NBER WORKING PAPER SERIES

EXCHANGE RATES AS NOMINAL ANCHORS

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Working Paper No. 4246

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 1992

This is a significantly revised version of a paper prepared for the World Bank in October of 1991. I have benefitted from comments by participants in a World Bank seminar. I am particularly grateful to Ramgopal Agarwala and Federico Sturzenegger for fruitful discussions and comments. Abraham Vela has provided able research assistance. I also thank Fernando Losada for his help. Finally I thank an anonymous referee for useful comments. This paper is part of NBER's research programs in International Finance and Macroeconomics and International Trade and Investment. Any opinions expressed are those of the author and not those of the National Bureau of Economic Research.

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ABSTRACT

This paper discusses the use of nominal exchange rates as nominal anchors in stabilization programs. The first part deals with the dynamics of inflation in highly indexed economies. It is shown that credible exchange rate anchors will reduce the degree of inflationary inertia. However, if some residual inertia is maintained in some contracts, real exchange rate overvaluation will result. Data from Chile, Mexico and Yugoslavia are used to test the implications of the model. The second part deals with the long run, and uses a 56 countries data set to investigate whether fixed exchange rates have been associated with greater financial discipline.

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I. Introduction

In 1973 the international monetary system forged in Bretton Woods experienced a final collapse, as the industrial nations abandoned all efforts to sustain a fixed exchange rate system and decided to adopt freely floating exchange rates. In spite of this significant change in the international financial system, throughout the 1970s most of the developing countries continued to rely heavily on fixed exchange rates. For example, the December 1979 issue of the International Financial Statistics (IFS) reports that 85% of the developing countries had some sort of fixed exchange rate system at that time.

During the 1980s and early 1990s, however, more and more developing countries moved away from fixed exchange rates and adopted more flexible regimes. For example, according to the December 1990 issue of the IFS the proportion of LDC members of the IMF that had some type of fixed exchange rate had declined to 67%.[1] This movement on behalf of the LDCs towards greater exchange rate flexibility was, to a considerable extent, associated with the debt crisis unleashed in 1982. Those countries that had to cope with sudden cuts in external financing had very limited policy options. In an effort to engineer gigantic resource transfers to their creditors, most of these countries adopted adjustment packages that included, as an

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[1]The IFS distinguishes several categories of fixed exchange rate countries, including those pegged to the U.S. dollar, those pegged to the French franc and those pegged to a "composite of currencies". It is unclear, however, to what extent the countries in this latter group have indeed followed a policy of pegging their currency to a basket. For all practical purposes, if a country alters continuously the composition of the basket the resulting policy will not be one of a pegged exchange rate, but rather a form of exchange rate management.

important component, large nominal devaluations. It is in this context that in the mid-1980s we saw the end to long experiences with fixed exchange rates in countries such as Venezuela, Paraguay and Guatemala.

Recently, however, a number of observers and experts -- including prominent members of the IMF Executive Board -- have argued that the enthusiasm for devaluation an active exchange rate policy has gone too far. It has been pointed out that by relying too heavily on exchange rate adjustments, and by allowing countries to adopt administered systems characterized by frequent small devaluations, many adjustment programs have become excessively inflationary. According to this view exchange rate policy in the developing countries should move towards greater rigidity -- and even complete fixity -- as a way to introduce financial discipline and provide a nominal anchor. This position has largely been influenced by modern macroeconomic views that emphasize the role of expectations, credibility and institutional constraints. Others, however, maintain that exchange rate flexibility allows developing countries to avoid real exchange rate (RER) overvaluation, and to accommodate shocks to real exchange rate fundamentals without incurring real costs.[2]

In the 1990s the debate on exchange rates as nominal anchors acquired a new dimension, as the countries of Eastern Europe and the former Soviet Union began to reform their economies. Many countries in the region, including Poland, Czechoslovakia, and Yugoslavia, adopted a fixed exchange rate as a fundamental component of their anti-inflationary programs. However, as in the developing

[2]For a flavor of the discussion within the IMF see, for example, Burton and Gillman (1991), Aghevli et al. (1991) and Flood and Marion (1991).

countries, the adoption of fixed exchange rates as a way to bring down inflation have generated important debates in Eastern Europe. Some authors have argued that this approach is likely to generate a real exchange rate appreciation, putting the balance of payment targets of the program in jeopardy.[3]

The ongoing debate on the desirability of an exchange rate policy in the developing and Eastern European countries stems largely from the fact that exchange rates are perceived as playing two different roles. On the one hand, exchange rates, jointly with other policies, play an important role in helping maintain international competitiveness. On the other hand, exchange rates -- also jointly with other policies -- help promote macroeconomic stability and low inflation. In a way, when making decisions regarding exchange rate action, economic authorities face a classical policy dilemma. Most of the recent academic literature on the subject has focused on optimal ways of assigning exchange rates and other policy tools to competing objectives, and on determining the optimal degree of exchange rate flexibility.

The purpose of this paper is to discuss some of the most important issues related to the merits and limitations of using exchange rates as anchors. I deal with aspects of exchange rate policy under two macroeconomic scenarios. In Section II, I consider the case of an indexed economy with considerable inflationary inertia. In this case the initial condition is one of (approximate) RER equilibrium, but rapid inflation prevails. This scenario corresponds to the experiences of many Latin American and Eastern European countries. This section focuses on the role of a nominal exchange

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[3]See Nunnenkamp (1992).

rate anchor in a disinflation process, and stresses the need for credible commitments to financial stability. In this section I analyze empirically some of the recent experiences with exchange rate anchors in stabilization programs in Latin America and Eastern Europe. In Section III, I consider a longer term perspective, and I inquire whether the adoption of fixed exchange rates introduces financial discipline, as is argued in recent credibility-based models. Finally, in Section IV, I present some concluding remarks and policy implications of the previous discussion.

II. Inflation, Stabilization and Nominal Exchange Rate Anchors

It has long been known that it is not possible to maintain a fixed exchange rate under conditions of major fiscal imbalances financed by money creation. If domestic inflationary pressures exceed "the" international rate of inflation, international reserves will decline, overvaluation will take over, and a speculative attack on the Central Bank foreign exchange holdings will eventually take place.[4]

A number of countries that have suffered from high inflation have dealt with this situation by adopting an adjustable, or crawling peg, exchange rate regime, where the nominal exchange rate is periodically adjusted according to inflation rate differentials. The motivation behind this type of system is the recognition that, given the country's fiscal stance, it is not possible to maintain a competitive real exchange rate with a fixed nominal exchange rate. In this scenario the economy typically learns how to live with relative high inflation, and generalized indexation becomes institutionalized.

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[4]There is now an extensive literature on speculative attacks under fixed exchange rates. The pioneering piece is Krugman (1979). See Edwards (1989a) for a number of case studies on the subject.

In the 1960s and 1970s there was considerable enthusiasm regarding the potential role of indexation as a way to isolate the real sector from the effects of inflation. In the last few years, however, it has become clear that the benefits of indexation had been greatly overestimated. The experiences of a large number of countries -- especially in Latin America -- showed that a generalized indexed system introduces great rigidities into the economy, precluding required relative prices adjustments. Additionally, it was found that once indexation becomes ingrained, inflationary forces exhibit a remarkable degree of inertia, almost acquiring a life of their own.

In the late 1970s and 1980s a number of countries have tried to break these inertial inflationary forces by implementing stabilization programs based on replacing their crawling peg regimes by a fixed exchange rate or nominal exchange rate anchor.[5] Naturally, in order for these programs to succeed in moving the economy to lower inflation, the fixing of the nominal exchange rate has to be accompanied by restrictive credit and fiscal policies.

In this section I analyze the mechanics of exchange rate indexation and inflationary inertia and I discuss under what circumstances the adoption of nominal exchange rate anchors are expected to be successful in a stabilization program. In doing this I deal with the issue of credibility and I stress the need to implement a broad de-indexation program that goes beyond the exchange rate. I also provide an empirical analysis of three recent historical experiences with nominal exchange rate anchors.

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[5]For a discussion on the use of alternative anchors in stabilization programs see, for example, Bruno (1991). See, also, Kiguel and Liviatan (1992) and Calvo and Vegh (1990).

II.1 The Simple Mechanics of Indexation, Inflationary Inertia and Nominal Exchange Rate Anchors

Consider the case of an economy that produces two types of goods: tradables and nontradables. Tradables prices are assumed to be linked to international prices, while nontradables prices are determined by the condition that this market clears at all times. In order to focus on inflationary issues I abstract from problems related to changes in real exchange rate fundamentals, such as terms of trade, the degree of protection and capital flows.[6] I assume that initially the country follows a passive crawling peg exchange rate system, where the exchange rate rule consists of adjusting the nominal exchange rate by a proportion ϕ ($\phi \leq 1$) of lagged inflation differentials. I also assume that wages are adjusted according to a rule that includes lagged inflation as well as expected future inflation. Monetary policy is assumed to be passive and to accommodate inertial inflationary forces. This stylized economy, which captures, for example, some of the most salient aspects of many Latin American countries in the 1980s, can be depicted by the simple set of equations:

$$\pi_t = \alpha\pi_{Tt} + (1-\alpha)\pi_{Nt} \tag{1}$$

$$\pi_{Tt} = E_{t-1}(dt+\pi^*_{tt}) \tag{2}$$

$$d_t = \phi(\pi_{t-1}-\pi^*_{t-1}) \tag{3}$$

$$N^D(P_N/P_T, z_t) = N^S(W/P_N) \tag{4}$$

$$w_t = \gamma\pi_{t-1} + (1-\gamma)\pi^e_t \tag{5}$$

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[6] On these issues see Edwards (1989a).

where the following notation has been used:

π_t = rate of change of the domestic price level;

π_{Tt} = rate of change of the price of tradables in domestic currency in period t;

π_{Nt} = rate of change of nontradable prices in period t;

d_t = rate of devaluation in period t;

π^*_t = rate of world inflation in period t;

E_{t-1} = expectations operator, where expectations are assumed to be formed in period t-1;

w = rate of change in nominal wages;

z_t = index of aggregate macroeconomic policies, which includes monetary expansion beyond passive accommodation of past inflation;

N^D, N^S = demand and supply for nontradables;

ϕ, γ = parameters that measure the degree of indexation in this economy.

Equation (1) says that the domestic rate of inflation is a weighted average of tradables and nontradables inflation. Equation (2) states that the law of one price holds ex ante, and that the change in the domestic price of tradables is equal to the expected change in the exchange rate plus the expected rate of world inflation.[7]

Equation (3) is the devaluation rule, and states that the exchange rate is adjusted in a proportion ϕ of inflation rate differentials. If $\phi = 1$ we have a typical Purchasing Power Parity rule, where the rate of devaluation is equal to (lagged) inflation rate

[7]The presence of the expectations operator reflects the assumption that the domestic price of tradables is set before the rate of devaluation or world inflation are observed.

differentials. This type of policy has sometimes been referred to as a "real target" approach.[8] Equation (4) is the market clearing condition for nontradables. The demand for nontradables is assumed to depend on relative prices (P_N/P_T) and on aggregate demand (z_t); the supply of nontradables is assumed to be a function of real product wages. Finally, equation (5) is the wage adjustment rule, and states that wage increases depend on two factors: lagged inflation and expected future inflation. The special case when $\gamma = 1$ corresponds to a situation where there is 100% backward looking wage indexation. In equation (5) the value of γ will determine the degree of inflationary "memory" of this economy. Although in equation (5) w stands for the rate of change of nominal wages, it is perhaps more useful to think this variable captures a broader category of "other" costs. In that sense, then, the coefficient γ can be interpreted as summarizing the degree of indexation of non-exchange rate contracts in the economy.[9]

This model can be solved in order to find an expression for the dynamics of inflation. Before solving the model it is necessary to make an assumption regarding inflationary expectations. Consider the case of rational expectations, where actual realizations of inflation in period t differ from the expectations formed at the beginning of that period by a random term μ: $\pi_t = \pi^*_t + \mu_t$.

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[8]This, however, is a somewhat misleading name since it is used to denote two quite different policies. While some authors refer to a strict PPP rule as a "real targets" policy, others define this "real target" as a policy aimed at accommodating changes in RER fundamentals. See Corden (1991).

[9]Notice that in this model no explicit expression has been included for the rate of growth of domestic credit. This responds to the assumption that the monetary authorities follow a passive credit policy that accommodates the inertial inflation.

After manipulating equations (1) through (5) the dynamics of domestic inflation can be written as the following first order difference equation:[10]

$$\pi_t = a_1\pi_{t-1} + a_2\pi^*_{t-1} + a_3\hat{z}_t + \mu' \tag{6}$$

where:

$$a_1 = \frac{(\eta+\alpha\epsilon)\phi+\epsilon(1-\alpha)\gamma}{(\eta+\epsilon\alpha)+\epsilon(1-\alpha)\gamma} \tag{7}$$

$$a_2 = \frac{(\eta+\alpha\epsilon)(1-\phi)}{(\eta+\epsilon\alpha)+\epsilon(1-\alpha)\gamma} \tag{8}$$

$$a_3 = \frac{-\delta(1-\alpha)}{(\eta+\epsilon\alpha)+\epsilon(1-\alpha)\gamma} \tag{9}$$

and where η is the demand elasticity of nontradables with respect to relative prices ($\eta < 0$), ϵ is the supply elasticity of nontradables with respect to the real product wage ($\epsilon < 0$), δ is the demand elasticity of nontradables with respect to aggregate demand pressures, and μ' is an error term related to μ.

In equation (6) coefficient a_1 provides a measure of the degree of <u>inertia</u> of domestic inflation. The closer is a_1 to unity the more persistent will inflation be, and the higher the degree of inertia. As can be seen from the definition of a_1 in equation (7), the degree of inertia in the economy will depend on the different elasticities involved <u>and</u>, what is particularly important for this discussion, on the indexation parameters ϕ and γ.[11]

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[10] In obtaining (6) I also assumed that $E_{t-1}(\pi^*_{Tt}) = \pi^*_{t-1}$.

[11] Recently a number of authors have discussed alternative ways of measuring the degree of persistence in the time series of GNP (Cochrane, 1988). Much of this recent discussion has centered on measuring persistence in non-stationary series.

From equation (6) a number of important features of the dynamics of inflation emerge. First, if there is full lagged indexation of the exchange rate -- that is, ϕ is equal to one -- the coefficient of π_{t-1} will become unity $a_1 = 1$. Under these circumstances the system will have no anchor, and the time series of domestic inflation will exhibit a unit root. In this case inflation could explode as a result of exogenous, or aggregate demand shocks. Second, if ϕ is smaller than one, the autoregressive term a_1 will also be smaller than one, and inflation will be characterized by a stationary process. In this case domestic inflation will converge to the world rate of inflation.[12] The speed at which this convergence process takes place will depend on the degree of backward wage rate indexation. Third, and related to the previous point, a reduction in the rate of exchange rate indexation ϕ will result in a decline in the value of a_1 and, thus, in a reduction in the degree of inflationary inertia in the economy. This, of course, has been the rationale for adopting nominal exchange rate anchor policies in a number of countries. It is possible to argue, however, that if the announced anchor policy is not credible ϕ will not decline and the reduction in inertia will not necessarily occur.

A fourth interesting feature of equation (6) is that if indexation is totally eliminated, and both ϕ and γ become simultaneously equal to zero, domestic inflation will immediately converge to world inflation. This situation corresponds to a Poincare-type stabilization program.[13] Notice, however, that if after the nominal exchange rate is fixed ($\phi=0$) some degree of wage indexation remains ($\gamma>0$) there will still be some inertia

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[12]Assuming that in the steady state $\hat{z} = 0$.

[13]This again assumes that aggregate demand measures have been eliminated ($\hat{z}_t=0$), and that there is full credibility. See Sargent (1986).

and the real exchange rate will be subject to consistent appreciation during the transition process. In a sense, then, the authorities face a tradeoff where, on the one hand, the exchange rate anchor will reduce inertia and, on the other hand, it will generate a loss of international competitiveness. Whether the net benefits of this package will be positive will depend on a number of factors, including the initial level of the real exchange rate -- an initial condition of undervaluation being preferred -- and the extent to which the degree of inertia (coefficient a_1 in the current representation) is actually reduced. Under some conditions, however, it is possible to face situations where due to the lack of credibility in the anchor policy -- or, more clearly, due to backward looking expectations -- the country ends up in the worst of worlds, with no significant reduction in the degree of inflationary inertia and a substantial loss in competitiveness.

It is easy to extend the analysis to the more general case when the system has a longer inflationary memory, and wage rate adjustments depend on lagged inflation in more than one period. In this case the dynamics of inflation will be represented by a K^{th} order difference equation, and it will still be true that full backward indexation of the rate of devaluation will result in domestic inflation having a unit root.

An interesting special case emerges when the wage adjustment rule depends exclusively on past inflation. If only one period lagged inflation is taken into account for wage increases, equation (5) becomes:

$$w_t = \gamma \pi_{t-1}, \quad \gamma \leq 1. \tag{5'}$$

In this case the dynamics of inflation is given by:

$$\pi_t = \frac{(\eta\phi+\epsilon\gamma)+\alpha\epsilon(\phi-\gamma)}{\eta+\epsilon}\,\pi_{t-1} + \left(\frac{\eta+\alpha\epsilon}{\eta+\epsilon}\right)(1-\phi)\pi^*_{t-1} - \frac{\delta(1-\alpha)}{\eta+\epsilon}\,\hat{z}_t \qquad (10)$$

If γ and ϕ are equal to one (full backward indexation), domestic inflation will have a unit root. On the other hand, if either ϕ or γ are smaller than one, the coefficient of π_{t-1} in (10) will be smaller than one, and inflation will be characterized by a stationary process.

An important implicit assumption in the nominal exchange rate anchors approach to disinflation is that the adoption of a fixed nominal exchange rate is a credible policy and that the public believes that, from the date of the new policy announcement, the coefficient ϕ will remain lower.[14] In fact, one of the most commonly used arguments for favoring nominal exchange rate anchors over monetary anchors has to do with credibility. It has been argued that since nominal exchange rates are more visible, they provide a more credible policy than if a constant level of monetary base is announced.[15]

In terms of the model presented above, it follows from equation (6) that if the nominal exchange rate anchors policy is credible, we would empirically observe a structural break in the dynamic properties of inflation. This structural break would indeed take place at -- or around -- the moment the nominal anchor is implemented. From that point in time onward, the coefficient of lagged inflation in an equation of the type of (6) should decline, reflecting the reduction in the degree of persistence in the inflationary

[14]See Agenor and Taylor (1992) for a survey on alternative ways to empirically test for credibility effects.

[15]See Bruno (1991) for related discussions.

process. Of course, this assumes that the structural roots of inflation -- fiscal imbalance and monetary creation -- have been controlled by the economic authorities. If, however the nominal anchor policy lacks credibility, and the public has doubts regarding the extent to which the government will stick to the new policy, the estimated degree of inertia in equations of the type of (6) will not be significantly affected by the adoption of the nominal exchange rate anchor.[16] Empirically, there are a number of possible ways to investigate whether the adoption of exchange-rate-based stabilization programs have changed inertia. Two possible approaches used are: (1) the use of interactive dummy variables to test for structural breaks in coefficient a_1 in equation (6) at the time (or around the time) of the policy change; and (2) the estimation of equation (6) using time-varying coefficient techniques.[17]

II.2 Nominal Exchange Rate Anchors and Inflationary Inertia in Recent Stabilization Programs

Chile and Mexico provide two important, and highly contrasting experiences with exchange-rate based disinflationary programs. While in Chile the program was abandoned in 1982, after little more than two years, in the midst of a severe external crisis largely generated by an acute process of real exchange rate overvaluation, in Mexico the program implemented in 1987 has worked relatively smoothly, helping reduce inflation to lower and

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[16] Edwards and Sturzenegger (1992) provide a model with endogenous credibility of the nominal exchange rate anchor.

[17] See Agenor and Taylor (1992).

lower levels.[18] These two experiences, in fact, provide important lessons for other nations both in the developing world and Eastern Europe. In this subsection I provide empirical evidence on how the adoption of an exchange rate rule affected the dynamics of inflation in Chile, Mexico and Yugoslavia.

Chile and Mexico

In the late 1970s, and after having eliminated a stubborn fiscal deficit, Chile adopted an exchange rate based stabilization program. Initially -- from February 1978 to June 1979 -- the program consisted of a preannounced declining rate of devaluation of the domestic currency. This system, popularly known as the tablita, deliberately set the starting declining rate of devaluation at a lower rate than ongoing inflation. With the trade reform having virtually eliminated the most important barriers, it was expected that this system of preannounced devaluations would have two important effects on inflation. In terms of the model presented above this policy amounted to reducing parameter ϕ in equation (3). In June 1979, with inflation standing at an annual rate of 34%, the government put an end to the system of a preannounced declining rate of devaluation and fixed the nominal exchange rate at 39 pesos per dollar. It was expected that this move to a fixed rate would reinforce and accelerate the convergence of domestic to world inflation.[19] It was thought that fixing the nominal exchange rate would help bring down inflation through two channels. First, it would reduce expectations on inflation, and

[18]See Williamson (1990) for discussions on the Mexican reform. On Chile see Edwards and Edwards (1991). In September of 1992 Mexico accelerated the preannounced rate of devaluation from 20 to 40 cents per day.

[19]These measures consisted of setting ϕ equal to zero.

second it was expected that a fixed rate would impose discipline on prices of tradable goods.

When the tablita was adopted in early 1978, and again when the peso was pegged to the dollar in June of 1979, it was decided not to alter the wage indexation mechanism, which at that time was characterized by 100% adjustment to lagged price increases. Paradoxically then, while the authorities expected price setters and other agents to form forward-looking expectations, they maintained a crucial market linked to a rigidly mechanical backward indexation regime. In terms of the model presented above, this amounted to setting ϕ equal to zero and γ equal to one.

Contrary to what was expected by the architects of the Chilean exchange-rate-based stabilization plan, after the exchange rate was fixed in mid-1979, the domestic rate of inflation did not rapidly converge to its world counterpart. In fact, the use of the exchange rate as a stabilization tool helped generate a steady real appreciation of the peso, which among other things negatively affected the degree of competitiveness of firms producing goods in the tradable sector, including nontraditional exports.[20] In 1982, under considerable pressure and increasing capital flight, the fixed exchange rate was abandoned, as Chile's experiment with a nominal exchange rate anchor came to an end.

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[20]Besides the adoption of a fixed exchange rate regime, another important development took place during 1979. Steps toward the liberalization of capital flows were taken, when in June of that year commercial banks were allowed to greatly increase their ratio of foreign liabilities to equity. This relaxation of capital inflows results in massive borrowing from abroad and paved the way to Chile's debt crisis. I have argued in Edwards (1985) that the massive inflow of foreign capital was another of the fundamental causes of real exchange rate overvaluation in Chile.

In 1986-87, and after a significant fiscal adjustment had been accomplished, the Mexican government embarked on an ambitious stabilization and reform program aimed at regaining price stability, deregulating the economy and opening foreign trade to international competition. As in the case of Chile, the manipulation of the nominal exchange rate became an important component of the stabilization plan. During 1988 the nominal exchange rate was fixed to the U.S. dollar, and starting in 1989 a system where the rate of devaluation of the peso was preannounced was adopted. As in the case of Chile, and in an effort to guide expectations downwards, the rate of devaluation was deliberately set below the rate of ongoing inflation. In successive revisions of the program the preannounced rate of adjustment of the nominal rate was reduced downward with the hope that eventually the peso would be fixed to the U.S. dollar. These successive reductions in the preannounced rate of change of the nominal exchange rate are equivalent to reductions in the value of coefficient ϕ in equation (3).

The Mexican program differed from the Chilean plan in three important respects. First, Mexico has had a considerably longer transition with a positive (although declining) predetermined and preannounced rate of devaluation. Second, at the outset of the program the RER was considerably undervalued. Thus, the system had a "built-in cushion" that was able to absorb the process of real exchange rate appreciation that accompanied the "sliding peg". And third, while in Chile exchange rate deindexation was the only component of the package, in Mexico incomes policies became a central element of the anti-inflationary package, supplementing the exchange rate rule and the fiscal adjustment. Indeed, in late 1987 with the establishment of the Pacto de Solidaridad,

unions, entrepreneurs and the government worked out a politically and economically plan for defeating inflation: price and wage guidelines became important elements of this program.[21]

In order to investigate empirically the way in which the adoption of a nominal exchange rate anchor affected the degree of inflationary inertia, I estimated equations of the following type using quarterly data:

$$\pi_t = b_0 + b_1\pi_{t-1} + b_2(D\pi_{t-1}) + b_3\pi^*_{t-1} + b_4\hat{z}_{t-1} + \mu_t \qquad (11)$$

where the variable D is a dummy that takes the value of one for the period when the nominal exchange anchor is in place and zero otherwise. If the anchors program is effective and credible the estimated coefficient of b_2 should be significantly negative, indicating that this policy successfully reduced the degree of inertia in the system. Moreover, in the extreme case of a Poincare style disinflation, inertia should disappear at the time the new policy is put in place, and (b_1+b_2) should not be significantly different from zero.

In the case of Chile two alternative definitions of D were used. The first (D1) has a value of one between the second quarter of 1978, when the program of preannouncing the rate of devaluation was first implemented, and the first quarter of 1982 when the fixed rate policy was abandoned. In the second case (D2) the dummy variable has a value of one between the third quarter of 1979 and the first quarter of 1982. That is, D2 covers only the period when the nominal exchange rate was strictly fixed. The rate of growth of

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[21] It is crucially important to point out, however, that the adoption of incomes policies in Mexico took place two years after the fiscal accounts had been balanced. See Beristain and Trigueros (1990) for a useful description.

domestic credit was used as a measure of aggregate demand pressures ($\hat{z}$). The raw data were taken from the IFS tape. Although most equations were estimated for the period comprised between the first quarter of 1974 and the first quarter of 1982 -- that is, the last quarter of a fixed exchange rate -- a number of other time periods were also considered. In every regression the coefficient of (DUMMY π_{t-1}) turned out to be insignificantly positive, indicating that the adoption of the exchange rate rule did not alter the degree of inflationary inertia in Chile. The following result obtained when the D1 dummy was used (t-statistics in parentheses):

$$\pi_t = \underset{(-1.344)}{-0.041} + \underset{(12.993)}{0.750}\,\pi_{t-1} + \underset{(0.688)}{0.019}(D1\,\pi_{t-1}) + \underset{(1.415)}{0.236}\,\pi^{*}_{t-1} + \underset{(4.812)}{0.288}\,\hat{z}_{t-1} \qquad \bar{R}^2 = 0.970,\ DW = 2.042,\ \text{Period: 74Q1-82Q1} \tag{12}$$

When the alternative dummy variable D2 was used the basic results did not change significantly:

$$\pi_t = \underset{(-1.397)}{-0.049} + \underset{(10.317)}{0.756}\,\pi_{t-1} + \underset{(0.430)}{0.025}\,(D2\,\pi_{t-1}) + \underset{(1.378)}{0.477}\,\pi^{*}_{t-1} + \underset{(4.737)}{0.285}\,\hat{z}_{t-1} \qquad \bar{R}^2 = 0.969,\ DW = 2.036,\ \text{Period: 74Q1-82Q1} \tag{13}$$

In order to further test whether the adoption of the fixed exchange rate in June of 1979 had an effect on the inflation process, a number of tests on the structural stability of the inflation equations were computed. If, indeed the shift from an accommodating adjustable exchange rate regime to a rigidly predetermined one is credible, it would be

expected that the inflation equation would capture a change in regime. These stability tests were supportive of the dummy variable results reported previously, and showed no structural break in the inflation equation. For example, in the case of equation (13), the chi-square statistic for structural stability had a value of $\chi^2(6) = 2.03$, indicating that there is no evidence of a change in the inflationary regime in mid-1979.

These results, then suggest that the adoption of a predetermined exchange rate in Chile was not associated with a change in the nature of the inflationary process that one expects from a credible nominal exchange rate anchor policy. In particular, expectations and contract practices (e.g., indexation) do not seem to have been affected in a significant way by the reform in the exchange rate system. As a result, the degree of inflationary inertia remained unchanged after the adoption of the exchange rate based program. An important consequence of this is that the persistent inflationary measures, in the presence of a fixed nominal exchange rate, helped create a significant real exchange rate overvaluation that eventually had serious negative effects on the Chilean economy.

In the estimation of inflation inertia equations for Mexico I also defined two dummies. The first one, D3, takes a value of one between the second quarter of 1988 and the second quarter of 1990, while D4 takes a value of 1 from the first quarter of 1989 (when the Pacto was first renewed) and the second quarter of 1990. The rationale for this second dummy is that it may be argued that only once the Pacto was reconfirmed in 1989, did the nominal anchor policy become credible. In this case both the rate of growth of domestic credit and of narrowly defined money were used as measures of aggregate demand pressures -- $\hat{z}$ in equation (11).

In every equation estimated for Mexico the coefficient of (DUMMY π_{t-1}) turned out to be significantly negative, indicating that the adoption of the preannounced exchange rate system and the other policies in the Pacto were credible, significantly changing the dynamics of inflation. The following result was obtained when D3 was used (when alternative time periods and dummy definitions were used, similar results were obtained):

$$\begin{aligned} \pi_t = & \underset{(-3.546)}{-0.060} + \underset{(15.119)}{0.896}\,\pi_{t-1} - \underset{(-4.559)}{0.194}\,(D3\,\pi_{t-1}) + \underset{(1.726)}{0.698}\,\pi^*_{t-1} \\ & + \underset{(2.789)}{0.179}\,\hat{z}_t + \underset{(2.476)}{0.220}\,\hat{z}_{t-1} + \underset{(1.764)}{0.144}\,\hat{z}_{t-2} \qquad \bar{R}^2 = 0.945 \\ & \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad DW = 1.828 \\ & \qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad \text{Period: 79Q1-90Q2} \end{aligned} \tag{14}$$

Formal tests for the stability of the regression as a whole show that the dynamics of inflation in Mexico experienced a structural break in the first quarter of 1988, when the exchange-rate-based and the Pacto de Solidaridad were enacted. The $\chi^2(6)$ statistic for structural stability turned out to be equal to 44.2, rejecting the null hypothesis that there was no structural break in the first quarter of 1988.

The contrasting results between Chile and Mexico clearly suggest that it is not enough to adopt a nominal exchange rate anchor to alter the inertial nature of the inflationary process. As the Chilean regressions show, it is possible to have such a system in place for a considerable period of time without inflicting a serious dent in the dynamics of inflation. To the extent that the public does not perceive the new policy as credible, pricing behavior and contract clauses will not be altered in any significant way, and the

ingrained aspects of inertial inflation will continue.[22] Although it is not possible to extract from these data the exact underlying macroeconomic reasons for the differences in effectiveness of these two programs, it is possible to speculate that the incomes policies implemented in Mexico alongside the pegged nominal exchange rate provided a broad sense of coherence to the stabilization program. On the contrary, the continuation -- and even reinforcement -- of the lagged wage indexation rule gave important contradictory signals to the private sector in Chile. It is important to notice, however, that even though there is a reduction in inertial forces, the remaining degree of persistence -- measured by the coefficient of π_{t-1} after the adoption of the Pacto -- is still significant. In fact, the estimated coefficient of lagged inflation during that period was still a high 0.702. This explains, in part, the substantial degree of real exchange rate appreciation that Mexico has experienced in the last few years. This suggests that even in very favorable circumstances, such as those experienced by Mexico, the adoption of an exchange rate anchor type of policy will have serious real exchange rate consequences.[23]

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[22]One way to rationalize this is to think that the public interprets the adoption of the fixed rate as a weak commitment, which can be abandoned under certain contingencies. If the private sector perceives that these contingencies are very permissive, the degree of commitment associated with the change in exchange rate regime will be very low, or non-existing.

[23]In principle, there are some possible ways of disentangling the contribution of different policies to inflationary inertia. For example, if the rate of devaluation is included in equation (11) as a regressor, the coefficient of lagged inflation will be influenced by the degree of indexation of wages and other contracts. When this was done for the case of Chile, the results supported the view that non-exchange rate indexation contributed greatly to overall inertia.

Yugoslavia

The recent efforts in Eastern and Central Europe to introduce economic reform and stabilization programs have elicited considerable attention among experts. From the perspective of this paper the Yugoslav and Polish anti-inflationary plans of 1990, and the Czechoslovakian Plan of 1991 are particularly important. In the three countries a fixed nominal exchange rate was used as an anchor. In Poland the zloty was initially pegged with respect to the dollar; in Yugoslavia the dinar was fixed with respect to the DM; and in Czechoslovakia the koruny was fixed relative to a basket of currencies. In their other elements the Polish and Yugoslav programs were more similar to the Mexican episode than to the Chilean one. In particular, incomes policies -- including drastic limits in wage rate indexation -- were imposed in both countries (see Coricelli and Rocha, 1991). Though wage controls were also enacted in Czechoslovakia (IMF, 1992), some degree of price flexibility was maintained. Wage controls, however, were also enacted in Czechoslovakia (IMF, 1992).

In the three countries the short term results of the programs were spectacular. More specifically, in Yugoslavia inflation dropped substantially in the first half of 1990, only to rebound in the fourth quarter when it reached 16.4%. Well known political and armed civil conflicts in 1991 put an abrupt end to the stabilization attempt in that country.

I estimated equation (11) for the case of Yugoslavia,[24] using data for the period comprised between the first quarter of 1979 and the first quarter of 1991 were used. The dummy variable D5 took a value of one between the first and fourth quarters of 1990, and the rate of growth of domestic credit was used as $\hat{z}$. The estimated equation using quarterly data was:

$$\begin{aligned} \pi_t = & \underset{(-3.079)}{-0.055} + \underset{(5.509)}{0.843}\,\pi_{t-1} - \underset{(-17.168)}{1.141}\,(D4\pi_{t-1}) \\ & + \underset{(1.421)}{0.243}\,\pi^*_{t-1} + \underset{(5.119)}{0.861}\,\hat{z}_{t-1} \end{aligned} \qquad \begin{aligned} & \bar{R}^2 = 0.928 \\ & D.W. = 2.013 \\ & \text{Period: 79Q1-91Q1} \end{aligned} \tag{15}$$

These results suggest that, at least during 1990 the Yugoslavian program -- including its nominal exchange rate anchor component -- was very effective in altering the nature of the dynamics of inflation in the country: as can be seen the coefficient of $(D4\pi_{t-1})$ is significantly negative, and it points estimate is quite high. Moreover, it is not possible to reject the hypothesis that during 1990 the inertia coefficient in equation (15) became zero. The $\chi^2(1)$ for the null hypothesis that $a_1 + a_2 = 0$ was equal to 251.7. The collapse of the Yugoslav program in the first quarter of 1991, stemmed mostly from political, regional and ethnic struggles, and not directly from an inherent lack of initial credibility in the stabilization program.

To sum up, then, the results presented in this section suggest that the adoption of a nominal exchange rate anchor -- even in the presence of a balanced budget -- is not a

[24] Lack of sufficient data points precluded us from estimating this type of equation for Czechoslovakia. Also, this type of analysis cannot be performed for Poland due to the widespread use of price controls in the period prior to December 1990.

sufficient condition for reducing the degree of inertia of the inflationary process. As the results for the Chilean case clearly suggest, the inability (or unwillingness) to eliminate indexation in other markets may negatively affect credibility, and result in no change in the extent of inertial forces.

III. Exchange Rates and Nominal Anchors in the Long Run

Much of the recent enthusiasm for fixed nominal exchange rates is intellectually rooted on the modern credibility and time consistency literature.[25] According to this approach governments that have the discretion to alter the nominal exchange rate will tend to abuse their power, introducing an inflationary bias into the economy. The reason for this is that under a set of plausible conditions, such as the existence of labor market rigidities that preclude the economy from reaching full employment, it will be optimal for the government to "surprise" the private sector through unexpected devaluations.[26] By engineering these unexpected devaluations the government expects to induce a reduction in real wages and, thus, an increase in employment and a boost in output. Naturally, in equilibrium the public will be aware of this incentive faced by the authorities, and will react to it by anticipating the devaluation surprises and hence rendering them ineffective. As a consequence of this strategic interaction between the government and the private sector, the economy will reach a high inflation plateau. What is particularly interesting about this result is that this inflationary bias will be present even if it is explicitly assumed

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[25]The new impetus for fixed rates has emerged especially in the International Monetary Fund. See Aghevli et al. (1991).

[26]This assumes that wages are set before the government implements the exchange rate policy, but after it has been announced.

that the government has an aversion for inflation -- which in most models is fueled by the devaluation. This is because the government perceives that the marginal benefits of higher inflation -- associated with the increase in employment once nominal wages have been set -- outweigh its marginal costs.[27]

An important feature of the credibility literature is that under most circumstances policy commitment is welfare-superior to discretionary policy. If the government can credibly commit itself to low (or no) inflation, society will be better off: employment will be the same as in the discretionary policy case, but inflation will be lower. The problem, however, is that governments have a hard time making credible commitments. In the absence of effective constraints that will tie the government's hands, any promise of low inflationary policy will not be credible and, thus, will be self-defeating.

A key policy implication of this literature is that defining (and implementing) constraints -- either institutional or reputational -- that will make government pre-commitments credible will result in an improvement in society's welfare. It is here, thus, where fixed exchange rates come into the picture. It has been argued that the adoption of a fixed exchange rate will constrain governments ability to surprise the private sector through unexpected devaluations. Promises of fiscal discipline will become credible and private sector actions will not elicit successive rounds of inflationary actions.

In spite of its elegant appeal this view has, in its simplest incarnation, some problems. First, in simple settings exchange rate policy has a very limited role. In fact, its only effect is to alter the domestic rate of inflation and, through it, the government

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[27]See Persson and Tabellini (1990).

perceives it as altering real wages. However, in most modern exchange rate models, nominal devaluations can also help accommodate shocks to real exchange rate fundamentals, helping to avoid RER misalignment.[28] Second, in economies with stochastic shocks, contingent exchange rate rules can, at least in principle, be superior to fixed rates (Flood and Isard 1989). Third, it is not clear why a country that can credibly commit itself to unilaterally fixing the exchange rate, cannot commit itself to maintaining a fixed stock of domestic money.[29]

In recent papers, Devarajan and Rodrik (1991) and Kamin (1991), among others, have addressed the question of the desirability of fixed exchange rates from a more general perspective. In Devarajan and Rodrik (1991), policymakers face a tradeoff regarding exchange rate policy: while exchange rate flexibility has an inflationary bias, it also allows the country to reduce output variability. This is accomplished by smoothing, via exchange rate adjustments, the consequences of terms of trade shocks on output. In this model it is not possible to rank a priori fixed and flexible (or active) exchange rate regimes. The larger are terms of trade shocks the more likely it is that flexible rates will be superior. Likewise, the more vulnerable the real economy is to terms of trade shocks, the more desirable will flexible arrangements become. On the other hand, the greater is the government's built-in inflationary bias, the greater will be its temptation to abuse devaluations, and the less desirable will a flexible arrangement become.

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[28]See, for example, Edwards (1988).

[29]By "unilaterally" I mean that the fixed rate is not enforced by a multilateral institutional arrangement such as the EMS or the West African Monetary Union.

The previous discussion suggests that in evaluating the desirability of alternative exchange rate regimes -- adjustable or fixed -- it is important to have an idea of the authorities proclivity towards inflation. If given discretion to adjust the exchange rate, how tempted will they be to "abuse" that discretion? This is largely a (difficult) empirical issue which will depend on the specific economic, social and especially political characteristics of the country. Recent work on the political economy of inflation can, in fact, provide some clues to this question. For example, it has been found that there is a close relationship between the degree of political instability and polarization, on the one hand, and the reliance on the inflation tax on the other: societies that are politically more unstable and/or polarized will tend to have a higher proclivity towards inflation.[30] Recently, Edwards and Tabellini (1991) have measured the degree of political instability as the perceived probability of a transfer of political power. According to their index, Asian nations tend to have a lower degree of political instability than that observed in other developing countries and, especially, in Latin America. This suggests Asian countries, as a group, face a smaller temptation to abuse their exchange rate discretion and, then, the benefits associated with fixed rates will tend to be smaller than in other regions.

III.1 Fixed Nominal Exchange Rates and Financial Discipline: Some Cross Country Evidence

An important assumption of the credibility-based literature on exchange rate systems is that fixed exchange rates introduce constraints to fiscal and monetary policies.

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[30]For recent work on the political economy of inflation, see Persson and Tabellini (1990).

As a result of this, under fixed rates (rules) the equilibrium will be characterized by lower rates of inflation than under discretionary (i.e., adjustable) exchange rate policies. It has often been argued that the comparative inflation record of countries with alternative exchange regimes supports this contention. For instance in a recent IMF document it is stated that "the inflation performance of the countries that have operated under a fixed exchange rate regime has been, on the whole, superior to that of the group operating under more flexible arrangements" (Aghevli, 1991, p. 13).

A serious problem with this line of argument -- and one acknowledged in the IMF document -- is that the direction of causality is not clear: is it that those countries that have operated under fixed rates for a long period of time have lower inflation, or is it that those countries with lower inflation have been able to maintain a fixed rate? The IMF document by Aghevli et al. states this problem as follows: "[A]n examination of countries that maintained pegged exchange rate arrangements over a given period neglects the experience of countries that initially adopted a pegged arrangement but were forced to abandon it..." (p. 13). The problem, of course, is that these simple descriptive analyses focus on the ex post performance of peggers and non-peggers.

An essential question in this debate is whether a nominal fixed exchange rate regime indeed provides ex ante constraints to fiscal and credit policy. In analyzing this issue two basic alternative forms of fixed rates should be distinguished. The first and most common system is one where a country unilaterally declares that it is pegging its currency to another country's currency. Usually, under this type of regime there is no institutional impediment to alter the exchange rate. Under these circumstances the adoption of fixed

exchange rates amounts to a declaration of good intentions. In principle, it may be argued that this type of unilateral policy will carry little credibility weight. After all, the authorities can alter their exchange rate at will. The public can, in fact, see this type of regime as a commitment with escape clauses. If the contingencies under which such escape clauses are used are perceived as being too permissive, the commitment itself will be very weak and will have little effectiveness. An alternative line of argument emphasizes the role of reputation. By choosing a highly visible variable (the exchange rate) as the anchor the authorities are placing their reputations at stake in a very obvious fashion; if the peg is altered, the authorities could incur heavy political costs. According to this line of reasoning one would expect that the reputational constraint is more important in countries with a more stable political system. This is because in unstable political regimes the probability of government change is high, and thus the costs associated with being thrown out of office for incompetence reasons is very low. See Edwards and Tabellini (1991).

Naturally, the degree of commitment associated with the unilateral adoption of a fixed regime can be increased by implementing legislation that makes the alteration of the parity costly. The most clear case of such legislation corresponds to a constitutional provision banning changes in the parity. Argentina has recently (1991) attempted to provide this type of pre-commitment technology by instituting a "currency convertibility" law that strictly limits the authorities unilateral authority to alter the exchange rate parity. However, as the experience of the Dominican Republic during the 1980s has shown, it is even possible to work around this constraint through the use of multiple exchange rates.

The second basic type of fixed exchange rate regime corresponds to a system where the authorities enter some type of multilateral arrangement that makes the alteration of the peg costly. There are a number of such regimes that attempt to preclude or limit exchange rate flexibility. Among them some of the best known are the French-Zone African Monetary Unions, the ERM of the EMS and, before 1971, the Bretton Woods System. Naturally, the degree of commitment associated with this type of system will depend on the costs related to changing the parity. In the pre-1971 Bretton Woods regime, for example, this was not very costly; all it took was for a country to declare that it was facing a situation of "fundamental disequilibrium". In the case of the African Franc Zone, on the other hand, the alteration of the parity has been (until now) virtually impossible.[31] Moreover, as the September 1992 ERM crisis has shown, even in the presence of this type of institutional constraints exchange rate crises can (and do) occur.

In this subsection I investigate empirically whether the adoption of a fixed exchange rate has indeed resulted in ex ante financial discipline in a large cross section of developing nations. I do this by analyzing whether those countries that had a fixed rate at the beginning of the 1980s have done better throughout the decade than those with a more flexible regime. By considering all those countries that had a fixed rate at the beginning of the decade of the 1980s, we are trying to isolate the role of initial conditions. We are thus inquiring whether a fixed nominal exchange rate (in this case with respect to the U.S. dollar) imposes ex ante financial discipline.

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[31] Until now the only way for a country to effectively alter the parity has been to abandon the union.

Table 1 contains data on a number of key macroeconomic variables for the 1980s for the 37 countries that according to the IMF had a fixed exchange rate with respect to the U.S. dollar in December of 1979. A number of interesting features emerge from this table. First, out of the 37 countries with a fixed rate in late 1979, only 11 maintained the fixity throughout the 1980s. This makes the rather obvious (but not always recognized) point that adopting a fixed parity at a particular moment in time is no guarantee that the rate will in fact not be altered in the future. Second, the countries that did in fact maintain throughout the 1980s a fixed exchange rate correspond, in a large proportion, to very small countries, including a substantial set of Caribbean nations. It is unclear, however, whether this fact introduces some bias into our sample. Third, during the 1980s (or subperiod with available data) the countries that had a fixed rate in 1979 experienced nontrivial levels of inflation: 23.4% yearly average. This figure is significantly higher than the average inflation for those countries in the table that actually maintained a fixed nominal rate relative to the U.S. dollar throughout the period. Fourth, as can be seen in the last two columns, in those countries where the fixed rate was abandoned, the rate of growth of monetary aggregates -- money and domestic credit -- was very high, greatly exceeding what is compatible with the maintenance of a fixed parity. For this second group average annual inflation was only 5.5%.[32]

It may be tempting at this point, and in consideration to the information in Table 1, to argue that fixed exchange rate arrangements have no ex ante effects on financial

[32]This discrepancy in the two averages neatly captures the selectivity bias in those studies that look at the performance of fixed rate countries from an ex post perspective.

TABLE 1
Macroeconomic Performance of 1979 Exchange Rate Fixers During the 1980s
(percentages)

Country	Average Annual Devaluation	Average Annual Inflation	Average Change in REER *	Average Growth In Domestic Credit	Average Growth In Money
Chile	24.1	20.3	6.9	•	•
Costa Rica	28.3	25.6	4.8	21.5	24.8
Dominican Republic	26.3	24.6	4.2	19.4[1]	24.3[1]
Ecuador	42.7	36.4	7.9	42.4[2]	28.4[2]
El Salvador	12.4	18.5[1]	•	11.7	11.3
Guatemala	17.5	11.8[1]	•	13.0	15.7
Haiti	0.0	5.2[1]	•	8.5[1]	12.1[1]
Honduras	0.0	6.2[1]	•	13.9	12.0
Nicaragua	252.9	304.4[2]	-14.6	•	•
Panama	0.0	1.8	•	1.8	2.6
Paraguay	25.9	20.2[2]	8.2	24.1[2]	23.1[2]
Venezuela	27.9	23.3	7.5	22.3	18.3
Bahamas	0.0	5.5	0.6	11.3	9.2
Barbados	0.0	5.7	•	10.2	8.2
Dominica	0.0	4.7[1]	•	13.2	10.5
Grenada	0.0	5.4[1]	-1.5[1]	13.5	6.6
Jamaica	16.3	14.8	•	10.6	18.8
Surinam	0.0	12.4[2]	•	27.3[1]	24.8[1]
Trinidad & Tobago	5.9	11.0	•	•	5.4[1]
Iraq	0.5	•	•	•	•
Oman	1.1	•	•	17.4	9.7
Yemen P.D.R.	1.6[1]	6.1[5]	•	14.8[2]	9.1[2]
Syrian A.R.	11.1	22.1[1]	•	19.2[3]	17.6[3]
Egypt	11.1	16.9	•	21.6	14.0
Yemen Arab Republic	8.8[1]	•	•	28.1[1]	16.1[1]

Table 1 (cont.)

Country	Average Annual Devaluation	Average Annual Inflation	Average Change in REER *	Average Growth In Domestic Credit	Average Growth In Money
Laos	61.0[2]	•	•	•	•
Nepal	9.7	10.1	•	22.0[1]	16.9[1]
Pakistan	8.3	7.0	•	14.6	14.3
Djibouti	0.0	•	•	•	•
Burundi	6.3	7.6	2.6	11.3[1]	8.8[1]
Ethiopia	0.0	4.4	•	12.4	12.9
Liberia	0.0	3.9[1]	•	12.7[1]	14.8[1]
Libya	0.2	•	•	21.0[1]	2.2[1]
Rwanda	2.7	4.3	•	27.8[1]	3.3[1]
Somalia	74.2[1]	45.6[2]	•	43.3[1]	54.5[1]
Sudan	24.6	36.2[1]	•	33.4[1]	37.2[1]
Romania	6.8	4.0[4]	•	7.4[4]	7.8[4]
Average	19.1	23.4	2.5	18.4	15.5

*A positive number denotes real devaluation.

[1]1980-1989

[2]1980-1988

[3]1980-1987

[4]1980-1986

[5]1980-1985

Source: International Financial Statistics, IMF (various issues).

discipline and inflationary performance. This, however, is an incorrect inference for at least two reasons: first, this analysis has not inquired into the fate of those countries that did not adopt a fixed rate in the early 1980s. They may, in fact, have fared much worse than those nations in Table 1. Second, and closely related to the previous point, we have not controlled for other determinants of inflation. In what follows I take these two factors into account in trying to explain the determinants of inflation for a cross section of countries.

Modern analyses on the determinants of inflation have emphasized the fact that inflation is a tax on money holdings.[33] From a modern public finance perspective the share of the inflation tax on total government revenue will depend on the country's structural, political and institutional characteristics. The higher the costs of administering a "regular" tax system, the higher the reliance on the inflation tax will tend to be. The reason for this is that, although inflation is a highly distortionary tax, it is very easy to collect. Variables that capture the cost of running a regular tax system will thus be important determinants of the variability of inflation across countries (Edwards and Tabellini, 1991).

Recent inflation theories have also predicted that, with other things given, countries that are politically more unstable will tend to rely more heavily on inflationary finance. There are two reasons for this: first, in politically unstable countries there are little incentives to implement an efficient tax system (i.e., one that does not rely heavily on inflation). This is because in this case there is a higher probability that the benefits of the

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[33]This of course, is not a new idea. However, it is a notion that from time to time has been ignored by many analysts.

more efficient tax regime will be reaped by the government's opponent.[34] Second, in politically more unstable countries, reputational constraints are less binding.[35] Finally, the degree of reliance on inflationary finance will also depend on institutional arrangements. In terms of the subject of this paper, we are interested in determining whether from an ex ante perspective the exchange rate regime affects inflationary performance. Does the adoption of a fixed exchange rate introduce financial discipline?[36]

A 52 country data set was used in a regression analysis aimed at explaining cross country differentials in inflation. The dependent variable was the average rate of inflation for 1980-89 and was taken from the 1991 issue of the World Development Report. Table 2 contains the list of the countries in the sample, a dummy variable (d80) that takes the value of one if the country had a fixed nominal exchange rate (with respect to any currency or basket of currencies) in 1980, and the average rate of inflation for 1980-89.

The following variables were used as regressors in the cross-country regressions for the 1980-89 rate of inflation:[37] (a) income per capita measured in 1989 dollars. This variable captures the ability of running a "regular" tax system; its coefficient is expected

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[34]For a model along these lines see Cukierman, Edwards and Tabellini (1992).

[35]Persson and Tabellini (1990); Edwards and Tabellini (1991).

[36]Other studies have inquired as to whether the degree of independence of the central bank affects a country's proclivity towards inflation. An inherent difficulty in that line of attack, however, is that it is not easy to measure the degree of central bank independence. On these issues see Grilli et al. (1991).

[37]See Cukierman et al. (1992) for a formal model that argues for the inclusion of these regressors in empirical analyses on inflation.

TABLE 2

Exchange Regimes and Inflation in Selected Developing Countries

	Country	d80	Inflation 80-89
15.	Greece	0	18.2
17.	Portugal	0	19.1
19.	Turkey	0	41.4
23.	South Africa	0	14.1
25.	Bolivia	0	391.9
26.	Brazil	0	227.8
27.	Chile	1	20.5
28.	Colombia	0	24.3
30.	Dominican Rep.	1	19.1
31.	Ecuador	1	34.4
32.	El Salvador	1	16.8
35.	Honduras	1	4.7
36.	Mexico	0	72.7
37.	Nicaragua	1	•
39.	Paraguay	1	23.2
40.	Peru	0	160.3
42.	Venezuela	1	16.0
43.	Jamaica	1	18.5
44.	Trinidad Tobago	1	5.8
45.	Iran	1	13.5
47.	Jordan	1	•
50.	Oman	1	-6.6
59.	Sri Lanka	0	10.9
60.	India	0	7.7
61.	Indonesia	0	8.3

Table 2 (cont).

	Country	d80	Inflation 80-89
67.	Pakistan	1	6.7
68.	Philippines	0	14.8
70.	Thailand	1	3.2
74.	Botswana	1	12.0
75.	Burundi	1	3.7
76.	Cameroon	1	6.6
77.	Central Afrep.	1	6.5
78.	Chad	1	1.5
79.	Congo Peoplerep.	1	.3
80.	Zaire	1	59.4
82.	Ethiopia	1	2.0
83.	Gabon	1	-1.0
84.	Ghana	0	43.6
87.	Cote d'Ivoire	1	3.1
88.	Keyna	1	9.0
89.	Lesotho	1	12.8
95.	Mauritania	1	9.4
96.	Mauritius	1	8.5
97.	Morocco	0	7.4
99.	Niger	1	3.4
100.	Nigeria	0	14.2
101.	Zimbabwe	1	11.0
102.	Rwanda	1	4.0
104.	Sierra Leone	1	54.1
105.	Somalia	1	42.8
107.	Sudan	1	•
108.	Tanzania	1	26.1
109.	Togo	1	5.1
110.	Tunisia	1	7.5

Table 2 (cont.)

	Country	d80	Inflation 80-89
111.	Uganda	1	108.1
113.	Zambia	1	38.3

Source: IFS (several issues); World Development Report.

to be negative. (b) Proportion of the population living in urban areas. Since it is easier to reach urban taxpayers, its coefficient is expected to be negative. (c) Share of agriculture in GDP. This variable is also related to the cost of administering a non-inflationary tax system. Its coefficient is expected to be positive. (d) Dummy variables for Asian and Latin American countries. (e) An index of political instability. This was constructed by Cukierman, Edwards, and Tabellini (1992) as the estimated probability of government change during 1971-82. The estimated probability was obtained, in turn, from a probit analysis where actual government changes were regressed against political, economical and institutional variables. (f) A dummy variable that took a value of one if the country had a fixed exchange rate system in 1980 and zero otherwise.[38] (g) An interactive term defined as the exchange regime dummy variable times the average rate of inflation in the period 1965-80. This variable was incorporated as a way to test whether the effect of the exchange regime on fiscal discipline and inflation depends on countries macroeconomic history and inflationary reputation.

Table 3 contains the basic results obtained from three OLS estimates of cross country inflationary differentials. As can be seen they are quite satisfactory. All coefficients have the expected signs and a large number of them are statistically different from zero at standard significance levels. What is particularly important, and to some extent even striking, for the purpose of our discussion is that these results provide preliminary evidence suggesting that with other things given, countries that had a fixed exchange rate at the beginning of the 1980, have been financially more responsible -- in

[38]The raw data were taken from the World Development Report and the IFS.

TABLE 3

The Determinants of Inflation In Developing Countries 1980-1989:

Cross Country Results*

(Dependent Variable: Average Rate of Inflation)

	Eq. (1)	Eq. (2)	Eq. (3)
Constant	-0.071 (-1.71)	-0.034 (-0.93)	0.082 (0.242)
Per Capita GDP	.	-0.041E-3 (-0.539)	-0.077E-3 (-0.947)
Agriculture/GDP	0.014 (2.718)	0.012 (2.116)	0.011 (1.810)
Urban	-0.106 (-0.179)	.	.
Latin America	0.667 (3.063)	0.616 (3.357)	0.619 (3.339)
Asia	-0.310 (-1.230)	-0.340 (-1.342)	-0.359 (-1.424)
Political Institut.	1.159 (1.974)	1.232 (2.047)	1.179 (1.964)
Exchange Rate Regime	-0.448 (-2.342)	-0.446 (-2.477)	-0.707 (-2.543)
(Ex.Regime)×(Inf.65-80)	.	(2.478)	(1.722)
N	52	52	52
R^2	0.446	0.449	0.467

*t-statistics in parentheses.

the sense of having a lower average rate of inflation -- than those with a more flexible exchange rate regime.[39]

More specifically, the results reported in Column (3), for the regression that includes the interactive term (Exchange Regime) × (Inflation 65-80), confirm the hypothesis that the financial discipline effect of a fixed exchange rate is significantly higher in countries with a history of price stability. As past inflation becomes higher and higher, the discipline ex ante effect of fixed rates on financial stability becomes weaker and weaker. In fact, according to these point estimates, at levels of 30% of historical inflation, fixed rates lose their ex ante discipline effect.

The regression results reported above may be subject to some potential limitations. First, the dependent variable is the inflation rate, while much of the analytical discussion referred to the reliance on the inflation tax. This means, then, that the inflation tax base may play an important role in explaining cross country differentials in inflation. When the ratio of money to GDP -- which is the base on which the inflation tax is levied --was introduced into the analysis as an additional regressor, there were no changes in our fundamental results: its coefficient was negative, as expected, and the estimated coefficient of the exchange rate system dummy remained significantly negative:

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[39]This result still holds if we use the average rate of growth of money as the dependent variable.

Inflation 80-89 = 0.798 - 0.099E-3 PCGDP - 0.004 Urban
(1.865) (-0.758) (-1.663)

+ 0.673 Latin America - 0.499 Asia + 1.607 Pol. Inst.
(2.249) (-1.669) (2.051)

- 0.922 Exchange Regime + 2.976 IInf.65-80)×(Ex Regime)
(-2.532) (1.710)

- 0.006 (M/GDP) $R^2 = 0.539$
(0.796) N = 41

A second potential limitation of these regressions is that by including the African countries belonging to the Franc Zone we may be biasing the results. In order to investigate the importance of this potential shortcoming the regressions were re-estimated excluding from the sample all countries whose currency was fixed to the French Franc in 1980. When this was done the main conclusions from the previous analysis were not affected in any significant way.

A third possible limitation is that the dependent variable is inflation rather than a more direct measure of macroeconomic policy, such as the average rate of growth of money. However, when this variable is introduced into the analysis the results provide broad support to our previous findings, suggesting that those countries with a fixed rate in 1980 exhibited a lower rate of growth of money during the 1980s:

Growth Money = 0.480 - 0.013E-3 PCGDG - 0.002 Urban
(1.724) (-2.489) (-0.698)

+ 0.357 Latin America - 0.359 Asia + 1.202 Polit. Instab.
(1.985) (-1.818) (2.428)

- 0.591 Ex Regime + 2.644(Inf65-80)(Ex Reg) $R^2 = 0.424$
(-2.662) (1.649) N = 50

To sum up, the evidence presented here suggests that, with other things given, the adoption of a fixed exchange rate regime has indeed been associated with financial discipline and lower inflation. What is particularly interesting is that this result holds even after we have controlled for other determinants of inflation, including the perceived degree of political instability and some important structural characteristics. A crucially important result from this analysis is that the discipline effect of fixed exchange rates depends on the inflationary history of the country. Nations with a history of stability are in fact those that will probably gain the most from a fixed exchange rate regime. It is important to note, however, that the fact that the regional dummies for Latin America and Asia are significant in almost every regression suggests that there are elements determining inflation and government financial discipline not fully captured by this analysis.

IV. Concluding Remarks

Recently, fixed exchange rates have become increasingly popular in some policy circles. In particular, a number of IMF executive directors have expressed concern for the widespread use of flexible exchange rate practices in the developing countries. They have argued that a return to limited flexibility (or plain fixity) would provide the developing countries with a credible nominal anchor that will help them (rapidly) achieve stability and low inflation.

In this paper I have investigated several aspects of the new nominal exchange rate anchor view. I first argue that under conditions of RER misalignment an adjustment process based on corrective fiscal and credit policies and a nominal devaluation can be

extremely effective. In fact, significantly more effective than an adjustment process that eschews devaluations and relies exclusively on disinflation.

In Section II, I moved more deeply into the nominal anchor discussion by investigating conditions under which a disinflation program based on a pegged exchange rate may have positive effects on the stabilization process. I showed that in an economy characterized by inertial forces, limiting the degree of exchange rate adjustment will, in principle, reduce the degree of inflationary persistence. I argued, however, that the actual effect of such a program will depend on the degree of credibility of the nominal anchor policy, and on the extent to which other markets are deindexed. I also argued that under a broad set of circumstances these policies result in a real exchange rate appreciation. I empirically investigated the experiences of Chile, Mexico and Yugoslavia with exchange rate based stabilization. I showed that in Chile the fixed exchange rate policy adopted in 1978-79 did not alter the inertial dynamics. Inflation, in fact, maintained its degree of inertia, and a severe overvaluation that eventually comprised the fate of the whole program evolved. This episode -- which, as I show, contrasts with those of Mexico and Yugoslavia -- clearly suggests that even in circumstances when the fiscal balance is under control, there are risks associated with the adoption of an exchange rate nominal anchor policy. The evidence also suggests that a possible way to minimize these risks is by complementing the pegging of the exchange rate with income policies aimed at deindexing the rest of the economy, and by starting the program from a situation of undervaluation. However, the results obtained for Mexico suggest that even when incomes policies are used, the remaining degree of inflationary inertia may still be significant.

In Section III, I concentrate on the longer run effects of fixed exchange rates on financial discipline and inflation. The empirical analysis reported in that section supported the contention that in countries with a reputation for stability, the adoption of a fixed exchange rate has introduced financial discipline. However, as this reputation -- which we measured by past inflation -- becomes weaker, the constraining effect of the fixed exchange rate begins to rapidly disappear. This result provides some important, but qualified, support for the modern credibility-based views of inflationary finance. This, of course, does not mean that fixed rates are superior to adjustable pegs. The desirability of alternative exchange rate regimes still depends on the degree of external vulnerability of the economy -- including the magnitude in terms of trade shock and the degree of concentration of exports -- and on the inflationary proclivity of the authorities. While the evidence supports the view that fixed rates help reduce the inflationary bias of the payments system, it also indicates that this positive effect is stronger in those countries that may need it the least: those nations that already have a history of stable prices. That is, the evidence indicates that fixed exchange rates reduce the ability to abuse discretion in those nations where this temptation is weaker.

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