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Financial Turmoil and the Choice of Exchange Rate Regime

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Introduction

Financial turmoil is becoming a fact of life in Latin America. The 1990s have been characterized by enormous volatility in the magnitude and cost of capital flows **(**see Figures 1, 2, and 3**).** The swings in capital flows have not only been large, but very highly correlated across countries. The correlation across disparate countries suggests it is not only the quality of policies in each emerging market that is responsible for these swings but global factors that have been the main actors in this drama. Therefore, the blame for financial turmoil has moved away from inappropriate domestic policies. Instead, the paradigm has shifted to one of determining which policies—be they domestic or international—are most effective in taming the destabilizing effects of inherently volatile capital flows.

This debate has been raging throughout the decade and some areas of consensus have been emerging. In particular, fiscal and financial policies have been revisited in order to make them more resilient and stabilizing in a world of volatile capital flows. Gavin and Hausmann (1999) review these policies. There has been much less agreement on the appropriate design of exchange rate policy. This paper asks, what is the appropriate exchange rate arrangement for Latin American countries? It reviews the theoretical claims made in favor of each regime and checks whether the empirical record is consistent with these claims.

For much of its history until the 1960s, Latin America adopted fixed exchange rate systems (see Table 1). In the 60s, a few countries, notably Brazil and Colombia, faced the problem of domestic inflation leading to recurrent exchange rate crises and adopted a crawling exchange rate system. This approach became more common in the 70s. With the debt crisis in the early 80s, most countries abandoned fixed exchange arrangements and adopted a myriad of alternative regimes. However, as inflation became a central concern of monetary policy, Latin America began to explore exchange arrangements that provide some anchor on price expectations but with some built-in flexibility to make them more sustainable. *Pre-announced crawling rates* were used as an inflation stabilization strategy in the Southern Cone in the late 70s (e.g. Argentina, Chile and Uruguay). These attempts led to massive real appreciation and were abandoned in the context of the debt crisis. Then the mood changed in favor of *backward looking crawling pegs* in order to protect the real exchange rate from serious misalignment. However, in many countries this arrangement was put under stress in the early 90s by large inflows of capital. *Exchange rate bands* were then introduced (e.g. Chile, Colombia and Mexico) in order to provide

some flexibility while creating an anchor for the price level. Other countries adopted managed floats either in the context of stabilization attempts (e.g. Bolivia 1985, Peru 1990) or as a consequence of exchange rate crises (e.g. Mexico 1994, Brazil 1999). Hence, the region has been exploring with alternative exchange rate systems with a growing preponderance of more flexible arrangements such as managed floats and crawling bands. Only Argentina, with the adoption of a currency board in 1991, has moved into a highly fixed regime. This shift highlights one of the major undercurrents behind the experimentation of alternative regimes: the benefits of a clear and strong price anchor to fight inflation provided by fixed regimes vis-a-vis the degrees of freedom in monetary policy and exchange rate outcomes provided by more flexible arrangements. The crawling band appears as an intermediate regime that attempts to provide a bit of both objectives.

Argentina excepted, the region has been moving from fixed to more flexible arrangements. There has been very little convergence to a new paradigm: the classification of regimes in Table 1 counts 9 different systems. Many of these regimes were adopted not on the basis of proven success but of theoretical promise. It is fair to say that given the difficult times the region has had to endure in the past decade, these regimes do not have snake-oil properties. For this reason, the debate has been reopened as unsavory experiences with one regime prompt a change towards another. Venezuela fixed the official exchange rate in 1994 but was forced to abandon it in a currency crisis in 1996. Two exchange rate bands have collapsed (Mexico 1994 and Brazil 1999) and have been substituted by floating regimes. Chile and Colombia have kept their currency bands but with frequent adjustments to their parameters. Argentina's currency board was able to survive the Tequila, Hong-Kong, Russian and Brazilian crises, calling increasing attention in policy circles to this arrangement throughout the region. However, at present Argentina is giving serious consideration to the possibility of full dollarization, in the context of the Brazilian crisis. This proposal comes after the launching of the yet-untested Euro and suggests the possible convenience of supra-national currencies. It also has focused attention on the financial experience of Panama, the only Latin American country with a fully dollarized system.

This paper attempts to assess the performance of alternative exchange rate regimes in Latin America relative to the benefits they are theoretically supposed to deliver. We will test empirically whether flexible systems allow for better cyclical management, more monetary autonomy and improved control of the real exchange rate. We find that flexible exchange regimes have not permitted a more stabilizing monetary policy but instead have tended to be more pro-cyclical. In addition, flexible regimes have resulted in higher real interest rates, smaller financial systems and greater sensitivity of domestic interest rates to movements in international rates. We also find that flexible regimes tend to promote wage indexation. We show that the revealed preference of Latin America is to allow very little exchange rate movement, even in periods of large real shocks such as 1998. We explain this preference as a consequence of de facto wage indexation and the high proportion of dollar-denominated financial liabilities. The paper then discusses the problems with fixed exchange rates and reviews the current interest in supra-national currencies, including full dollarization.

The Case for Exchange Rate Flexibility

One way to explain the logic behind exchange rate flexibility is by noting that without it one cannot have an independent monetary policy. If a country fixes its exchange rate, monetary policy and outcomes will be determined by its exchange rate commitment. Domestic short-term interest rates will reflect the rates observed in the country to whose currency it is pegged, plus a risk premium related to the credibility of the peg. There is no leeway to use monetary policy for other purposes such as demand management or balance of payments adjustments. Moreover, a fixed exchange rate implies 'importing' the monetary policy of the country to which it is pegged. This has two unsavory consequences. First, it may be the wrong monetary policy given the business conditions in that country. It may be that the country you peg to is undergoing a recession and wants to reduce interest rates in order to stimulate aggregate demand. However, your country may be in the midst of an unsustainable boom and may need to reduce aggregate demand through higher interest rates. Hence, the country may be importing the wrong kind of policy. In fact, the theory of optimal currency areas (Mundell 1961, and McKinnon 1962) is based precisely on this intuition. Two areas that undergo highly correlated economic fluctuations could share the same currency since they would want to expand or contract aggregate demand at the same time. The high correlation may be the consequence of the fact that the two areas undergo similar external shocks or, more likely, that economic fluctuations in one country are transmitted to the other through highly integrated goods and factor markets. For example, a boom in one country spills over to the other through an increased demand for its exports and its workers.

The second problem is sovereignty. Even if the business cycle in a country is highly correlated with that of the country it is pegged to, the polity may have different interpretations of current conditions or may have different preferences over the trade-offs between inflation, unemployment and external competitiveness that monetary policy entails. Canada is a good example of this case. It is a country that is often said to be more integrated to the United States than it is to itself, but it has opted to float the exchange rate in order to maintain its monetary independence. In this context, exchange rate flexibility—by allowing a country to run its own monetary policy—leaves it with the choice of either mimicking the policies of its trading partners or going its own way by exploiting its sovereignty.

With exchange rate flexibility, so the argument goes, interest rate policy can be used to achieve internal balance while the exchange rate is allowed to move in order to achieve external balance. It provides an additional degree of freedom, which makes economic management more protective of the level of domestic activity and of unemployment.

So exchange rate flexibility has many theoretical arguments in its favor that may have underpinned the movements towards more flexible regimes in Latin America. Have the promises been fulfilled? After almost two decades of experience with more flexible regimes in Latin America, we are in a position to check the empirical validity of many of these considerations.

Exchange Rate Flexibility and Monetary Policy: From the European Aspirin to the Latin American Headache

Suppose a country is suffering from high unemployment and is keeping interest rates high in order to defend a certain exchange rate peg. The policy is costly because all major constituencies are unhappy. Workers complain about unemployment. Manufacturers and farmers are unhappy because the strong currency makes them less competitive vis-a-vis foreign producers. The construction, financial and consumer durable sectors are upset about the high interest rates. Suppose that instead of defending the currency the monetary authority decides to lower interest rates and let the exchange rate weaken. If this can be done, then the same constituencies that were previously upset will now be happy and would most likely be willing to forgive the Central Bank for reneging on its commitment to a strong and stable currency.

The European experience suggests this can be done. Figure 4 shows the exchange rates and interest rates for the UK, Italy and Spain circa October, 1992. In the first two cases, the government reacted to an attack against the currency by letting it float and used the opportunity to lower interest rates. In the UK, rates were lowered from the 9-10 percent level to around 5 percent as the currency depreciated by some 30 percent[1]. In Italy, interest rates rose from 12 percent in the pre-crisis period to 18 percent in the middle of the attack, and were then brought down to less than 9 percent while the currency weakened continuously over the course of the following months. In Spain, two discreet devaluations in October 1992 and April 1993 'failed' in the sense that they did not allow a reduction in interest rates. Nevertheless, the government was not overwhelmed by the attack. In the end, a further depreciation in June 1993 finally allowed interest rates to decline from 13 percent to 9 percent. Overall, the peseta depreciated by some 40 percent.

The European experience of 1992 suggests that it is possible to let the exchange rate go and reduce interest rates allowing the economy to gain both from improved competitiveness and from more expansionary monetary conditions. Moreover, the impact on domestic inflation was minimal in spite of the sizeable devaluations. Letting the exchange rate go relieves the pain.

Therefore, the European experience suggests that letting the exchange rate go:

- allows for lower interest rates
- has minor effects on the price level
- and allows output to recover

However, the Latin American experience is quite different (See Figure 5). Take, for example, the case of Mexico 1994. On December 21, the government announced a controlled devaluation (a la Spain) of some 20 percent. However, the authorities could only defend the new parity for two days and were forced to let it float. The exchange rate depreciated by 70 percent in spite of an interest rate hike from 18 percent in the pre-crisis

[1] All rates of depreciation are calculated in the Latin fashion: it's the change in the amount of local currency needed to buy a unit of foreign currency.

period to over 80 percent at the peak before settling into an average of 50 percent in the second semester of 1995. This increase took place despite massive international financial assistance. In contrast to the European experience, output dropped by almost 8 percent in 1995 and inflation accelerated from 8 percent in 1994 to 55 percent in 1995.

Brazil had a very similar experience in January 1999. The government announced a controlled devaluation (a la Spain and Mexico) that it could only defend for a day, in spite of some US$ 35 billion in reserves and an equivalent amount in commitments of international financial assistance. It was then forced to float. The currency quickly depreciated by some 60 percent, an amount that exceeded everyone's assessment of the previous level of overvaluation. But in spite of this 'overshooting,' interest rates went up, not down. The government has announced that it expects to achieve an inflation rate of 15 percent in 1999 (up from 0.5 percent) and that output will fall by 3 to 4 percent.

Hence, the Latin American experience suggests that letting the exchange rate go:

- forces an increase in interest rates
- has a large inflationary impact
- and causes a major decline in output

Although much less dramatic in nature, the depreciations in Chile and Colombia during 1998 led to qualitatively similar results.

The Revealed Preference of Latin American Central Banks

Perhaps these stylized facts explain the choices made by Latin American monetary authorities since the Asian crisis erupted. Since July 1997, Latin America has suffered a sequence of negative external shocks. First came the financial contagion associated with the East Asian crisis. Then came the major deterioration in the terms of trade caused by declines in the prices of oil, metals and agricultural products. Furthermore, the region was hit by devastating natural disturbances such as El Niño, hurricanes Georges and Mitch and the earthquake in Colombia. The region also suffered from the major financial contagion that followed the Russian crisis. How did the monetary authorities of Latin America react to this sequence of negative real shocks? In particular, did countries with exchange rate flexibility make use of it or did they rely on higher interest rates and reserve losses to cope with the external shocks (as would be required in a fixed exchange rate regime)?

Table 2 shows the changes in international reserves, exchange rates, and interest rates from May 1997 to October 1998 for 11 Latin American countries. We divided the period into three segments in order to capture the major shock that characterized each period: the Asian financial contagion (May–November 1997), the collapse in the terms of trade (December 1997–July 1998) and the Russian crisis (July 1998–October 1998). The table includes countries with very fixed (or dollarized) systems such as Argentina and Panama, countries with crawling rates such as Costa Rica and Uruguay, countries with crawling bands such as Brazil, Chile, Colombia, Ecuador and Venezuela, and countries with managed floating regimes such as Mexico and Peru.

The first stylized fact is that in spite of the large magnitude of the external shocks *most countries used their exchange rate flexibility very sparingly*. If anything, exchange rate depreciations were not used to attempt a real depreciation but were instead used to keep up with inflation differentials, as was the case in Costa Rica, Ecuador, Uruguay and Venezuela. In Peru—a formally floating rate country that was severely hit by both El Niño and the collapse in the terms of trade—the cumulative devaluation barely kept pace with inflation. Chile also allowed minimal movements in its exchange rate in spite of a major collapse in the price of copper and in the Asian demand for its exports. The only countries that did allow the exchange rate to move more significantly were Colombia and Mexico.

The second stylized fact is that *countries did use interest rates very aggressively* to defend their exchange rates. Brazil increased interest rates dramatically after the Hong Kong and Russian attacks. Chile, Mexico, Peru and Venezuela increased interest rates very dramatically in response to the terms of trade collapse and the Russian crisis.

The third stylized fact is that *interest rates moved the least in countries with no exchange rate flexibility!* In Argentina and Panama there were very small movements in the domestic interest rate. In contrast, countries with formally floating systems such as Mexico and Peru saw very large interest rate movements. The same can be said of Chile, which started the period with a very wide exchange rate band.

Hence, in spite of large real and financial shocks Latin American Central Banks use exchange rate flexibility very sparingly, even when they formally float or have wide bands. Interest rates are used much more aggressively in these countries. Contrary to the theoretical arguments presented above, exchange rate flexibility seems to go with higher not lower instability in interest rates.

This result is surprising and merits further exploration. Is there anything wrong with the conventional theory? If so, what is it? Moreover, is this empirical result of limited validity? Is it only a recent phenomenon?

Exchange Rate Arrangements and Financial Systems

The choice of an exchange rate regime depends on the nature of the shocks faced by an economy—at least that is what the literature teaches. As the theory goes, countries that are subject to domestic monetary shocks benefit from a fixed exchange rate since the money supply automatically adjusts to accommodate changes in money demand (through variations in reserves) without affecting the real side of the economy. On the other hand, countries subject to external shocks or to domestic real shocks do better with flexible arrangements that allow the movement in relative prices needed to reallocate resources in response to these shocks. These prescriptions–fixed regimes for domestic monetary shocks and floating for external and real shocks–have become deeply entrenched in the conventional wisdom.[2] Since Latin America is a region characterized by substantial terms of trade shocks, should countries in the region tend to adopt more flexible arrangements?

[2] See, for example, the survey by Aghevli, Kahn and Montiel (1991).

In answering this question, it is interesting to see whether countries have, in fact, followed the policy prescriptions of the literature in choosing their exchange rate regimes. Recent studies provide empirical evidence suggesting this is not the case. Lane (1995), using a sample of 110 countries during the 1982-91 period finds that, contrary to the conventional wisdom, the more variable the terms of trade are, the more likely a country will adopt a fixed exchange rate. The coefficient of his terms of trade volatility variable is highly significant and robust. Frieden, Ghezzi and Stein (1999), have qualitatively similar findings using a panel of 26 Latin American countries for the period 1960-94. Again, countries subject to large terms of trade shocks tended to adopt less flexible arrangements such as fixed exchange rates or forward looking crawling pegs.

Both of these studies present this result as a puzzle. We will argue, however, that perhaps this puzzle may be explained by factors that were overlooked in the theory of optimal regime choice. More specifically, we will argue that fixed exchange rate regimes should result in deeper financial markets, which should be particularly important in economies facing important terms of trade shocks.

How does the argument go? First, remember that the exchange rate does not only affect the relative prices of goods or labor. It also affects the relative price of financial assets. Imagine that you are in a country that is subject to large terms of trade shocks. Suppose the government adopts a flexible exchange rate regime so that innovations (i.e. unexpected movements) in the terms of trade are transmitted to the exchange rate. In particular, when the terms of trade decline, e.g. because of a fall in the price of coffee or oil, the currency would be expected to depreciate. Alternatively, the exchange rate would strengthen when export prices rise. Suppose the public is given the choice of saving in the domestic currency (call it pesos) or in dollars. What will people do?

Consider a negative terms of trade shock. This will bring about a decline in income, and at the same time, a depreciation. The key point is that, if people hold domestic assets, they will be hit twice by a negative terms of trade shock. Their income will decline; and, on top of that, the depreciation will wipe out the real value of their peso deposits, just when they need to dip into their stock of savings to compensate for their lower income. In the case of positive terms of trade shocks, in contrast, both their income and the value of their peso-denominated savings would increase at the same time. Said differently, letting the exchange rate fluctuate with innovations in the terms of trade will make the value of domestic financial assets have the wrong covariance with the income process. Consequently, the public will shy away from holding domestic assets and prefer to hold dollars instead. In order for people to hold domestic assets, they would demand a higher real interest rate.

This view has very important empirical implications. If it were right, one would expect fixed exchange rate countries to have deeper financial markets and lower real interest rates. In fact, such a benefit would explain why, contrary to the conventional wisdom, more volatile terms of trade do not go hand in hand with more flexible exchange rate arrangements.

Figure 6 looks at the financial depth (measured as the ratio of M2/GDP) of fixed vs. flexible exchange rate countries since 1960. We divided the sample period into four subperiods, corresponding to the Bretton Woods period (up to 1973), the period of the oil crises (1974 through 1981), the period of the debt crisis (1982 through 1988) and the period in which capital flows to the region resumed (1989 through 1994). While there is a tendency for financial depth to increase throughout the period in both regimes, it has done so more rapidly for the fixed exchange rate countries. Since the vast majority of countries started with fixed exchange rate regimes, it can be said that financial depth rose faster in those countries that remained fixed. In fact, for the period 1989-94, the average financial depth of countries under fixed exchange rates was 11 percentage points of GDP larger and 41 percent greater than that of countries under flexible arrangements.[3]

This graph, although highly consistent with our story, does not control for other factors that may influence the results (see Appendix A). In the appendix we ran a panel regression that controls for differences in inflation. It also includes country dummies and time dummies to account for structural differences across countries, or international variables that have not been explicitly considered. After all these controls, the impact of the exchange rate regime on financial depth remains highly significant and accounts for 4 percentage points of GDP, or 15 percent of the financial depth of countries under flexible arrangements.[4]

This last result probably underestimates the effect of the regime on financial depth. The reason is that, by including country dummies, we capture the differences within countries, but disregard the difference across countries in measuring the effect of the regime. For this reason, we ran another set of regressions to capture the effects of differences across countries. The details of the regressions are discussed in Appendix A. In this case, our results suggest that the average financial depth of countries under fixed arrangements for the entire sample period would have been 20 percentage points of GDP larger than that of countries under flexible arrangements.[5]

This last result likely overestimates the effect of the exchange rate regime on financial depth by leaving out certain country characteristics that may explain both financial depth and the choice of regime, which in the previous regressions were captured by the country dummies. The true effect of the exchange rate regime on financial depth is probably somewhere in between. Notwithstanding the differences in the size of the effects, all of our evidence points in the same direction: fixed exchange regimes are associated with

[3] Other regimes, such as crawling pegs and bands, were excluded from this exercise, as were regimes that were formally fixed but subject to very frequent readjustments. The results are very similar, however, when we compared financial depth in fixed regimes vs. all other regimes.

[4] We also run regressions controlling for GDP per capita, in addition to inflation. However, this variable was excluded from the regressions shown in the appendix, since it is subject to endogeneity problems. It should be noted, however, that the inclusion of this variable did not affect the results significantly.

[5] Since in this case the regime variable captures the share of the time that a country spent under fixed arrangements, a different way to state the result is that each additional year spent under fixed arrangements would have increased the average financial depth of a country by 0.2/35 years, i.e by 0.57 percentage points of GDP.

deeper financial markets. The results are very large in economic terms and highly significant in statistical terms.

The Effect of Exchange Rate Regimes on Real Interest Rates

We have established that the statistical record for Latin America suggests that fixed exchange rate regimes generate deeper financial markets. We also conjectured that fixed regimes would lead to lower real interest rates. This result can be justified theoretically by the fact that since the fixed regime, as long as it is sustained, insures the exchange rate against movements in the terms of trade caused *inter alia* by terms of trade shocks, depositors will demand lower returns than those required under flexible regimes.

To assess this issue we developed a monthly database of monetary and exchange rate statistics for Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Peru, Uruguay, and Venezuela for the period 1960–98. As can be seen in Figure &, fixed exchange rate regimes are associated with significantly lower real interest rates for deposits. For the 90s, flexible regimes have averaged 9.2 percent real rates while fixed regimes have paid only 5.1 percent. In fact, the results shown compare periods in which annual inflation has been below 20 percent in order not to skew the results in favor of fixed regimes. Moreover, the difference is statistically significant for the whole sample as well as for the low inflation observation. The difference remains significant and similar in magnitude after the inclusion of country dummies (See Appendix B).

Hence, the proposition that fixed exchange rate regimes lead to lower real interest rates on average appears to have strong empirical support in Latin America. A lower real interest rate is not only good for borrowers. It is also good for the health of the financial system. If depositors demand high real rates then bankers must look for higher return borrowers, which also tend to be riskier. Hence, a lower real interest rate permits safer lending. (See Figure 7)

Do Fixed Exchange Regimes Lead to Less Anti-cyclical Monetary Policy?

We have established that fixed exchange rate systems are not only associated with deeper financial markets but with lower average real interest rates. In this section we explore the cyclical properties of real interest rates to determine whether there has been a difference in the timing of real interest rate movements. Do flexible regimes allow for a more anti-cyclical policy? Does exchange rate flexibility allow for a more independent monetary policy?

To explore the cyclical properties of monetary policy we looked at the reaction of real interest rates to the output gap under alternative exchange rate regimes. The output gap is the difference between actual monthly industrial output and a fitted trend. Countries include Argentina, Brazil, Chile, Colombia and Mexico. Data is monthly from 1960 to 1998, where available.

The results of our experiments are presented in Table 3. We find that there is a negative relationship between the output gap and real interest rates. This indicates that monetary

outcomes have moved in a pro-cyclical fashion: low real interest rates in expansions, high rates in contractions. To check whether this result is peculiar, we ran a similar regression for the United States. We found that while the regression coefficient is also negative (indicating pro-cyclical outcomes) the estimated value of the coefficient was one-twentieth the size of the Latin American average when considering the whole sample, but of similar value when excluding periods where the annual inflation rate exceeded 20 percent. Said differently, Latin American monetary outcomes were very pro-cyclical in periods of high inflation but normal (by US standards) in periods of low inflation.

More interestingly, we included an interaction term between pegged exchange rates and the output gap to test whether fixed regimes were more or less pro-cyclical than flexible regimes. Interestingly, while the results are not statistically significant, our estimates consistently indicate that fixed regimes are less pro-cyclical than flexible regimes. Hence, while we cannot say with confidence that fixed regimes are less pro-cyclical than flexible regimes, we can say that they are definitely not more pro-cyclical. This result contradicts the theoretical argument in favor of flexible regimes on the grounds that they have a stabilizing effect on output.

One interpretation for this result is the following. As argued, the revealed preference of Latin American Central Banks is to use exchange rate movements very sparingly, even after large real shocks such as those of 1998. We will rationalize this behavior below by making reference to wage indexation and dollarization. So, to a certain extent, flexible regimes are managed as if they were fixed but without the benefits of such pre-commitment. Hence, when the market sees a bad shock and no depreciation it anticipates that at any moment the authorities might change course and let it take place. In anticipation, real interest rates remain high, especially in bad times.

Hence, the empirical record in Latin America does not argue in favor of a more stabilizing monetary policy under flexible regimes, even in periods of low inflation.

Another important empirical point is whether flexible regimes allow a certain degree of freedom to limit the domestic impact of movements in foreign interest rates. Are flexible regimes more insulating? Have they better sheltered the domestic economy from foreign interest rate shocks?

We have already established that as opposed to Europe 1992, exchange rate flexibility leads to higher, not lower, interest rates. But are domestic interest rates less sensitive to movements in foreign rates under flexible regimes?

To find out we conducted two tests. First, we studied the relationship between daily movements in domestic 30-day interest rates (expressing internal monetary conditions) and foreign dollar rates on sovereign bonds of the same country (expressing the cost of access to world markets) for Argentina, Venezuela and Mexico for the period September 1997–February 1999. We chose these countries for reasons of data availability and because they represent three very distinct exchange rate systems. The results of this exercise are presented in Table 4. As shown, a movement of 1 percent in the foreign

interest rate in Argentina causes an increase of 1.45 percent in the domestic rate. The equivalent number for Venezuela, a country with relatively narrow exchange rate bands is 2.77 while for Mexico it is 5.93. Said differently, movements in foreign interest rates have a maximum impact on domestic rates in Mexico (a country that floats), minimal impact in Argentina (a country with a strongly fixed regime) and intermediate effects in Venezuela (a country with limited flexibility). It is not the case that floating rates deliver monetary sovereignty, as the original logic would have it. In fact, it seems to amplify the domestic effects of external movements.

This result holds for the very recent past using daily data on three countries. Does it hold for the longer run too? We ran a similar exercise using monthly data for the 11 countries mentioned above for the period 1960 to 1998. According to the results reported in Table 5, flexible regimes do not provide more insulation from movements in international interest rates. The estimated equation suggests that U.S. real interest rates affect domestic rates with an estimated coefficient very close to 1, as is assumed in most theories[6]. We find again that the average real annualized interest rate of fixed rates is 3.2% below that of floating rates in this equation. More importantly, when the U.S. real rate is interacted with the pegged exchange rate and included in the equation we obtain a coefficient that is negative and large but is not statistically significant. The point estimate of the coefficient implies U.S. rates affect domestic rates by 25 percent less in countries that peg relative to other countries.

Hence, with this data set we again find no evidence to suggest that floating arrangements are better at insulating domestic interest rates from foreign rate movements. Instead, the numbers, although not in a statistically significant manner, point mainly in the other direction.

Exchange Rate Flexibility and Competitiveness

In the previous section we found that, contrary to conventional wisdom, exchange rate flexibility in Latin America has neither allowed for a more accommodating monetary policy nor sheltered the domestic economy from movements in international interest rates. The conventional wisdom would also argue that by allowing depreciations to take place, the monetary authorities could achieve a more competitive real exchange rate, which will be good for output in the tradeable sectors and for the sustainability of external accounts. By lowering wages, as measured in dollars, exchange rate depreciation improves competitiveness, thereby stimulating exports and reducing imports. Countries with flexible regimes can in principle use the exchange rate to affect dollar wages while those with fixed regimes cannot.

One question is whether the real exchange rate has been more anti-cyclical in regimes that allow for more exchange rate flexibility. One would expect in boom times for

[6] This coefficient is different from the one estimated in the previous exercise because it measures a very different response. In this case, we are looking at the reaction of real domestic interest rates (i.e, nominal rates deflated by domestic inflation) to US real rates (i.e. US$ rates deflated by US inflation). In the previous exercise we looked at the response of nominal domestic rates to nominal dollar rates.

domestic demand to be high, external resources abundant and the real exchange rate relatively strong. By contrast, in bad times, low domestic demand and the absence of real or financial external resources would lead to a weaker real exchange rate. To explore this question we used our 11-country monthly database and ran the equation presented in Table 6. The regression suggests that real exchange rate movements have been anti-cyclical in the sense that the currency has been relatively strong when the output is high (the output gap is small) and relatively weak when there is a recession. The result is not statistically significant and the estimated effect is not large. A 10 percent drop in output would cause a 1.5 percent real depreciation in flexible exchange regimes. By contrast, in fixed regimes the effect is estimated at about half as much but the difference is not statistically significant. Hence, the evidence suggests that real exchange rates have been very mildly anti-cyclical and more so under flexible regimes, even though the difference is not statistically significant.

This result is interesting. One would have expected a clearer difference in the behavior of dollar wages and competitiveness. Don't flexible regimes allow better control over dollar wages and the real exchange rate than pegged systems? This proposition is based on the idea that wage-setting arrangements are not significantly affected by the choice of exchange rate regime. However, we have reason to suspect that this is not so. Imagine two otherwise identical countries subject to relatively large real shocks. In one country the exchange rate is credibly fixed. In the other, it is freely floating so that real shocks are transmitted to the exchange rate. Consider the problem faced by a trade union representative of the widget industry that is negotiating a collective contract. He is asked to sign a contract that is implicitly denominated in dollars in the fixed exchange rate regime but is denominated in an erratic and unpredictable unit in a flexible regime. It is reasonable to assume that under the flexible regime the representative would bargain for a shorter life to the contract (to provide for more rapid renegotiations), or for some form of indexation (to denominate the contract in a more stable unit). Under these conditions, nominal wages tend to react more swiftly to price shocks under flexible regimes than under fixed, leading to more *de facto* indexation.

To check for this intuition we studied the dynamic properties of wages and prices under alternative exchange rate regimes for Argentina, Brazil, Chile, Peru and Mexico using monthly data. We inquired about the degree of response of nominal wages to jumps in the price level after controlling for linear and quadratic trends intended to capture expected movements in inflation and unemployment. The results presented in Figure 8 tend to confirm the above-stated conjecture.

Let us start with Argentina. In the period between February 86 and December 88, in which average monthly inflation was 8.5%, the estimated elasticity of wage inflation to innovations in price inflation was 65%. This means that in the same month, wages recovered 65% of any unexpected inflation change. By contrast, in the period after the convertibility plan had settled down (January 1993 to June 1998), the reaction of wages basically disappeared. A very similar pattern can be seen in Brazil. While during the period prior to the Real Plan (June 1989 to June 1993) the elasticity of wage inflation was 91%, this reaction also disappeared after the Real Plan had stabilized.

These differences could be attributed to the substantial differences in average inflation rates across exchange rate regimes. Yet, the evidence from Mexico, Peru and Chile suggests that inflation is not the whole story. For example, the Mexican case shows that indexation may be quite different at similar rates of inflation. In this country, we selected two periods in which the exchange rate regimes were different but average monthly inflation rates were about the same. While the wage inflation elasticity was 25% during the fixed exchange rate regime period (February 1970 to January 1975), it increased to 88% during the crawling band period in the early 90s.

The case of Peru from 1992 to 1994 is another good example since it features a flexible exchange rate arrangement and low inflation. Despite the low levels of inflation, nominal wages respond substantially to changes in price inflation. Moreover, this response is much larger than the one featured in Argentina or Brazil during their fixed exchange rate periods.

The last case study corresponds to Chile during the 90s. Our results suggest that despite Chile's low inflation, actual wage indexation is large but takes place over the course of a quarter. After three months the accumulated elasticity of wage inflation is 58%. Hence, Chile's flexible exchange rate arrangement goes with substantial de facto indexation, making real wages quite rigid.

Hence, Chile and Peru in spite of low inflation have substantial de facto indexation. By contrast, Argentina and Brazil with more fixed arrangements were able to de-index wages in spite of a previous history of high indexation. This is suggestive of the idea that de facto indexation is not just the consequence of inflation. Instead, it plays the role of an insurance device against the possibility of sudden price movements, which are more likely under flexible than fixed rates. Said differently, the possibility of lowering dollar wages through exchange rate depreciation is anticipated by employers and workers and incorporated in the wage negotiation process. This anticipation reduces the supposed effectiveness of exchange rate flexibility to affect competitiveness.

De facto indexation also implies that the inflationary cost of any attempt to use the nominal exchange rate to achieve a relative price shift will be very high. This may explain the observed tendency of Latin American Central Banks to use depreciations very sparingly even after very bad negative shocks such as those experienced in 1998. This logic may explain why Chile and Mexico in 1998 decided to prevent further movements in the exchange rate opting instead for large increases in domestic interest rates. They argued that further depreciation would compromise even more their inflation targets.

Therefore, flexible regimes face heavy costs when they attempt to improve competitiveness through devaluation. Improvements come at the cost of substantial inflation and tend to be rather short-lived since de facto wage indexation (and the pass-through of imported inflation) nullifies the changes in competitiveness. This logic also explains why after the massive devaluations in Mexico 1994 and in Venezuela in 1996, the economies returned to the pre-crisis real exchange within two years.

Hence, the evidence suggests that exchange rate flexibility leads to higher de facto wage indexation, as employers and workers protect their agreements from unexpected changes in prices. Indexation will cause exchange rate flexibility to have important dynamic consequences, as wages will then influence prices and cause a further cycle of inflation. The response of wages will tend to limit the effect of nominal exchange rate movements on external competitiveness while amplifying the inflationary consequences. In this context, one would expect a Central Bank that is concerned about inflation to allow very little exchange rate flexibility, even if it is under a formally floating exchange rate system.

De facto Dollarization

Latin America is heavily dollarized. In a few countries such as Argentina, Uruguay, Peru and Bolivia the formal domestic banking system has dollar deposits that are significantly higher than domestic currency deposits. In other countries the reality is similar but dollar deposits are held either in off-shore institutions or abroad. In all countries, governments, banks and corporations have large liabilities denominated in dollars. Moreover, dollarization is not just a temporary phenomenon promoted by high inflation. It has been years since inflation has been brought down in the countries with highly dollarized banking systems, and there has been no trend back towards local currency assets. On the contrary, the share of dollar deposits keeps increasing.

Dollarization has important implications for the conduct of macroeconomic policy. In particular, dollarization and foreign denominated debt have quite unsavory effects on exchange rate movements. By suddenly increasing the value of dollar liabilities it may bankrupt the banking system or raise the prospect of defaults on foreign debt, making capital flows more volatile.

In this context, devaluations can be highly disruptive and consequently may overshadow any expansionary effect of a more competitive exchange rate on output. Therefore, Central Banks can reasonably be expected not to let the exchange rate move much, even in countries with flexible regimes such as Mexico and Peru and even after a serious real shock, such as that observed in 1998.

Exchange Rates and Currency Crises

According to our results, fixed exchange rates deliver lower real interest rates, deeper financial markets, lower de facto wage indexation, less pro-cyclical monetary policy and lower domestic impact of foreign interest rate movements. With all these benefits, why the movement towards more flexible rates?

One major problem with fixed exchange rates is that they tend not to be fixed for very long. The history of Latin America and the world is full of fixed regimes that do not last. In fact, Obstfeld and Rogoff (1995) have shown that in the last 20 years fixed exchange

rates have become a dying breed. For some time now, there have only been 5 countries where the exchange rate has been fixed for more than 5 years, even though the names of those 5 countries keep changing.

One problem is that fixed exchange rate countries, when hit by a large negative real shock must adjust without resorting to a sudden improvement in competitiveness through the magic of devaluation. Wage contracts need to be flexible enough to incorporate the new realities so as to avoid a long and protracted recession. This is well known. Nevertheless, it is interesting to note that the recovery after the Tequila was as fast if not faster in Argentina, a country with quite rigid labor laws and a currency board, than in Mexico, a country that underwent a massive devaluation. The answer is very much related to the fact that real interest rates were much lower in Argentina than in Mexico and credit was much more abundant during the recovery. This difference is not only related to the properties of fixed exchange rate systems but also to the fact that Argentinean banks were not weakened by devaluation. In this respect, the deeper financial markets associated with fixed exchange rate systems may allow for smoother inter-temporal adjustments instead of devaluation-induced sudden relative price changes.

It is important to note that fixed exchange rate regimes may be more likely to suffer currency crises as a successful attack is often feasible. Moreover, these crises may be more likely to put stress on the banking system under pegged regimes since the collapse in deposit demand will cause a loss of liquidity, while they would lead to a depreciation (and no loss of nominal liquidity) in a floating rate country. It is often argued that flexible regimes are immune to these inconveniences for two reasons: first, they cannot be successfully attacked; second, the Central Bank can act as lender of last resort.

These two considerations have received wide acceptance but have been shown to be formally wrong. First, as shown by Eichengreen (1998) it is not true empirically that fixed exchange rate systems are more prone to banking crises than flexible arrangements. Second, Chang and Velasco (1998) show that a flexible exchange rate system with foreign debt can be subject to self-fulfilling crises. The perverse dynamics can be characterized as follows: the fear that the currency might depreciate to the point where companies or the government are no longer able to pay will cause capital flight and a massive depreciation in anticipation of that event. Such events may well have happened in East Asia in 1997–98.

In addition, it is not true that a central bank in a floating rate country can act as lender of last resort without the fear of a serious currency crisis. If the market anticipates that the supply of last resort lending to the banking system will rapidly expand the monetary base, it will expect the currency to loose value and a major destabilizing depreciation could occur. That is exactly what happened in Venezuela during the first semester of 1994, when its Central Bank resorted to ample lending to quench the erupting banking crises. This action led to a 100 percent depreciation of the floating exchange rate until exchange controls were imposed. Last resort lending will be destabilizing if it is based on the idea that money is easy to print. Argentina's new innovative market-based arrangements are not only for countries that adopt currency boards. They are applicable to any country,

such as the typical Latin American economy, where the market may react adversely to a lender of last resort based solely on fiat money.

The difficulties in providing last resort lending under flexible arrangements, together with their higher real interest rates and shallower financial markets may explain Eichengreen's finding that floating rate countries are as likely to experience banking crises.

The "Peso Problem" as a Potential Source of Financial Vulnerability

It is easier for governments to prevent a sudden appreciation than a sudden depreciation. They also have more of a financial stake in a large depreciation since it will allow them to collect a hefty inflation tax. Consequently, market expectations about exchange rates tend to be skewed. There is always some probability of a large depreciation. To compensate for this eventuality, risk-neutral investors will demand a higher interest rate. This is known as the "peso problem." In fact, as argued before, this problem is not exclusive to pegged systems since flexible exchange rate regimes also try to avoid exchange rate movements. In fact, our finding that real interest rates are higher in floating regimes may indicate that the problem is even more serious in those systems.

The point is that while ex ante interest rates are reasonable, given the devaluation risk, ex-post rates are higher than expected if the devaluation does not take place. Investors will have received returns that are larger than they were expecting and borrowers, whether banks, corporations or the government, will have paid more than planned. Consequently, their debts will be growing faster than expected. So as time goes by, the position of the borrower ex post may become consistently weaker through the sole effect of the risk of an unrealized depreciation. In fact, it may well be that a financial position that would have been sustainable in the absence of exchange rate risks, may become explosive due to the peso problem. It can be argued that the recent Russian and Brazilian crises have elements of this story: a large stock of debt denominated in local currency was issued at high interest rates to pay investors for the risk of devaluation. After a long enough period of no depreciation the debt had ballooned to unsustainable levels prompting the crisis.

This problem need not take such spectacular proportions in order to become a serious challenge. The higher domestic interest rates will cause the financial system to be smaller and riskier than it would otherwise be and this may have important long-run effects on growth.

The Case for a Supra-national Currency

We have argued that exchange rate flexibility has not been much of an asset for Latin America. It has not allowed for a more independent monetary policy. It has not permitted a more stabilizing monetary policy. It has produced higher real interest rates and smaller financial systems. It has prompted more indexed wage arrangements, making relative

price movements more inflationary. De facto wage indexation and dollarization have affected the revealed preferences of the monetary authorities not to use the exchange rate flexibility they formally have. However, they have had to pay the price of that unused flexibility through higher interest rates.

If the benefits of exchange rate flexibility are limited and the costs are large, then fixing appears attractive. But if the currency is to remain fixed, what is the advantage of having your own currency? Imperfect credibility of the peg will make financial intermediation unnecessarily complex. This is expressed in the fact that not a single Latin American country today is able to place long-term debt denominated in its own currency. All long-term financial markets (e.g. those that fund infrastructure and housing needs) are denominated either in dollars or are indexed. In fact, even today, the only country where a worker can get an unsubsidized 30-year mortgage loan at 9% interest denominated in the same currency as his wage is Panama!

The fact that long-term financial markets are either dollarized or indexed means that the balance sheets of corporations and individuals suffer from very serious exchange rate mismatches. This makes currency adjustments potentially devastating as has been shown by recent crises in East Asia.

In this context, it is easy to understand the interest in a supra-national currency. It is a way of seriously pre-committing not to devalue, thus avoiding the nightmare scenario of wide-ranging defaults. It is a way to reduce the exchange rate mismatches caused by de facto dollarization and the lack of long-term financial markets denominated in the domestic currency. It is an idea that is prompted by the fact that the world is moving toward a situation where there are two soft drink corporations, two airplane manufacturers, three toothpaste producers and 180 central banks printing their own currency. Consequently, globalized companies, banks and households have to manage serious problems of exchange rate risk, in currencies that have no liquid derivative markets in which to hedge. In fact, European companies found those problems difficult and expensive, prompting their support for the Euro.

In Latin America the attraction of a supra-national currency is understandable for the same reason that the Euro is more popular in Southern Europe than in Germany or France. Spain, Portugal and Italy have seen much larger declines in inflation and interest rates and much larger financial benefits than have their neighbors to the north.

However, a supra-national currency needs to address three issues: seniorage, lender of last resort and governance structure. Seniorage, i.e. the revenue generated by printing fiat money, is a small but not unimportant source of income for most governments. For example, in Argentina it represents about US$ 750 million per year. As a principle of fairness among member countries, a supra-national currency would need to have some acceptable mechanism to share the seniorage proceeds.

Secondly, a lender of last resort facility must be constructed. This is a tricky business because up to now, last resort lending has been done by national central banks to rescue

national banks with the backing of national taxpayers. At the supra-national level the problem presents new angles. Which tax payers will stand behind last resort lending? Which banks are eligible, given their increasingly international character?

Finally, the question of governance is politically complex. Who will make what decisions? With what objectives? Accountable to whom?

These three central questions need to be addressed in the context of concrete structures. In this respect, two models are in the air: mimicking the Euro, or adopting the dollar. The European approach would surely provide a more negotiable governance structure and a more formalized lender of last resort. However, right now no Latin American currency is considered reserve currency and an amalgamation of many weak currencies may not create a particularly strong one. Countries may fear that instead of reducing risks by adopting a single currency, they may be importing significant volatility from their very unstable neighbors. In particular, the launching of the new currency designed to substitute national moneys is unlikely to prompt asset holders to switch away from dollars or to generate long-term markets in the new currency. Hence, existing exchange rate risks and mismatches would survive.

Adopting the dollar would have clear advantages. It is the currency of choice for most international trade and for a large share of the region's financial assets and liabilities. Its adoption would eliminate most of the very large exchange rate risks that exist in the balance sheets of corporations, homeowners and banks.

However, the sharing of seniorage would constitute an issue that would have to be discussed in the context of a treaty with the U.S. government. Can the political case be made in the United States?

If this problem were resolved, the lender of last resort problem could be more easily addressed. Even if the U.S. attempted to restrict access to the discount window of the Federal Reserve System, U.S. banks would line up to furnish the needed regulatory arbitrage provided they could be secured with adequate collateral. In this respect, the future flow of seniorage can be used as prime collateral to generate a "market-based" or privately arbitraged lender of last resort. Moreover, dollarization is likely to increase the set of assets that are considered collateral. In a dollarized system, real estate could be considered collateral while it usually is not used today for international transactions because of the inherent exchange rate and convertibility risk. Moreover, the risks to U.S. taxpayers of lending to Latin banks is mitigated significantly by the fact that in most countries a majority of banks are already foreign owned. Hence, they already receive consolidated home country supervision, a trend that will undoubtedly continue.

The difficult point with dollarization is the governance structure of the monetary authority. Given where Latin America is today—with dollar-denominated interest spreads that move by several hundred basis points on a monthly basis—it is hard to see how a 25 basis point move by the Federal Open Market Committee (FOMC) once in a blue moon would be much noticed. This is especially true given that spreads are likely to decline

significantly from their current levels. Moreover, as we have seen, the region already imports the decisions of the FOMC, especially in flexible exchange-rate regimes.

Politically, the Fed is likely to want to maintain total independence because it may fear that markets will think it might consider the economic conditions of Latin America when setting policy. But that fear is probably a reality in today's world. Was it not the economic conditions of emerging markets and their impact on the U.S. financial system that prompted the interest rate cuts of October and November 1998?

For Latin America, the symbolic loss of its formal monetary institutions and the national currency is likely to be difficult. Globalization has caused the disappearance of many flagship airlines and the appearance of foreign artistic designs on the tails of British Airways jumbo jets. Would a dollar bill with Columbus on it be a proper symbol for the currency of the Americas?

Table 1. Proportion of Exchange Rate Arrangements by Period

	1960-73		1974-81		1982-88		1989-94	
Type of arrangement	#of Obs	%	#of Obs	%	#of Obs	%	#of Obs	%
Fixed to single currency	322	88.5	159	76.4	110	60	56	35.9
Fixed to basket					4	2.2		
Fixed w/frequent adj.	18	4.9	12	5.8	4	2.2	3	1.9
Forward looking crawling peg			9	4.3	4	2.2	10	6.4
Forward looking crawling band							3	1.9
Backward looking crawling peg	12	3.3	22	10.6	46	25	9	5.8
Backward looking crawling band							7	4.5
Dirty Floating	8	2.2	6	2.9	5	2.7	28	17.9
Free Floating	4	1.1			9	4.9	40	25.6
Total	364	100	208	100	182	100	156	100

Source: Frieden, Ghezzi and Stein (1999)

Table 2. Reserves, Exchange Rates and Interest Rates since the Asian Crises

	May 97- Nov 97			**Dec 97-Jul 98**			**Jul 98-Oct 98**		
	FINANCIAL CRISIS IN ASIA			**TERMS OF TRADE**			**RUSSIAN CRISIS**		
	ΔR	Δe	Δi	ΔR	Δe	Δi	ΔR	Δe	Δi
Argentina	4.40	0.00	2.40	0.80	0.00	-2.13	0.98	0.00	0.81
Brazil	-12.11	3.56	18.68	33.79	4.12	-15.31	-40.45	2.65	17.66
Chile	10.72	3.91	6.50	-16.30	5.78	8.29	3.66	-0.58	2.15
Colombia	-2.38	21.06	0.26	-8.57	5.96	8.76		12.87	0.89
Costa Rica	13.27	5.12	-0.75	-14.16	6.13	0.76	-2.79	2.78	0.00
Ecuador	-5.26	10.66	-0.02	-2.62	21.07	9.36	-21.58	25.72	2.96
Mexico	10.25	3.69	1.26	10.01	10.32	1.16	-3.17	13.90	12.94
Panama	-39.94	0.00	-0.26	13.05	0.00	0.03	-2.37	0.00	-0.09(*)
Peru	4.89	1.87	-0.94	0.64	7.33	7.60	-3.90	4.78	12.44
Uruguay	22.08	5.82	-1.77	9.47	4.94	-6.42		1.40	8.82
Venezuela	22.41	3.41	2.87	-20.66	11.55	19.35	1.37	1.51	2.34

Source: IFS
(*)August

Table 3 Domestic Real Monthly Interest Rates and the Output Gap

Dependent variable: real ex post monthly interest rates

	All observations	Inflation<20%	Inflation<20% Country dummies
Pegged XR	-.0018 (-0.22)	.0014 (0.46)	.0101 (2.45)
Output gap	-.1577 (-3.21)	-.0050 (-.40)	-.0130 (-1.01)
Pegged*Output Gap	.1418 (1.21)	.021 (1.07)	.0316 (1.59)
Number of observations	867	388	388
R2	.07	.58	.60

Table 4. Domestic Interest Rates

	I*	contant
Argentina 12/9/97-18/2/99	1.45 (15.9)	-7.19 (-7.2)
Mexico 01/01/98-18/02/99	5.93 (27.4)	-36.05 (-15.99)
Venezuela 12/9/97-11/2/99	2.77 (21.6)	-5.07 (-2.94)

Table 5. Domestic Real Monthly Interest Rates and the Impact of Foreign Rates

Dependent variable: real ex post monthly interest rates

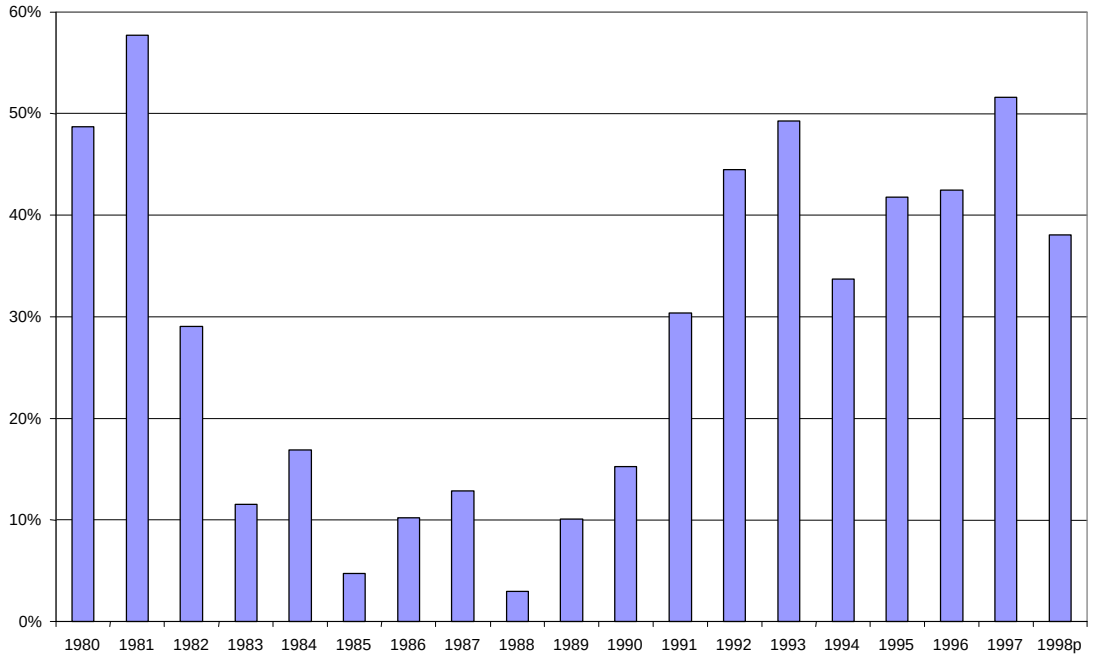
US Real interest rate	.96 (2.0)
Pegged exchange rate	-.032 (-1.02)
Peg*US Real int.rate	.-.25 (-.29)
Number of observations	2272
R2	.003

Table 6. Real Exchange Rate Gap: Output Gap

	Inflation<20%
Output gap	.179 (1.21)
Pegged exchange rate	.0832 (6.91)
Peg*Output gap	-.079 (-.34)
Number of observations	460
R2	.098

Figure 1

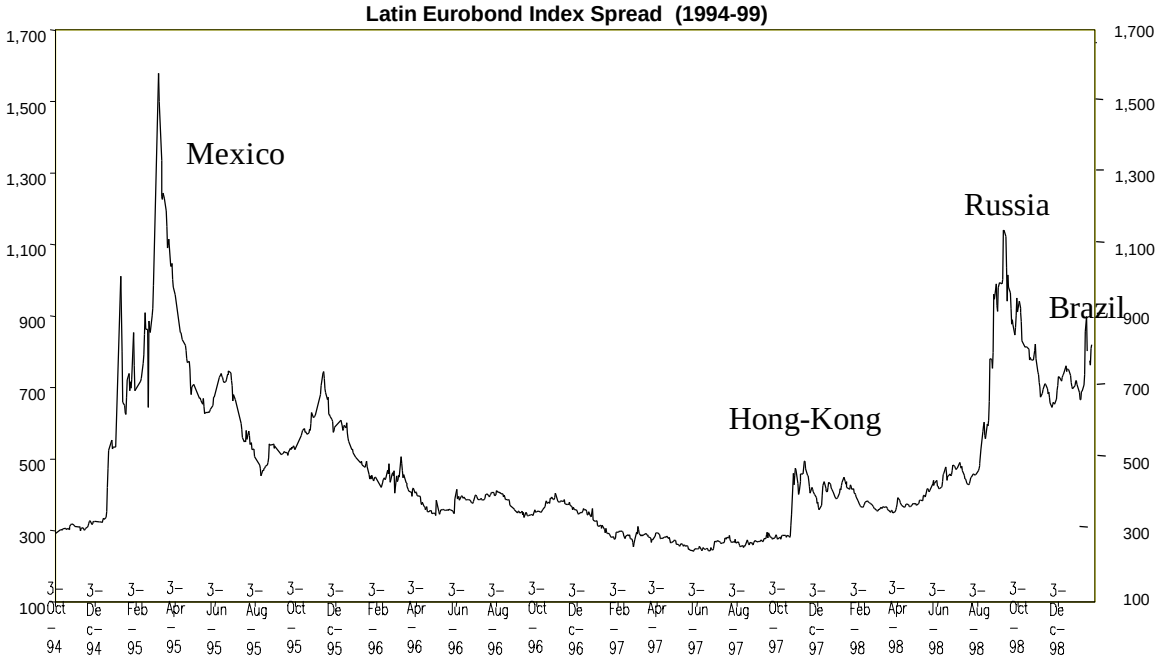
The Volatility of Capital Flows
(% GDP)



Source: IMF

Figure 2

Volatility of Yields on Latin American Sovereign Dollar Bonds



Source: JP Morgan.

Figure 3

Correlation of Emerging Market Bond Prices across Disparate Regions

EMBI+ Price Index (1994-98)

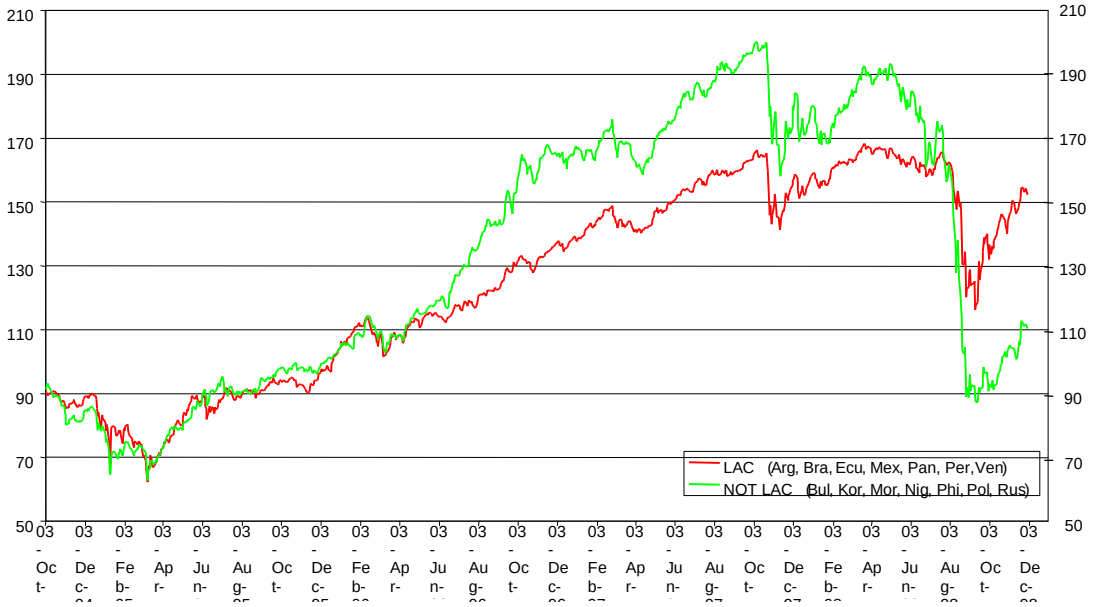
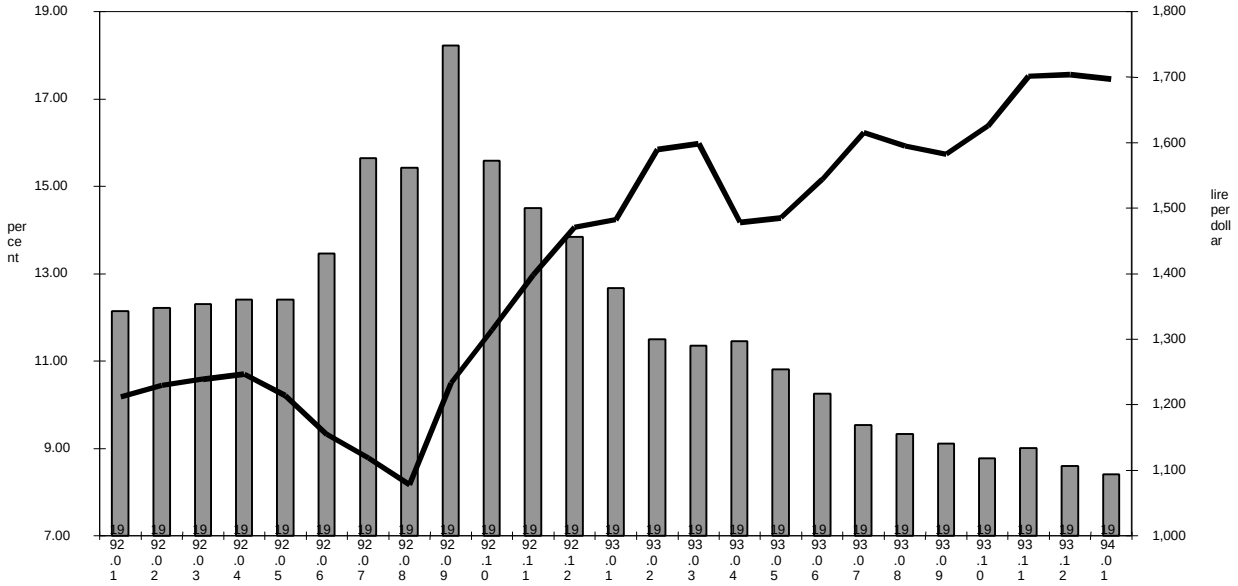
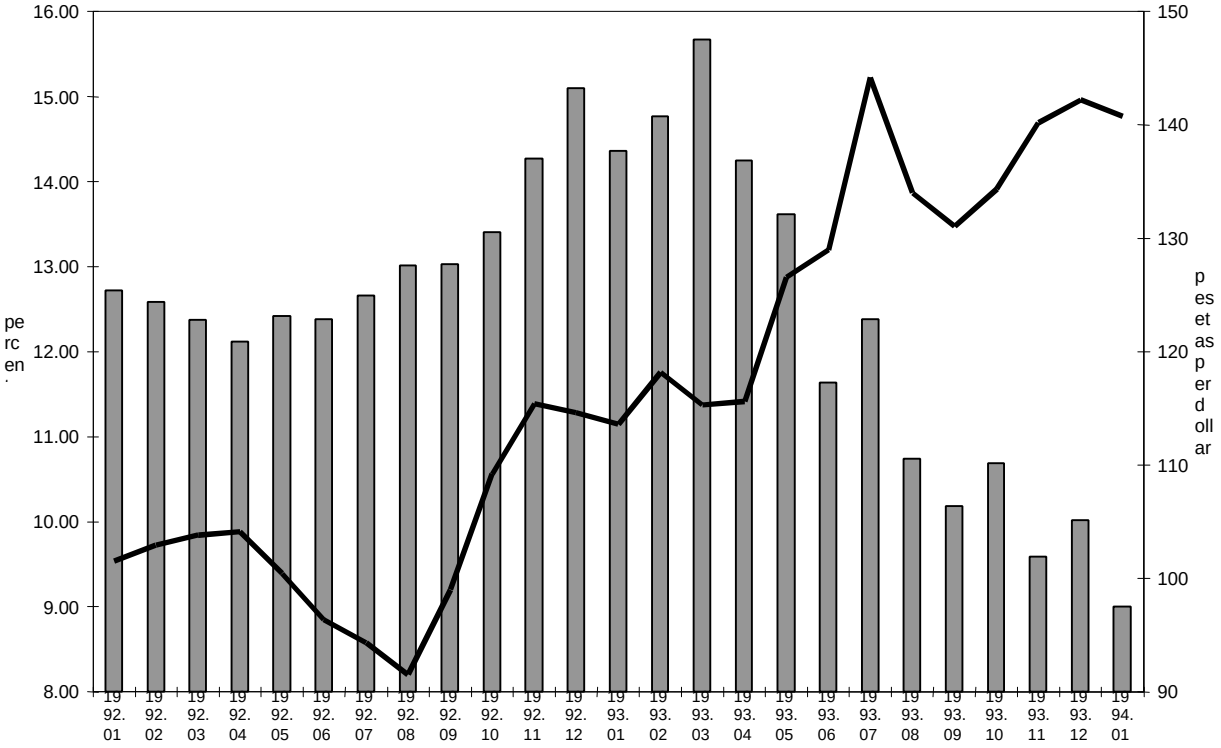


Figure 4

ITALY: Nominal Exchange Rate and Interest Rate



SPAIN: Nominal Exchange Rate and Interest Rate



UK: Nominal Exchange Rate and Interest Rate

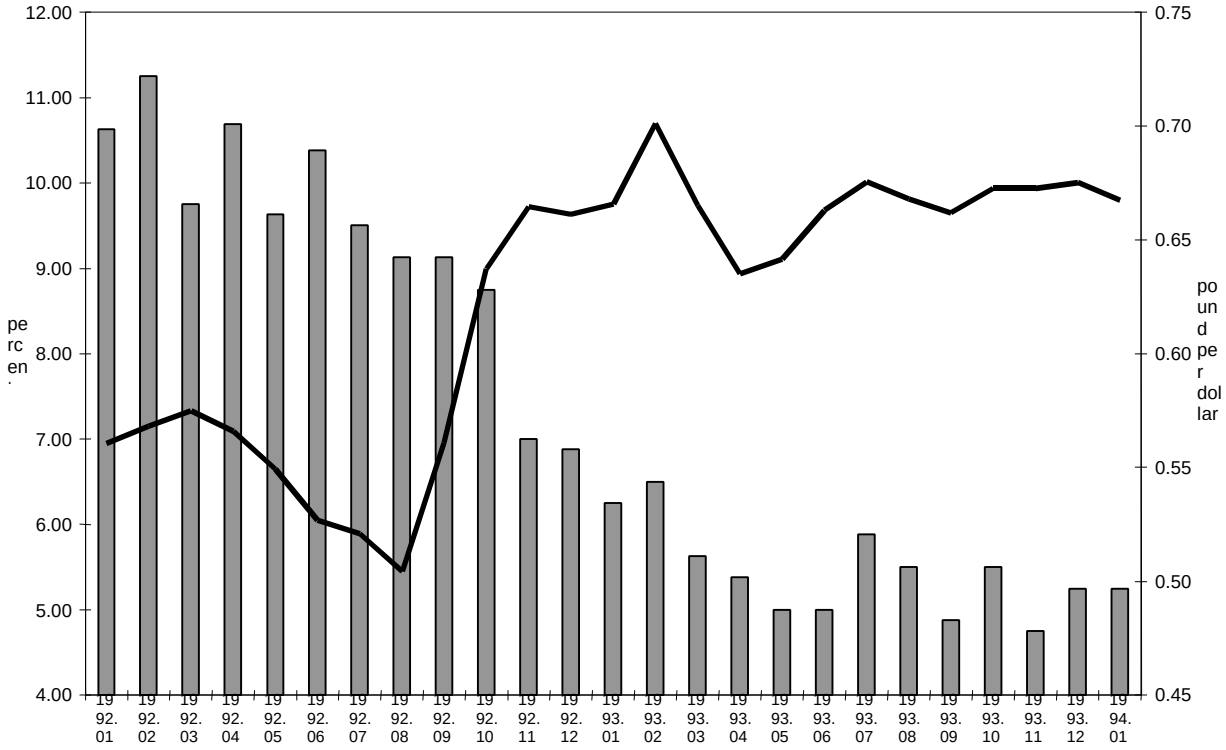
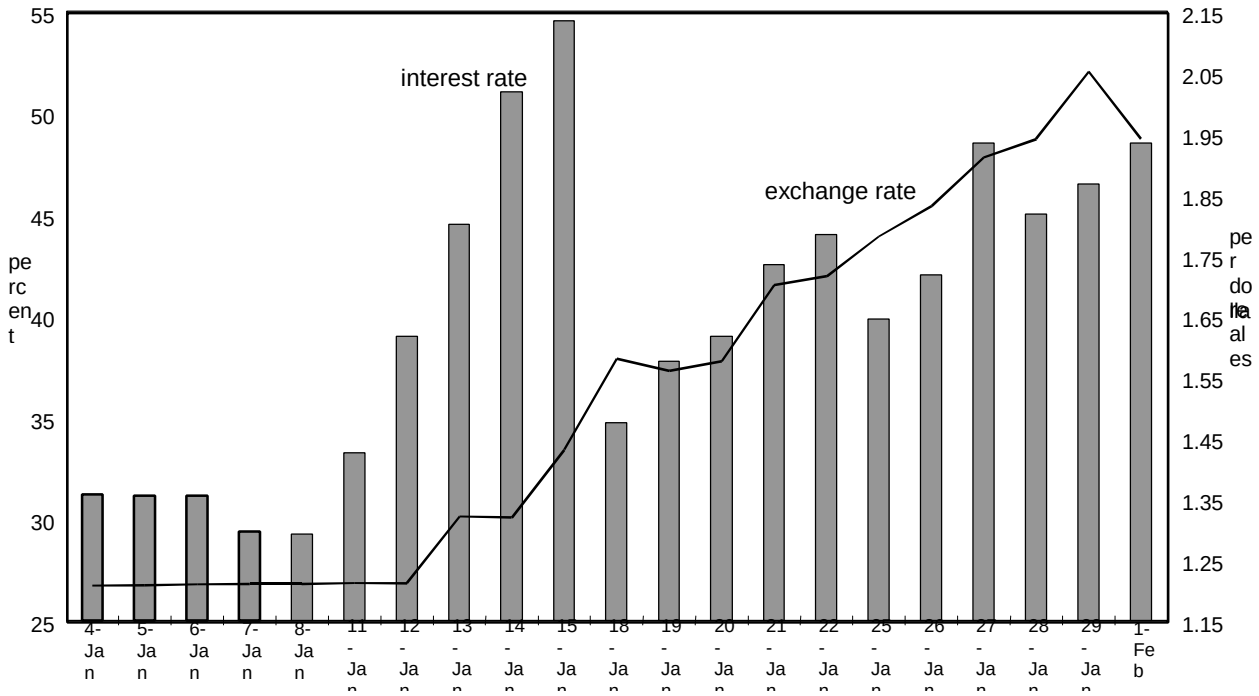


Figure 5

BRAZIL: Nominal Exchange Rate and Interest Rate



MEXICO: Nominal Exchange Rate and Interest Rate

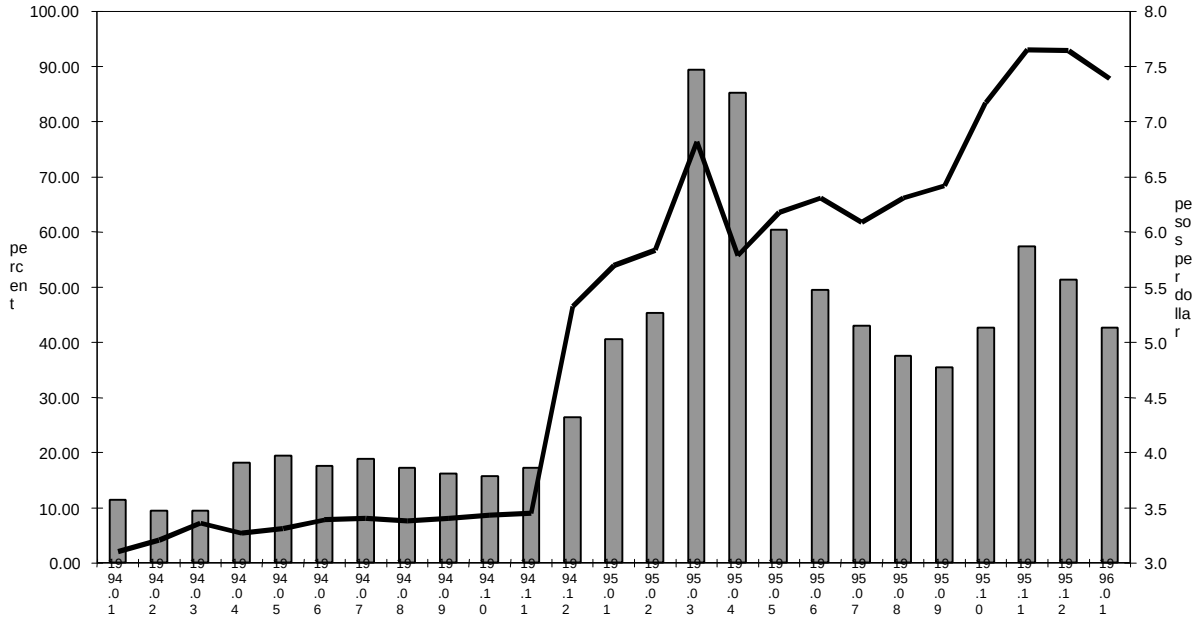


Figure 6

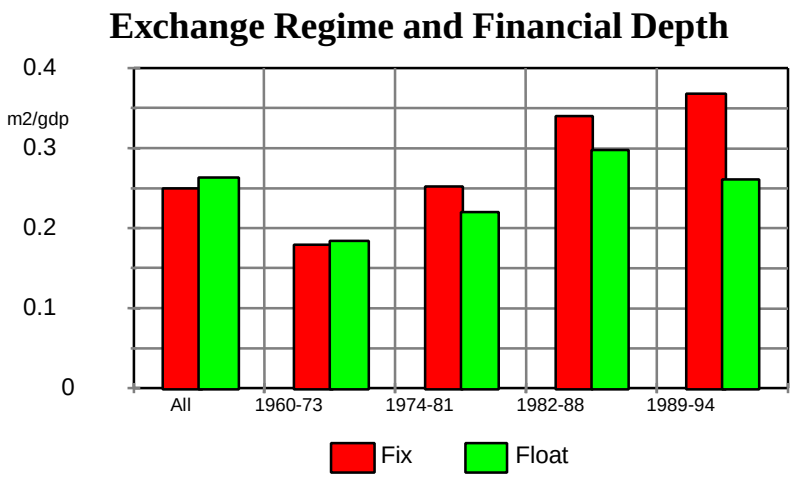


Figure 7

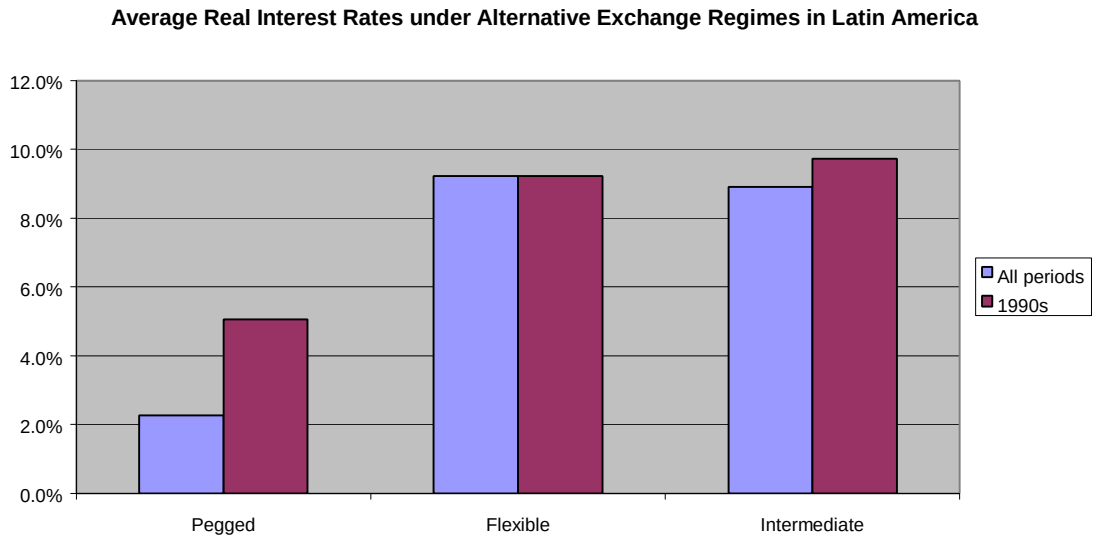
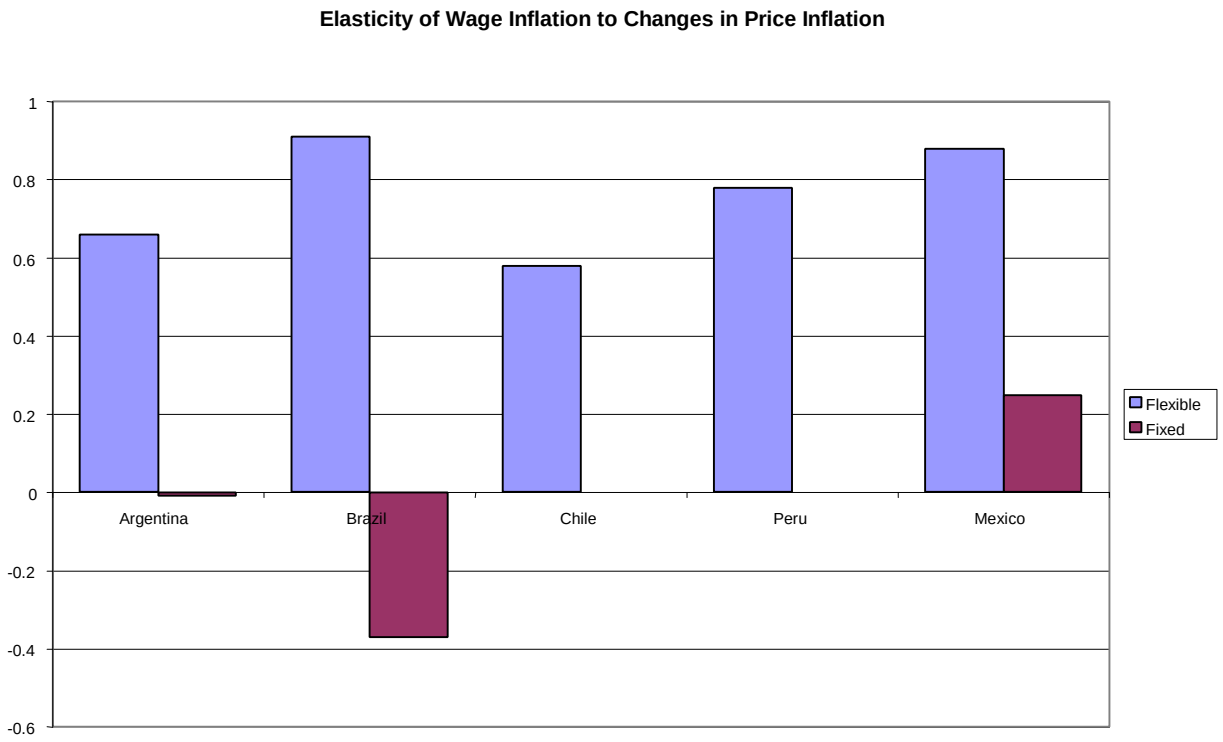


Figure 8


Elasticity of Wage Inflation to Changes in Price Inflation
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
Argentina
Brazil
Chile
Peru
Mexico
Flexible
Fixed

Appendix A

In this appendix, we describe the data and present the evidence on the relationship between exchange rate regimes and financial depth. As a proxy for financial depth, we used the ratio of M2/GDP.[7] In order to correct for the effect of inflation, the value of the variable for a particular year was calculated as the average of monthly M2 for the year divided by that year's GDP. Had we simply used M2 corresponding to the end of year, this variable would have had an upward bias in years of high inflation.

To characterize exchange rate regimes, we used two different definitions: First, we defined as fixed (PEG) all regimes that were fixed to a single currency or to a basket of currencies, according to the classification in the *Exchange Arrangements and Exchange Restrictions* of the IMF. We excluded from the definition those countries where the value of the nominal exchange rate lasted less than six months, in an attempt to separate the regimes that are fixed for a reasonable length of time from those which are "fixed but adjustable." Second, we use a more narrow definition (PEG1) in which the regime is considered to be fixed if the nominal exchange rate is constant (or, more precisely, did not change by more than 1 percent per year) during a period of at least 24 months. This is an attempt to capture those cases in which the exchange rate was "really fixed."[8]

Among other potential determinants of financial depth, we considered inflation and per-capita GDP. Since the effect of inflation was not expected to be linear, we used the log of inflation (or, more precisely, log 1 + inflation) as a control variable. In order to capture non-linear effects, we also added a dummy for hyperinflation in addition to the log of inflation, but this variable turned out not to be significant, and was excluded from the regressions shown here. Similarly, the regressions using per-capita GDP are not shown. In this case, our concern was the potential for endogeneity, in particular in the second set of regressions discussed below. It should be noted, however, that the inclusion of this variable did not change the effect of the regime on financial depth in any significant way.[9]

Table A1 presents the results of our panel regressions, which include fixed effects for each country and each year. The country dummies capture the effect of omitted country characteristics, which are implicitly assumed to be invariant over time. The time dummies capture common shocks that could affect the degree of financial depth (such as the oil crises, the debt crisis, or common capital flows), as well as the effect of technological changes. In fact, the upward trend in financial depth seen in figure %% suggests the appropriateness of using time dummies. As shown in the table, fixed exchange rate regimes increase financial depth between 4 and 5 percentage points of

[7] The source for M2 is the IFS. GDP was taken from the Economic and Social Database of the IDB (ESDB).

[8] We also used a third, broader definition, which groups the forward-looking regimes (such as the "tablitas") together with the fixed regimes. Perhaps due to the fact that there are few observations of forward-looking pegs and crawls compared to the number of fixed regimes, the results varied little and are thus not reported here.

[9] The source for inflation is the IFS. Per-capita GDP was taken from the World Penn Tables.

GDP, depending on the specification and the definition of regime chosen, and the coefficients are highly significant.

While the regressions discussed above account for country characteristics, they do not capture the differences across countries in measuring the effect of the regime. For this reason, we ran a second set of regressions (between regressions on panel data) to capture this cross-country variation. These regressions, presented in Table A2, are equivalent to a cross-section regression in which the dependent variable is the average financial depth over the sample period, and the independent variable of interest is the proportion of years in which the country has operated under fixed regimes. The measured effects are much larger in this case. Financial depth in countries that have had fixed regimes throughout the period is estimated to be around 20 percentage points of GDP larger than that in countries under flexible regimes. The coefficient is quite robust to changes in both the specification of the equations, or the definition of the regime.

Table A1
Panel Regressions with (Country and Time) Fixed Effects
Dependent Variable: M2/GDP

	Using Peg		Using Peg1	
fixed regime	0.047	0.0394	0.0487	0.455
	(4.564)	(3.655)	(5.203)	(4.604)
log inflation		-0.0454		-0.0447
		(-5.89)		(-5.94)
Number of obs.	773	721	851	795
Adj. R sq.	0.654	0.665	0.651	0.658

Regressions include country dummies and time dummies, not shown in the table
t-stats are in parenthesis

Table A2
Between Regressions (Cross country means of each variable for each country)
Dependent Variable: M2/GDP

	Using Peg		Using Peg1	
fixed regime	0.211	0.196	0.207	0.214
t-stat	2.616	2.11	2.849	2.324
log inflation		-0.0337		-0.00867
t-stat		-0.509		-0.11
Number of obs.	773	721	851	795
Adj. R sq.	0.2219	0.2747	0.2527	0.2983

Peg = 1 if the regime is fixed and the level unchanged for at least six months
Peg1 = 1 if the regime is "really fixed", defined as unchanged for at least two years

Appendix B. Nominal Wage Response to Changes in Inflation under Alternative Exchange Rate Regimes

To investigate nominal wage responses to surprises in inflation we estimate the following regression using monthly data series for fixed and flexible exchange rate periods.

$$d(\log w) = c + beta1 * trend + beta2*(trend)^2 + beta3*d(\log p)$$

where w is the nominal monthly industrial sector wage and p is the monthly consumer price index. Performing Dickey-Fuller tests on the monthly data we did not reject the null hypothesis of unit root. For that reason, the specification was run in first differences. The linear and the quadratic terms reflect expected trends in inflation. Therefore, *beta3* captures the contemporaneous response of wage inflation to unexpected surprises in price inflation.

Table B1: Coefficient on d(log p)

	Flexible	Fixed
Argentina	86:02-88:12 [8.5%]	93:01-98:06 [.2%]
beta3	0.66	-0.009
t-statistic	(2.72)	(-.11)
Brazil	89:06-93:06 [19.3%]	94:12-96:12 [1.2%]
beta3	0.91	-0.37
t-statistic	(6.08)	(-.24)
Chile (*)	90:02-94:01 [1.3%]	
beta3	0.58	NA
t-statistic	(2.95)	NA
Peru 1/	92:01-94:06 [2.9%]	
beta3	0.78	NA
t-statistic	(1.36)	NA
Mexico 2/	91:01-94:01 [.99%]	70:02-75:01 [.97%]
beta3	0.88	0.25
t-statistic	(1.03)	(0.43)

Note: In square brackets the average inflation rate in the period.
1/Bimonthly Data.
2/ The exchange regime during the period 91:01-94:01 was a Backward looking crawling Peg
(*) Results for Chile show the cumulative response of wages over a quarter

Results for Chile indicate that the coefficient beta3 was almost zero, yet significant auto-correlation was present in the residuals. In order to test whether there were significant delays in responses, a second specification was run again for all countries including *d(log*

P_{t-1}) and $d(\log P_{t-2})$. These terms were highly significant for Chile. Therefore, in the former table we report the quarterly cumulative response of wage inflation to a change in price inflation. This cumulative response is computed as the sum of the three coefficients on prices and lagged prices. In the rest of the cases, the inclusion of lags did not substantially affect the results. For instance, in Brazil, during the end of the eighties, the cumulative response resulted in 100% versus the 91% same month response reported in the previous table. In general the cumulative response was somewhat larger than the contemporaneous one under flexible regimes and smaller under more fixed exchange regimes, reinforcing our results that wage responses are smaller under fixed than under flexible regimes.

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