

Aggregate Volatility in Modern Latin America: Causes and Cures¹

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I. Introduction

Latin America has experienced deep transformations during the 1990s. In many countries of the region traditional imbalances have been largely abated, privatizations are widespread, openness of both trade and financial accounts has been largely accomplished, supervisory and enforcement institutions are steadily improving, pension systems have been modernized, and so on. Symptoms of success abound.

An important exception to this rosy scenario is the untamed and widespread volatility of real and financial variables.³ In a few countries, this volatility is still explained by the traditional maladies that plagued Latin America in earlier decades -- namely, chronic fiscal imbalances and political instability -- perhaps due to also chronic income inequality-- lack of export diversification, and failed policy experiments. However, those countries that have largely tamed these traditional problems are still affected by volatility, although now of a more subtle financial origin, not unlike that recently affecting East Asia. These financial factors are often compounded by leftover weaknesses resulting from the mismatch between the dramatic increase in financial activity “required” by the post-Brady era, and the shortage of institutional and human capital infrastructure created by nearly a decade of post-debt-crisis turmoil and financial repression.

While some of these financial factors are undoubtedly a part of the new global economy - - in particular the greater flexibility and options for capital as well as the highly-leveraged

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nature of many of these investors -- a significant component of the problems associated with them can be attributed to domestic weaknesses present in even the most advanced economies of the region. It is these weaknesses that I attempt to identify here, as they most likely represent the primary Latin American challenge in the near future. With this objective, the bulk of the evidence presented here corresponds to the recent experiences of Argentina, Chile, and Mexico, three of the most advanced economies in the region.

Rather than attempting to characterize every possible shock and amplification mechanism, this paper offers a parsimonious account of volatility in countries that have already tamed most of the traditional sources of macroeconomic instability in Latin America. It builds on two widely observed weaknesses: (i) weak links with international financial markets, and (ii) underdeveloped domestic financial markets. Once interacting, these two ingredients not only explain the observed volatility but they also generate clear externalities that require policy intervention. This framework thus provides a clear foundation for policy analysis. Most other shocks and deficiencies are leveraged – even made possible – by these two factors. Moreover, to the frustration of highly competent policymakers, the environment becomes intolerant of policy mistakes.

II. Diagnostic and Analysis

In this section I provide a conceptual framework, hopefully flexible enough to be adapted to a broad set of circumstances, albeit precise enough to speculate on policy issues. The first and main part of this section presents the essence of the framework, while the second part discusses a few canonical shocks and their impact within the outlined environment.⁴ I refer to these parts as “the core” (of the analysis) and “the periphery,” respectively.

³ See IPES (1995) for an excellent and forceful exposition of Latin America’s volatility problem.

⁴ The essence of the conceptual framework is an adaptation of that in Caballero and Krishnamurthy (1999, 2000). The examples and applications are mostly from Caballero (1999a,b,c). All of these papers can be downloaded from <http://web.mit.edu/caball/www>.

II.1 The Core

The Ingredients

Emerging economies are distinctly characterized by two fundamental weaknesses: (i) a weak link to international financial markets, and (ii) underdeveloped domestic financial markets. One can think of these two ingredients as the *core*, in the sense that even after addressing the traditional imbalances they remain present and ready to cause and leverage crises. I provide some evidence for each of these key ingredients below.

A. Weak international financial links. These are simply financial constraints, possibly time-varying, that limit the public and private international borrowing (broadly understood) of emerging countries. Weak links to international financial markets limit the smoothing of shocks over time and are themselves a source of shocks, creating excessive volatility in the real economy.

The evidence for this is substantial. Just to highlight a few dimensions of this problem, consider:

- i) *Quantities.* An immediate piece of evidence is that Latin American economies, unlike OECDs, typically exhibit pro-cyclical fiscal deficits.⁵ As standard macroeconomic stabilization arguments indicate that these deficits ought to be counter-cyclical, this pattern has been interpreted as a seriously sub-optimal policy, and most likely the result of the financial constraints faced by the governments themselves. Additional evidence is present in the very low levels of current account deficits when compared to a neoclassical benchmark, or the large swings in capital flows that bear little relation – at least in terms of magnitude – to changes in fundamentals.
- ii) *Prices.* There is also evidence of financial constraints in the price data. Figure 1 illustrates the path of an index of sovereign spreads for Latin America's largest

⁵ See, e.g., IPES (1997) for a discussion of the pro-cyclical nature of fiscal deficits in Latin America.

economies over the second half of the 90s. The large surge in these spreads around the Mexican and Russian crises, starkly illustrates the massive withdrawal of much-needed foreign support for Latin American assets.

Figure 1: Latin American Sovereign Spreads



Note: the time series is an average of Argentina, Brazil, Mexico, and Venezuela.

- iii) *(Self-fulfilling?) Volatility premium.* Moreover, while less than prime corporate assets in the U.S. also suffered during the Asian and Russian crises, the rise in their premia was substantially smaller. This difference can also be appreciated over longer time intervals. Table 1, for example, compares the performance of several Argentine sovereign bonds with that of several U.S. corporate bonds of equivalent rating. The table reports the average spreads of these instruments over U.S. Treasury instruments, as well as the variance of these spreads and that of their changes. The evidence illustrates that, relative to U.S. corporate bonds, Latin American bonds pay a higher spread and their returns are substantially more volatile.⁶ Moreover, the spread-premium is probably a result of this “excess volatility” that mostly comes from episodes when financial markets tighten for emerging markets. Latin American bonds look “illiquid” from the point of view

⁶ A similar pattern appears in other Latin American countries. See Caballero (1999c) for evidence in Mexico.

of spreads and volatility, despite the fact that their volume is often much larger than that of the specific U.S. corporate bonds described in the table.⁷

Table 1: The Volatility Premium

	S&P rating	Moody's rating	Spread average	Spread variance	Variance of spread changes
<i>Argentine Sovereign Bonds</i>	BB-	B1	4.28	2.25	0.36
	BB	Ba1	5.11	3.10	1.74
	BB		4.65	3.97	2.66
	BB	B1	4.59	4.12	1.76
Average			4.66	3.36	1.63
<i>U.S. Corporate Bonds</i>	BB		1.92	0.48	0.07
	BBB-	B1	3.38	0.62	0.41
	BB-	B1	4.50	0.49	0.23
	BB-	B1	4.49	0.44	0.15
	BB-		3.17	1.32	0.48
	BB		2.97	0.67	0.10
	BB-	B1	3.36	1.02	0.28
	BB-		4.91	6.51	2.13
Average			3.59	1.44	0.48

Notes: Spread average means average over bond lifetime (or starting at earliest date available in Datastream). Argentine Sovereign Bonds: ARGENTINA-PAR G/R 93-23, ARGENTINA 11 3/8% 97-17, ARGENTINA 11% 96-06, ARGENTINA 8 3/8% 93-03. U.S. Corporate Bonds: FRUIT OF THE LOOM 7% 81-11, MAXUS ENERGY CORP. DEB 8 1/2% 89-08, SEA CONTAINERS 12 1/2% 93-04 (B), SEA CONTAINERS 12 1/2% 92-04 (A), AK STEEL HOLDING CORP. 10 3/4% 94-04, CLARK OIL REFINING 9 1/2% 92-04, BETHLEHEM STL.CORP. DEB 8.45% 86-05, TRSP.MARITIMA MEXICO 9 1/4% 93-03.

Source: Bond data from Datastream.

B. Underdeveloped domestic financial markets. Turning to the second ingredient, the development of domestic financial markets is instrumental not only in fostering investment and growth, but also in aggregating resources during distress. Underdeveloped financial markets limit the prompt reallocation of resources, creating wasteful contractions in those markets most affected by shocks or less plugged into the financial system. On the other hand, as financial development rises so does leverage, and with it the vulnerability of the financial system to shocks also increases. Many Latin

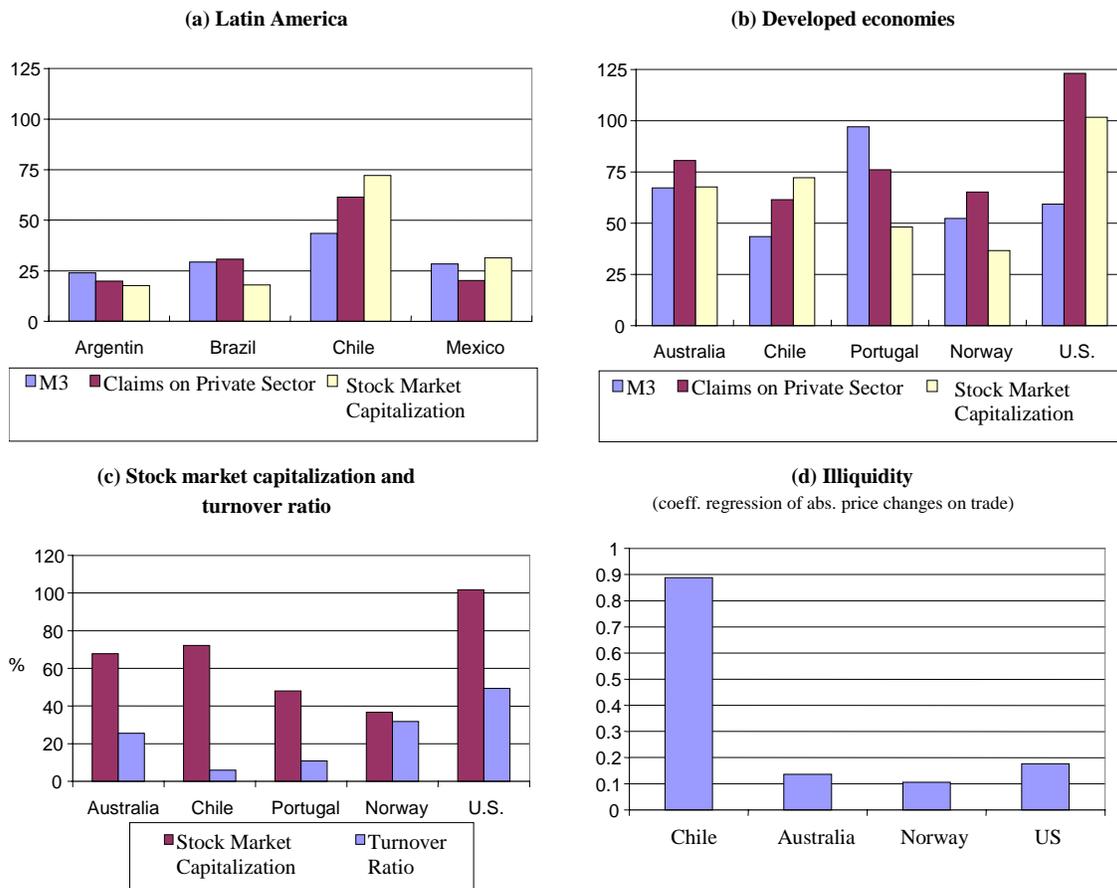
⁷ The conclusions must be interpreted cautiously, since it is difficult to assess the relative diversification features of these

American economies have suffered at both ends: chronic financial repression and underdevelopment and, when moving away from that, large collapse of the banking system.

Most significantly, following Caballero and Krishnamurthy (1999, 2000), I will argue below that it is this *domestic* underdevelopment that naturally creates externalities that justify macroeconomic policies aimed at improving the country's *international* liquidity management.

Later on I discuss “shocks” to the domestic financial sector, while here I simply highlight the low level of development of most Latin American financial markets. For this, consider two basic features of these markets:

Figure 2: Latin America’s Level Problem



different bonds and spreads, and it is also well known that the volatility of “junk” bonds varies over time.

- i) *Low levels.* Figure 2 highlights Latin America’s “level problem.” Regardless of how it is measured, and despite significant improvements over the last decade, Latin America’s financial markets and level of financial intermediation are sub-standard. In panels (a) and (b) it is clear that M3, loans, and stock market capitalization, each relative to GDP, fare poorly with respect to OECD economies.
- ii) *Illiquidity.* Even when the standard measures of financial depth are at world class levels, there is always evidence of underdevelopment. The dark bars in panel (c) confirm that in terms of stock market capitalization values, Chile is an outlier in the region and fares well compared to more advanced economies. The light bars, on the other hand, reflect that Chile has a very substandard turnover ratio.⁸ Panel (d) reports the results of running a simple regression of the absolute value of daily price changes (a measure of volatility) on the change in the fraction of total capitalization traded. Literally interpreted, it reveals that on average an increase in the volume traded, in terms of total capitalization value, is associated with an increase in price volatility that is about ten times larger in Chile than in countries with presumably better developed financial markets.

A Simple Model

With the help of a few diagrams, in this section I outline a structure to think through the macroeconomic consequences – and later on, the policy implications – of the two core-ingredients highlighted above.⁹

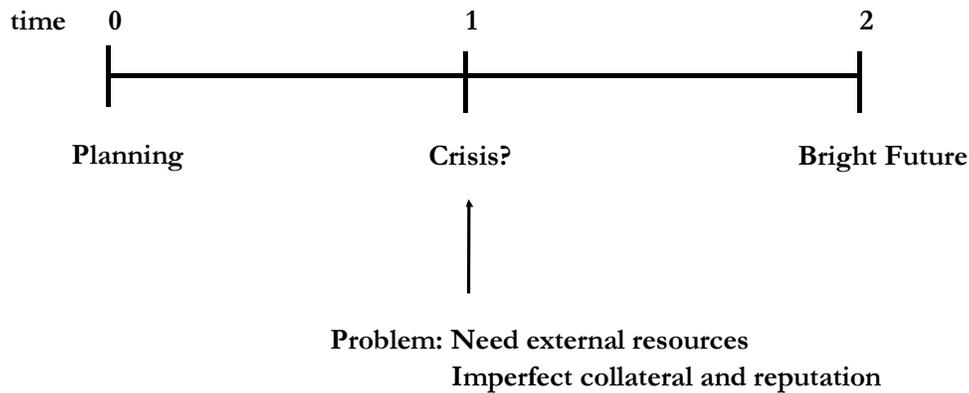
It is not too farfetched to think about an emerging economy’s timeline in the terms described in Figure 3. Date 0 corresponds to “normal” times, when investment, planning

⁸ While excessive churn can be wasteful, it is highly unlikely that Chile's depressed levels are enough to support a solid infrastructure of market makers able to provide optimal levels of immediacy and liquidity. Moreover, one could argue that the wastes associated with normal churn are a cost worth paying to reduce the extent of systemic liquidity crises when these arise. This is a theme worth researching further in the context of emerging economies.

⁹ See Caballero and Krishnamurthy (1999) for a fully-fleshed model along these lines.

and prevention are all very relevant. A significant part of this planning has to do with anticipating and preventing a crisis in the perhaps not too distant future at date 1.¹⁰ Date 2 represents the future, always brighter than the present, but a significant obstacle is that the country – both its sovereign as well as its corporations — often fails to persuade foreign financiers fully that they will share in that bright future if they help to avert the crisis (weak international financial links).

Figure 3: Timing



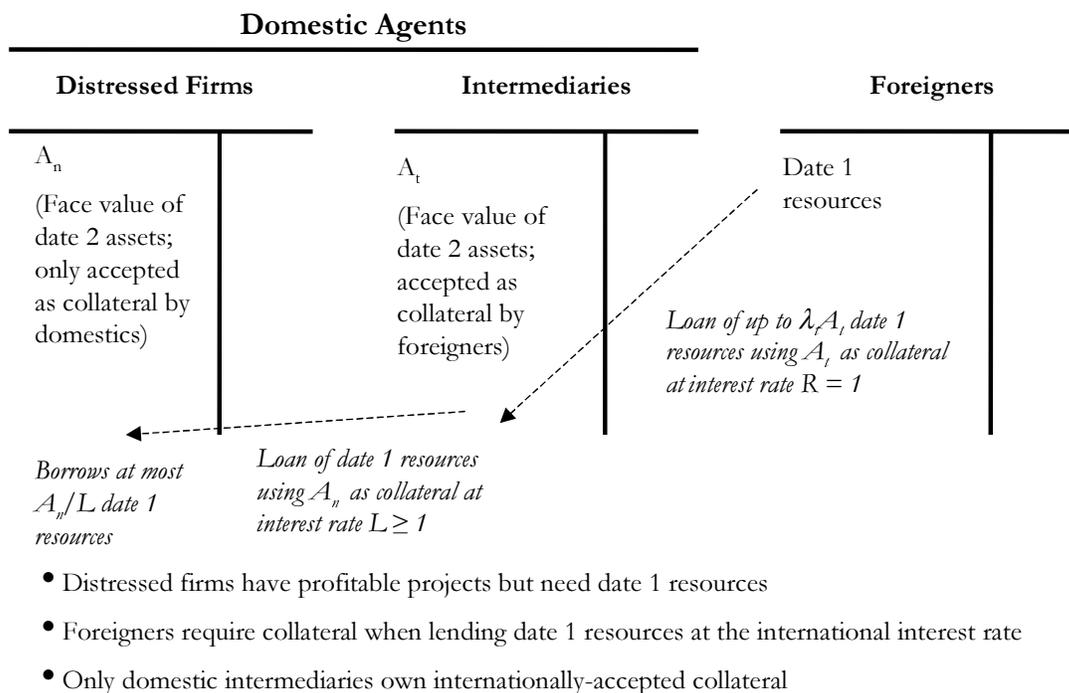
External Crisis

Figure 4 describes the elements creating a crisis driven entirely by insufficient external resources, but with a perfectly functioning domestic financial system – that is, when only the first ingredient is present. We can think of a crisis as a time when, (a) a significant fraction of firms or economic agents are in need of financing to either repay debt or implement new investments needed to save high return projects, and (b) on net, the economy as a whole needs substantial external resources but does not have enough assets and commitment to obtain them. Loosely, I refer to these assets and commitment as “collateral,” which needs not be interpreted literally as pledged assets but as the resources that are likely to be recouped by a lender. In order to make things as stark as possible,

¹⁰ Moreover, many of the business cycle recessions as opposed to deep crisis episodes occur at date 0, when

imagine that distressed firms have no assets of value to foreigners, but that the high date 2 return on their investment if successfully maintained, A_n , is fully pledgeable to other domestic agents. To be concrete, think of A_n as the value of a building (nontradeable) delivered at date 2, and assume that absent a crisis the discount of future flows is simply zero, the international discount rate. The mass of these projects is one.

Figure 4: Equilibrium in Domestic Financial Markets

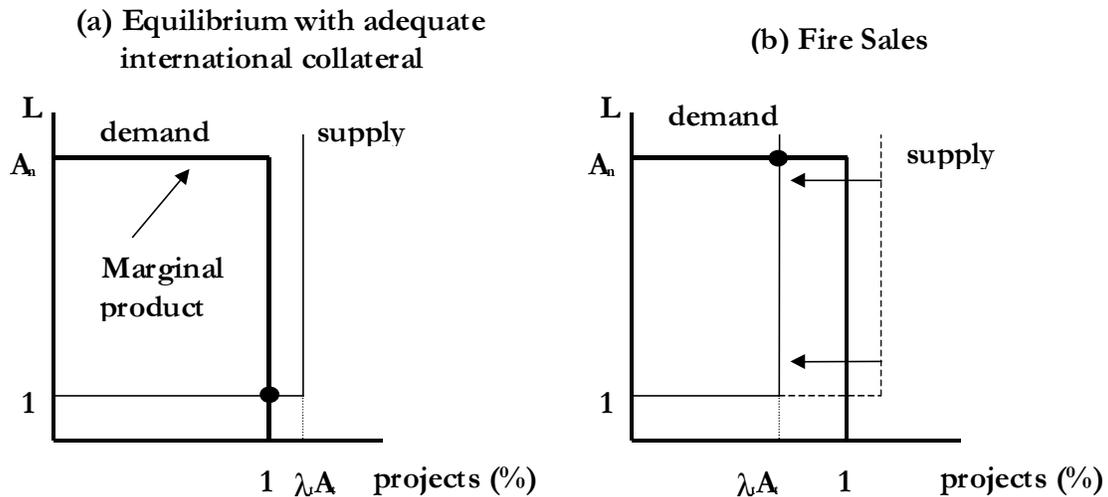


Other domestic firms and investors (or foreign specialists) have assets, A_t , that are “good collateral” to foreigners. For example, U.S. T-bills, the present value of exports as well as other domestic assets --like telecoms-- that may be deemed more transparent and trustable by foreign investors. As is highly unlikely that foreigners would be willing to provide financing equivalent to the full value of these assets –due to a sovereign problem,

domestic policy makers attempt to prevent a deep crisis at date 1.

for example-- assume that one unit of A_t only secures a loan of λ_t date 1 resources.¹¹ Much of the policy discussion later on has to do with increasing the value of this parameter.

Figure 5: Fire Sales



- Limited number of profitable projects
- Scarcity of international collateral limits the transfer of funds to distressed firms
- A decline in the quality of a country's international collateral can cause a fire sale

Domestic financial markets are essentially the place where up to $\lambda_t A_t$ date 1 resources are made available to the distressed firms, who have date 2 assets A_n to pledge in exchange. When the economy's pledgeable resources are greater than the needs of distressed firms, arbitrage keeps the internal cost of funds L equal to the international interest rate (normalized to one here), all distressed firms are able to borrow funds, and only a fraction of domestic collateral A_n needs to be pledged. This is the case in panel (a) of Figure 5. In this simple example, where all projects have the same high return, the domestic demand for international liquidity by distressed firms is flat up to the point where all projects are fully refinanced. The supply, on the other hand, is flat at the international interest rate

¹¹Thus, in addition to binding microeconomic incentive problems, there may be sovereign risk associated to many of these assets, especially in the event of crises. The latter affects foreigners' valuation of these assets even when they acquire the

until international collateral $\lambda_t A_t$ runs out, where it becomes vertical.¹² When the aggregate needs of distressed firms are greater than pledgeable resources, competition among distressed firms transfers all of their private surplus (return above the international interest rate) to the *domestic* suppliers of *international* liquidity. Panel (b) illustrates this *fire sale* of domestic assets. The fraction of projects financed is $\lambda_t A_t < 1$, and the discount of domestic collateral jumps from one, the international level, to $L = A_n > 1$.

Externality and Policy Problems

Under-provision. While the scenario described above can indeed represent a great source of uncertainty and volatility for a country, it is not clear that there is a role for policy, aside from structural ones (see section III). Since domestic providers of international liquidity are transferred all of the surplus during crises, they are given the right incentives to supply this liquidity. It is here where the second ingredient highlighted above plays a central role. When domestic financial markets are imperfect in the sense that distressed firms without direct access to international financial markets do not have the means to fully pledge their returns to other domestics or informed investors, the ex-ante incentive to hoard and supply international liquidity is weakened. Market-making is not a great business in a market with constrained demands. Imperfect domestic financial markets are captured here by the assumption that only a fraction $\lambda_n < 1$ of a distressed firm's value can be pledged.

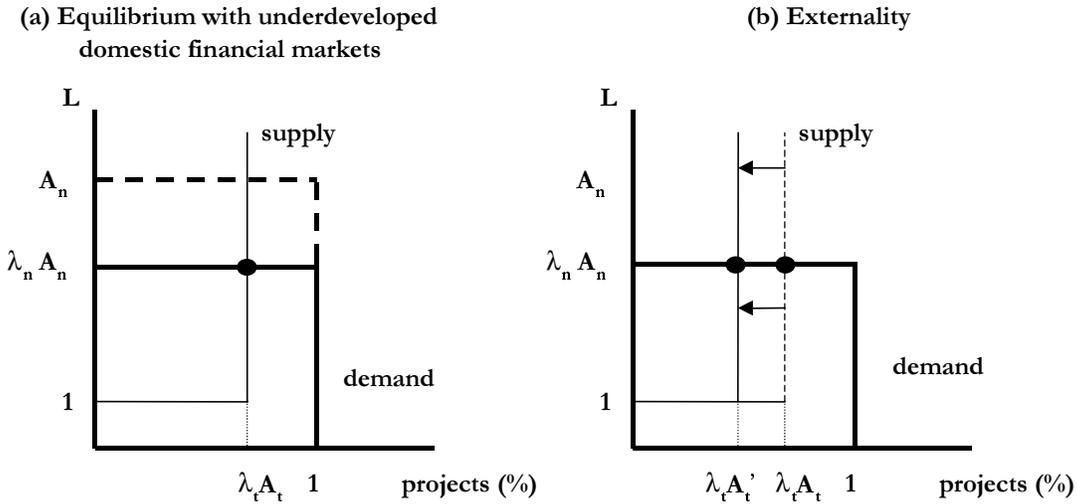
Panel (a) in Figure 6 illustrates the scenario just described. Given the date 0 allocations, a decline in λ_n reduces the effective demand (payment capacity) of international liquidity. While the marginal product curve remains unchanged (dashed line), the effective demand curve (solid line) shifts down as the maximum payment per unit of investment is only

private control rights

¹² These abrupt changes in slopes are only meant to capture as clearly as possible the fact that there are regions where most firms can satisfy their financial needs and the cost of credit is determined by international conditions, and others where it is the domestic availability of international assets that determines such cost.

$\lambda_n A_n$. As long as pledgeable assets are greater than the opportunity cost of funds (the international interest rate), however, domestic providers will make these loans.¹³

Figure 6: Excess Vulnerability



- Imperfect domestic collateral reduces the effective demand for funds
- Lower demand reduces intermediaries' expected returns for lending
- These lower returns reduce date 0 investment in international collateral
- Less international collateral increases the vulnerability of the economy to bad shocks.

But domestic availability of international collateral will not remain unchanged. In this environment, frictions in the market for domestic assets distort the private returns of holding domestic and international collateral. The ex-ante equilibrium response to such distortion at date 0 is captured in panel (b), with an inward shift in the ex-ante supply of international liquidity/collateral. Since domestic financial constraints limit the returns received by international liquidity providers below the full return of distressed projects, the incentive to provide such liquidity declines. In so doing, the economy experiences more frequent fire sales and more severe distress in the event of an international squeeze on the country. The economy is in the end made too vulnerable to external shocks as

¹³ Note that a decline in L does *not* necessarily imply that the domestic interest rate falls relative to the case with better developed domestic financial markets (for given international liquidity). It may imply instead that a larger share of the domestic “loan” becomes uncollateralized.

domestic investors do not value international liquidity enough, creating less international collateral than is socially optimal.

Distorted External Maturity Structure and Currency Denomination. A similar situation arises with respect to short versus long term debt, and with respect to the currency denomination of external debt. Long term debt is like short-term debt plus rollover insurance. When domestic financial markets are underdeveloped, there is less incentive to buy the insurance than is socially optimal since the holders of that insurance that do not experience distress and financial needs at date 1 do not receive the full social return of their guaranteed debt-rollover. Similarly, denominating external debt in domestic currency amounts to adding a hedge against depreciations. For the reasons exposed above, this hedge will be undervalued by the domestic private sector as well. I will return to these issues in the policy section.

To summarize, I have portrayed the *core* of an advanced emerging economy in terms of two basic features. First, it frequently finds itself near the limit of its capacity for international financing (stocks or flows). In such a position, intertemporal smoothing is limited and changes in external or domestic conditions can have potentially large effects on domestic activity. Second, domestic transfers of value are limited by underdeveloped financial markets and the institutions that support them (see policy section). As a result, the incentive to reduce the vulnerability brought about by the first feature is undervalued by the private sector. Thus, the decentralized equilibrium is excessively volatile. In the next section I discuss shocks within this framework and in section III I discuss appropriate policy responses to deal with the excess volatility problems given the structure (the λ s) as well as measures to improve the structure.

II.2 Shocks and the Periphery

Continuing with a minimalist approach, I argue here that once in the environment described above, the bulk of the volatility observed in advanced Latin American economies can be described using just two canonical external shocks. Sometimes it is the direct effect of these shocks that creates volatility, while in others it is simply the fear of them that leads the authorities to create precautionary recessions, or the private sector to speculate on their potential arrival.

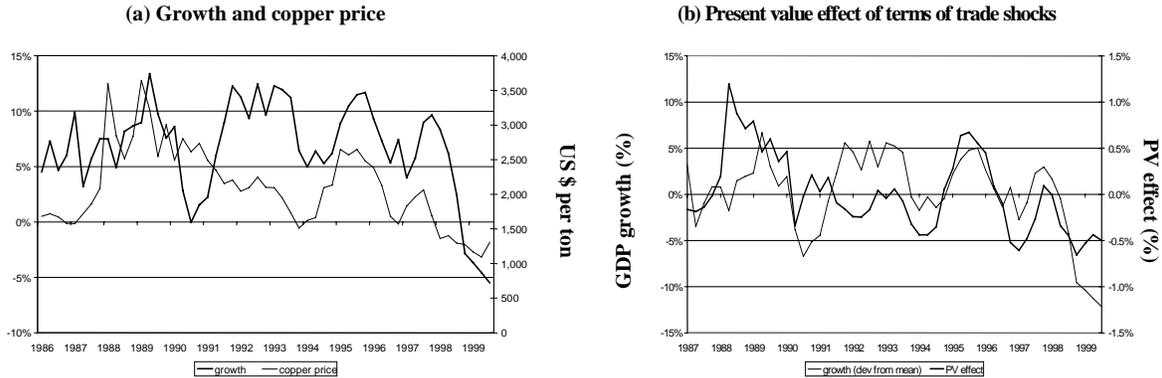
Canonical Shocks

External financial shocks. The most direct shock conducive to a fire sale and crisis is indeed a sudden loss in the international appeal of a country's assets. This can be due to country-specific factors as well as to changes and shocks in the segments of international financial markets relevant for the country. The turmoil after the Russian crisis in October 1998, as well as the debt crises that followed U.S. interest tightening during the early 1980s, are two prototypical examples of the latter.

A shock of this nature can be captured in the model as a deterioration in the quality of an emerging economy's international collateral, λ_i , that shifts the supply curve to the left as the country's capacity to borrow abroad is reduced. As the spread between the domestic and international interest rates rises, there is a fire sale of domestic assets because the domestic opportunity cost of holding these assets is high when credit is scarce.¹⁴ The counterpart of the fire sale is the limited reinvestment and costly termination of distressed high net present value projects.

¹⁴ Foreigners or non-specialists are unable to capture these high returns because at times of crises they only hold and arbitrage claims backed by international collateral. While their arbitrage during normal times keeps the international spread at zero, it is immaterial when the international collateral constraint binds. That is, the interest parity condition shifts until domestic equilibrium, rather than international arbitrage, holds.

Figure 7: Excess Sensitivity and Chile



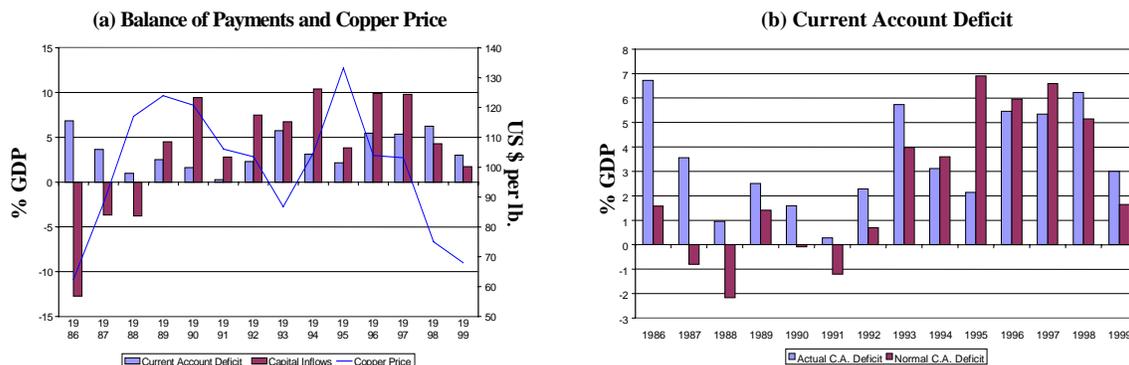
Sources: growth from IFS, copper prices (London Metal Exchange) from Datastream.

Terms of trade shocks. Shocks need not come directly from external financial factors to reflect the weakness of financial links. Panel (a) in Figure 7 plots the paths of the spot price of copper from the London Metal Exchange and Chile’s quarterly GDP growth. The resemblance is stark, with the only important exception being the 1990 growth slowdown and its recovery episode which had a purely domestic origin. Panel (b) documents the excessive sensitivity of Chile’s GDP response to copper prices by plotting the annuity value of the expected present value impact of the decline in copper prices, as a share of GDP.¹⁵ It is apparent from this figure (the different scales in the axes, in particular) that fluctuations in GDP are an order of magnitude larger than a smoothing model would dictate.¹⁶

¹⁵ The present value effect is computed assuming an AR(4) process for the spot price of copper, a constant growth rate for copper production (7%) and a fixed discount rate (7.5%).

¹⁶ The price of copper has trends and cycles at different frequencies, some of which are persistent (see Marshall and Silva 1998). But there seems to be no doubt that the sharp decline in the price of copper during the current crisis was mostly the result of a transitory demand shock brought about by the Asian crisis. As the latter economies have begun recovering, so has the price of copper. I would argue that conditional on the information that the current shock was a transitory demand shock, the univariate process used to estimate the present value impact of the decline in the price of copper in figure 3, overestimates the extent of this decline. The lower decline in future prices is consistent with this view. The variance of the spot price is 6 times the variance of 15-months-ahead future prices. Moreover, the expectations computed from the AR process track reasonably well the expectations implicit in future markets but at the very end of the period, when liquidity premia considerations may have come into play.

Figure 8: Copper Prices and Chile's Current Account



Source: INE and Banco Central de Chile.

The view portrayed in this paper identifies the fundamental problem as one of weak links to international financial markets. Panel (a) of Figure 8 reinforces this conclusion, illustrating the *positive* correlation between the current account deficit and the price of copper, opposite to what one would predict from standard smoothing arguments. The “tequila” crisis of 1995 appears to be the exception that proves the rule as the high copper price gave the Chilean economy enough “liquidity” to ride through the crisis and experience fast domestic growth despite the large international credit crunch experienced by emerging economies.¹⁷ This is confirmed in panel (b), which demonstrates that Chile used a large fraction of the “liquidity” given by the high price of copper to offset the decline in capital inflows as the current account deficit at normal prices reached its highest level during that year. Most importantly, exactly the opposite occurred during the 1998-99 crisis as the price of copper plummeted (erasing Chile’s liquidity) at the precise time that international financial markets tightened.¹⁸

¹⁷ Capital flows were high matching the high copper price, but the current account was not. The other exception reflects a domestically induced recession, as it resulted from the monetary tightening implemented at the beginning of the new government to offset the inflationary pressures of the preceding political cycle. Capital flows remained high but ultimately led to the accumulation of international reserves rather than financing a current account deficit.

¹⁸ Note that terms of trade were also bad in 1993 and that, consistently, growth slowed down that year as well (see figure 1). However, international financial markets were buoyant at the time so this decline did not come together with a severe credit crunch.

In order to place this scenario in the context of the model above, assume that international collateral is constituted only of tradable goods while domestic collateral represents non-traded goods.¹⁹ An adverse terms of trade shock is simply a decline in the value of traded goods, A_t , which reduces the country's borrowing capacity and shifts the supply curve to the left in a manner similar to the financial shocks above. A sufficiently large or sufficiently long sequence of terms of trade shocks can significantly reduce a country's international liquidity, causing a fire sale and corresponding real decline. Needless to say, the extent to which this is likely to happen depends critically on the tightness of external financial markets.

Apprehension

In isolation, these canonical shocks are not always large enough to justify the observed aggregate volatility created by a crisis, and at times crises occur even without their apparent presence. These features are not in contradiction to the basic premise, for both their presence as well as a high likelihood of them becoming a factor in the near future typically suffice to trigger public and private responses with recessionary consequences.²⁰

Monetary Policy "Shocks". The case of Chile during its 1998 recession starkly illustrates a precautionary recession. The mandate of the Central Bank of Chile has two basic components:²¹ to meet a declining inflation target, and to prevent the current account deficit (at "normal" terms of trade) from going too much beyond four percent – it obviously becomes more sensitive toward the latter when external financial conditions tighten. The latter component of the mandate is clearly an institutional reflection of the country's concern with external crises. Under this mandate, the 1998 scenario represented the Central Bank's "worst nightmare." The sharp decline in terms of trade put pressure

¹⁹ The international economics literature has long recognized the importance of international collateral and its relation with a country's tradeable sector. See Simonson (1985). Formal models of sovereign debt renegotiation are built around the question of what international lenders can threaten sovereign countries with in the event of default. In this literature, international collateral is typically taken to be some fraction of exports. See Eaton and Gersovitz (1981) or Bulow and Rogoff (1989). Cash revenues from exports can be seized before they make it back into the country. This feature was used by Mexico during the 94-95 crisis when its oil revenues were made part of the collateral backing the liquidity package it received.

²⁰ Of course, these responses may indeed prevent larger crises in the near future.

²¹ There is an extensive debate in Chile on whether this was indeed the Central Bank's mandate or whether it was simply an inadequate interpretation of it. This distinction is irrelevant for the point made here.

on the peso, and hence on inflation, and directly worsened the current account via its income effect. All of this happened in the middle of a very difficult external financial markets scenario. It was in the mandate – optimal or not – to do what the Central Bank did; a sharp tightening of monetary policy was the outcome.

Speculative Attacks and Credibility Problems. At times, as indeed was the case of Chile in the episode described above, the private sector also anticipates the potential external bottleneck. In doing so, it typically runs against the currency and domestic assets, exacerbating their fire sale and the central bank's precautionary tightening. It is important to note, nonetheless, that absent the potential external constraint these attacks have a very diminished chance of succeeding, and that a fragile domestic financial system makes these attacks more likely and more costly (see below).²²

Conversely, the much-needed adjustment of the real exchange rate during times of external crises –an adjustment that is mostly required by the limited availability of external financing– is sometimes hampered by the lack of credibility of domestic monetary policy. The case of Mexico during the Russian crisis makes the point. Table 2 compares the experience of Mexico to that of more advanced economies with flexible exchange rate systems: Australia and Canada. It is apparent from the table that while all these countries experienced large and comparable nominal depreciations during this period, Mexico had much less to show for it in terms of a real-devaluation as inflation eroded a large part of the nominal depreciation. Rather mechanically, one can interpret this in terms of a very high pass-through. My view is that the problem results from a lack of a credible monetary anchor that drives both the exchange rate and domestic inflation up at the first sight of trouble.

²² This claim does not deny that there are times when attacks are based purely on the anticipation of a monetary policy that is inconsistent with the existing nominal exchange rate rather than the anticipation of a sharp shortage of real external resources.

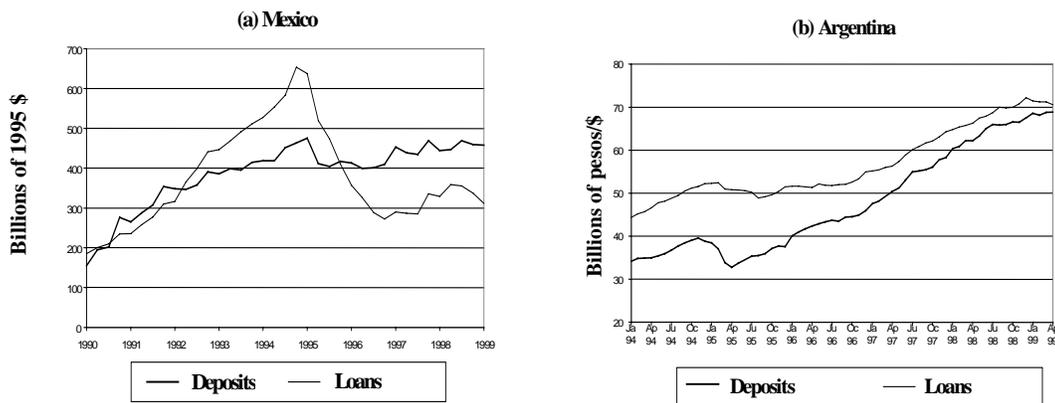
Table 2: The Real Benefits of Depreciation

	<i>Asia</i>	<i>Russia</i>	<i>Both</i>
A. Nominal Depreciation			
Australia	17.33	-0.07	17.25
Canada	4.47	6.60	11.36
Mexico	10.71	15.76	28.15
B. Real Depreciation			
Australia	17.46	-0.07	17.38
Canada	4.94	7.09	12.38
Mexico	0.04	7.67	7.72
C. Ratio (B/A)			
Australia	1.01	1.11	1.01
Canada	1.10	1.08	1.09
Mexico	0.00	0.49	0.27

Notes: January 1997 is the base year in each panel. Nominal exchange rates are relative to the United States. Real exchange rates are constructed using the Consumer Price Index and are relative to the United States. Asia includes the depreciation from 97:3 to 98:2 while Russia includes depreciation from 98:2 to 98:4. Data are from the IFS.

Domestic Financial System Shocks and Amplification: Credit Crunches and Runs. The description of levels in Figure 2 hides important dynamic and cyclical aspects of financial markets, and of banks in particular. These play important roles as amplification and causes of external crises. Panel (a) of Figure 9 illustrates the severe Mexican credit crunch that followed the “tequila” crisis. Loans, and in particular new loans, imploded early on during the crisis, especially as the currency went into free fall and dragged the already weak balance sheets of Mexican banks with it. There is no doubt that the severe credit crunch significantly leveraged the 94-95 crisis and that the collapse in the banking system will impose costs on the economy and the public accounts for many years to come.

Figure 9: Credit Crunches



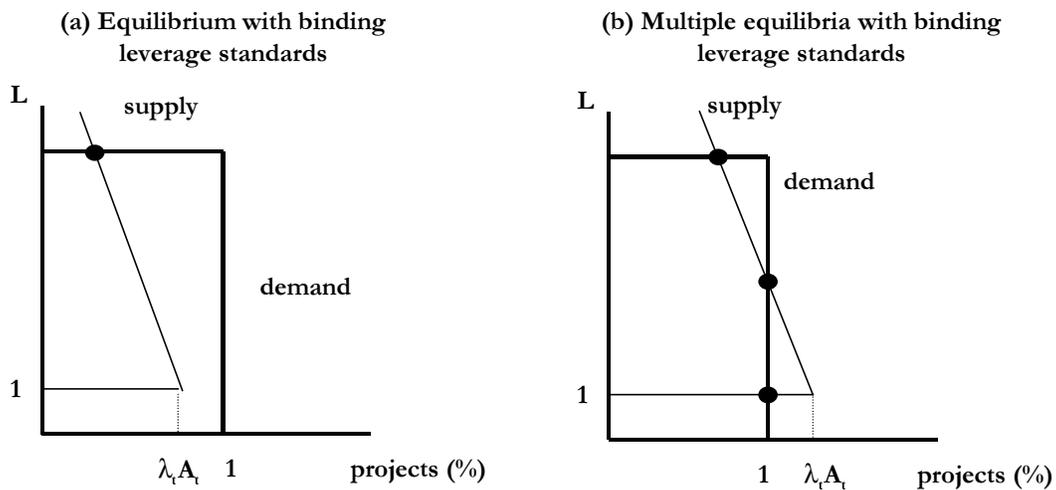
The Argentine case during the same episode started from the other side of the banks' balance sheets. Panel (b) of Figure 9 illustrates the path of deposits and loans, indicating that it was not the value of the loans that imploded – perhaps because the exchange rate did not collapse – but that depositors ran for their deposits in order to convert them into dollars as they expected that the tight *external* conditions would make the convertibility system unsustainable.

The basic model is easily extended to include a banking sector that replaces the domestic credit chains discussed above. For example, in order to capture a Mexican-style credit crunch, let banks make loans to firms funded at date 0 by issuing debt to foreigners. At date 1, domestic holders of international assets mortgage them and deposit the proceeds in the banking system that in turn intermediates new loans to distressed firms. Banks are subject to capital adequacy standards such that the ratio of the market value of capital to loans must be at least α . When banks are unconstrained, the economy is equivalent to that described above with perfect domestic financial markets and weak financial links. Once adequacy standards bind, however, the supply curve for internal funds becomes backward bending as bank capital is eroded by higher interest rates that in turn lower asset prices.

Panel (a) of Figure 10 illustrates that this fire sale of assets may sharply reduce the banking sector's lending capacity, creating a credit crunch. Frictions in the banking sector

are actually more serious than those described in undeveloped financial markets above. Constrained banks become a financial bottleneck as excess domestic resources are not properly channeled to distressed firms, wasting otherwise good international collateral. While the contraction in loan supply causes the increase in interest rates, the collapse in asset prices amplifies the impact of the crisis by deepening the credit crunch caused by distressed banks' balance sheets. Panel (b) demonstrates that the feedback between asset prices and feasible intermediation can easily bring about the possibility of multiple equilibria.

Figure 10: Bank Capital Crunches



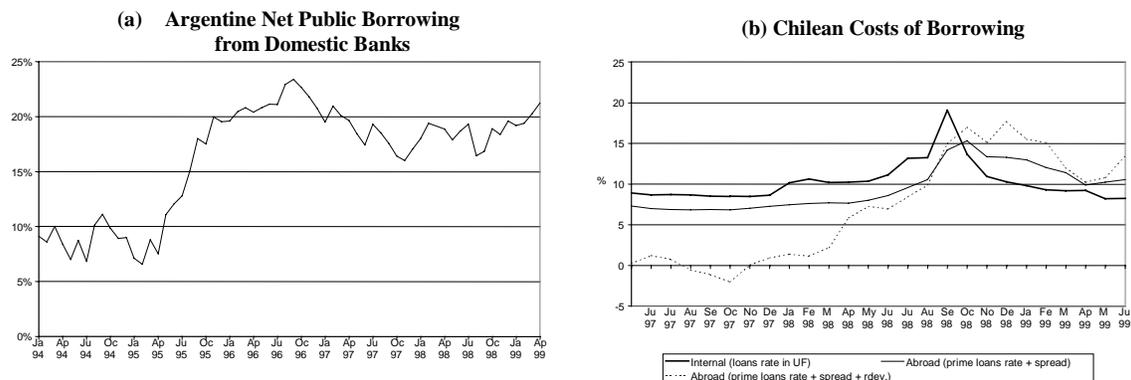
- Banks must hold sufficient capital against date 1 loans to distressed firms
- Higher interest rates reduce the value of date 0 loans, increasing market leverage
- Binding leverage standards require banks to reduce date 1 lending as interest rates

Further Amplification Mechanisms: Crowding out and Labor Market Rigidities

Traditional sources of macroeconomic problems become more troublesome in the financially fragile environment that affects Latin American economies.

Crowding out by the government. When financing from foreigners evaporates, Latin American governments frequently turn to domestic markets for financing, crowding out private sector investment. This is costly, since one of the main features of financial crises is that funds lose their fungibility – it is no longer irrelevant where the government gets its funding from. Moreover, it is the government that normally has the most opportunity to access international financial markets. Thus, the government should shift its financing away from domestic markets. The Argentine case during the “tequila crisis” illustrates the lack of such adjustment. Panel (a) in Figure 11 shows that during that episode there was a sharp increase in the share of loans by domestic banks going to the government.²³ The slow recovery of loans to the private sector relative to deposits described above can be partly attributed to this shift.

Figure 11: Crowding Out



This mechanism should be distinguished from that when it is the sovereign itself that is perceived as the source of the problem. Whether such perception is justified or not is

²³ During the recent crisis the Argentine government resorted to domestic financing again; this time by selling bonds to the pension funds rather than by borrowing from the banking system.

more or less analogous to the issues behind the private sector's λ_s (that in turn may be partly due to problems of the sovereign). In such a case, tightening fiscal accounts may be an unavoidable response rather than one of smoothing across domestic margins.

Crowding out by large firms – the cost of sharp interest rate reductions. As external financing tightens for large firms, they too turn to domestic markets as preferred customers, facilitating the “flight-to-quality” demand by domestic financiers. The social cost of this strategy is that small firms generally do not have access to international financial markets, regardless of price. To make matters worse, this not only happens during the crisis but it may also extend to the recovery phase. Some evidence of this can be found during the recent Chilean recession. As the perception that the worst of the crisis had passed and that the contraction was more severe than expected began to emerge, interest rates were lowered sharply, so much so that large firms may have found it advantageous to turn to domestic financial markets to obtain financing which was still difficult abroad. Panel (b) in Figure 11 illustrates approximate measures of the cost of international versus domestic borrowing for a prime Chilean firm.²⁴ The line in between represents the cost of borrowing in dollars. It is apparent that while before the crisis borrowing abroad was probably cheaper for these firms (especially given the real appreciation of the peso), the opposite holds after the crisis.²⁵

Labor rigidities and inflexibility. Lastly, exchange rate and real rigidities are once again a more serious source of concern in an environment of limited financial resources. Absent the latter constraint ---and aside from medium term level problems--- short-term lack of adjustment in prices should have limited impact on long term investments and projects. Present these, on the other hand, short-term problems also affect these long-term decisions.

²⁴ The figure compares the U.S. prime rate, plus a measure of the international spread on Chilean corporate debt and two different measures of the peso's real devaluation.

²⁵ With time, if the situation persists, local banks will probably borrow abroad to lend to the small firms. But in the short run, given uncertainty and the conservative attitude of banks, this mechanism is limited. In fact, one may think of the crowding out mechanism in reverse: it is the sharp increase in the banks' appetite for quality that lowers the equilibrium rate and exacerbates the rationing mechanism.

Argentina is the regional prototype here, with its strict convertibility law and European style labor markets. While the credit crunch experienced by the Argentine economy during 1995 could probably not have been averted by a more flexible real wage, it is probably true that in the still unraveling recession such rigidity enhanced the crisis by generating a “collateral squeeze,” that is a decline in the appeal of the firm’s outlook from the point of view of the banks.²⁶ Firms are severely squeezed from two complementary ends: financial and labor markets.

Moreover, the relative rigidity of wages in Argentina during crises underestimates the extent of the relative rigidity of the Argentine system. On one hand, countries with more flexible exchange rate systems may choose not to utilize this flexibility as much in the midst of a crisis, when controlled devaluations are risky to play with.²⁷ On the other hand, and more significantly, the lack of real exchange rate adjustment today comes together with a lack of adjustment in the near future as well. The perceived present value of overvaluations relative to crisis-overvaluations is likely to be higher in the Argentine system than in more flexible ones.²⁸

III. Policy Recommendations

The goal of the organizing framework was to highlight and understand the nature of the policy problem created by what I perceive as the fundamental sources of modern Latin America’s volatility. Latin American economies, including the most advanced ones, lack along two central dimensions: links with international financial markets and development of domestic financial markets. As most primitive forms of macroeconomic volatility have been tamed by deep reforms, it is these two ingredients, either directly or by leveraging a variety of standard shocks, that probably account for much of fluctuations and crises in modern Latin America. While conventional advice for conventional maladies remains,

²⁶ Of course, one could argue that with real wage flexibility, particularly through exchange rate flexibility, the run on deposits and the ensuing credit crunch would have been avoided altogether.

²⁷ See Hausmann et al. (1999) for preliminary but suggestive evidence on devaluation “refrainment.”

²⁸ This concept is difficult to measure, although some information can be obtained from peso-dollar spreads, stock markets, and real activity. In Caballero (1999a) I referred to this phenomenon as “claustrophobia” and reported evidence on its costs and on how it changes the interpretation of movements in interest rates.

focusing on these two primitive and ingrained features offers a clear and potentially rewarding policy target.

With this target in mind, I have arranged the main policy discussion into two groups: *macroeconomic and contingent (second best)*, on one side, and *structural (first best)*, on the other. In principle, the former takes the core deficiencies as given and points at policies aimed at reducing volatility within that environment. The latter, on the other hand, is about changing the core environment, a more long-term goal. In practice, this distinction is less clear since volatility itself is probably an important factor behind the pervasiveness of the core ingredients.

What follows combines a list of policy suggestions aimed at ameliorating the problems discussed above, as well as a series of caveats on conventional advice raised by the perspective adopted in this paper.

Macroeconomic and Contingent Policies

Taking the structure as given, there are essentially two policy problems: prevention and crisis management. As discussed above, underdeveloped domestic financial markets typically lead to a situation where, ex-ante, international liquidity provision is undervalued. Thus, the goal of macroeconomic policy is to reallocate international liquidity use and availability from booms to crises. During the latter, the goal is to reallocate it to those economic agents that need it the most, but this must be done with care not to affect significantly and perversely ex-ante incentives to hoard and create international liquidity. Ideally, these policies should be made contingent in order to reduce speculative behavior due to policy uncertainty. Moreover, to the extent that it is feasible, a significant component of the aggregate risk associated with external shocks should be insured away (see below).

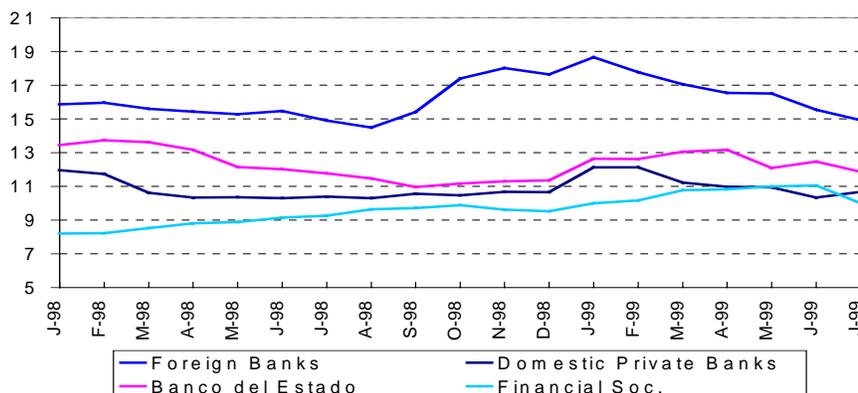
Macroeconomic Policy

Monetary Policy. The quintessential monetary policy to deal with this international liquidity management problem, is a sterilized intervention – essentially, the central bank sells public bonds for international reserves – during the capital flows boom. The counterpart ought to be the selling back of these reserves during external crises. Experience and theory suggest that the first half of this policy, the sterilized intervention, is hard and expensive to implement for prolonged periods, and it may even backfire as the private sector reacts perversely to the quasi-fiscal deficit, appreciation, and reserves accumulation at the central bank.²⁹ Thus, this is probably *not* an instrument that can be used for medium term prevention.

Banks in Monetary Policy. A closely related measure that works mostly through controlling international liquidity aggregation within the country is active management of bank reserves and capital adequacy ratios, and possibly international liquidity ratios. The model sketched above hints that the level of these ratios should be increasing with respect to the degree of underdevelopment of financial markets. In principle, these requirements also need to be made procyclical. There are however two practical problems with such a recommendation. First, for those countries where the health of the banking system is suspect, weakening standards may make a run more likely – this was a concern in Argentina during the recent crisis. Second, in other cases, especially when the participation of foreign banks is large, the policy may be ineffective during crises since the constraint may not be binding. Figure 12 shows the capital adequacy ratios for different segments of the Chilean banking sector; it is apparent that foreign banks voluntarily withdrew. While there is no doubt that fostering the arrival of solid international banks is a must, it is also important to understand the implications they may have for aggregate liquidity management.

²⁹ See Calvo (1991) and Caballero and Krishnamurthy (2000).

Figure 12: Risk Capital Ratios of Chilean Banks



Capital controls can supplement sterilization or, in principle, slow down capital inflows (perhaps of a targeted maturity) by themselves. But there are four caveats to them.

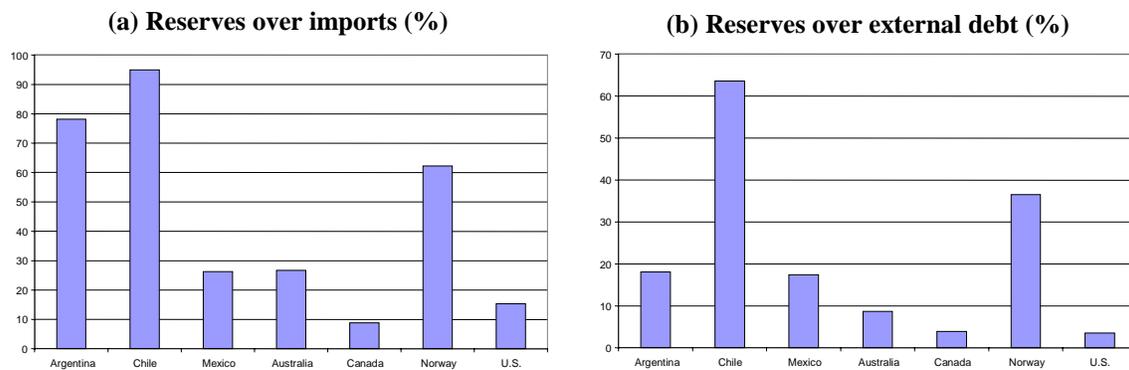
- i) At the very least they should be made contingent on the availability of external flows, lowering them during external crises.
- ii) Since an important part of the volatility in capital flows seems to be caused by suppliers' problems (e.g. hedge funds), it may be worth considering requiring liquidity-ratios from them as well.
- iii) Also, the domestic "under-insurance" externality is likely to be more pronounced at the short end of the spectrum. Thus, controls should be biased toward reducing short-term capital flows.³⁰ Having said this, I must admit concern with the emerging "consensus" that developing economies have excessive short-term borrowing relative to their international reserves. At some level the claim is trivially right –it is impossible to have a liquidity crisis if the country holds more reserves than short-term debt and renewals. At another, figure 13 shows that emerging economies are much more prudent than developed ones along this margin.³¹ Running an economy with all the precautions that "well-behaved" emerging economies do is extremely expensive. Borrowing only long-term

³⁰ This argument is different from that which sees the problem on "noisy" speculators who concentrate on short term capital flows (see below).

³¹ The figure has to be interpreted with caution, nonetheless, since an important difference between developed and developing economies is that the latter often have to issue a larger share of their debt in foreign currency.

- (expensive) and holding large amount of reserves would most likely be considered very poor management of an average U.S. corporation. What is important here is to determine how large this ratio is relative to what the country's institutions and financial markets can support. Putting all emerging markets, regardless of financial development, in the same bag is likely to be unnecessarily burdensome for the most developed of these economies
- iv) Most importantly, while the controls described above may be justifiable in terms of static second-best arguments, they are likely to hurt in the medium-run once the endogenous arrival of international market makers and corporate governance improvements are considered (see the discussion on integration for further discussion of this issue).

Figure 13: Precautionary Reserves



Notes: Data for 1997, except Norway data in panel (b) (1993). External debt for developed countries: BPS(IMF). External debt for emerging economies is the sum of debt securities issued abroad, Brady bonds, bank loans, trade credit and multilateral claims. External debt for developed countries is the sum of debt securities and other investment (including loans, deposits and trade credits) according to the IMF classification. Sources: Reserves and Imports: IFS. External Debt for developing countries: joint BIS, IMF, OECD, World Bank Statistics.

Caveats on the Exchange Rate System. Aside from the standard considerations, and the contingent aspect of it that I discuss in the next subsection, the perspective highlighted in this paper points at three additional ones in relation to sterilization:

- i) Since the optimal policy is one of reallocation of international reserves from high to low capital flow states, it clearly has an element of real exchange rate stabilization. Reserve management must be active and transparent.

- ii) While Mundell-Fleming type considerations give an edge to flexible exchange rate systems if sterilization is to be tried, it can be shown that this advantage, if systematically utilized, can be non-Pareto and may eventually reduce the incentives to supply international liquidity.³² In other words, if sterilization succeeds by choking intermediation during booms, it also represents a tax on savers and liquidity providers in general.
- iii) On the other hand, a fixed exchange rate system probably requires that a very large share of the country's international liquidity be held by the central bank (or mandated on the private sector) if it is to succeed in the improving the use of this liquidity.

Unconditionally, I would probably advocate a flexible exchange rate system coupled with a very active -- but explicit and contingent (see below) -- reserve management strategy and a nontradeables inflation target. If credibility problems are of the essence, fixed may be the way to go while still preserving the reserve management strategy, which in this case may require potentially costly mandatory international liquidity requirements and/or taxes on capital flows. A close eye must be kept on the consequences of these policies for private sector's incentive to hoard and produce international liquidity.

Labor Markets. Most countries in the region are in need of a modern labor code, and the pervasive income inequality problem that affects them adds a series of additional complications to this task. But for the purpose of this section, the main point to emphasize is the fact that ---leveraged by financial problems--- Latin American economies are exposed to much larger short-term adjustment needs. These are highly unlikely to be accommodated fully -- and to a different degree in different countries-- by exchange rate movements. Thus the new labor code must allow for a more or less automatic recession/crisis-package. I believe, for example, that following the advice of those that argue that temporary contracts have not been effective in Europe, as Argentina

³² An additional point against a fully flexible exchange rate system is that it may not be possible for an individual country to allow the development of sufficiently deep currency-risk hedging instruments. Investors may use them to hedge the risk on neighbors' currencies, if these do not have their own deep hedging markets. This was a problem for Mexico around the Brazilian turmoil during 1998-99, and it is a particularly serious concern if the country's financial markets are not deep enough.

did in the recent past, is misguided.³³ The European problem is primarily one of lowering structural unemployment, while Latin American economies need also to deal with sharp short term crises. Thus the Latin American solution should at the very least allow for a contingent relaxation of temporary contracts constraints; this form of hiring should be fostered during crises.

Fiscal Policy. Grounded on Keynesian mechanisms, *optimal* fiscal policy over the business cycle is traditionally thought of as being counter-cyclical. Latin American economies, unlike OECDs, typically exhibit the opposite pattern; fiscal deficits are *pro*-cyclical rather than counter-cyclical. This pattern has been interpreted as a seriously sub-optimal policy, and most likely the result of the financial constraints faced by the governments themselves. This assessment may be true but it misses an important point: if external financial shocks are an important source of fluctuations, the economy should distribute the scarce available international resources across domestic economic agents so as to smooth their differences in financial distress. It is highly unlikely that government expenditure, unless used very selectively to solve financial distress in the private sector, is the right place to allocate the marginal dollar.³⁴ Fiscal policy may need to be *pro*-cyclical after all.³⁵

Public Debt Management. Since the government itself may trigger a crisis in the face of large debt renewal or payment, it has become a common practice to advocate a debt management strategy that avoids lumps. This is sound advice, but it is important to understand that it may lose some of its effectiveness absent other measures to reduce the externality highlighted in these notes. The reason is that while the government may reduce its own bottleneck, which is unambiguously good, the private sector will probably undo part of the smoothing. This is simply to note that it is not only the government's

³³ The argument against temporary contracts is not that they don't create employment, but that they separate even further insiders from outsiders by reducing the pressure on insiders and creating a class of temporary –and unskilled– workers.

³⁴ This also suggests that fiscal adjustments during crises ought to be done on the expenditure rather than taxes side. And if the latter is unavoidable, they should probably be targeted away from the supply side of the economy.

³⁵ This is an optimal policy argument, as opposed to the more standard one which explains the fiscal pattern in terms of the financial constraints faced by the government itself. Which effect dominates depends on whether the private sector (perhaps a specific sector within it) or the government faces the tightest financial constraints during the crisis.

debt schedule that matters, but also that of the country as a whole, and the private sector may undervalue the advantages of a smooth aggregate debt repayment schedule.

Contingent Policies

As much of the modern Latin America's volatility problems can be ultimately linked to external financial factors and terms of trade shocks (themselves important only due to weak international financial links), the basis to design a solid contingent policy are clearly outlined.

Contingent Rules. While most macroeconomists would agree in principle on the cyclical features of the policies described above, much more disagreement would arise in practice. Opposition often comes from those that put credibility issues ahead of the rest. Most prominent is the example of the exchange rate system, where the main argument in favor of dollarization and other strong-fixed systems, is their credibility. To me, however, the most credible policy is that which is most suited to the scenario faced by the country. Indeed, problematic discretion can be removed entirely from the authorities by making the contingent rule explicit. This rule must be simple, easily verifiable, and a function of variables not directly controlled by the authorities. Terms of trade (in most cases) and some index of the tightness in international financial markets (EMBI-spread?) would probably suffice. If the locally preferred exchange rate system is fixed, for example, this may be allowed to depart transitorily from its long run parity as a function of the state; care must be taken not to generate arbitrage opportunities. If the choice is flexible, on the other hand, the rule must control the release of central bank reserves to the open market.

Insurance and Hedging. Yet another manifestation of the underprovision of international liquidity that justified the policy interventions discussed above, is that international insurance is undervalued by the private sector (see Caballero and Krishnamurthy 2000).³⁶

³⁶ Strictly, the undervaluation is with respect to *aggregate* contingencies. That is, one would want agents that are not suffering distress to be able to collect the insurance when the country as a whole is experiencing a crisis. Lines of credit have this feature since funds' disbursement is not necessarily tied to a bad realization within the firm.

If, for example, one thinks about long-term external debt as short-term debt plus a rollover insurance clause, the private sector will on average borrow at maturities that are shorter than socially optimal. Similarly, from the point of view of the economy as a whole, the private sector will underinsure with respect to terms of trade and external financial shocks.

Aside from controversial taxation of short-term capital inflows, governments often resort to stabilization funds and other self-insurance mechanisms. Industrial policy aimed at export diversification is another.³⁷ These are expensive and inefficient insurance methods, but unfortunately the incomplete nature of the corresponding insurance and hedging markets makes them the main available option.

Why are these markets so incomplete is a key research question, that should probably be linked to the emerging literature on underdeveloped “catastrophe risk” markets in more developed economies. Aside from incentive problems affecting countries, it is probably the case that the high correlation of commodity prices with global activity makes the capital required to insure that risk naturally very expensive and too large for insurance companies to immobilize. It is here where a market-making role by the IFIs may represent a significant aid.³⁸

Structural Policy

But what to do with the structure, in order to improve links with international financial markets and the development of domestic financial markets?

Institutions. By now, there is widespread consensus on a series of general recommendations to improve external financial links, which can be found in most “international financial architecture” pamphlets. These recommendations include norms

³⁷ Yet another is to sell domestic assets to foreigners (see e.g. IPES 1995). The issues here are when to sell and, closely related, whether the perceived agency problems (e.g. risk of expropriation) are low enough to prevent a steep price discount.

of transparency and accountability; banks' sound practices for supervision, settlement, accounting and disclosure; aggregate risk management; and a series of related measures and practices aimed at improving the country's contractual environment and corporate governance.³⁹

Fostering Integration Synergies. But it takes more than change in regulation and supervision to achieve the desired goal. A good example of this observation is the case of Chile. While Chile has and continues to make substantial progress in ensuring an appropriate legal environment as it relates to businesses, its limited size and very unequal wealth distribution makes progress on the corporate governance front difficult especially when considering its natural or "structural" ownership concentration. This hints at an important synergy in fostering a much deeper integration with international financial markets: not only is good corporate governance needed to succeed on integration, but also integration may be an essential ingredient to achieve good corporate governance as well. It is for this reason that I find capital flows taxation, while justifiable on static second best ground, potentially very harmful. A more reasonable recipe, I believe, is as follows: if the country's institutions are so far off the ideal ones that the decentralized equilibrium is very unstable, taxing capital inflows contingently may be justified. But if that is not the case, it may well pay off to bear the additional risk in exchange for a faster development of financial links and markets.⁴⁰

³⁸ The recent election-contingent line of credit contracted by Mexico, and the multiple offers of credit lines received by Argentina to substitute for its limited lender of last resort capabilities (which would allow them to reduce the very high banks' liquidity ratio requirements), are promising developments.

³⁹ TIAA-CREF, one of the largest institutional investors in the U.S. has made public that it simply does not invest in claims issued by companies with poor corporate governance standards. (See pages 10-11 in May 1999 issue of "Participant," TIAA-CREF's quarterly news and performance magazine.) Among its requirements are that: (i) a company's board consist of a substantial majority of independent directors (i.e. no significant personal ties, current or past); (ii) a company's board must obtain shareholder approval for actions that could alter the fundamental relationship between shareholders and the board; (iii) companies must base executive compensation on a "pay for performance" system, and should provide full and clear disclosure of all significant compensation arrangements. It does not take an in-depth knowledge of Latin American corporations to realize that very few of them would make it into TIAA-CREF's good corporate governance list.

⁴⁰ As of this month (May 2000), Chile has opted for permanently removing "taxation" of short term capital inflows, as well for implementing a series of measures to facilitate both the participation of domestic firms in foreign financial markets as well as the participation of foreign investors in domestic markets. At the same time, several measures to improve corporate governance are being actively discussed. From the point of view adopted in this paper, these steps are significant steps forward.

Institutional Investors. Fostering and nurturing the development of well supervised institutional investors is an efficient mechanism to delegate the enforcement of good corporate governance standards to the private sector, as these institutions often ponder such factors in their investment decisions.

Macroeconomic Collateral Requirements. Many of the structural reforms discussed above are also the key to improving the development of domestic financial markets, as indeed the latter is a pre-requisite to developing solid international financial links. There is, however, an aspect of domestic banking regulation that is worth highlighting. By observing the stock market patterns of financial and non-financial sectors, and the relation between the allocation of credit by banks and the valuation of the receiving firms, I concluded that unlike the conventional wisdom has it, there is a good case for arguing that it was not misbehavior and corruption alone that may have caused the banking sector debacle in Mexico 1994-95 (see Caballero 1999c). A distinct possibility is that bankers substituted for their lack of knowledge – the result of many years of financial repression – by requiring collateral, mostly in the form of real estate. This practice is a great idea in the case of idiosyncratic shocks but not when these are aggregate.⁴¹ The banks also made an error of judgement on the permanence of the fixed exchange rate system. The collapse of the system helped to destroy their balance sheets as they were very real estate intensive in loans and collateral and had apparently gambled on the off-balance sheet side (certainly a form of misbehavior). In sum, it appears that the deficiencies were not only on the banks handling of the microeconomic aspects of credit, as is often emphasized, but also, and perhaps primarily, on their handling of macroeconomic risk. Most importantly, domestic collateral – e.g. real estate – is often inadequate for crises, particularly those triggered by the sudden scarcity of capital inflows. The same holds true of loans to some non-tradeable sectors. This suggests imposing additional capital-adequacy requirements with respect to assets exposed to systemic risk, and to foster the usage of collateral that is more adequate to foreign

⁴¹ The proportion of loans over 20 million pesos that were collateralized right after the crisis is around 70% of the total for most banks. Gelos and Werner (1999) document that banks' use of collateral increased after privatization.

investors.⁴² Put differently, *macroeconomic risk* should be mandated more weight in the financial institutions VARs.

⁴² E.g. shares or claims on export-oriented companies, who may in turn hedge their own risks with claims from non-tradeables. Of course these transactions may be done within the banking system, but the point is that the macro-capital adequacy ratio must take these into account.

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