HOW EFFECTIVE ARE CAPITAL CONTROLS?

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ABSTRACT

In the aftermath of the East Asian crisis a number of authors have argued that capital mobility is highly destabilizing, and that emerging countries would benefit from restricting capital flows. In this paper I investigate, from a historical perspective, the effectiveness of capital controls. I deal with Tobin taxes, controls on outflows and controls on inflows. I argue that controls on outflows have seldom worked as expected. They introduce major distortions and breed corruption. Market-based controls on inflows - similar to those implemented by Chile - have the potential for lengthening the maturity of foreign debt. They are not very effective, however, in achieving other objectives, including a higher degree of monetary policy independence.

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A number of authors have recently argued that globalization has gone too far, and that free capital mobility has created a highly unstable international financial system. Krugman (1999, p. 74), for instance, has maintained: "[S]ooner or later we will have to turn the clock at least part of the way back: to limit capital flows for countries that are unsuitable for either currency unions or free floating." Discussions on the new international financial architecture have focused on two type of controls on cross-border capital movements: controls on capital outflows, perhaps similar to those that Malaysia imposed in mid-1998, and controls on capital inflows, perhaps similar to those implemented in Chile between 1991 and 1998. While most economists continue to be skeptical about the former, the idea of restricting capital inflows has grown in popularity. For example, Joseph Stiglitz (1999), the World Bank's Chief Economist, has said: "Volatile markets are an inescapable reality. Developing countries need to manage them. They will have to consider policies that help stabilize the economy…These could include sound bankruptcy laws and Chilean-style policies that put some limits on capital flows." This view has also been recently endorsed by Ito and Portes (1998) and Eichengreen (1999), among others.

The idea of restricting capital mobility as a means of reducing macroeconomics instability is not new in modern policy discussions. In the 1970s James Tobin (1978) argued that a global tax on foreign exchange transactions would reduce destabilizing speculation in international financial markets. In the mid 1990s Tobin's proposal was discussed in the context of the devaluation of the British Pound and the Italian Lira. Barry Eichengreen and Charles Wyplosz (1993), for example, argued that Tobin-taxes would discourage short-term speculators from betting against major currencies. However, it soon

became evident that to be effective, Tobin-taxes would have to be implemented by all countries simultaneously. This made them technically and politically unfeasible. Recent discussions on the future of the international monetary system have tended to shy away from grand and universal schemes, focusing instead on the merits of more modest proposals aimed at restricting capital mobility in (some of) the emerging economies.

In this paper I review some evidence on capital controls, with some focus on Chile as the leading example of where such controls have been widely acclaimed as effective. The discussion deals with: capital controls and the sequencing of economic reform, the measurement of the degree of capital mobility, the empirical evidence on the relationship between capital mobility and economic performance, and the effectiveness of controls on both capital outflows and inflows. In Chile, I will discuss how controls on capital inflows have affected the composition of capital flows, the behavior of exchange rates, and Chile's monetary policy and macroeconomic instability.

Capital Controls and the Sequencing of Reform

For a long time economists have argued about the benefits of free capital mobility. This discussion has been carried out at both theoretical and empirical levels. Theoretically, the question is whether the theorems on the gains from free trade in goods, extend to free trade in financial capital. Maurice Obstfeld and Keneth Rogoff (1996), for example, have provided persuasive theoretical arguments that support the existence of gains from intertemporal trade, through a free international market for securities. Jagdish Bhagwati (1998) and Richard Cooper (1998), on the other hand, have argued that in a world with imperfect information, free capital mobility is likely to amplify existing distortions, create

situations of moral hazard, encourage excessive risk taking, and generate major and costly crises.

At the practical policy level the debate has centered, not so much on whether capital controls should be eliminated, but on *when* and *how fast* this should be done. This discussion has come to be known as the "sequencing and speed of reform debate" (James Hanson 1995, Stanley Fischer 1998).   Early discussions on the sequencing of reform focused on the order of liberalization of the current and capital accounts of the balance of payments. Ronald McKinnon (1973) argued that the opening of the capital account, through the dismantling of capital controls, should be postponed until free trade in goods was consolidated. According to him, if the opposite sequencing were followed, excessive capital inflows would result in a substantial real exchange rate appreciation, which, in turn, would frustrate the attempt to open-up trade in goods.

With time, the sequencing debate extended to other markets, and by the late 1980s a consensus of sorts had emerged. Most authors agreed that major fiscal imbalances had to be tackled first, and that a minimal degree of macroeconomic stability should be attained very early on during the reform process. Most analysts also agreed that the capital account should only be liberalized once the domestic financial sector had been reformed, and once the liberalization of trade in goods had become consolidated.   It was also agreed that an effort should be made to ease labor markets regulations as early as possible in the reform process.

During the 1990s, a number of authors argued that a successful sequencing required establishing a sound banking system -- including effective prudential regulations --, before restrictions on capital mobility were lifted. Mc Kinnon (1991) and McKinnon and Pill

(1995) argued that, because of the moral hazard associated with the financial sector, capital account liberalization should wait until the end of the reform episode. In the aftermath of the Mexican and East Asian crisis economists have become particularly aware of the need to put in place, very early on in the reform process, a modern banking supervisory system. As Calvo (1998) has pointed out, the problem is that poorly regulated banks will intermediate the inflows of capital in an inefficient – or even corrupt – way, increasing the probability of a systemic financial crisis (See also, Rudi Dornbusch 1998, Graciela Kaminsky and Carmen Reinhart 1999 and Frederic Mishkin, this issue).

Capital Controls, the "True" Extent of Capital Mobility and Economic Performance

Legal controls on capital mobility are not always translated into actual restrictions on these movements. In country after country the private sector has found ways of getting around controls. The simplest mechanisms are the overinvoicing of imports, the underinvoicing of exports, and the mislabeling of the nature of the capital movement (Garber 1998 discusses more sophisticated mechanisms). The differences between the *legal* and *actual* degree of capital mobility has affected economists' ability to measure the "true" degree of financial integration of particular countries, and has been at the center of recent debates on the effectiveness of capital controls. Some authors have followed Martin Feldstein and Charles Horioka (1980), and have relied on the correlation (or lack there off) between savings and investment as a measurement of the degree to which capital markets in different countries are integrated. Using this approach, Peter Montiel (1994) concluded that in most developing countries, savings and investment exhibited a rather low degree of correlation. This, in turn, suggests that the "true" degree

of capital mobility is much larger than what a simple analysis of legal restrictions would indicate. Other authors have concentrated on interest rate differentials in trying to determine whether a particular country is actually integrated to world financial markets. Using this methodology, Michael Dooley, Donald Mathieson and Liliana Rojas-Suarez (1997) have found that the degree of "actual" capital mobility is almost always larger than what the authorities had intended when imposing capital controls.

More recently, some authors have used information contained in the International Monetary Fund's *Exchange Rate and Monetary Arrangements* to construct indexes on capital controls for a panel of countries. Alberto Alesina, Vittorio Grilli and Gian Maria Milesi-Ferreti (1994), for example, constructed a dummy variable index of capital controls. This indicator -- which takes a value of one when capital controls are in place and zero otherwise -- was then used to analyze some of the political forces behind the imposition of capital restrictions in a score of countries. Dani Rodrik (1998) used a similar index to investigate the effects of capital controls on growth, inflation and investment between 1979 and 1989. His results suggest that, after controlling for other variables, capital restrictions have no significant effects on macroeconomic performance.

A serious limitation of these IMF-based indexes, however, is that they are extremely general and do not distinguish between different intensities of capital restrictions. Moreover, they fail to distinguish between the type of flow that is being restricted, and they ignore the fact that, as discussed above, legal restrictions are frequently circumvented. For example, according to this IMF-based indicator, Chile, Mexico and Brazil were subject to the same degree of capital controls in 1992-1994. In reality, however, the three cases were extremely different. While in Chile there were restrictions on short-term inflows, Mexico

had (for all practical purposes) free capital mobility, and Brazil had in place an arcane array

of restrictions. Montiel and Reinhart (1999) have combined IMF and country-specific

information to construct an index on the intensity of capital controls in 15 countries during

1990-96. Although their index, which can take three values (0, 1 or 2) represent an

improvement over straight IMF indicators, it is still extremely general, and does not capture

the subtleties of actual capital restrictions. As Rogoff (this issue) has argued, empirical

work aimed at understanding the relationship between trade in financial assets and

growth is in its infancy. Progress in this area will require constructing indexes that are

able to adequately capture the "true" degree of capital mobility in different countries.

Controls on Capital Outflows

Controls on capital outflows have been advocated as a way of dealing with a

financial and currency crisis. In assessing the effectiveness of controls on outflows it is

useful to distinguish between two type of controls. The first type corresponds to

"preventive controls." These are imposed (or tightened) when a country is facing a severe

balance of payments deficit, but has not yet suffered a devaluation crisis. These

preventive controls can take a number of forms, including taxes on funds remitted

abroad, dual exchange rates (with a more depreciated rate for capital account

transactions), and outright prohibition of funds' transfers. The idea is that these measures

will help slow down the drainage of international reserves, giving the authorities the time

required to implement corrective policies, and fend-off speculators.[i]

The empirical evidence suggests that this type of controls have been largely

ineffective. When faced with the prospect of a major crisis, the private sector finds ways

of evading the controls, moving massive volumes of funds out of the country. Worse yet,
more often than not, controls on capital outflows have resulted in corruption, as investors
try to move their monies to a "safe haven." Moreover, once controls are in place the
authorities usually fail to implement a credible and effective adjustment program. Quite
on the contrary, once the controls are imposed – or tightened --, the extent of the
macroeconomic disequilibria tends to increase, rather than subsiding. Edwards (1989)
and Edwards and Julio Santaella (1993) analyzed, in great detail, the anatomy of currency
crises in a large number of developing countries. These studies show that the private
sector found easy ways of circumventing the controls in the months prior to the
devaluation crisis. In almost 70% of the cases were controls on outflows were used a s a
preventive measure, there was a significant increase in "capital flight" after the controls
had been put in place. Cuddington (1986) reached a similar conclusion in his study on
the determinants of capital flight in developing countries. Also, in a large number of the
balance of payments crises analyzed by Kaminsky and Renhart (1999), the authorities
tried, unsuccessfully, to avoid the currency collapse by stepping up controls on capital
outflows.

There is also evidence suggesting that controls on capital outflows may give a
false sense of security, encouraging complacent and careless behavior on behalf of policy
makers and market participants. The recent currency crisis in Korea is a case in point.
Until quite late in 1997, international analysts and local policy makers believed that, due
to the existence of restrictions on capital mobility, Korea was largely immune to a
currency crisis. So much so that, after giving the Korean banks and central bank stance
the next to worst ratings, Goldman-Sachs (1997) argued, in its *Emerging Markets*

Biweekly, that because Korea had "a relatively closed capital account", these indicators should be excluded from the computation of the overall vulnerability index. As a consequence, during most of 1997 Goldman-Sachs played down the extent of Korea's problems. If, however, it had (correctly) recognized that capital restrictions cannot truly protect an economy from financial weaknesses, Goldman would have clearly anticipated the Korean debacle, as it anticipated the Thai meltdown. During 1997-98, controls on the free mobility of capital also gave a false sense of security to Brazilian policy makers. They repeatedly argued that since short-term capital inflows were restricted, their currency could not suffer the same fate as the Mexican peso. As it turned out, they were wrong. Once the collapse of the *Real* became imminent, investors rushed to the door, and flee the country.

More recently, a second type of controls of capital outflows has gained support among some academics and policy makers. Paul Krugman (1998), for example, has argued that countries already facing a major crisis could benefit from the temporary imposition (or tightening) of controls on outflows. According to this view, once these "curative" controls on outflows are in place, the crisis-country can lower interest rates, and put in place pro-growth policies. Controlling capital outflows would give crisis countries additional time to restructure their financial sector in an orderly fashion. Once the economy is back on its feet, the argument goes, controls are to be dismantled. Malaysia followed this path in 1998-99. And, although it is too early to assess fully the effects of this policy on that country's economic performance, preliminary evidence suggests that, contrary to the fears of orthodox analysts, the temporary controls did not produce much harm. A skeptic could argue, however, that Brazil did not tighten controls on outflows after its

devaluation crisis in January 1999, and that it has experienced – so far – a very strong recovery.

Naturally, the merits of a particular policy cannot be evaluated on the basis of one or two historical episodes. So, what does comparative history tell us about the effectiveness of this type of post-crisis "curative" capital controls? Although the evidence is not fully conclusive, my reading of it is that the imposition (or tightening) of controls on outflows in post-crisis periods has not been, on average, very helpful. For instance, according to the analysis in Edwards (1989), in 50% of the countries that imposed post-crisis controls, the devaluation was "unsuccessful," in the sense that it failed to generate a significant change in the real exchange rate, and failed to improve the balance of payments. Furthermore, according to the data compiled in that study, two-thirds of the countries that enacted post-crisis controls experienced "unsatisfactory" GDP growth in the period immediately following the currency crisis. In contrast, only 35% of the countries that did not restrict outflows after the crisis went through a period of growth slowdown.[ii]

The 1980s debt crisis provides a recent historical illustration of the working of controls on capital outflows. Those Latin American countries that stepped-up controls on capital outflows – Argentina, Brazil and Mexico, to mention just the largest ones– muddled through, and experienced a long and painful decline in growth, high inflation and protracted unemployment. Moreover, the stricter controls on outflows did not encourage the restructuring of the domestic economies, nor did they result in orderly reforms. The opposite, in fact, happened. In country after country, politicians experimented with populist policies that encouraged corruption, and that at the end of the

road deepened the crisis. Mexico nationalized the banking sector and expropriated dollar-denominated deposits. Argentina and Brazil created new currencies, at the same time as they controlled prices and expanded public expenditure. In Peru, tighter controls on outflows allowed President Alan Garcia's administration to systematically erode the bases of a healthy and productive economy, as the country was rapidly consumed by a virtual civil war. Moreover, in none of these countries were controls on capital outflows successful in slowing down capital flight (Dornbusch and Edwards 1991, World Bank 1993).

Controls on Capital Inflows

In the aftermath of the East Asian crisis, there has been increasing support for the imposition of controls on capital inflows, as a way of preventing future currency crises (Eichengreen 1999). Controls on inflows are expected to protect emerging countries from international speculation, at the same time as allowing them to undertake an independent monetary policy. Some of the countries that have relied on controls on capital inflows during the last two decades include Brazil, Chile, Colombia, the Czech Republic and Malaysia. It has been Chile's experience, however, the one that has attracted the greatest attention from economists, policy advisers and the specialized media. It has been argued that by discouraging short-term capital, while still attracting longer terms funds, Chile's controls have helped the country achieve a remarkable record of growth and stability (Massad 1998a, Stiglitz 1999).

How Chile's Controls on Capital Inflows Worked

Chile has relied on controls on capital inflows on two occasions during the last 20 years: in 1978-82 and, more recently, during 1991-98. In both episodes, foreigners wishing to move funds into Chile were required to make non-interest bearing deposits at the Central Bank.

Controls were first imposed in 1978 when, as a result of massive inflows, the real exchange rate experienced a large appreciation, and the Central Bank faced increasing difficulties managing money supply. This first episode came to an end in 1982 when, as a consequence of the Latin American debt crisis, capital began to move out of the country. During this early period (1978-82), the controls were particularly stringent. Inflows with maturities below 24 months were prohibited, and those with maturities from 24 to 66 months were subject to reserve requirements that ranged from 10 percent to 25 percent of the value of the inflows (Edwards and Edwards 1991). Chile reintroduced restrictions on capital inflows in June 1991 when, once again, a surge in capital inflows intruded with macroeconomic policy. Originally, all portfolio inflows were subject to a 20 percent reserve deposit that earned no interest. For maturities of less than a year, the deposit applied for the duration of the inflow, while for longer maturities, the reserve requirement was for one year. The private sector quickly found ways of avoiding the controls. The most common mechanism was misstating the purpose of the inflow; for instance, short-term portfolio flows were often labeled as trade credit, or as loans supporting a direct foreign investment (DFI) project. In July 1992, the rate of the reserve requirement was raised to 30 percent, and its holding period was set at one year, independently of the length of stay of the flow. Also, at that time, its coverage was extended to trade credit and to loans related to DFI. In 1995, and in an effort to close additional loopholes, the controls

were extended to Chilean stocks traded on the New York Stock Exchange, and to international bond issues. In June 1998, to reduce the risk that the capital flows to Chile would decline as part of contagion from the East Asian financial crisis, the rate of the reserve requirement was lowered to 10 percent, and in September of that year the rate was reduced to zero. Throughout this period Chile also regulated foreign direct investment. Until 1992, foreign direct investment was subject to a three years minimum stay in the country; at that time the minimum stay was reduced to one year. No restrictions exist on the repatriation of profits from foreign direct investment.[iii]

By forcing investors to deposit, at zero interest, a proportion of their funds in the Central Bank, Chile's system of unremunerated reserve requirements is equivalent to a tax on capital inflows. The implicit rate of the tax depends both on the proportion of the investment that has to be held in reserve, on the length of time the reserve must be held at the bank, on the length of time the investment funds stay in the country, and on the opportunity cost of these funds.[iv] Figure 1 contains estimates of this tax-equivalent for funds that stay in Chile for six months, one year and three years. These calculations are based on the prevailing reserve requirements each year, and assume that the opportunity cost of these funds is the interest rate on one-month certificates of deposit in the United States. Three aspects of this figure are particularly interesting. First, the shorter the length of time that investment funds remain in the country, the higher the implicit tax rate. Second, the rate of the tax is fairly high – even for longer maturities. During 1997, for example, the average tax, even for three-year investments, was 80 basis points. Third, the tax equivalent has varied through time, both because the rate of the required deposit was altered and because the opportunity cost has changed.

Of course, the implicit tax imposed by capital controls only applies to the extent that the controls cannot be easily sidestepped. The discussion has already pointed out that it is relatively easy for investors to avoid capital controls on outflows, and also on many kinds of inflows. In particular, large firms typically have access to international finance, and thus have the connections and ability to reconfigure their assets in a way that will circumvent controls on capital inflows or outflows. Valdés-Prieto and Soto (1998) have argued that in spite of the authorities' efforts to close loopholes, Chile's controls have been subject to considerable evasion. Cowan and De Gregorio (1997) constructed a subjective index of the "power" of the controls. This index takes a value of near one if the controls are rarely evaded, and takes a value of zero if they are completely evaded. This index reached its lowest value during the second quarter of 1995; by early 1998, and after many loopholes had been closed, this index had reached a value of 0.8, still significantly below one.

The Goals of Chile's Capital Controls

The Chilean authorities had three explicit goals in mind when they passed capital controls. First, to slow down the volume of capital flowing into the country, and to tilt its composition towards longer maturities. Second, to reduce (or at least delay) any real exchange rate appreciation that stemmed from these inflows. And third, to allow Chile's Central Bank to maintain a high differential between domestic and international interest rates, and thus to conduct an independent monetary. An additional goal, and one that follows from these first three, was to reduce the country's vulnerability to international

financial instability policy (Zahler 1992, Cowan and De Gregorio, 1997; Massad, 1998a; Valdes-Prieto and Soto, 1996).

The Composition of Capital Inflows in Chile

There is some primae facie evidence that by restricting capital mobility, the Chilean authorities indeed affected the composition of inflows. Between 1979 and 1981, when relatively draconian restrictions on capital inflows were in place, the average maturity of inflows to Chile was a very long 59 months (Edwards and Edwards 1991).

Table 1 presents data on the composition of capital flowing into Chile between 1988 and 1998. During this period shorter-term flows -- that is, flows with less than a year maturity -- declined very steeply relative to longer term capital, and the change in composition happened immediately after the implementation of the controls on capital inflows in 1991. Regarding the post-controls period, the data in Table 1 show that, with the exception of a decline in 1993, the total volume of capital inflows into the country continued to increase until 1998. In constructing the figures in Table 1, the Central Bank of Chile, classified inflows as "short term" or "long term" on the basis of contracted maturity. It is possible to argue, however, that when measuring a country's degree of vulnerability to financial turmoil what really matters is "residual" maturity, measured by the value of the stock of the country's liabilities in hands of foreigners that come due within a year. Figures on "contractual" and "residual" maturity can, in fact, be very different. Consider the following simple example: assume the case of a county that, every year, receives US$ 100 million in flows with a two-year contractual maturity. Assume also, that the end of the two years these funds flow back to their country of origin. In the steady state, this country's

stock of debt is US$200, one half of which (US$200) is due within a year. In this hypothetical case, then, from a "contractual" point of view, there are no short- term inflows (all the funds are coming in for two years), suggesting that the country faces a very low degree of vulnerability. However, one half of the stock of debt is due within a year, making the "residual" maturity equal to 50%.

Table 2 presents data, from the Bank of International Settlements (BIS), on residual maturity for the stock of loans extended by banks in the BIS "Reporting Area," to Chile and a group of selected of Latin American and East Asian countries.[v] The results are revealing. First, once residual maturity is used, the percentage of short-term debt does not look as low as when contracting maturities are considered. Second, the figures in table 2 indicate that in late 1996, before the detonation of the East Asian financial crisis, Chile had a lower percentage of short-term residual debt to the BIS "Reporting Area" banks than any of the East Asian countries, with the exception of Malaysia. Third, although by the end of 1996 Chile had a relatively low percentage of short term residual debt to BIS "Reporting Area" banks, it was not significantly lower than that of Argentina, a country with no capital restrictions. Moreover, this percentage was higher than that of Mexico, another Latin American country without controls. Fourth, Chile experienced a significant reduction in its residual short-term debt to BIS "Reporting Area" banks between 1996 and 1998, just after the controls were tightened in 1995.

The general picture emerging from Tables 1 and 2 has been confirmed by more formal analyses. For example, Soto (1997) and De Gregorio et al. (1998) have used vector

autoregression analysis on monthly data to analyze the way in which capital controls have affected the composition of capital inflows. Their findings suggest that the tax on capital movements indeed discouraged short-term inflows. Valdés-Prieto and Soto (1998) reach a similar conclusion, although they argue that the controls only became effective in discouraging short-term flows after 1995, when the implicit rate of taxation imposed by the controls increased significantly. These studies also suggest that the reduction in shorter-term flows was fully compensated by increases in longer- term capital inflows and that, consequently, aggregate capital moving into Chile was not altered by the controls. Interestingly enough, these findings are in broad agreement with the results from a comparative study on the experience of 15 countries during 1990-96, undertaken by Montiel and Reinhart (1999).

Real Exchange Rates

In December 1989, after 17 years of a military regime, a new government was democratically elected in Chile. Chile regained access to international financial markets, and capital began to flow into the country, raising demand for the peso and putting upward pressure on the real exchange rate. The newly elected authorities believed that to gain credibility among international and domestic investors, it was important to obtain the support of exporters, a group that from the beginning had been behind the market-oriented reforms program (Labán and Larraín, 1997). By late 1990, exporters had begun to complain that the rapid strengthening of the peso in real terms – it had appreciated by more than 20 % since 1985-- was negatively affecting their ability to compete in international markets. As Cowan and De Gregorio (1997, p. 3) write: "[G]rowing concerns [in 1991]

about inflation and the exchange rate pressure of capital inflows ... led policymakers to introduce specific capital controls."

During the period when the controls were in effect – April 1991 through September 1998 – the real exchange rate experienced an accumulated appreciation of 28%.[vi] An important question is whether the extent of real exchange rate appreciation would have been greater in the absence of controls on inflows. Several authors, using different methodologies and various time periods in the 1990s, have investigated this issue and have concluded that Chile's capital controls did not affect real exchange rates. Valdés-Prieto and Soto (1996) analyzed the relationship between capital controls and the real exchange rate with an error correction model and concluded that (p. 99) the "reserve requirement does not affect in any way the long run level of the real exchange rate ... [I]n addition ... these reserve requirements have an insignificant effect on the real exchange rate in the short run." Edwards (1999) used monthly data for the period June 1991-September 1998 to estimate a number of vector autoregressions concerning how changes in the tax on capital inflows might have affected the real exchange rate. Four endogenous variables were included in the vector autoregressions: the tax equivalent of the controls, under the assumption that the funds stay in Chile for 180 days; the change in the log of the bilateral real exchange rate with respect to the United States; the rate of devaluation of the nominal exchange rate; and domestic various alternative measures of domestic interest rates.[vii] The results showed that a hike in the tax on capital inflows did not have a significant effect on the real exchange rate. De Gregorio et al (1998) made an effort to capture the effects of other variables on the equilibrium real exchange rate. Their results, obtained from the estimation of an error

correction model, suggest, once again, that contrary to what the authorities had hoped, Chile's controls on capital inflows had no effects on the behavior of the real exchange rate.

Domestic Interest Rates and the Independence of Monetary Policy

Since the mid-1980s, the Chilean Central Bank pursued an anti-inflation policy based on interest rate targeting. The authorities argued that by maintaining domestic peso-denominated interest rates above international rates, inflation would decline gradually. This policy worked relatively well until the late 1980s, when capital inflows to Chile surged, threatening a rise in domestic inflation. The democratic government of Chile elected in 1989 thus turned to controls on capital inflows as a tool to allow a persistent gap between Chilean and world interest rates, which in turn was expected to help the government's effort to reduce inflation to the lower single-digit level (Zahler 1992).

There is some evidence that Chile's controls on capital inflows were able to affect domestic interest rates. However, the magnitude of this effect was rather small. Analysis on this point tends to focus on inflation-indexed interest rates, since most financial transactions in Chile have traditionally been based on such rates. Using a vector autoregression specification, Soto (1997) found that a change in the implicit tax on capital inflows had a positive, very small, short-term effect on indexed interest rates. My own calculations, based on the vector autoregression framework sketched in the previous section and reported in Edwards (1999), suggest that an increase in the tax on capital inflows will have a positive and small effect on indexed interest rates. De Gregorio et al (1998), however, found a somewhat larger effect of the controls on domestic interest rates.

According to their calculations, if the rate of the reserve requirement is 30%, short-term interest rates will increase by approximately 140 basis points.

In Edwards (1998b), I argued that if the controls on capital inflows are effective, then once they are imposed, the differential between dollar and peso interest rates should rise (after properly adjusting by expected devaluation). I also argued that once the controls are in place, it should take longer for interest rate differentials to return to their equilibrium level. I tested these propositions by examining the evolution of the interest rate differential in response to a range of variables and its own value in the previous period. I found out that the controls had a very small effect on long-term differentials between peso and US Dollar denominated interest rates. I found, however, that interest rate differentials became more sluggish after the imposition of controls -- that is, it took longer for them to reach their steady state equilibrium. An important implication of this result is that in the post-controls period the Central Bank had a greater ability to manipulate domestic interest rates.

All in all, then, the accumulated evidence suggests that the controls on inflows allowed Chile's Central Bank to undertake a more independent monetary policy. The flip side of this, however, is that by rising domestic interest rates, the controls resulted in a higher cost of capital to Chilean firms.

Do Controls on Capital Inflows Reduce Financial Instability?

Controls on capital inflows are clearly insufficient to eliminate financial instability. In spite of Chile's draconian restrictions on capital inflows from 1978-82, Chile went through a traumatic currency crisis in 1981-82: the peso was devalued by almost 90 percent and the government had to bail out a large number of banks. The main cause behind this

crisis was a poorly regulated banking sector, which used international loans to speculate in real estate, and that extended large volumes of credit to the owners of the banks. A massive banking reform, implemented in 1986, established strict guidelines on banks' exposure and activities, and instituted a broad system of on-site inspections. This banking reform has helped Chile withstand the global financial travails of the second half of the 1990s (Edwards and Edwards, 1991; Bosworth, Dornbusch and Laban, 1994).

Surprisingly, to date there have been no in-depth attempts to evaluate formally the extent to which Chile's capital controls in the 1990s may have helped its financial stability. In this section I use weekly data to provide a preliminary analysis. Have the controls on inflows reduced stock market and interest rate volatility in Chile? Has Chile been at least somewhat immune from financial "contagion" during the 1990s when the controls have been in effect?

To analyze the effect of the tax on inflows on Chile's financial volatility, I considered a Generalized Autoregressive Conditional Heteroskedasticity (GARCH) framework, which has become standard in financial economics, and is discussed in detail by Campbell, Lo and MacKinlay (1997). This methodology consists of estimating two equations jointly. In the first one, the dependent variable is the change in either the domestic interest rate or (the log of) the stock market index. The independent variables include, in principle, a range of variables that affect changes in these financial market variables, and may include lagged values of interest rates or the stock market index as well. The error term in this equation, will be expected to have a mean of zero and a time-varying variance σ^2_t. Thus, this first equation – known as the *mean equation* -- will be:

$$\Delta r_t = \theta + \Sigma \phi_j x_{t-j} + \eta_t$$

The second equation to be estimated is the variance equation itself. It is assumed that the variance (σ^2_t) depends on lagged squared values of the first equation's error term, on its own lagged values, and possibly on other variables (y_{t-j}). This second equation – known as the *conditional variance equation* -- is:

$$\sigma^2_t = \phi + \alpha \eta^2_{t-1} + \beta \sigma^2_{t-1} + \Sigma \gamma_j y_{t-j}.$$

I estimated this two-equation model for changes in the short-term central bank nominal interest rates (known as the repo rate), and for changes in the logarithm of the stock market index. In both cases the data were weekly, covered the longest period for which they are available, and were obtained from Datastream.[viii] In order to simplify the analysis, I estimated the mean equations using only lagged values of past interest rates and stock market prices (respectively) as explanatory variables.

The question at hand is whether the level of variance is reduced by the implicit rate of tax on capital inflows. Thus, in estimating the equation for the (conditional) variance, the explanatory variables were the square of the error term in the previous time period, the variance in the previous time period, and the existing tax rate implied by the capital controls.[ix] That is, the conditional variance equation that was actually estimated is:

$$\sigma^2_t = \phi + \alpha \eta^2_{t-1} + \beta \sigma^2_{t-1} + \gamma \text{ Tax}_t.$$

In particular, the tax level corresponds to the calculations in Figure 1, under the assumption that the funds stay in the country for 180 days. If the controls on capital inflows have indeed succeeded in reducing financial volatility, then the coefficient on the tax rate in the estimated variance equation, should be significantly negative.

The interesting results obtained from the conditional variance equations are reported in Table 3, for both the interest rate and stock market data. First, this representation works adequately for both stock market returns and nominal interest rates.[x] Second, the coefficient on the tax variable is negative and significantly different from zero in the stock market regression; on the other hand, it is not significant in the short-term interest rate equation. The fact that the estimated coefficient of γ is significantly negative is important, and suggests that the policy of restricting capital inflows helped Chile reduce stock market instability; interestingly enough, these results also suggest that that policy did not help reduce short term interest rate volatility.[xi]

These results have nothing to say about whether Chile's controls on capital inflows helped to insulate its economy from contagion stemming from shocks that originated in other emerging markets. A particularly interesting issue is whether Chile's controls on inflows helped the country to become partially isolated from the financial turmoil that erupted in east Asia in mid-1997. To address this issue, I asked whether changes in short term rates in Chile were affected by changes in short term interest rates in Hong Kong. The use of Hong Kong's interest rates as an index of financial instability in East Asia is, of course, arbitrary. When alternative indicators are used the results are similar, however.

For the dependent variable, this regression uses the same data on the change in Chile's short-term nominal interest rates (Δr) as in the previous regression. The explanatory

variables are the change in Chile's interest rates in the previous four periods; the change in

the one-month U.S. certificate of deposit rate in the previous four periods (Δ rUS); the

change in Hong Kong's one-month deposit interest rate in the previous four periods (Δ

rHK); and the rate of devaluation of the Chilean peso in the previous four time periods (Δ

dev). The time period is weekly, and the data, which cover the period October 1994

through January 1999, were again obtained from Datastream. The regression is:

$$\Delta r_t = \theta + \Sigma \alpha_j \Delta r_{t-1-j} + \Sigma \beta_j \Delta r^{US}_{t-1-j} + \Sigma \lambda_j \Delta r^{HK}_{t-1-j} + \Sigma \varphi_j \Delta dev_{t-1-j} + \varepsilon_t$$

The sum of the coefficients on the four lags of the Hong Kong interest rate variable are

taken to capture the extent to which Chile has been subject to "contagion" from East Asia

during this period. An analysis of the data (including an analysis of a regression's

residuals) suggested that, approximately in May 1997, there was a break point in the series.

For this reason the equation was estimated for two subperiods: October 1994-May 1997

and May 1997-January 1999. The results obtained are reported in Table 4.[xii]

During the early period, changes in Chile's interest rates were apparently not

affected by changes in interest rates in Hong Kong, which was highly insignificant. Things

changed, however, during the later period, when according to these estimates, changes in

short-term interest rates in Hong Kong had a positive effect in Chile's short term rate.

Notice that, for the May 1997-September 1998 period, the sum of the estimated coefficients

for Hong-Kong's interest rates is larger than one, indicating that these shocks were

amplified in Chile. The fact that this transmission took place in spite of the presence of

capital controls -- and moreover, capital controls which had been specifically tightened after 1995, as discussed earlier -- suggests that the controls on capital inflows may have been able to protect Chile from relatively small external shocks, but were not effective in preventing "contagion" stemming from very large shocks. Determining the size of shock at which capital controls come to lose effectiveness is an interesting topic for future research.

Concluding Observation

A number of authors have recently argued that, in order to avoid financial instability, emerging countries should rely on capital controls. Two type of controls have been considered: controls on capital outflows, and controls on capital inflows. The existing historical evidence suggests, quite strongly, that controls on outflows – and, in particular, quantitative controls on outflows --, have been largely ineffective. They are easily circumvented, encourage corruption and, in most historical episodes, have not helped the adjustment process. A major drawback of controls on outflows is that, in most cases, they are not used as a temporary device to face a crisis situation. Instead, they become a permanent feature of the country's incentive structure.

It has been argued that a way of avoiding these problems, and still protecting the economy from international financial markets' instability, is by adopting controls on short-term capital inflows. If speculative capital cannot come in, the argument goes, then it will not go out suddenly. Advocates of this policy have used Chile's experience between 1991 and 1998, as a successful example of this policy (Eichengreen 1999).

The effectiveness of Chile's controls on capital inflows has often been exaggerated. Chile's controls did appear to increase the maturity of its foreign debt significantly.

However, even in 1996 more than 40 percent of Chile's debt to banks in the BIS "Reporting Area" had a residual maturity of less than one year, and the total volume of aggregate capital flows moving into Chile during the 1990s did not decline. The controls on inflows had no significant effect on Chile's real exchange rate, and only a very small effect on interest rates. There is some preliminary evidence that Chile's capital controls policy helped reduce stock market instability, also that the controls were unable to isolate Chile from the very large financial shocks stemming from East Asia in 1997-1999.

Moreover, Chile's capital controls have also had costs. The most important one is that they have increased the cost of capital significantly, especially for those small- and medium-size Chilean firms which find it difficult, or impossible, to evade the controls on capital inflows. During 1996, for example, the cost of funds for smaller Chilean firms was as high as 24 percent in pesos; in U.S. dollars, this translated into more than 21 percent per year. During 1997, the cost of funds to small firms exceeded 19 percent in dollar terms. A country considering the adoption of Chile-style controls must compare this higher cost of capital, especially for small and medium firms, with potential benefits like a reduced macroeconomic vulnerability to short-term inflows of capital.

Economists have long recognized that cross-border capital movements pose a difficult policy issue. In the absence of strong financial supervision in either lending or borrowing countries, unregulated capital flows may indeed be misallocated, eventually generating waves of major disruptions in the receiving nations.

Many authors, myself included, have argued that the relaxation of controls on international capital movements is in order towards the end of a market-oriented reform, and only after a sound supervisory system for the domestic financial market is in place.

Controls on capital inflows may sometimes be a partial stop-gap. However, the long-term

solution for a nation concerned with its vulnerability to flows of international capital is for

countries to pursue sound macroeconomic policies, to avoid overly rigid exchange rates,

and to implement banking supervisory systems that reduce moral hazard and corruption.

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Table 1 : Capital Inflows (gross) to Chile: Millions of US$[a]

Year	Short term flows	Percentage of total	Long term flows	Percentage of total	Total	Deposits*
1988	916,564	96.3	34,838	3.7	951,402	--
1989	1,452,595	95.0	77,122	5.0	1,529,717	--
1990	1,683,149	90.3	181,419	9.7	1,864,568	--
1991	521,198	72.7	196,115	27.3	717,313	587
1992	225,197	28.9	554,072	71.1	779,269	11,424
1993	159,462	23.6	515,147	76.4	674,609	41,280
1994	161,575	16.5	819,699	83.5	981,274	87,039
1995	69,675	6.2	1,051,829	93.8	1,121,504	38,752
1996	67,254	3.2	2,042,456	96.8	2,109,710	172,320
1997	81,131	2.8	2,805,882	97.2	2,887,013	331,572

a. These figures refer to gross foreign capital flowing into Chile each year.

* Deposits in the Banco Chile due to reserve requirements; short term flows have a stay of less than one year.

Table 2: Ratio of Short-term Bank Loans to Total Bank Loans[a]

(Percentage)

	Mid-1996	End-1996	Mid-1997	End-1997	Mid-1998
Argentina	53.4	56.3	54.2	57.7	57.4
Brazil	57.7	63.0	62.6	64.3	62.6
Chile	*57.7*	*51.2*	*43.3*	*50.4*	*45.9*
Colombia	45.9	39.3	39.4	40.0	39.6
Mexico	47.8	44.7	45.5	43.7	44.9
Peru	78.3	79.2	67.0	69.3	75.7
Indonesia	60.0	61.7	59.0	60.6	55.0
Korea	70.8	67.5	68.0	62.8	45.8
Malaysia	49.7	50.3	56.4	52.7	48.6
Taiwan	86.4	84.4	87.3	81.6	80.1
Thailand	68.9	65.2	65.7	65.8	59.3

a. These figures correspond to the stock of bank loans that are due within a year to banks

in the Bank for International Settlements' "Reporting Area." See text for details.

Source: The Bank for International Settlements.

Table 3: Financial Market Volatility and Controls on Capital Inflows*
Results from Estimation of Conditional Variance Equation
(GARCH Estimates: Weekly Data)

| Dependent variable:	Change in short term interest rate	Change in log of stock market index
φ	3.387 (2.539)	0.0005 (3.855)
η_{t-1}^{2}	0.864 (7.669)	0.619 (6.377)
σ_{t-1}^{2}	0.407 (7.669)	0.507 (15.909)
Tax_{t}	0.008 (0.847)	-0.010 (-2.695)
Period	1994/9-1999.1	1991.9-1999.1
Number of observations	229	385
LM Test[a]	4.41	13.86

a. This is a maximum likelihood test for the presence of heteroskedasticity.
* The figures in parentheses are the t-values.   See text for details.

Table 4: Changes in Chile's Short Term Domestic Interest Rates and Asian Interest Rates:
Is there Contagion?
(Weekly Data, 1994-1999)

	October 1994-May 1997	May 1997-January 1999
θ	0.0732 (0.309)	-0.092 (-0.312)
$\Sigma \Delta r_{t-1-j}$	-0.597 (-1.432)	-0.649 (-2.730)
$\Sigma \Delta dev_{t-1-j}$	2.302 (1.006)	4.871 (2.930)
$\Sigma \Delta r^{US}_{t-1-j}$	-6.541 (-0.406)	-2.441 (-1.491)
$\Sigma \Delta r^{HK}_{t-1-j}$	-1.498 (-0.733)	2.684 (5.129)
Number of observations	139	89
R^2	0.081	0.281
Durbin-Watson	2.143	2.376

* The figures in parentheses are the t-values.   See text for details.
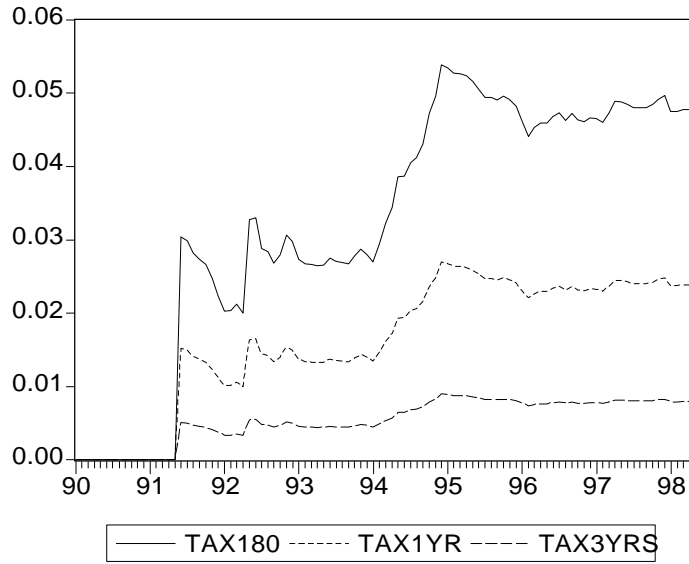
**Figure 1: Tax Equivalent of Capital Controls:
Stay of 180 days, 1 year and 3 years**

ENDNOTES

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1. This view was particularly prevalent in Latin America during the 1960s, 1970s and 1980s. See the discussion and case studies in Dornbusch and Edwards (1991). See also John Cuddington (1986).

2. "Unsatisfactory" growth was defined as a situation where real GDP growth, in that particular year, was in the lowest quartile for a group of developing countries that included both crisis and non-crisis countries. For details see Edwards (1989, Ch. 7)

3. For further details see Massad (1998a, b), De Greogorio, Edwards and Valdes (1999), and Budnevich and Lefort (1997).

4. As shown by Valdés-Prieto and Soto (1996) and De Gregorio, Edwards and Valdes (1998), the tax equivalent for funds that stay in Chile for k months, is given by the following expression:

$$\tau(k) = [\, r * \lambda / (\, 1 - \lambda\,)\,]\,(\,\rho / k),$$

where r* is an international interest rate that captures the opportunity cost of the reserve requirement, λ is the proportion of the funds that has to be deposited at the Central Bank, and ρ is the period of time (measured in months) that the deposit has to be kept in the Central Bank.

5 . Ideally, one would want to have comparative data on the total stock of national liabilities in hands of foreigners. These data, however, are not available for a long-enough period of time. The BIS "Reporting Area" is comprised of the Group of Ten countries plus Austria, Denmark, Finland Ireland, Luxembourg, Norway and Spain. A somewhat broader coverage can be obtained, for some countries and for a limited period of time, from the BIS-IMF-OECD-World Bank project on debt data (http:/www.imf.org/)

[6.] It should be mentioned that some authors have found a small transitory effect of Chile's capital controls on real exchange rates in certain specifications, including Soto (1997) and De Gregorio et al. (1998).

[vii.] These data were obtained from the International Financial Statistics and from the Central Bank of Chile and are available on request. All the VARs were estimated using two lags.

8. More specifically, the central bank nominal interest rate is the repo rate, which is the rate used for short-term transactions with commercial banks. When other interest rates were used, the results were similar.

9. A likelihood ratio test suggests that the residuals of both the interest rates and stock market equations are subject to heteroskedasticity. This means that estimating a GARCH model is appropriate.

10. The results for the mean equation are not reported due to space considerations.   For the case of stock market returns, it is not possible to reject the hypothesis of an integrated (1,1) GARCH.

11. The LM test reported in the final row of Table 3 is Engle's test for the existence of residual conditional heteroskedasticity.

12. These results were obtained using a polynomial distributed lag procedure, that allows for greater flexibility in the estimated lag structure.