three regional dummies (*LATAM*, *SAFRICA*, and *TRANS*), and the lagged dependent variable (Δ*M21*).[20] Our results, reported in Table 7, offer partial support for the hypothesis of the existence of a disciplining effect on money growth. Using either the IMF classification (column 1) or the de facto classification (column 2), the fixed regime dummy has the expected negative sign but is not significant. However, a significant relationship is detected when we look at long pegs separately (column 3), a result driven, once again, by the group of nonindustrials (column 5). Thus, for the group of long pegs, the regime has an effect on inflation through both enhanced credibility and a disciplining effect on monetary policy.

[20]Additional tests were run including the change in interest rates (Δ*INTRATE*), lagged inflation (*INF1*), the change in government consumption (*GOV1*), and the ratio of government consumption to GDP (*GOVGDP*), with similar results.

Deeds vs. Words

The mismatch between the IMF and the LYS classification, and in particular the fact that in the past numerous countries repeatedly adopted de jure fixed regimes without implementing consistent monetary policies, opens the question of whether, for a given monetary policy, the announcement of a peg brings by itself a benefit in terms of lower inflation, thus providing a potential motivation for this seemingly inconsistent behavior.

In the "deeds" regression (Table 8, column 1), we control for the announced (de jure) regime, including the dummy *FIXFIX* that takes the value of one for observations identified as pegs by both classifications. In this way, we test whether the actual behavior of the economy (deeds) has any additional effect on inflation, above and beyond that resulting from the announcement of a peg. The coefficient of *FIXFIX* is highly significant and negative, suggesting that countries that announce a peg but in practice let the exchange rate fluctuate exhibit higher inflation levels, an unsurprising result that simply confirms the inflationary impact of (partially) unanticipated devaluations.

Regarding words, in addition to controlling for the de facto regime (distinguishing between long and short pegs), we include two interaction terms that identify observations within each group that are also classified as de jure pegs. This allows testing whether the actual announcement of a peg (words) has any additional effect on inflation, above and beyond that resulting from the actual behavior of the economy. As can be seen in column (2) of Table 8, the announcement only lowers inflation rates for the case of long pegs.

The "deeds vs. words" comparison indicates that, for inflation, deeds appear to play a more important role. De jure pegs that do not behave as real pegs are obviously associated with higher inflation, because the announcement of a peg has no value in the face of recurrent devaluations. On the other hand, within de facto pegs, words appear to have no value in terms of inflation unless the country behaves in a manner consistent with maintaining a peg.

IV. Interest Rates

While much has been said of the impact of exchange rate regimes on real wages and employment, there is surprisingly little work on their effect on the cost of capital, which accounts for a larger share of production costs in most countries. Quite possibly, one reason for the scarcity of research on the issue is the difficulty in obtaining reliable interest rate data for a reasonably large number of countries, as in many cases interest rates were largely administered and thus unrepresentative of actual market rates.[21] On the other hand, episodes of very high inflation are typically characterized by negative real rates, as the banking sector sometimes is not allowed to fully accommodate extremely high inflation expectations. Moreover, in a context of rapidly changing expectations, a small mismatch between the time at which inflation and the nominal interest rate are measured may derive in sizable distortions.

[21]This problem is particularly acute before the 1990s.

Table 8. Inflation: Deeds vs. Words

	(1) Deeds	(2) Words
Δ*GDP*	–0.22***	–0.20**
	0.09	*0.08*
Δ*M2*	0.13**	0.13**
	0.06	*0.06*
Δ*INTRATE*	3.23**	3.23**
	1.30	*1.27*
INF1	0.20**	0.19**
	0.08	*0.08*
OPEN	–2.74**	–2.74**
	1.37	*1.22*
LATAM	6.43***	6.37***
	1.00	*0.99*
SAFRICA	7.25***	7.00***
	1.25	*1.20*
TRANS	4.07	4.24
	4.10	*4.08*
IMFINT	1.15**	
	0.47	
IMFFIX–FIXFIX	0.52	
	0.85	
FIXFIX	–4.60***	
	1.09	
LYSINT		1.59***
		0.58
LYSFIX–LONG		0.92
		0.88
LONG		–1.20**
		0.51
IMFFIX(LYSFIX–LONG)*		–3.09
		2.29
*IMFFIX*LONG*		–3.91***
		1.00
Observations	997	997
R^2	0.539	0.547

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics. The regression sample includes only low- to moderate-inflation countries (annual inflation below 50 percent).

Measurement errors aside, the channels through which the exchange rate regime may influence the real rate are by no means obvious. Legal pegs are a case in point. Whereas they are prone to exhibit a "peso problem" that increases real interest rates, pegs on the other side may reduce inflation expectations and thus nominal (and real) rates.

More in general, the real rate should depend on the same fundamentals that determine the level of country risk that typically represents a lower bound for all domestic lending rates. Thus, a relatively larger amount of liquid international

reserves, a buoyant economy, or a low level of indebtedness should help reduce the cost of capital for the economy inasmuch as open international markets tend to equalize the funding cost of countries of the same risk class. On the contrary, as long as there is some imperfect substitutability between domestic and foreign assets, increases in the government financing needs may crowd out domestic resources, pushing the domestic real rate higher. Alternatively, sluggish growth may provide incentives for short-term expansionary monetary policies with a view to lowering domestic financing costs.

With all these caveats in mind, we attempted to explore the issue using a relatively broad specification that captures some of the factors mentioned above. Thus, we include lagged GDP growth rate ($\Delta GDP1$) to control for incentives to use monetary policy to lower the real rate, the ratio of net interest payments over GDP (*INETGDP*) as a proxy for the level of debt, the degree of openness (*OPEN*) to control for international arbitrage constraints, and the ratio of fiscal surplus over GDP (*SUPGDP*) as an (inverse) measure of government crowding out. We also included current inflation (*INF*) to control for potential measurement error due to differences in the sampling time or to financial repression, as well as the three regional dummies.[22]

Table 9 presents the results for the IMF classification. Given that this exercise has not been undertaken with either classification, we study alternative specifications for both. Using the IMF classification, we found that real rates are significantly lower under pegs, while both intermediate and floating regimes do not differ from each other (column 1). These results are even stronger during the 1990s, both for the whole sample and for nonindustrial countries (columns 3 and 5). However, the regime dummies are not significant during the 1970s and 1980s, either for the whole sample or for nonindustrial countries (columns 2 and 4), probably reflecting substantial measurement errors during those years.

The previous results may be a consequence of the inclusion of failed pegs among the fixers in the IMF classification. More precisely, unexpected devaluations may induce negative real interest rates in the aftermath of the realignment of the nominal exchange rate. This hypothesis is consistent with a series of findings. First of all, the result applies to first-round (high volatility) observations (column 6) but not to second-round (low volatility) observations (column 7). Moreover, no systematic link is detected when using the LYS classification (Table 10).[23]

This hypothesis is further confirmed by the results of Table 11, which indicate that while de jure fixes display significantly lower interest rates in general, the impact appears to be stronger for those of them that in practice let the exchange rate fluctuate (as shown by the coefficient of the regime dummy *IMFFIX–FIXFIX* in column 1). Alternatively, when looking at de facto regimes, we find an effect on real interest rates only for the case of short pegs (columns 2 and 3). Note that the last result is consistent with the presence of an announcement effect on inflation expectations, combined with the failure of short pegs to lower inflation as revealed in the previous section.

[22]Other proxies for country risk, such as the ratio of reserves over GDP and over the monetary base, and interest debits over exports, were also tested and found to be not significant.

[23]A negative link appears in the second-round regressions (columns 4 and 6).

Table 9. Real Interest Rates: IMF Classification

	(1)	(2) 1974–89	(3) 1990s	(4) Nonindustrials 1974–89	(5) Nonindustrials 1990s	(6) First Round	(7) Second Round
INETGDP	1.54	–3.93	0.16	0.02	0.05	0.83	–2.74
	2.33	*13.12*	*2.18*	*15.66*	*2.27*	*3.32*	*2.32*
ΔGDP1	0.21***	0.13	0.23***	0.17	0.29***	0.27***	0.12**
	0.06	*0.10*	*0.07*	*0.12*	*0.08*	*0.09*	*0.06*
INF	–0.08***	–0.08***	–0.08***	–0.08***	–0.08***	–0.06***	–0.45***
	0.02	*0.02*	*0.03*	*0.02*	*0.03*	*0.01*	*0.05*
OPEN	2.23	–0.12	2.37	1.75	3.24	2.69	–2.65**
	1.37	*2.42*	*1.83*	*2.89*	*2.13*	*2.37*	*1.32*
SUPGDP	–2.41	–6.21	4.56	–8.41	3.95	14.10	–17.28***
	5.60	*7.69*	*7.68*	*9.54*	*10.20*	*9.34*	*4.63*
LATAM	–0.24	–1.27	0.20	–0.55	0.39	–1.92**	3.57***
	0.57	*0.97*	*0.72*	*1.07*	*0.80*	*0.89*	*0.56*
SAFRICA	–2.94***	–5.02***	–0.83	–4.41***	–0.57	–3.73***	–0.44
	0.70	*0.94*	*1.01*	*1.07*	*1.05*	*0.94*	*0.59*
TRANS	–4.07*		–3.43		–3.98*	–3.37	–5.11
	2.16		*2.18*		*2.10*	*2.31*	*3.37*
IMFINT	–0.10	0.06	0.43	0.42	0.39	–1.37*	2.54***
	0.48	*0.65*	*0.65*	*1.80*	*0.98*	*0.73*	*0.53*
IMFFIX	–2.20***	–0.71	–2.85***	–0.55	–2.84***	–4.23***	–0.92
	0.62	*0.95*	*0.85*	*1.87*	*1.07*	*1.04*	*0.61*
Observations	981	493	488	319	351	497	484
R^2	0.272	0.304	0.191	0.283	0.220	0.301	0.484

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

Table 10. Real Interest Rates: LYS Classification

	(1)	(2) Long Pegs	(3) First Round	(4) Second Round	(5) Second Round 1974–89	(6) Second Round 1990s
INETGDP	1.68	2.00	1.03	–4.65**	–30.32***	–1.50
	2.34	*2.37*	*3.40*	*2.34*	*8.47*	*2.69*
ΔGDP1	0.20***	0.20***	0.25***	0.10*	0.03	0.19**
	0.06	*0.06*	*0.09*	*0.06*	*0.08*	*0.09*
INF	–0.07***	–0.07***	–0.05***	–0.39***	–0.47***	–0.30***
	0.02	*0.02*	*0.01*	*0.05*	*0.05*	*0.08*
OPEN	–0.26	–0.49	–1.83	–4.04***	–10.01***	–0.07
	1.24	*1.25*	*2.15*	*1.29*	*1.74*	*2.04*
SUPGDP	–1.34	–1.60	15.38	–17.81***	–24.56***	–15.01**
	5.68	*5.73*	*9.87*	*4.74*	*6.10*	*7.15*
LATAM	–0.71	–0.76	–2.29***	3.15***	2.81**	3.14***
	0.57	*0.57*	*0.88*	*0.68*	*1.12*	*0.87*
SAFRICA	–3.55***	–3.60***	–3.70***	–1.14*	–1.33	–2.14***
	0.68	*0.69*	*0.90*	*0.66*	*0.90*	*0.70*
TRANS	–4.40*	–4.32*	–3.18	–5.02		–6.70
	2.28	*2.27*	*2.54*	*4.32*		*4.13*
LYSINT	–0.53	–0.52	–3.09**	0.29	0.19	0.62
	0.50	*0.50*	*1.24*	*0.46*	*0.58*	*0.73*
LYSFIX	0.16					
	0.47					
LYSFIX–LONG		–0.48	1.01	–1.72**	–1.76*	–1.07
		0.75	*1.24*	*0.80*	*0.97*	*1.19*
LONG		0.53	0.31	–1.42**	–0.54	–1.88*
		0.51	*0.77*	*0.68*	*0.87*	*1.02*
Observations	981	981	497	484	272	212
R^2	0.259	0.260	0.294	0.438	0.551	0.271
p-values (Wald)		0.209	0.592	0.745	0.258	0.564

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

Table 11. Interest Rates: Deeds vs. Words

	(1) Deeds	(2) Words	(3) Words II
INETGDP	2.30	1.33	1.78
	2.42	*2.37*	*2.36*
ΔGDP1	0.21***	0.20***	0.19***
	0.06	*0.06*	*0.06*
INF	–0.08***	–0.08***	–0.08***
	0.02	*0.02*	*0.02*
OPEN	1.95	0.38	–0.26
	1.37	*1.30*	*1.28*
SUPGDP	–2.62	–1.58	–2.32
	5.65	*5.62*	*5.72*
LATAM	–0.49	–0.41	–0.42
	0.60	*0.61*	*0.60*
SAFRICA	–3.12***	–3.33***	–3.32***
	0.71	*0.71*	*0.70*
TRANS	–4.30**	–4.18*	–3.91*
	2.17	*2.24*	*2.12*
IMFINT	–0.10		
	0.48		
IMFFIX–FIXFIX	–2.70***		
	0.69		
LYSINT		–0.57	–0.53
		0.50	*0.50*
LYSFIX–FIXFIX		0.77	
		0.54	
FIXFIX	–1.43*	–0.68	
	0.77	*0.69*	
LYSFIX–LONG			1.06
			0.74
LONG			0.55
			0.66
IMFFIX(LYSFIX–LONG)*			–6.89***
			1.76
*IMFFIX*LONG*			–0.21
			0.84
Observations	981	981	981
R^2	0.274	0.261	0.275

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics. The regression sample includes only low- to moderate-inflation countries (annual inflation below 50 percent).

VI. Growth

The literature has not considered the exchange rate regime as an important determinant of growth performance. This is probably due to the fact that we tend to associate only nominal effects to the choice of nominal variables. However, several arguments have been advanced to suggest a link between the two.

On the one hand, by reducing relative price volatility, a peg is expected to foster growth through its positive effect on investment and trade. Moreover, lower price uncertainty should lead to lower real interest rates, contributing to the same effect. On the other hand, the lack of exchange rate adjustments under a peg, coupled with some degree of short-run price rigidity, may result in price distortions and high unemployment in the face of external shocks. More important, the need to defend a peg in the event of negative external shocks entails a significant cost in terms of real interest rates, as well as increased uncertainty as to the sustainability of the regime. Calvo (1999) has suggested that the external shocks faced by a country are not independent of the exchange rate regime. Not surprisingly, as pointed out in Fischer (2001), all the countries that suffered from a currency crisis had fixed exchange rate regimes. However, while both the lack of adjustment argument and the frequent external shocks that characterize a peg imply a higher expected output volatility, their consequences in terms of long-run growth are less straightforward.

At an empirical level this relationship has been studied in a series of recent papers. Mundell (1995), for example, examines the growth performance of industrial countries before and after the demise of Bretton Woods, finding that the earlier period, characterized by the prevalence of fixed exchange rates, was associated with faster average growth. Ghosh and others (1997), using all IMF reporting countries for the period 1960–90, fail to find systematic evidence of an impact of the type of regime on growth. However, these results are challenged by Rolnick and Weber (1997), who find, using long-term historical data, that output growth was higher under fiat standards compared with commodity (e.g., gold) standards.

A similar conclusion is reached by Levy-Yeyati and Sturzenegger (2000b), who explore the relationship between exchange rate regimes and growth using annual data covering the period 1974–99. In a nutshell, their main findings are the following:

1. Fixed exchange rate regimes are associated with a lower per capita output growth rate. The estimates range from 0.7 percent to 1 percent a year according to the specification. This result remains robust to alternative specifications of the model, including a correction for endogeneity. The previous result is driven by nonindustrial economies. For industrial economies the exchange rate regime is not related to growth performance.
2. Similarly, fixed exchange rate regimes are associated with higher output volatility only in the case of nonindustrial countries; they have no significant impact on volatility within the group of developed economies.

Levy-Yeyati and Sturzenegger (2000b) cast a relatively negative light on pegs. If policymakers worry about inflation and exchange rate stability because of their potential negative impact on economic growth, it appears that the beneficial effect of a peg in terms of price stability does not translate in the end into a stronger growth performance.

In this paper, we build on these results to explore two additional issues. First, we evaluate the announcement value of regimes in terms of growth performance, in light of the argument that legal pegs are more vulnerable to external shocks and

speculative attacks that ultimately undermine their growth performance. In turn, in the next section, we examine whether the negative growth performance found to be associated with fixed regimes remains even when we focus on the subgroup of hard pegs as opposed to conventional fixes.

Fear of Pegging

The experience of the financial crisis of the 1990s has placed in the forefront of the exchange regime discussion the increasing vulnerability of fixed regimes to speculative attacks and financial contagion. This may be behind a phenomenon that could be labeled "fear of pegging," namely the practice of de facto running a peg while avoiding a commitment to a fixed parity and the potential vulnerability to attacks that a legal peg may introduce.[24]

This issue is addressed in Table 12, where we test the consequences of the announcement of a peg on growth performance, after controlling for the de facto regime. Interestingly, when we split the group of pegs into short and long, we find that only the former are negatively affected by the announcement. This result seems to suggest that a commitment to a fixed parity increases the vulnerability of the country, except in those cases in which the regime has been in place long enough to strengthen its credibility. Thus, the evidence provides some support for the view that the adoption of a legal peg entails increased vulnerability, a fact that may underscore the finding of "fear of pegging."

VII. Are Hard Pegs Different?

The LYS classification works on the basis of facts, distinguishing between the broadly defined groups of fixed exchange rates, intermediate regimes (crawling pegs and dirty floats), and pure floats. However, some analysts, notably Eichengreen (1994) and, more recently, Fischer (2001), have argued in favor of the relative merits of extreme exchange rate regimes, drawing a line between conventional fixes and "hard pegs" that exhibit a stronger commitment to a fixed parity (as in a currency board) or directly relinquish control over their own currency (as in the case of countries with no separate legal tender). More precisely, it has been argued that, if the benefits of pegging accrue from increased credibility, conventional fixes may fall short on this ground and the stronger commitment that characterizes hard pegs may be necessary. In this section, we test whether and in which way this hypothesis is consistent with the data. To do so, we have a closer look at the group of hard pegs, defined as those countries classified by the IMF as having either a currency board or no separate legal tender.[25]

[24]The case of El Salvador before the recent attempt at full dollarization is a clear example of a country that claims to be running a flexible regime while keeping the exchange rate constant. On this, see Levy-Yeyati and Sturzenegger (2000a).

[25]The only exception to this rule are the countries within the African franc zone in 1994, the year in which they devalued their currency by 100 percent and, as a result, are classified as intermediates according to LYS. Thus, all observations in our group of hard pegs are de facto classified as either fixes or inconclusives. See Appendix I for a list of countries in this category.

Table 12. GDP Growth: Fear of Pegging

INVGDP	8.96***
	1.92
POPGR	–0.43**
	0.15
GDPPC74	–0.36***
	0.11
GOV1	–1.15***
	0.40
SECB	–0.89
	0.95
CIVIL	–0.25*
	0.12
Δ*TI*	5.17***
	1.03
OPEN	–0.10
	0.82
LATAM	–0.87**
	0.34
SAFRICA	–0.83*
	0.47
TRANS	–1.35
	1.75
LYSINT	–1.01***
	0.29
LYSFIX–LONG	–0.61*
	0.35
LONG	–0.22
	0.45
IMFFIX(LYSFIX–LONG)*	–1.11*
	0.66
*IMFFIX*LONG*	–0.83
	0.63
Observations	1,349
R^2	0.206
p-value (Wald)	0.023

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

Before we present the econometric results, a few comments are in order. First, as many authors before us have stressed, with the exception of the European Economic and Monetary Union (EMU), and possibly Argentina and Hong Kong SAR, countries with hard pegs are relatively small. Moreover, the biggest countries in the group (Argentina, Bulgaria, Estonia, Ecuador, El Salvador, Lithuania, and countries in the euro area) have adopted a hard peg relatively recently, and in many cases there is not sufficient data to test the impact of the new regime empirically.

Second, most of the hard pegs for which there are data to conduct econometric tests have been around for a long enough time to dispel concerns about potential endogeneity problems. With the exception of Argentina and Bulgaria, all of the remaining countries in the list have had the same regime in place over the whole

period included in our sample. On the other hand, long-standing currency boards include only Hong Kong SAR, Djibouti, and Brunei, which seriously limits the possibility of conducting meaningful tests of this type of regime in a separate way.

In view of the above, in what follows we treat hard pegs as a single group without discriminating according to their different varieties, bearing in mind the limits of extrapolating the experience of small countries and island economies to the rest of the sample. Moreover, because EMU observations are excluded from the LYS classification, no industrial country in our sample is classified as a hard peg. Therefore, we restrict our tests to the subgroup of nonindustrial economies.

Tables 13 and 14 offer a rough pass at the data by comparing the means and medians of the inflation rate, money growth ($\Delta M2$), and the rate of growth of real per capita GDP ($\Delta GDPPC$), for nonindustrial countries as a whole and for the subgroup of hard pegs.[26] Simple inspection indicates that, while hard pegs appear to exhibit much lower inflation and money growth levels, their growth performance does not differ from the group of nonindustrial pegs as a whole.

To assess the relative merits of hard pegs in terms of inflation, we run econometric tests similar to those in Tables 4 and 5, this time including a hard peg dummy (*HARDPEG*). To compare with previous results in the literature, see Ghosh and others (2000), we first run the inflation regression including only the hard peg dummy. Column 1 in Table 15 confirms the negative correlation between hard pegs and inflation present in Table 13. Furthermore, as column 2 shows, hard pegs have an additional disinflationary effect relative to conventional fixes, a result that remains once we expand the sample to include high credibility pegs (column 3).[27]

In line with the results of Section III, we replicate the previous three regressions dividing pegs into three mutually exclusive groups: short pegs, long conventional pegs (i.e., long pegs that are not hard pegs), and hard pegs (identified by the dummies *LYSFIX–LONG* and *LONG–HARDPEGS*).[28] As columns 4–6 show, we can conclude in all cases that, while both hard and long (conventional) pegs reduce inflation, the former have a significant additional disinflationary effect, as indicated by the p-value of a Wald test of the equality of the coefficients of both dummies reported in the last row of the table. Short pegs, as before, appear to be ineffectual.

Turning to growth, we run regressions for pooled annual data as well as for a cross section of countries. In both cases, the specification, taken from Levy-Yeyati and Sturzenegger (2000b), includes the following additional controls:[29] the investment to GDP ratio (*INVGDP*), the degree of openness (*OPEN*), the growth of government consumption (*GOV1*; lagged to avoid endogeneity problems), per capita GDP at the beginning of the period (*GDPPC74*; computed as the average over 1970–73), the degree of initial secondary enrollment (*SEC*), population growth (*POPGR*), and a measure of political instability (*CIVIL*). The literature suggests a

[26]The sample of Tables 13 and 14 comprises all nonindustrial observations for which data are available.

[27]Because the LYSFIX dummy already includes the hard pegs, the new dummy captures the differential effect associated with the presence of a hard peg.

[28]Note that all hard peg observations also belong to the group of long pegs, with the sole exception of the Bulgarian currency board (1998–99), which is therefore excluded from these regressions.

[29]Controls were chosen from those variables suggested by the growth literature as the most systematically significant determinants of growth. Several additional control variables were also tested, with similar results.

Table 13. Inflation and Money Growth: Conventional and Hard Pegs
(Nonindustrial countries)

		LYS				
		FLOAT	*INT*	*FIX*	*HARDPEGS*	*LONG*
Observations		409	445	650	363	491
INFLATION	Means	17.6	45.2	10.6	5.7	8.2
	Medians	11.5	19.3	8.3	4.0	7.3
Δ*M2*	Means	23.1	47.3	16.3	9.7	13.7
	Medians	18.3	24.2	14.5	8.5	12.7

Source: IMF's *International Financial Statistics.*
Note: Exchange rate classifications: IMF de jure from IFS, LYS de facto from Levy-Yeyati and Sturzenegger (2000a).

Table 14. GDP Growth: Conventional and Hard Pegs
(Nonindustrial countries)

		LYS				
		FLOAT	*INT*	*FIX*	*HARDPEGS*	*LONG*
Observations		413	458	744	433	569
DGDPPC	Means	1.9	0.6	1.4	1.5	1.4
	Medians	*2.1*	*1.1*	*1.3*	*1.3*	*1.3*

Source: IMF's *International Financial Statistics.*
Note: Exchange rate classifications: IMF de jure from IFS, LYS de facto from Levy-Yeyati and Sturzenegger (2000a).

positive sign for investment, openness, and education variables, and a negative sign for the government consumption (associated with a less productive use of resources), the measure of freedom (where a higher number implies less freedom), and population growth. A negative sign of the coefficient of initial GDP would be consistent with the presence of conditional convergence (Barro and Sala-i-Martin, 1995). We also control for changes in the terms of trade (Δ*TI*), as another source of variation in GDP, which is usually absent in cross section analysis but may play a role in annual data (Broda, 2000). Finally, we include regional and year dummies.

Table 16 shows the results for pooled annual data. The control variables behave largely as expected: Real growth is positively correlated with investment and negatively correlated with government consumption, population growth, and (albeit weakly) the political instability variable. The link is less clear in the case of openness and initial secondary enrollment, in contrast with what is usually suggested in the literature.[30] Changes in the terms of trade display the correct sign and are highly significant. Finally, the sign for the initial per capita GDP is negative, indicating the presence of conditional convergence.

[30]Levine and Renelt (1992) have already cautioned on the robustness of the coefficients of these variables.

Table 15. Inflation: Are Hard Pegs Different?

(Nonindustrial countries)

	(1) LYS	(2) LYS	(3) LYS High credibility	(4) LYS[a]	(5) LYS[a]	(6) LYS[a] High credibility
Δ*GDP*	–0.24**	–0.23**	–0.26***	–0.26***	–0.25***	–0.26***
	0.10	*0.10*	*0.09*	*0.09*	*0.10*	*0.09*
Δ*M2*	0.13*	0.12*	0.14*	0.11*	0.11*	0.13*
	0.07	*0.07*	*0.07*	*0.07*	*0.07*	*0.07*
Δ*INTRATE*	3.45*	3.05*	2.58	1.78	1.77	1.14
	1.87	*1.84*	*1.90*	*1.35*	*1.33*	*1.35*
INF1	0.18**	0.17**	0.19**	0.19**	0.19**	0.21**
	0.08	*0.08*	*0.08*	*0.09*	*0.09*	*0.10*
OPEN	–9.37***	–7.81***	–6.89***	–5.46***	–5.83***	–5.55***
	1.98	*1.88*	*1.61*	*1.67*	*1.73*	*1.51*
LATAM	4.19***	5.03***	3.82***	4.98***	5.16***	4.00***
	0.78	*0.82*	*0.72*	*0.92*	*0.92*	*0.82*
SAFRICA	5.06***	5.96***	4.72***	5.68***	5.94***	4.76***
	1.01	*1.06*	*0.94*	*1.16*	*1.15*	*1.03*
TRANS	5.27	6.39*	10.33***	7.05***	7.78***	9.98***
	3.69	*3.65*	*3.16*	*2.52*	*2.57*	*2.59*
LYSINT		2.05**	1.85**		1.97**	1.78**
		0.84	*0.83*		*0.84*	*0.83*
LYSFIX		–2.27***	–1.99***			
		0.79	*0.68*			
LYSFIX–LONG					0.25	0.09
					1.16	*0.93*
LONG–HARDPEGS				–5.07***	–4.26***	–3.59***
				1.04	*0.98*	*0.89*
HARDPEGS	–5.88***	–4.15***	–5.01***	–6.86***	–6.17***	–6.83***
	1.00	*1.05*	*0.88*	*1.04*	*0.98*	*1.02*
Observations	629	629	778	628	628	776
R^2	0.459	0.483	0.494	0.499	0.505	0.513
p-values (Wald)				0.04	0.03	0.00

Notes: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.
[a]Excluding Bulgaria.

Table 16. GDP Growth: Are Hard Pegs Different?

(Nonindustrial countries)

	(1)	(2)	(3) *LYSINT* = 0	(4) Fixed vs. Hard Pegs	(5) Floats vs. Hard Pegs	(6) High Credibility Pegs	(7) High Credibility Pegs *LYSINT* = 0
INVGDP	10.30***	10.35***	6.64**	7.16**	8.04	11.77***	9.82***
	2.45	*2.45*	*2.66*	*2.99*	*5.04*	*2.15*	*2.27*
POPGR	–0.43**	–0.43**	–0.42**	–0.20	–0.50**	–0.40***	–0.35**
	0.17	*0.17*	*0.17*	*0.28*	*0.20*	*0.16*	*0.16*
GDPPC74	–0.52*	–0.53*	–0.33	–1.39***	0.35	–0.77**	–0.80**
	0.28	*0.28*	*0.33*	*0.51*	*0.43*	*0.32*	*0.40*
GOV1	–1.35***	–1.23***	–0.36	–0.49	–0.47	–1.22***	–0.31
	0.41	*0.42*	*0.79*	*1.21*	*0.96*	*0.41*	*0.73*
SEC	0.52	0.18	–0.50	2.00	–2.08	1.08	1.21
	1.31	*1.32*	*1.61*	*2.36*	*2.15*	*1.30*	*1.55*
CIVIL	–0.24*	–0.24*	–0.14	–0.11	–0.07	–0.13	–0.01
	0.14	*0.14*	*0.16*	*0.23*	*0.20*	*0.12*	*0.13*
Δ*TI*	5.22***	5.27***	5.47***	6.08***	5.69***	5.51***	5.78***
	1.08	*1.08*	*1.28*	*1.46*	*2.01*	*1.02*	*1.11*
OPEN	–1.93*	–1.28	–0.06	–0.01	–0.57	–2.16**	–1.78
	1.16	*1.18*	*1.38*	*1.02*	*2.33*	*0.82*	*1.21*
LATAM	–1.18***	–0.97***	–0.71*	–2.16**	–0.48	–0.82**	–0.51
	0.35	*0.36*	*0.42*	*0.89*	*0.52*	*0.34*	*0.40*
SAFRICA	–0.97**	–0.79	–0.26	–2.02**	0.11	–1.09**	–0.73
	0.48	*0.50*	*0.52*	*0.99*	*0.72*	*0.46*	*0.49*
TRANS	–1.97	–2.17	–0.23		0.39	–2.11	–0.30
	0.82	*0.82*	*0.82*		*0.82*	*1.74*	*0.82*
LYSINT		–1.17***				–1.17***	
		0.39				*0.39*	
LYSFIX–HARDPEGS		–1.05***	–1.25***			–0.85**	–0.94***
		0.40	*0.41*			*0.35*	*0.36*
HARDPEGS	–0.16	–0.97	–1.46**	–0.19	–1.68**	–1.00*	–1.19**
	0.70	*0.73*	*0.72*	*0.76*	*0.83*	*0.53*	*0.53*
Observations	962	962	652	353	386	1,185	875
R^2	0.191	0.200	0.191	0.261	0.172	0.203	0.203
p-values (Wald)		0.909	0.762			0.767	0.632

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

Regarding specifically the impact of exchange rate regimes, we start again by comparing the growth performance of hard pegs against the rest of the sample, without discriminating among different regimes.[31] As can be seen, the results seem to suggest that hard pegs are no different from (and in particular, do not trail) other regimes. However, once we refine this specification to discriminate between particular regimes, a different picture emerges: Hard pegs cannot be distinguished from either conventional pegs or flexible regimes (column 2).[32] Moreover, repeating the regression on a sample that excludes intermediates (column 3), we find that hard pegs, while still similar to other pegs, grow significantly more slowly than floats. To resolve this apparent ambiguity, in columns 4 and 5 we compare hard pegs, separately, with conventional pegs and with the group of floats. The results confirm those in column 3: hard pegs appear to be similar to conventional pegs and to significantly trail floats. The same conclusion is reached when we rerun the regressions on an extended sample that includes "high credibility" pegs (columns 6 and 7). In view of these findings, it is not surprising to find that hard pegs do not differ significantly from other long pegs and that both groups are associated with slower growth than floats (Table 17).

The results of the regressions presented in Table 18 point in a similar direction, where the dependent variable is now the average growth rate throughout the whole period. In this exercise, investment, population growth, government consumption, civil liberties, and openness are now averaged over the sample period, while initial GDP levels and secondary enrollment are again measured at the beginning of the period.[33] The construction of a dummy to represent the "average" regime for each country is problematic given that many countries changed regimes during the period under study. As a compromise solution, we use the dummy *FIX50* to identify countries that are classified as pegs more than 50 percent of the time. We define dummies *LONG50* and *HARD50* similarly. As before, this leaves us with pegs divided into three mutually exclusive groups: those characterized by recurrent but short-lived pegs (*FIX50–LONG50*), those that implemented long (but not hard) pegs during most of the period (*LONG50–HARD50*), and hard pegs (*HARD50*).[34]

The results, presented in Table 18, largely mirror those in the previous table. A preliminary specification with *HARD50* as the only regime dummy fails to find any difference between hard pegs and the rest. However, a more complete specification that includes the variable *FIX50* to control for the presence of conventional pegs reveals that hard pegs trail in a statistically significant manner the growth performance of floats by approximately 1 percent a year (column 2). Moreover, a Wald test does not reject the null that the coefficient of *HARDPEGS* is equal to that of conventional pegs. Even when long pegs are singled out

[31]This exercise intends to replicate the specification tested in Ghosh and others (1999) for the case of currency boards.

[32]The last line of Table 16 shows the *p*-value of a Wald test of the null that the coefficient for hard pegs (i.e., the sum of the coefficients of the *FIX* and *HARDPEGS* dummies) is equal to zero.

[33]The specification excludes the annual change in the terms of trade.

[34]Note that countries that implemented hard pegs relatively recently are not identified as fixes for the purpose of this exercise.

Table 17. GDP Growth: Long vs. Hard Pegs
(Nonindustrial countries)

	(1) Fixed	(2) Float vs. Long
INVGDP	7.29**	6.38**
	2.99	*2.95*
POPGR	–0.21	–0.27*
	0.28	*0.16*
GDPPC74	–0.13**	0.26
	0.05	*0.40*
GOV1	–0.33	–0.80
	1.23	*0.90*
SEC	2.38	–1.19
	2.41	*1.91*
CIVIL	–0.12	–0.09
	0.23	*0.17*
ΔTI	6.12***	6.96***
	1.46	*1.52*
OPEN	–0.69	–0.33
	1.76	*1.62*
LATAM	–2.45***	–0.77
	0.87	*0.48*
SAFRICA	–2.05**	0.07
	0.97	*0.58*
TRANS		0.61
		1.27
LONG–HARDPEGS	0.71	–1.12*
	0.59	*0.61*
HARDPEGS	0.13	–1.91**
	0.76	*0.76*
Observations	353	529
R^2	0.263	0.196

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Heteroscedasticity-consistent standard errors are in italics.

(column 3), hard pegs are still associated with slower growth than floats. However, the coefficients of the regime dummies seem to suggest that the stronger the commitment to a peg, the weaker its cost in terms of growth. Indeed, while a Wald test fails to distinguish hard pegs from other long pegs, it does indicate that the former exhibit significantly stronger growth than countries with frequent short-lived pegs.[35]

[35]More precisely, the *p*-value of the null that the coefficients for hard and long pegs are equal is 0.45, while the *p*-value corresponding the null that hard pegs and short pegs do not differ is 0.076.

Table 18. GDP Growth: Are Hard Pegs Different?

(Nonindustrial countries, period averages)

	(1)	(2) Conventional vs. Hard Pegs	(3) Long and Hard Pegs
INVGDP	8.66**	7.52**	7.24**
	3.72	*3.28*	*3.28*
POPGR	–0.81***	–0.72***	–0.76***
	0.23	*0.20*	*0.21*
GDPPC74	–0.13	–0.09	–0.11
	0.26	*0.23*	*0.23*
GOV1	–1.15	–1.08	–1.19
	1.01	*0.89*	*0.89*
SEC	–0.01	–0.03**	–0.02**
	0.01	*0.01*	*0.01*
CIVIL	–0.13	–0.08	–0.10
	0.24	*0.21*	*0.21*
OPEN	–0.26	0.02	0.02
	1.36	*0.01*	*0.01*
LATAM	–1.20**	–0.69	–0.64
	0.53	*0.48*	*0.48*
SAFRICA	–1.51***	–1.23**	–1.14**
	0.55	*0.49*	*0.50*
TRANS	–0.84	–0.08	–0.23
	1.69	*1.49*	*1.50*
FIX50–LONG50			–2.20***
			0.50
FIX50–HARD50		–1.95***	
		0.44	
LONG50–HARD50			–1.60***
			0.56
HARD50	–0.19	–1.14**	–1.09**
	0.56	*0.54*	*0.54*
Observations	74	74	74
R^2	0.456	0.587	0.595

Note: ***, **, and * represent 99, 95, and 90 percent significance, respectively. Standard errors are in italics.

In sum, bearing in mind all the provisos mentioned at the beginning of this section, we could conclude that the evidence presented here provides only partial support to the hypothesis that hard pegs behave differently from conventional pegs. On the one hand, they appear to deliver better results on inflation. On the other hand, they do not eliminate the inflation-growth trade-off usually involved in the choice of exchange rate regimes. More precisely, they do not improve significantly on the growth performance of conventional fixed arrangements, particularly when compared with countries that displayed stable fixed regimes for a long period of time.

VIII. Conclusions

This paper explored the implications for macroeconomic variables of choosing a particular exchange rate arrangement by assessing the impact of exchange rate regimes on inflation, money growth, real interest rates, and real output growth. Surprisingly, there are relatively few references on these issues, possibly because of the lack of an appropriate exchange rate regime classification. Indeed, the paper illustrates how the use of a de facto classification that relies solely on actual behavior delivers new results.

Even at this exploratory level, we believe there is substantial evidence that regimes indeed matter in terms of real economic performance. On inflation, the data seem to suggest a negative correlation between fixed exchange rate regimes and inflation. However, a more careful examination revealed that this link, far from being a general finding, is mainly attributable to long pegs in low- to moderate-inflation developing countries. This distinction, combined with the results in Levy-Yeyati and Sturzenegger (2000b) showing that nonindustrial fixes grow more slowly than their more flexible counterparts, indicates that the regime choice involves an inflation-growth trade-off only for the case of long pegs. Short-lived pegs, in contrast, appear to be clearly inferior to floats, exhibiting a poorer growth performance with no substantive inflation gain.

The combined use of the de jure and the de facto classification made in this paper allowed us to test the relative value of announcements (words) as opposed to actual behavior (deeds). In this regard, while we find deeds to be the relevant dimension for inflation, words seem to be important for reducing inflation expectations and real interest rates. In contrast, among short de facto pegs, those that openly announce a fix are shown to grow more slowly than those that do not. Thus, words matter in terms of growth, albeit in a "negative" way, somehow rationalizing the concept of "fear of pegging."

Two additional distinctions introduced in this paper merit some attention: high and low volatility countries (first- and second-round observations according to LYS) and industrial and nonindustrial economies, both of which play an important role in our tests. In particular, the finding that exchange rate regimes have virtually no impact on the performance of nonindustrial economies deserves a more careful look. At any rate, these distinctions should inform future research on the topic.

Recently, Fischer (2001) has suggested that the relevant grouping of exchange rate regimes should involve hard pegs, intermediate regimes (including conventional pegs) and floating regimes (including dirty floats). We find only partial support for this bipolar view. While hard pegs are indeed associated with lower inflation rates than their more conventional counterparts, they are far from eliminating the inflation-growth trade-off mentioned above. Moreover, long pegs appear to be closer to hard pegs than to short pegs. Thus, in the end, the distinctive line seems to hinge not on the legal definition of what constitutes a hard peg but rather on whether the peg, conventional or not, attains some degree of perdurability.

Appendix I. Description of the Data

Table A1. Definitions and Sources

Variable	Definitions and sources
Δ*GDP*	Rate of growth of real GDP (Source: World Economic Outlook [WEO])
Δ*GDPPC*	Rate of growth of real per capita GDP (Source: WEO)
Δ*INTRATE*	Change in the interest rate (Source: IMF's *International Financial Statistics* [IMF])
Δ*M2*	Rate of growth of M2 (Source: IMF)
Δ*TI*	Change in terms of trade—exports as a capacity to import (constant Local Currency Units) (Source: World Development Indicators [WDI]; variable *NY.EXP.CAPM.KN*)
CIVIL	Index of civil liberties (measured on a 1 to 7 scale, with 1 corresponding to highest degree of freedom) (Source: Freedom in the World—Annual survey of freedom country ratings)
DCREDIT	Net domestic credit (current LCU) (Source: WDI, variable *FM.AST.DOMS.CN*).
GDPPC74	Initial per capita GDP (average over 1970–73) (Source: WEO)
GOV1	Growth of government consumption (lagged one period) (Source: IMF)
INETGDP	Ratio of net interest payments over GDP (Source: IMF)
INF	Annual percentage change in the Consumer Price Index (Source: IMF)
INVGDP	Investment to GDP ratio (Source: IMF)
LATAM	Dummy variable for Latin American countries
OPEN	Openness (ratio of [export + import]/2 to GDP) (Source: IMF)
POPGR	Population growth (annual percent) (Source: WDI; variable SP.POP.GROW)
QMM	Ratio quasi-money/money (Source: IMF)
SAFRICA	Dummy variable for sub-Saharan African countries
SEC	Total gross enrollment ratio for secondary education (Source: Barro, 1991)
SIZE	GDP in dollars over U.S. GDP (Source: IMF)
SUPGDP	Ratio of fiscal surplus to GDP (Source: IMF)
TRANS	Dummy variable for transition economies

Table A2. List of Countries

Industrial

Australia	Finland	Ireland	Portugal
Austria	France	Italy	Spain
Belgium	Germany	Japan	Sweden
Canada	Greece	Netherlands	Switzerland
Denmark	Iceland	New Zealand	United Kingdom
		Norway	United States

Nonindustrial

Albania	Egypt	Madagascar	Senegal
Antigua and Barbuda	El Salvador	Malawi	Seychelles
Argentina	Equatorial Guinea	Malaysia	Sierra Leone
Armenia	Estonia	Maldives	Singapore
Azerbaijan	Ethiopia	Mali	Slovak Republic
Bahamas, The	Gabon	Mauritania	Slovenia
Bahrain	Gambia, The	Mauritius	South Africa
Bangladesh	Georgia	Mexico	Sri Lanka
Barbados	Ghana	Moldova	Sudan
Belize	Grenada	Mongolia	Suriname
Benin	Guatemala	Morocco	Swaziland
Bhutan	Guinea	Mozambique	Syrian Arab Republic
Bolivia	Guinea-Bissau	Myanmar	Tanzania
Brazil	Guyana	Namibia	Thailand
Bulgaria	Haiti	Nepal	Togo
Burkina Faso	Honduras	Netherlands Antilles	Tonga
Burundi	Hong Kong SAR	Nicaragua	Trinidad and Tobago
Cambodia	India	Niger	Tunisia
Cameroon	Indonesia	Nigeria	Turkey
Central African Republic	Iran, Islamic Republic of	Oman	Uganda
	Israel	Pakistan	Ukraine
Chad	Jamaica	Papua New Guinea	United Arab Emirates
Chile	Jordan	Paraguay	Uruguay
Colombia	Kazakhstan	Peru	Venezuela, República Bolivariana de
Comoros	Kenya	Philippines	Yemen, Republic of
Congo, Democratic Republic of	Korea	Poland	Zambia
	Kyrgyz Republic	Qatar	Zimbabwe
Congo, Republic of	Lao People's Democratic Republic	Romania	
Costa Rica	Latvia	Russia	
Côte d'Ivoire	Lebanon	Rwanda	
Croatia	Lesotho	St. Kitts and Nevis	
Cyprus	Libya	St. Lucia	
Czech Republic	Lithuania	St. Vincent and the Grenadines	
Djibouti	Luxembourg	Sao Tomé and Principe	
Dominica	Macedonia, former Yugoslav Republic of	Saudi Arabia	
Dominican Republic			
Ecuador			

Table A3. Hard Pegs

Antigua and Barbuda	Estonia
Argentina: 1992–99	Gabon[b]
Benin[a]	Grenada[d]
Bulgaria: 1998–99	Guinea-Bissau[a,c] 1989–90 and 1997–99
Burkina Faso[a]	Hong Kong
Cameroon[b]	Lithuania: 1995–99
Central African Republic[b]	Mali[a,c]
Congo, Republic of[b]	Niger[a]
Côte d'Ivoire[a]	St. Kitts and Nevis[d]
Chad[b]	St. Lucia[d]
Djibouti	St. Vincent and the Grenadines[d]
Dominica[d]	Senegal[a]
Equatorial Guinea[b]	Togo[a]

Note: Members of WAEMU and CAEMC are classified as hard pegs except in 1994, when their currency was devalued 100 percent against the French franc.

[a]West African Economic and Monetary Union (WAEMU).

[b]Central African Economic and Monetary Community (CAEMC).

[c]Mali became a member of the WAEMU in 1984 and Guinea-Bissau in 1997.

[d]Eastern Caribbean Currency Area (ECCA).

Appendix II. White's Efficient 2SIV Estimates[36]

Consider the following structural equation for variable *i*:

$$y_i = X_i\delta_i + \varepsilon_i.$$

The matrix X includes both endogenous and exogenous variables. In our specification, y_i corresponds to the inflation rate and X includes the exogenous regressors in the inflation equation as well as the endogenous regime dummy. Let $V = V(\varepsilon_i)$ denote the (nonspherical) variance covariance matrix (*VCV*) of the residuals. We can estimate consistently our parameter of interest, δ, by finding the value of δ that minimizes the quadratic distance from zero of $Z'(y-X\delta)$; that is,

$$\hat{\delta} = \min_{\delta} (y-X\delta)'ZRZ'(y-X\delta),$$

where Z indicates a set of instrumental variables and R corresponds to any symmetric positive definite matrix. R must be chosen appropriately, however, in order to achieve asymptotic efficiency. The estimator corresponding to the minimization problem is

$$\hat{\delta} = (X'ZRZ'X)^{-1}X'ZRZ'y. \tag{1}$$

It can be shown that the limiting distribution of $\hat{\delta}$ is

$$\sqrt{T}\left(\hat{\delta}-\delta\right) \approx N\left(0, pim\left[(Q'RQ)^{-1}(Q'RVRQ)(Q'RQ)^{-1}\right]\right),$$

where

$$Q = p\lim\frac{Z'X}{T} \tag{2}$$

$$V = \mathrm{var}\left(T^{-1/2}Z'\varepsilon\right).$$

Proposition 4.45 in White (1984) proves that choosing $R = V^{-1}$ provides the asymptotically efficient IV estimator, distributed according to

$$\sqrt{T}\left(\hat{\delta} - \delta\right) \approx N\left(0, pim\left(Q' RQ\right)^{-1}\right). \tag{3}$$

If we use R to obtain the asymptotically efficient estimator, we need an estimator of V. However, because the εs are not observable, we need consistent estimators of the errors in order to construct a feasible estimator for the *VCV*. The procedure is as follows. We first construct a *regime index* denoting the regimes included in the regression. We then estimate a standard multinomial logit regression of the regime index on all the variables included in the inflation regression, plus the following additional controls: the ratio of domestic credit over GDP (*DCREDIT*), the ratio of the country's GDP over that of the United States (*SIZE*), and a measure of financial deepening (the ratio of quasi-money over narrow money, *QMM*). Frankel and Rose (1996) find that *DCREDIT* is significantly and positively associated with the collapse of an exchange rate regime. The size variable is potentially related to the regime choice by the usual argument that smaller countries tend to be more open and favor fixed exchange rate regimes. Finally, other authors, notably Kaminsky and Reinhart (1999), have shown that the degree of financial deepening may be associated with the probability of a currency collapse, thus motivating the inclusion of QMM in our model.[37] Once we obtain the estimated regime from the multinomial logit, we use them as instruments for the regime dummies in the original specification of the growth regression. This provides consistent estimates of the error terms that allow us to estimate White's efficient covariance matrix.[38] From this simple IV regression we obtain a consistent estimate for the ε's, which are then used to compute a consistent estimate of V, $\hat{V}$, as

$$\hat{V} = \frac{\sum_t z_t' \hat{\varepsilon}_t^2 z_t}{T},$$

which allows for heteroscedasticity. Thus, we can readily implement our estimators as suggested in (1) and compute its *VCV* matrix as in (3).

REFERENCES

Aizenman, Joshua, 1991, Foreign Direct Investment, Productive Capacity and Exchange Rate Regimes, NBER Working Paper No. 3767 (Cambridge, Massachusetts: National Bureau of Economic Research).

Anderberg, M.R., 1973, *Cluster Analysis for Applications* (New York: Academic Press).

Barro, Robert J., 1991, "Economic Growth in a Cross Section of Countries," *Quarterly Journal of Economics*, Vol. 106 (May), pp. 407–43.

———, and Xavier Sala-i-Martin, 1995, *Economic Growth* (New York: McGraw-Hill).

Broda, Christian, 2000, "Terms of Trade and Exchange Rate Regimes in Developing Countries" (unpublished; Cambridge, Massachusetts: Massachusetts Institute of Technology).

Calvo, Guillermo A., 1999, "Fixed versus Flexible Exchange Rates: Preliminaries of a Turn-of-Millennium Rematch" (unpublished; College Park, Maryland: University of Maryland).

[36]This Appendix follows White (1984).

[37]Other instruments tried in the first stage model (lagged inflation and the ratios to GDP of reserves, government deficit, and M2) yielded identical conclusions but entailed the loss of some observations and were therefore excluded.

[38]We thank Jerry Hausman for suggesting this procedure to us.

———, and Carmen M. Reinhart, 2000, "Fear of Floating," NBER Working Paper No. 7993 (Cambridge, Massachusetts: National Bureau of Economic Research).

———, and Carlos Végh, 1994, "Credibility and the Dynamics of Stabilization Policy: A Basic Framework," in *Advances in Econometrics*, Sixth World Congress, Vol. II, ed. by Christopher A. Sims (New York: Cambridge University Press).

Domac, Ilker, and Maria Soledad Martinez Peria, 2000, "Banking Crises and Exchange Rate Regimes: Is There a Link?" World Bank Policy Research Working Paper, No. 2489 (Washington: World Bank).

Eichengreen, Barry J., 1994, *International Monetary Arrangements for the 21st Century* (Washington: Brookings Institution).

———, and Ricardo Hausmann, 1999, "Exchange Rates and Financial Fragility," NBER Working Paper No. 7418 (Cambridge, Massachusetts: National Bureau of Economic Research).

Fischer, Stanley, 2001, "Exchange Rate Regimes: Is the Bipolar View Correct?" *Finance & Development*, Vol. 38 (June), pp. 18–21.

Frankel, Jeffrey A., 1999, "No Single Currency Regime Is Right for All Countries or at All Times," NBER Working Paper No. 7338 (Cambridge, Massachusetts: National Bureau of Economic Research).

———, and Andrew K. Rose, 1996, "Currency Crisis in Emerging Markets: Empirical Indicators," NBER Working Paper No. 5437 (Cambridge, Massachusetts: National Bureau of Economic Research).

———, 2000, "Estimating the Effect of Currency Unions on Trade and Output," NBER Working Paper No. 7857 (Cambridge, Massachusetts: National Bureau of Economic Research).

Frieden, J., P. Ghezzi, and E. Stein, 2001, "The Political Economy of Exchange Rate Policy in Latin America," in *The Currency Game*, ed. by Jeffrey Frieden and Ernesto Stein (Washington: Inter-American Development Bank).

Ghosh, Atish R., and Paolo Pesenti, 1994, "Real Effects on Nominal Exchange Rate Regimes," IGIER Working Paper (Milan, Italy: Bocconi University).

Ghosh, Atish R., Anne-Marie Gulde, Jonathan D. Ostry, and Holger Wolf, 1997, "Does the Nominal Exchange Rate Regime Matter?" NBER Working Paper No. 5874 (Cambridge, Massachusetts: National Bureau of Economic Research).

Ghosh, Atish R., Anne-Marie Gulde, and Holger Wolf, 2000, "Currency Boards: More Than a Quick Fix?" *Economic Policy*, Vol. 31 (October), pp. 270–335.

International Monetary Fund, 1999, *International Financial Statistics* (Washington).

Kaminsky, Graciela, and Carmen Reinhart, 1999, "The Twin Crises: The Causes of Banking and Balance of Payments Problems," *American Economic Review*, Vol. 89 (June), pp. 473–500.

Larraín, Felipe, and Andres Velasco, 1999, *Exchange Rate Policy for Emerging Markets: One Size Does Not Fit All* (Princeton, New Jersey: International Finance Section, Department of Economics, Princeton University).

Levine, Ross, and David Renelt, 1992, "Sensitivity Analysis of Cross-Country Growth Regressions," *American Economic Review*, Vol. 82 (September), pp. 942-63.

Levy-Yeyati, Eduardo, and Federico Sturzenegger, 2000a, "Classifying Exchange Rate Regimes: Deeds vs. Words," CIF Working Paper No. 02/2000 (Buenos Aires: Universidad Torcuato Di Tella). Available via the Internet: http://www.utdt.edu/~ely/Regimes_final.pdf.

———, 2000b, To Float or to Trail: Evidence on the Impact of Exchange Rate Regimes," CIF Working Paper No. 01/2001 (Buenos Aires: Universidad Torcuato Di Tella). Available via the Internet: http://www.utdt.edu/~ely/growth_final.pdf.

———, forthcoming, *Dollarization* (Cambridge, Massachusetts: MIT Press).

Mundell, Robert A., 1995, "Exchange Rate Systems and Economic Growth," *Revista di Politica Economica*, Vol. 85 (June), pp. 3–36.

Norusis, M., 1993, *SPSS for Windows Professional Statistics, Release 6.0* (Englewood Cliffs, New Jersey: Prentice Hall).

Obstfeld, Maurice, and Kenneth Rogoff, 1996, *Foundations of International Macroeconomics* (Cambridge, Massachusetts: MIT Press).

Quirk, Peter J., 1994, "Fixed or Floating Exchange Regimes: Does It Matter for Inflation?" IMF Working Paper 94/134 (Washington: International Monetary Fund).

Rolnick, Arthur J., and Warren E. Weber, 1997, "Money, Inflation, and Output Under Fiat and Commodity Standards," *Quarterly Review*, Federal Reserve Bank of Minneapolis, Vol. 22 (Spring), pp. 11–17.

Romer, David, 1993, "Openness and Inflation: Theory and Evidence," *Quarterly Journal of Economics*, Vol. 108 (November), pp. 869–903.

Rose, Andrew, 2000, "One Money, One Market? The Effect of Common Currencies on International Trade," *Economic Policy*, Vol. 30 (April), pp. 9–45.

Summers, Lawrence H., 2000, International Financial Crises: Causes, Prevention and Cures," *American Economic Review, Papers and Proceedings*, Vol. 90 (May), pp. 1–16.

White, Halbert, 1984, *Asymptotic Theory for Econometricians* (New York: Academic Press).