THE BEHAVIOR OF INTEREST RATES AND REAL EXCHANGE RATES
DURING A LIBERALIZATION EPISODE: THE CASE OF CHILE 1973-83

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Abstract

This paper analyzes the behavior of some key variables during the recent economic liberalization reform attempted in Chile. The paper concentrates on the behavior of the real exchange rate and nominal and real interest rates during the period 1977-83. It is argued that as a consequence of the liberalization of the capital account in Chile in 1979-81, dramatic inflows of financial capital resulted. These capital inflows generated an important increase in expenditure, and a lower relative price of tradables to nontradables or real appreciation. Moreover, it is argued that it is the liberalization of the capital account, and not the adoption of a preannounced rate of devaluation, that generated the dramatic real appreciation of the Chilean currency between 1979 and 1981. A model to analyze interest rate behavior in a semi-open economy is also presented and applied to the case of Chile. The results obtained suggest that during this period interest rates responded both to open-economy and closed-economy factors. Among the former the increase in the expected rate of devaluation was particularly important.
INTRODUCTION

The study of Chile's modern economic history usually generates a sense of excitement and sadness. Excitement, because during the last 50 years Chile has been a social laboratory of sorts, where almost every possible type of economic policy has been experimented; sadness, because to a large extent all these experiments have ended up in failure and frustration.

The most recent of these "experiments" began in 1973, after the military overthrew President Salvador Allende. In the ten years following the coup, the military implemented deep reforms directed towards transforming Chile from an economy semi-isolated from the rest of the world, with strong government intervention, into a liberalized world-integrated economy where market forces were freely left to guide most of the economy's decisions. These liberalization reforms were carried out at the same time as a major stabilization program, aimed at reducing a 600 percent rate of inflation was being implemented. Many of the policies undertaken roughly correspond to what a vast number of economists have been advocating for developing countries -- trade was liberalized; the capital account was (partially) opened; interest rates were freed and an active domestic capital market was developed; the fiscal system was reformed with a value added tax replacing a cascading type sales tax; the social security system was reformed; and the private sector began to play a more active role in the growth and development process.

This period was characterized by acute contrasts. For example, while in 1973 Chile had the highest rate of inflation in the world (600%), in 1981
it had one of the lowest (9%). On the other hand, the rate of growth of real GDP fluctuated drastically: it was -13 percent in 1975; it then averaged almost 7 percent per annum during 1977-81; and became -15 percent in 1982. In fact, the rapid growth of real GDP in Chile during 1977-81 and the apparent success of other policies prompted some observers to (prematurely) talk about the Chilean miracle. By the end of 1981, however, the euphoria came to a sudden end, as it became evident that the growth pace of the previous years was not sustainable. The inflow of foreign capital was halted, the foreign debt could not be paid, real interest rates skyrocketed, and a severe financial crisis erupted. These events, and a drastic deterioration of the terms of trade -- which amounted to 26 percent between 1979 and 1983 --, provoked one of the worst recessions faced by the country, from which, at the time of this writing, it still has not fully recovered. In addition, a number of the reforms were partially reversed: tariff rates were hiked; capital movements were forbidden; the financial sector was plagued with bankruptcies, and was virtually nationalized. 1/

A number of economic puzzles have emerged from this experience, including the extremely high interest rates that prevailed throughout the episode and the persistence of unemployment. Also, the ultimate failure of the experiment has added considerable interest to the analysis. Here the most relevant question -- which has far-reaching policy implications for other developing countries -- is whether this failure was a consequence of the liberalization policies themselves, or if it was the result of other events, including foreign shocks and inappropriate macroeconomic policies.

In this paper, an attempt is made to provide some clues for answering this question. The analysis concentrates on some of the more controversial
aspects of the experiment -- opening of the external sector and real exchange rate appreciation, interest rates behavior, and stabilization policies in an open economy --, and tries to extract some lessons of experience that could, in principle, be applicable to other countries. This paper, then, does not provide a comprehensive account of the Chilean experiment with free market policies. This is deliberate, since at this time a number of such general interpretations are available, and the reader is referred to them. 2/ By focusing on some specific -- and especially controversial -- aspects of this experience it is hoped that a better understanding of this episode will be obtained.

The paper is organized in the following form. In Section I, the behavior of the real exchange rate and its relation to the liberalization of the capital account is investigated. A central question addressed in this section is whether, as some analysts have pointed out, having fixed the exchange rate to the U.S. dollar in June of 1979 constituted a major policy mistake. Section II deals with interest rates, and some plausible explanations for their puzzling behavior are offered. Even though exchange rate and interest rate behavior are intimately related I have decided to analyze these issues separately, so that a clearer perspective can be obtained. In Section III, some issues related to the Chilean stabilization program are discussed. In this section I compare the military's monetarist stabilization program of 1973-83 with the only previous serious monetary-type stabilization program in Chile -- the Klein-Saks Mission program of 1955-57. Finally, in Section IV, some concluding remarks are offered.
I. REAL EXCHANGE RATE AND THE LIBERALIZATION OF THE CAPITAL ACCOUNT

The behavior of the real exchange rate during the military experiment affected the developments of the Chilean economy in many important ways.  

Between the second quarter of 1979 and the second quarter of 1982 the (effective) real exchange rate appreciated by approximately 25 percent. This real appreciation has had a central role in most interpretations of the Chilean crisis of 1982. In fact, a number of authors have claimed that the adoption of a fixed exchange rate in June of 1979 was a major policy mistake that provoked the real appreciation and, in conjunction with other elements -- like the full indexation of wages to past inflation -- generated the subsequent crisis.  

In this section the behavior of the real exchange rate is analyzed, and it is argued that the main cause of the real appreciation was related to the massive capital inflows that followed the liberalization of the capital account in 1979. Some regression results reported provide support to this hypothesis. It is further argued that while the adoption of a fixed rate -- at the same time that wages were fully indexed to past inflation -- was a policy mistake, it was not a major one.

In Table 1 quarterly data on the behavior of the effective real exchange rate between 1977 and 1984 are presented. An increase in this index reflects a real depreciation, whereas a decline shows a real appreciation. As may be seen, between 1977 and the second quarter of 1979 -- in spite of the fact that the so-called tablita was in effect -- there was actually a slight real depreciation of the peso.  

However, starting in the third quarter of 1979, and up to the second quarter of 1982 a continuous and steep real
appreciation was observed, which at the end of the first quarter of 1982 had accumulated to 22 percent. In the second quarter of 1982, the fixed exchange rate system was abandoned and a succession of devaluations followed. The fixed rate was first replaced by a system where the exchange rate was pegged to a basket. This was soon replaced by a floating system, which in turn was quickly replaced by a crawling peg. This system is in effect at the time of this writing. Between the abandonment of the fixed parity and mid-1984 a real effective depreciation of almost 13 percent has taken place. ⁶/

Although the domestic capital market was reformed in early 1975 -- with interest rates being freed and the creation of new financial institutions allowed -- foreign capital flows were strictly controlled until mid-1979. In June of that year a process of liberalization of the capital account of the balance of payments was begun; restrictions on medium- and long-run capital movements were lifted. The final steps in this process were taken in April of 1980 when additional regulations regarding the maximum monthly inflow of foreign capital were relaxed. ⁷/ Short-term capital movements, however, were forbidden throughout most of the experiment. In July of 1982, and for a brief period of time thereafter, short-term inflows were also allowed.

Even though throughout most of the experiment only medium- and long-term capital movements were permitted, the opening of the capital account resulted in extremely large inflows of foreign capital. In 1980, capital inflows more than doubled with respect to 1979, and in 1981 the level of capital inflows doubled again. In Table 2, biannual data on net capital inflows in U.S. dollars are presented for 1977 through 1982. The most striking feature of these data is the very rapid increase in the net inflow in the period 1978-81 and equally rapid decline in 1982. Most of the increased
foreign indebtedness between 1979-81 took place through higher loans obtained by the private sector without any government guarantees. For example, in 1979 the private sector obtained 98 percent of the foreign funds imported through Article 14 of the Exchange Law. In 1980 that figure was 97 percent, in 1981 it was 98 percent and in 1982 it was 77 percent. Most of these funds were obtained by the banking sector, which in turn loaned it to the final users. Banks, however, were not allowed to take the exchange risk; all their loans financed with foreign funds were documented in foreign exchange. The final borrower was subject to the devaluation risk. These regulations generated a highly segmented credit market, where only some agents had access to the "relatively cheap" credit denominated in foreign exchange.

The massive inflow of foreign capital experienced between mid-1979 and mid-1981 was the main factor behind the real appreciation of the peso. In fact, the absorption of these foreign funds required a real appreciation. From an analytical perspective, the reason for this is that, to the extent that a fraction of the net inflowing capital is spent on nontradable goods, an incipient excess demand for this type of goods will emerge; in order to restore equilibrium, nontradable goods' relative prices will have to increase, and a real appreciation will result. 8/ This was indeed the case in Chile, where a large proportion of the newly imported foreign capital was used to finance a dramatic boom in the construction sector.

The fact that a real appreciation is actually required to absorb an increase in the level of net capital inflows, introduces an important element in the discussion of the Chilean experience. This means that the 1979-1981 real appreciation was a short-run equilibrium phenomenon. It was an equilibrium phenomenon in the sense that, given the level of the capital
inflows, the real appreciation was needed to maintain internal equilibrium in the nontradable goods sector. On the other hand, it was a short-run phenomenon, since the rate at which capital flowed into Chile between mid-1979 and mid-1981 was _not_ sustainable in the long run. Once the nature of the real appreciation of 1979-1981 is understood in this way, it becomes clear that the adoption of a fixed rate in 1979 was not the main cause of the real appreciation. Independently of the exchange rate system, the absorption of a massive inflow of capital would have required a real appreciation. This means that, if instead of having pegged the peso to the dollar in June of 1979, Chile had adopted a floating rate, the opening of the capital account carried out between June of 1979 and mid-1980, would have resulted in a nominal, as well as real, appreciation of the peso. 9/

However, it is important to notice that the rate of capital inflows is an endogenous variable which, at least in principle, will differ under alternative exchange rate systems. To the extent that these inflows respond to interest rate differentials, it is likely that their magnitude would be somewhat lower under floating or adjustable exchange rates. In the Chilean case, however, the existing evidence suggests that for the 1979-1981 period, capital inflows were not sensitive to changes in interest rate differentials. Sjaastad, for example, reports that between August of 1979 and December of 1980 there was a weak relationship between the rate of capital inflows the domestic and foreign interest rates spread. Between January 1981 and March 1982 this relationship, however, basically disappeared. 10/ If capital inflows didn't respond to interest rate differentials, what explains, then, the massive inflow of foreign funds? A simple explanation is based on the idea that immediately after the liberalization reforms, the perceived
profitability of domestic investment -- as seen from abroad -- increases dramatically. This provokes a portfolio disequilibrium in the developed countries, since investors now want to hold a significantly higher fraction of the liberalizing country's capital stock as part of their portfolios. As a result, immediately following the liberalization, capital inflows into the country will jump. As time goes by, however, and the portfolio imbalance in the developed countries is solved, the flow of foreign capital into the country will slowly decline towards its new long-run equilibrium.

Alternatively, we can think that during the period of capital controls a large stock disequilibrium had developed, with the desired level of foreign debt well above its actual level. In this setting, once the capital account is opened, there is a tendency to solve this stock disequilibrium fairly fast. This will result in massive inflows of foreign funds in the short run. In fact, short-run capital inflows will overshoot their new long-run postliberalization level. This behavior of net capital inflows can be modeled in the following form: $\Delta K = \min [\Delta K, \theta(D^* - D_{-1})]$, where $\Delta K$ are actual capital flows, $\Delta K$ is the maximum amount of net capital inflow allowed every period before the capital account liberalization. $D^*$ is the desired or sustainable level of foreign debt, which will depend on real permanent income, and real wealth among other things. $D_{-1}$ is the actual stock of debt in the previous period and $\theta$ is a partial adjustment coefficient. Clearly, if prior to the liberalization $\Delta K < \theta(D^* - D_{-1})$ the gap between desired and actual debt will increase through time. Once the restrictions on capital inflows are lifted, actual inflows will become equal to $\theta(D^* - D_{-1})$. That means that, as with the alternative interpretation discussed above, immediately following the opening of the capital account capital flows will
jump to a fraction $\theta$ of the accumulated gap between the desired and actual debt. As this gap is closed, the level of capital inflows will slowly be reduced until it reaches a new equilibrium level. 11/ This was clearly the case of Chile where during 1980-81 the inflow of foreign funds was extraordinary and greatly exceeded its sustainable long-run level.

The existence of a fixed nominal exchange rate since June of 1979 made things even worse. First, the slow (approximate) convergence of domestic inflation towards world inflation, after the exchange rate had been fixed, generated additional forces towards a real appreciation. 12/ Second, and more important, the coexistence of a fixed exchange rate and 100 percent indexed wages made the adjustment required once capital inflows declined, extremely difficult. The reason for this is that while the absorption of large amounts of capital inflow requires a real appreciation, the reduction (or reversal) of capital inflow requires a real depreciation to maintain equilibrium. As reflected in Table 2, starting in late 1981 the rate of capital inflows experienced a steep decline. Since the nominal exchange rate was fixed, the adjustment of the real exchange rate required to cope with the lower rate of capital inflows had to take place through a decline in the nominal price of nontradable goods and of real wages. The problem, however, was that due to the indexation mechanism incorporated into the labor law of 1979, real wages were virtually inflexible downward. At this point it became apparent to most observers that a fixed exchange rate and the real wages policy were highly inconsistent, and that their coexistence represented a policy mistake. As Sjaastad and others have indicated, these policies amounted to imposing two mutually inconsistent numeraires in the economy. 13/ As a result of this inflexibility in real wages, relative prices did not adjust. Instead, there
was a significant adjustment in quantities, with output and employment falling dramatically.

A traditional way to have solved the crisis, which was advocated by some analysts, was to devalue the peso. The purpose of this measure, of course, would have been to generate a real devaluation — an improvement in the degree of competitiveness in the tradable goods sector required to reestablish equilibrium compatible with the lower rate of net capital inflows. However, due to the wage rate policy — and in particular to the backward-looking indexation — it is highly likely that the nominal devaluation would not have succeeded. As numerous historical experiences have indicated, when wages are 100% indexed, nominal devaluations will usually be fully translated into higher wages and prices, being self-defeating. In that regard, an appropriate policy package at this point in time would have included the simultaneous abandonment of the wage indexation scheme and of the fixed exchange rate system. The government, however reacted in a very different way. Between the second half of 1981 and the first half of 1982 a passive policy was followed. It was argued that the economy would automatically adjust to the new circumstances. In particular the economic authorities strongly rejected the idea of intervening in the labor and exchange rate markets. It was argued at the time that the macroeconomic adjustment would take place automatically and costlessly through higher interest rates, reduced expenditure and lower, and even negative, inflation. Interest rates did increase and inflation was somewhat reduced in the second half of 1981. The magnitude of the resulting adjustment, however, was clearly insufficient. The degree of real appreciation remained high and real interest rates climbed even faster. The level of domestic activity plummeted in
1982. The maintenance of a fixed exchange rate -- in conjunction with fully indexed wages -- constituted a policy mistake only at this time (1981-82), when the reduction in the level of capital flows required a real depreciation. Before late 1981, the fixed exchange rate did not constitute a serious mistake.

The interpretation of real exchange rate behavior between 1977 and 1982 presented in this paper relies heavily on the alleged existence of a negative effect of capital inflows on the real exchange rate; according to this view higher capital inflows will generate a real appreciation of the domestic currency. In order to investigate the extent of this relationship, a regression analysis was performed. Reduced form regressions using quarterly data for the period comprised between the first quarter of 1977 and the fourth quarter of 1982 were run. In addition to the (lagged) rate of net capital flows, other possible determinants of the real exchange rate like the terms of trade and real growth were also included in the regressions. The following results were obtained; where REER is the indexing of the real effective exchange rate and the numbers in parentheses are t-statistics:

\[
\begin{align*}
\log \text{REER}_t &= 0.014 - 0.078 \log \text{[net capital flows]}_{t-1} + 0.798 \log \text{REER}_{t-1} \\
(3.458) & \quad (-3.801) \quad (10.376) \\
R^2 &= 0.897 \\
\text{D.W.} &= 1.887
\end{align*}
\]

\[
\begin{align*}
\log \text{REER}_t &= 0.016 - 0.076 \log \text{[net capital flows]}_{t-1} \\
(3.973) & \quad (-3.521) \\
-0.218 \log \text{[terms of trade]}_{t-1} + 0.271 \text{[growth]}_{t-1} \\
(-1.935) & \quad (1.250)
\end{align*}
\]
\[ +0.005 \text{(devaluation dummy)}_t + 0.964 \log \text{REER}_{t-1} \]
\[ (0.194) \quad (7.889) \]
\[ R^2 = 0.946 \]
\[ \text{D.W.} = 1.753 \]

As may be seen, under both specifications, the coefficient of the lagged value of net capital inflows is significantly negative as expected. However, the value of the coefficient is not very large, suggesting that it would take a significant change in the rate of capital flows -- as in Chile -- to generate large variations in the real exchange rate.\(^\text{15/}\) It can also be seen from the results reported in equation (2) that the coefficients of the terms of trade variable is negative as expected. The coefficient for real growth, however, turned out to be positive and insignificant, suggesting that the Ricardo-Balassa effect did not play an important role in determining the behavior of the real exchange rate in Chile during this period. Finally the coefficient of the lagged dependent variable was fairly high under both specifications, indicating that after a shock the real exchange rate moved only slowly towards its new equilibrium. This is, in some sense, not surprising given that these regressions were run using quarterly data. In sum, the results presented here provide support to the hypothesis that the real exchange rate has been negatively affected by the rate of capital inflows in Chile.

One of the most important consequences of the real appreciation of the peso was that the tradable goods sector suffered an important loss of competitiveness, and that a large number of firms ran into serious financial trouble. Most of these firms faced these problems by resorting to heavy borrowing from the financial sector, exercising a significant pressure on the
demand for credit and on interest rates. As the magnitude of the real appreciation increased, it became apparent for most economic agents that the fixed exchange rate system was not sustainable. These beliefs fueled, towards mid- and late 1981, expectations of a significant devaluation, which were translated into even higher interest rates. In addition to the loss in competitiveness generated by the real appreciation, the extremely high interest rates and the depressed domestic demand, especially after 1981, produced serious financial problems to most firms. 17/ The lack of government supervision of the financial sector, and the close ownership relationship between banks and large firms, made things even worse. In order to avoid the firms' bankruptcy many banks made -- and rolled over -- loans that, from a purely financial viewpoint, were highly questionable. 18/ As a result, the portfolio of bad loans in Chilean banks grew dramatically between 1981 and the end of 1982. Of course, these rolling-over operations were not sustainable, and in early 1983 the financial sector collapsed. The most important banks had to be rescued by the government, which in early 1985 directly or indirectly controlled (or owned) more than 70 percent of the banking system.

II. MONETARY POLICY, EXPECTED DEVALUATION AND INTEREST RATES

Interest rate behavior constitutes one of the most fascinating puzzles of the recent Chilean experience. Throughout the episode both nominal and real interest rates were very high. In fact most analysts have pointed out that the persistence of these high interest rates played a crucial role in the 1982 crisis. 19/ Table 3 contains quarterly data on borrowing nominal interest rates, inflation, foreign interest rates (LIBOR) and the rate of
devaluation for 1977 through 1983. A striking feature of these data is the fact that, even after the capital account was opened and the exchange rate was pegged against the dollar in June of 1979, there was a substantial differential between the domestic borrowing rates and the foreign (LIBOR) rate. Only a small fraction of this differential can be explained by the premium over LIBOR charged by the international financial community to Chilean borrowers. The average premium charged to loans obtained by Chile was 1.55 percentage points in 1978; 0.99 percentage points in 1979; 0.99 percentage point in 1980; 0.89 percentage points in 1981; and 0.97 percentage points in 1982. 20/

The data on nominal interest rates presented in Table 3 refers to average borrowing rates from the banking system. Throughout the period lending rates were substantially higher. The spread between nominal lending and borrowing rates -- which averaged 22.7 percentage points in 1978, 22.4 percentage points in 1979, 9.4 percentage points in 1980, and 11.1 percentage points in 1981 and 18.2 in 1982 -- partially reflected the inefficiency of the Chilean banking system, which had a much higher cost of operations per unit of deposits than banks of comparable size in the U.S. and other industrialized countries. In Table 4 data on spreads between lending and borrowing rates between 1974 and 1983 are presented.

Until mid-1979, when the process of opening the capital account was begun, real interest rates were also extremely high. The real borrowing interest rate averaged 8.8 percent per annum in 1977, 18.9 percent per annum in 1978 and 13.2 percent per annum during the first half of 1979. The (partial) opening of the capital account and the resulting large inflows of foreign capital quickly impacted real interest rates; between the third
quarter of 1979 and the fourth quarter of 1980 borrowing real rates declined significantly, averaging only 4.1 percent per annum. Towards the end of 1980 the situation drastically changed. In December of that year the real borrowing rate climbed to 15 percent per annum, while the real lending rate exceeded 20 percent per annum. Things became even worse in 1981, when the real borrowing rate reached an annual average of 27 percent, and the real lending interest rate averaged 37 percent. In the first half of 1982, immediately preceding the devaluation of the peso, the real borrowing rate averaged 37 percent, while the real lending rate reached the remarkable figure of 43.3 percent.

Some possible explanations for the behavior of interest rates have been offered. Sjaastad, for example, argues that regulations forbidding banks to operate in funds denominated in foreign currencies introduced exorbitant transaction costs. According to him these costs explain the extraordinarily high and stable spread between interest rates for peso-denominated operations and dollar-denominated operations. 21/ Harberger, on the other hand, has argued that the existence of a strong and evergrowing "false demand" for credit played a central role in the explanation of interest rate behavior. 22/ This "false demand" consisted of the rolling-over of loans, which in turn, had their origin in the privatization of a large number of firms (previously nationalized during President Allende's government) during the early years of the military regime. These firms were auctioned to private conglomerates that had to spend significant resources in order to operate, modernize and expand these companies. Many of these firms did not turn out to be profitable, and increasingly resorted to additional borrowing in order to stay afloat. As pointed out above, at the same time banks -- which had a close ownership
relation with the firms -- continued to roll over these loans in the hope that in this way their bankruptcy would be avoided. Of course, this whole operation was only possible due to the lack of supervision of the financial sector. 23/

Other observers have mentioned the role of expected devaluation and a higher country risk premium attached by the international financial community to Chile, as possible elements that would explain interest rate behavior. Still others have pointed out that the domestic monetary policy played a crucial role in the rapid increase of real rates experienced since late 1980. In particular, it has been argued that the so-called "neutral monetary" policy, which was an important ingredient of the "automatic adjustment" macro-economic approach followed by the economic authorities since late 1979, resulted in unnecessary upward pressures on the real interest rate. In connection to this it is usually mentioned that between the second quarter of 1980 and the fourth quarter of 1981 the real value of the monetary base declined by more than 18 percent. 24/ In this section a model that combines some of these explanations is presented and tested. Also, a number of analytical issues and lessons that emerge from this experience are raised.

II.1. Nominal Interest Rates

In this subsection an attempt to empirically explain the behavior of the nominal interest rate in Chile between 1977 and 1982 is made. Traditionally, empirical studies on nominal interest rates determination have made extreme assumptions regarding the degree of openness of the country under study. It has usually been assumed that the economy in question is either fully open to the rest of the world or that it is completely closed. These
extreme assumptions, of course, are not applicable to most developing
countries, whose capital account is, in fact, subject to different types of
controls. In that regard most developing economies, including Chile during
the 1977–83 period, can be classified as semi-open economies.

A model for analyzing the process of interest rate determination in
the context of semi-open economies as Chile has recently been proposed by
Edwards and refined by Edwards and Khan. According to this model the
behavior of the domestic nominal interest rate can be captured by the
following set of equations:

\[ i_t = \psi i_t^0 + (1-\psi) i_t^c \]  \hspace{1cm} (3)

\[ i_t^0 = i_t^* + D_t^e + p_t \]  \hspace{1cm} (4)

\[ i_t^c = r_t + \pi_t^e \]  \hspace{1cm} (5)

\[ r_t = r - \lambda EMS_t + \omega_t \]  \hspace{1cm} (6)

\[ EMS_t = \log m_t - \log m_t^d \]  \hspace{1cm} (7)

\[ \log m_t^d = a_0 + a_1 \log Y - a_2 (p + \pi_t^e) - a_3 \pi_t^e \]  \hspace{1cm} (8)

\[ \Delta \log m_t = \beta [\log m_t^d - \log m_{t-1}^d] \]  \hspace{1cm} (9)

where the following notation has been used:

- \( i_t \) = nominal interest rate in the semi-open economy
- \( i_t^0 \) = nominal interest rate under the extreme assumption of fully
  open economy
- \( i_t^* \) = foreign interest rate
- \( D_t^e \) = expected rate of devaluation
\[ P_t = \text{risk premium} \]
\[ i_t^c = \text{nominal interest rate under assumption of fully closed economy} \]
\[ r_t = \text{actual real interest rate in period } t \]
\[ p = \text{long-run real interest rate} \]
\[ \pi_t^e = \text{expected inflation} \]
\[ \text{EMS}_t = \text{excess supply for real money in period } t \]
\[ m_t = \text{actual real money} \]
\[ m_t^d = \text{quantity of real money demanded in period } t \]
\[ y_t = \text{real income in period } t \]
\[ \omega_t = \text{random shock} \]

and where \( \psi, \lambda, \alpha \) and \( \beta \) are parameters.

Equation (3) states that the nominal interest rate in a semi-open economy can be expressed as a weighted average of the values it would take under the fully open and fully closed extremes. Parameter \( \psi \) measures the degree of financial openness of this economy; if \( \psi = 1 \) equation (3) collapses into the interest arbitrary condition for a fully open economy, given by equation (4). If, on the other hand, \( \psi = 0 \) equation (3) becomes equal to the Fisher closed equation (5). A value of \( \psi \) between zero and one reflects that this is a semi-open economy. The closer \( \psi \) is to one the more open this country will be to foreign influences on its financial sector. Equation (4) is the traditional interest arbitrage condition. It is assumed that under risk aversion there is a time varying risk premium term \( (P_t) \). Equation (6) states that the real interest rates will negatively depend on the situation of excess liquidity in the economy. With other things given, an excess supply for real money \( (\text{EMS}_t > 0) \) will exercise negative pressure, in the short run, on
the real interest rate. In the long run, however, EMS = 0 and \( r_t = \sigma + \omega_t \).

Equation (8) is the demand for real money. Finally, equation (9) depicts the process through which monetary equilibrium is achieved.

Combining (3) through (9) the following expression form for the nominal interest rate in a semi-open economy is obtained:

\[
 i_t = \delta_0 + \delta_1 (i_t^* + D_t^e) + \delta_2 \log m_{t-1}^* + \delta_3 \log Y_t + \delta_4 \pi_t^e + \delta_5 \pi_t + \epsilon_t \tag{10}
\]

where \( \delta_1 > 0, \delta_2 > 0, \delta_3 > 0, \delta_4 > 0, \text{ and } \delta_5 < 0 \). The most important property of this expression is that it allows both open and closed economy factors to influence the domestic nominal interest rate in the short run. Indeed, the extremes of fully open or closed economies are particular cases of this equation.

Moreover, the degree of financial openness of this country will be related to the value of \( \delta_1 \). If \( \delta_1 = 1 \), and \( \delta_2 = \delta_3 = \delta_4 = 0 \) (10) becomes the open-economy interest arbitrage condition. In the Chilean case, however, it is expected that in a regression analysis both the coefficients of \( (i_t^* + D_t^e) \), i.e., \( \delta_1 \), and of \( \log m_{t-1}^* \), i.e., \( \delta_2 \), will be significantly different from zero; this would indicate that in Chile during the period under study both open-economy and closed-economy factors played an important role in the behavior of the nominal interest rate.

The estimation of equation (10) presents a number of problems. First data on the expected rate of devaluation have to be obtained. For the period between 1977 and June of 1979 this can be proxyed by the actual rate of devaluation. \( \text{27/} \). Especially for the 1978 through mid-1979 period this is a fairly uncontrovertial assumption, since the actual rate of devaluation was equal to the preannounced rate of devaluation determined by the tablita. On
the other hand, between July of 1979 and June of 1982, the actual rate of
devaluation with respect to the U.S. dollar was zero. It is hard to argue,
however, that during this period the expected rate of devaluation was also
equal to zero. On the contrary, the available evidence indicates that the
probability -- and expected magnitude -- of devaluation increased steadily
throughout the period. For example, Le Fort has determined, using Bayesian
methods, that the expected rate of devaluation increased from approximately 2
percent in July of 1979 -- one month after the parity was fixed -- to over 26
percent in May of 1982, just prior to the actual devaluation of June of that
year. In this paper, and in order to test the relevance of the model
presented above, the following simplifying assumption regarding the expected
rate of devaluation during July 1979 and June 1982 was made: It was assumed
that in every quarter the expected rate of devaluation can be proxied by the
difference, in percentage points, between that quarter's effective real
exchange rate and the effective exchange rate prevailing in the second quarter
of 1979, when the peso was fixed to the dollar. This means, then, that it is
assumed that the degree of real overvaluation of the peso relative to its June
1979 value provides a good proxy for the expected rate of devaluation.

Another problem related to the estimation of (10) has to do with the
definition of a time series of the expected rate of inflation. In order to
simplify the estimation \( \pi_t^e \) was replaced by \( \pi_t \), the actual rate of
inflation. This is a reasonable thing to do under the assumption of rational
expectations. And finally, a third serious problem with the estimation of
(10) is related to the risk premium term \( P_t \). Ideally one would want to model
this term, which will generally depend on the stock of outside assets of the
government and on other variables affecting the degree of country risk. This,
however, was considered to be outside of the scope of this paper. Consequently it was assumed that $P_t$ could be expressed as a constant $k$ plus a serially correlated random term $\mu_t = \delta \mu_{t-1} + \nu_t$. This means that in the estimation of equation (10) a procedure that corrects for serial correlation should be used. Given the simplifying nature of these assumptions the results obtained from the estimation of (10) should be interpreted with caution.

In the regression a dummy variable that took the value of zero from 1977 to mid-1979 and the value of one from then onwards was introduced in order to allow for some distinction between the fixed and non-fixed rate subperiods. The estimation of equation (10) using quarterly data for period 1977 through 1982 and using OLS corrected for serial correlation, yielded the following results, where as before the numbers in parenthesis are $t$-statistics (see the Appendix for the exact data definitions and data sources):

\[
i_t = 0.039 + 0.239(i^*_t + D_t) - 0.442 \log m_{t-1}
\]

\[(-0.418) (1.965) (-2.030)\]

\[-0.153 \log y_t + 0.378 \pi_t + 0.090 \text{ dummy}
\]

\[(-0.175) (-1.130) (0.905)\]

\[R^2 = 0.905\]

\[DW = 1.932\]

\[N = 18\]

\[RHO = -0.378\]

These results are quite interesting. The fact that the coefficient of $(i^*_t + D_t)$ and of $\log m_{t-1}$ are significant at conventional levels and have
the expected signs, provides some support to the hypothesis that during the period under study the behavior of the nominal interest rate in Chile was influenced both by open economy factors and internal monetary conditions. This means that interest rate determination in Chile should indeed be modeled using a semi-open economy framework.

In spite of the estimation's shortcomings the results reported in equation (11) point out towards three basic factors in the explanation of nominal interest rates behavior in Chile: (1) nominal world interest rates; (2) expected devaluation; and (3) real liquidity. In fact, during 1981, while the world nominal interest rate and the expected rate of depreciation increased, real liquidity, in at least some of its definitions, drastically declined. These elements, then, provide an important guide for the understanding of nominal interest rate behavior in Chile. Further refinement of the model, however, should provide additional insights. In particular, a more detailed consideration of the determinants of the risk premium -- which now has been assumed to be equal to a constant plus an autoregressive term -- is a logical step towards the improvement of this model. Also, finding a better proxy for the expected rate of devaluation would result in improved estimates.

II.2 Real Interest Rates

Not only were nominal interest rates extremely high during the Chilean experiment, but real rates were also dramatically high. As mentioned, the partial opening of the capital account in mid-1979, and the resulting increase in the rate of (net) capital inflows, generated an important initial decline in real interest rates. This situation lasted for approximately 18
months, until November of 1980. Towards the end of that year, however, a sharp change was observed. During the year 1981, in spite of the fact that net capital inflows reached a record high, averaging more than 1.1 billion dollars per quarter, real interest rates experienced steep increases. The real borrowing rate was 22.9 percent in the first quarter of 1981, 26.3 percent in the second quarter, 27.9 percent in the third quarter and 32.8 percent in the fourth quarter.

What events can account for this abrupt change in the conditions in the financial market? Obviously, a number of factors can be mentioned, including the fact that this period coincided with the sharp increase in world real interest rates. Another explanation that has been advanced refers to the fact that in 1981 Chile's rate of inflation was significantly reduced. 29/ For a given nominal rate, the argument goes, a decline in inflation results in higher real interest rates. While this reasoning is evidently (tautologically) correct, it is clearly incomplete. In fact, it begs the question on why wasn't the decline in inflation in 1981 accompanied by an equiproportional drop in nominal rates? The discussion on the behavior of nominal rates presented in the preceding section provides a partial answer to this. While inflation finally came down in 1981 to the level of world inflation, at that time it became apparent that the prevailing rate of capital inflows was not sustainable in the long run. This resulted in significant expectations of devaluation which positively impacted the nominal interest rate without affecting inflation in an equiproportionate way.

An approach similar to that used to discuss the behavior of the nominal rate can be used to focus the analysis on the behavior of the real rate. Consider equations (12) through (14).
\[ r_t = \beta r_t^0 - (1-\beta)r_t^c \]  
(12)

\[ r_t^0 = r_t^* + \delta_t \]  
(13)

\[ r_t^c = \rho - \lambda_{EMS} t + \omega_t \]  
(14)

Where \( r_t \) is the real rate in this semi-open economy, \( r_t^0 \) is the real interest rate that would prevail in the extreme case of a fully open economy, and \( r_t^c \) is the real rate under the other possible extreme -- completely closed economy. \( \beta \) is a parameter, equivalent to \( \psi \) in equation (3), related to the degree of openness of this economy. If \( \beta = 1 \), equation (12) becomes equal to the open economy extreme (13); if \( \beta = 0 \) the fully closed economy equation results. In the case of a semi-open economy, however, one would expect \( \beta \) to be between zero and one. In equation (13) \( \delta_t \) is the expected change in the real exchange rate. The real exchange rate, in turn, is defined as

\[ e = \frac{E}{P} \]  

where \( E \) is the nominal exchange rate, \( P^* \) is the foreign price level and \( P \) is the domestic price level. Equation (14), which is the real rate equivalent to equation (6) above, is the actual real rate of interest in period \( t \). Equation (13) is of particular interest and relevance for this discussion. It states that even under a completely open economy, with full capital mobility, real interest rates need not be equal. Moreover, according to this term if a real depreciation is expected (i.e., \( \delta_t > 0 \)) the domestic real interest rate will exceed the world interest rate. Equations (12), (13) and (14) can be combined to obtain an expression that provides some insights for the understanding of the behavior of the real interest in Chile between late 1980 and mid-1982:
According to this equation the domestic real interest rate can increase for three reasons: (1) a higher world real interest rate; (2) a higher expected rate of real depreciation; and (3) the creation of a situation of excess demand for real liquidity in the economy \((\text{EMS}_t < 0)\). All three elements were simultaneously present in 1981-82. First, the world real interest rate -- measured as the difference between LIBOR and the US CPI inflation -- increased by more than 7 percentage points between 1980 and 1981. Second, as Le Fort has recently established, there is no doubt that starting in late 1980 and during most of 1981 the expectations of a real devaluation increased dramatically. These expectations were fueled both by the generalized feeling that the external situation regarding capital inflows was not sustainable and by the fact that in 1981 the terms of trade began to turn dramatically against Chile. Between 1980 and 1981 the effective real exchange rate further appreciated by 12 percent. Finally, as pointed out in Section II, starting in 1981 there was a large increase in the demand for real liquidity, stemming (partially) from the bank's decision to roll over their bad loans as a way to avoid (or more accurately, postpone) firms' bankruptcy.

III. MONETARISM NOW AND THEN: THE KLEIN-SAKS MISSION VS. THE MILITARY REGIME

In this section the military government approach towards stabilization is compared to the only other sustained monetarist-type stabilization program undertaken in Chile, during 1955-57. This comparison focuses mainly on the implications of the two different programs for real exchange rate behavior. The comparison of both episodes provides interesting insights.
regarding the evolution through time of monetarist thinking in Chile and Latin America. Both experiments had a number of elements in common, and also some key features that were radically different. In fact this comparison turns out to be quite instructive.

In 1955 inflation in Chile had reached what at the time was considered to be an extraordinarily high level -- 84 percent. The government decided to seriously tackle the problem by implementing a long-term consistent stabilization program. For this purpose a New York-based consulting firm was hired, and in 1955 the Klein-Saks Mission began its work. The mission's terms of reference stated that it should evaluate the causes of inflation and external disequilibrium, and recommend a set of policies to combat these problems. The approach taken by the mission can undoubtedly be labeled as monetarist. It (correctly) traced the main cause of inflation to money creation to finance the fiscal deficit, and recommended a package of monetary-type policies that would work towards eliminating the underlying roots of inflation. The mission's program was a qualified success. By 1957 the rate of inflation had declined to 17 percent; the balance of payments had improved and fiscal finances were in better shape. All in all, given the existing political constraints, it is possible to state that the mission's achievements were quite significant.

The similarities between the Klein-Saks Mission program and the military program mainly refer to the diagnosis of the causes generating inflation and the external crisis. Even though the initial conditions were much worse in 1973 than in 1955, both programs correctly pointed out that the creation of money to finance the fiscal deficit was the main cause of the ongoing inflation. Both programs also emphasized Chile's weak external
position and the inability of the public sector to efficiently mobilize resources for investment purposes. 32/

The two stabilization programs also had some important differences. Two of them are worth pointing out within the context of the present paper. First, contrary to the Klein-Saks program, one of the main features of the military experience is that after the initial period, the stabilization program not only focused on the traditional short-run anti-inflationary elements present in any orthodox IMF-type of program, but also emphasized long-run institutional reforms, whose purpose was to drastically reduce the government's role in the economy. Towards the late 1970s, the so-called "modernization reforms," which introduced important structural changes, became an integral part of the long-run development program, with most of these reforms having actually been carried out by the end of 1981. 33/

A second major difference between both monetarist experiences refers to the framework used for formulating the stabilization programs. While the Klein-Saks experience was basically based on a closed-economy view of the world, the new monetarism postulated that, after the trade reform, Chile was an open economy subject to external shocks. The military stabilization program was highly influenced by the simplest version of the monetary approach to the balance of payments. In particular, there was great faith that in a small open economy the different parity conditions would hold, even in the short run. In fact, it was the belief that in an open economy the domestic rate of inflation rapidly converges to the world rate of inflation (plus expected devaluation) that prompted the economic authorities to base the stabilization programs on the preannouncement of the rate of devaluation. As a culmination of this policy the peso was fixed to the U.S. dollar in June of
1979. However, this experience showed, once again, that the purchasing power parity condition does not hold in the short run; for several years the domestic rates of inflation were significantly higher than the rate of world inflation plus the rate of devaluation. As already argued, this plus the opening of the capital account resulted in a major real appreciation of the domestic currency, and in a significant loss of competitiveness of the domestic sector. The situation was aggravated by the adoption of a 100 percent wage indexation law in 1979. Towards late 1981, when capital inflows were substantially reduced, the adjustment of the economy required, a real devaluation of the peso and a reduction of real wages, which were precluded by the existing institutional arrangements, including the fixed exchange rate and the indexation scheme. As a result, there was a significant adjustment in quantities, with output and employment falling dramatically.

More specifically, the two experiences differed significantly with respect to the (proposed) exchange rates and wage rate policies. As has already been pointed out repeatedly, the military program opted for a fixed exchange rate and fully indexed wages with respect to past inflation. Regarding these two specific policies the Klein-Saks Mission made very different policy recommendations. The following quotations from the Mission's report clearly illustrate this point: 34/

"[T]he Mission has held that automatic and obligatory readjustments of salaries and wages are an important contributing factor in the inflation. The Mission...advocated using wage policy as one of several elements in reducing the rate of...price increases. The eventual objective of this policy was seen in the restoration of freedom of wage negotiations..." (page 10)
Regarding exchange rates policy the Mission recommended:

"The Mission's concrete recommendations were based on the desirability of establishing a single flexible exchange rate for all merchandise transactions...While a free market for capital transactions was to be maintained..." (pages 11 and 12)

The suggestion of a dual exchange rate system, which differentiates between financial and current external transactions is particularly interesting in the light of the events of 1979-82, where the massive capital inflows resulted in a steep real appreciation of the peso. In principle, this kind of exchange rate arrangement tends to isolate the real side from real exchange rate movements originated in the financial side of the economy. In that regard under this type of arrangement the real appreciation resulting from the liberalization of the capital account would have a reduced effect on the real side of the economy. 35/

After comparing the stabilization programs of the Klein-Saks Mission and of the military regime one is tempted to argue that if (regarding exchange rates and wage rates) the monetarists of the 1970s had applied the policies of the monetarists of the 1950s, the magnitude of Chile's current economic problems would have been less severe.

IV. CONCLUDING REMARKS

What went wrong in Chile? This is a question with vast policy implications for developing countries. In the 1970s Chile adopted a set of policies advocated for a long time by mainstream economists for developing
countries. For a while things worked out well and a number of experts believed that Chilean approach would become the norm that developing countries would try to emulate. In 1982, however, the experiment collapsed. A number of things went wrong. However, it can be argued that the crisis of the Chilean economy was not directly the consequence of the more basic liberalization reforms. For example, it is clear that the collapse of 1982 was not related in any direct way to the fiscal reform of 1975, or to the tariff liberalization carried out between 1975 and 1979, or to the reform of the social security system. On the other hand, there is little doubt that the way in which the financial reform was carried out -- basically with no supervision of the financial sector -- played a major role in determining the magnitude of the crisis. Also, the timing of the opening of the capital account of the balance of payments in 1979/80 -- which generated wide swings in the real exchange rate -- was ill conceived.

It is in the sphere of macroeconomic management where the more serious mistakes took place. In that respect, the reliance on an "automatic monetary adjustment" towards late 1981 was particularly harmful. Also, the combination of a fixed exchange rate with fully indexed wages created important policy inconsistencies, which became particularly serious in late 1981 when the rate of capital flows dramatically dropped. It should be recognized, however, that foreign factors including the world recession and the drastic reduction in Chile's terms of trade between 1980 and 1982.

Another area where the government policies were particularly deficient refers to the capital accumulation process. Throughout the period savings and investment was very low; in fact lower than its level in the 1960s. In that regard it was quite apparent from the early stages of the economic recovery
that the growth pace of 1977-80 was not sustainable in the medium and long run.
APPENDIX

Data Sources for Regression Analysis

Terms of Trade: Defined as price of exports relative to imports. The data were obtained from Universidad de Chile.


Interest Rates ($i_t$): Nominal borrowing rates paid by banks. Data obtained from various issues of the Boletín, Banco Central de Chile.

Inflation: Rate of change of consumer price level as corrected by Cortazar and Marshall for 1975-79. For other years, data obtained from Banco Central de Chile.

Exchange Rate: Data obtained from Banco Central de Chile.

Output: Quarterly data obtained from Universidad de Chile.

See footnote 1. Note that this paper does not address other important issues related to the reform attempt, including the tariff liberalization, the income distribution problem, the unemployment problem and the
investments—savings process. On these issues see Edwards, "Stabilization with Liberalization..."


5/ It should be noted that between 1973 and 1975 a very sharp real depreciation took place. See Harberger, "The Chilean Economy in the 1970s."

6/ During this period the nominal exchange rate with respect to the U.S. dollar was devalued by 135 percent.

7/ Throughout the experiment capital inflows were subject to a number of controls. For example, there was a minimum maturity for loans to come in freely (66 months). Loans of shorter maturities were subject to very high reserve requirements. On this see Edwards, "Stabilization with
Liberalization;" Harberger, "Observations on the Chilean Economy;" and Corbo, "Recent Macroeconomic Developments..."


9/ In fact preliminary computations indicate that under a floating exchange rate, in mid-1981 the nominal exchange rate would have been approximately 30 pesos per dollar.

10/ Larry Sjaastad, "The Failure of Economic Liberalism in the Southern Cone" (March 1983). Attempts to explain econometrically the behavior of the net rate of capital flows in Chile during 1977-1981 didn't produce significant results. The regressions, available from the author on request, indicate that the rate of capital was not sensible during the period to uncovered interest rate differentials. Also, given the segmentation that existed in
the financial market, at every moment in time there was an excess demand for credits denominated in foreign exchange.


D.W. is the Durbin-Watson statistic; $R^2$ is the coefficient of determination. These regressions were run correcting for the existence of first order autocorrelation. Note that since lagged right-hand side variables are used, no simultaneity problems arise from the estimation reported here. The devaluation dummy in equation (2) takes a value of one in June of 1979 and March of 1982, and zero otherwise. On the relationship between real exchange rate changes and its theoretical determinants, see Sebastian Edwards, "Exchange Rates in Developing Countries," Working Paper, University of California, Los Angeles, 1985. See also Carlos Diaz-Alejandro, "Latin America Debt: I Don't Think We in Kansas Any More," Brookings Papers on Economic Activity 2 (1984): 335-404. See Guillermo Calvo, "Fractured Liberalism," Economic Development and Cultural Change (this issue) for an analysis of the Argentinian experience.

These results are in agreement with the simulation findings reported in Condon, Corbo and de Melo, "A Simulation Analysis..."

The devaluations of 1982 were a mixed blessing for most firms. On one hand, they saw an improvement in their degree of competitiveness. On the other hand, since they had incurred a significant dollar-denominated debt, the peso value of their liabilities greatly increased. This situation was partially solved by the government decision to establish a preferential exchange rate to pay debts denominated in foreign currency.

See also Julio Galvez and James Tybout, "Microeconomic Adjustment in Chile: The Importance of Being a Group," World Development (August 1985) for a detailed analysis of the interaction between banks and bank-related firms.

These figures refer to loans received by the banking sector; see Boletin Mensual del Banco Central de Chile. See Sebastian Edwards, "LDCs' Foreign Borrowing and Default Risk. An Empirical Analysis, 1976-80," American Economic Review 74 (September 1984): 726-34, for an empirical analysis of the determinants of the spread over LIBOR for a group of developing countries in the period 1976-80.

Sjaastad, "The Failure of Economic Liberalism."

Harberger, "Observations on the Chilean Economy."


See, for example, Fontaine, "Crecimiento, Recesion y Mercado." It should be pointed out, however, that the different definitions of real money behaved quite differently throughout the period. See Edwards, "Interest Rates and Money in a Semi-Open Economy: Chile 1975-81," Working Paper, University of California, Los Angeles, 1982 and Harberger, "The Chilean Economy in the 1970s."

Sebastian Edwards, "Money, the Rate of Devaluation and Interest Rates in a Semi-Open Economy," Journal of Money, Credit and Banking 17 (February 1985): 59-68 and Sebastian Edwards and Mohsin Khan, "Interest Rate
Determination in Developing Countries: A Conceptual Framework," IMF Staff Papers (September 1985).

26/ See Edwards and Khan (1984) for the exact expressions of the $w_s$ in terms of the structure parameters of equations (3) through (9).

27/ James Hanson and Jaime de Melo, "External Shocks, Financial Reforms and Stabilization Attempts in Uruguay during 1974-83," World Development (August 1985) also make this assumption in their study on Uruguay.

28/ Hanson and de Melo reached similar conclusions in their analysis of interest rate behavior in the case of Uruguay. See, however, Blejer and Gil-Diaz, "The Effects of Domestic and External Factors on the Determination of the Real Interest Rate: The Case of Uruguay," Economic Development and Cultural Change (this issue).

29/ See Sjaastad, "The Failure of Economic Liberalism."

30/ Equation (13) can be derived by combining the uncovered interest condition and the Fisher equation for the domestic and foreign countries.

31/ Le Fort, "The Real Exchange Rate and Capital Flows..."

32/ On the Klein-Saks Mission, see "The Chilean Stabilization Program and the Work of the Klein and Saks Economic and Financial Mission to Chile" (Santiago, Chile, May 1958).

33/ See the analysis in Foxley, "Latin American Experiments in Neoconservative Economics." There is little doubt that the implementation of the more drastic of these reforms -- including the labor law of 1979, the mining law and the privatization of the social security system -- could only be carried out because the democratic process had been suspended. It is highly unlikely that these (and other) reforms would have been approved by a democratically elected congress.
34/ See "The Chilean Stabilization Program and the Work of the Klein and Saks Economic and Financial Mission to Chile."

35/ On the role of dual exchange rates for separating the capital and current accounts, see Rudiger Dornbusch, "Exotic Exchange Rate Adjustments," Paper presented at the NBER/World Bank Conference on Structural Adjustment and Real Exchange Rates in Developing Countries.

36/ For example, Ronald McKinnon states in his "The Order of Economic Liberalization: Lessons from Chile and Argentina" in K. Brunner and A. Meltzer (eds.) Economic Policy in a World of Change (Amsterdam: North-Holland, 1982) that "The correct order of liberalization...approximates the successful Chilean experience after 1975. Chile is to be treated as the norm or standard of reference" (page 159).