Behind Bank Credit Fluctuations in Latin America during the 1990s:
Old and New Suspects

Augusto de la Torre
World Bank

and

Danny Leipziger
World Bank

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Abstract

This paper analyzes the factors behind the fluctuations in bank credit to the private sector observed in Latin America during the 1990s. It first discusses salient stylized facts, which include wide oscillations in credit growth around a relatively low level of credit depth, a significant synchronization in credit fluctuations across Latin countries (suggesting the relevance of common, regional factors), and a weakening of the co-movement between lending capacity and credit, especially after 1998. The paper then quantifies the importance of various credit supply and demand determinants, applying a pooled-mean group estimation technique to quarterly panel data (covering the 1991-2001 period for ten Latin American countries). It finds that lending capacity and economic activity have been the main drivers of credit growth in the longer run, but that the adjustment to the long-run equilibrium has been slow. Regarding the shorter run, important factors are found to have been crowding out by the government; macroeconomic uncertainty; changes in lending interest rates; and, especially during downturns, unwillingness to lend among banks and pressures on firms to de-lever. The paper presents evidence of a rising presence, particularly after 1998, of the phenomenon of “liquid banks that do not lend”—reflecting a slower adjustment in lending capacity during downturns, compared to the degree of deterioration in other credit determinants. Finally, the paper discusses policy implications.

JEL classification codes:

Keywords:
1. Motivation and Summary

A process of pronounced deceleration, stagnation, or frank contraction in bank credit to the private sector has been observed in a significant number of Latin American countries since the mid-1990s (following the Tequila crisis) and, especially, after late-1998 (following the Russian and Brazilian crises). These downturns—which were typically preceded by periods of buoyant credit growth—have become a growing source of concern to policy makers in the region, adding yet another headache to the long list of headaches caused by financial sector problems. The catalog of such headaches is in effect mind boggling. It ranges from costly financial crisis to stubbornly low levels of credit to the private sector (relative to GDP), and to glaringly inadequate access to financial services for small and medium enterprises and non-rich households. The marked slowdown or contraction in bank credit in many Latin countries in recent years is, of course, not independent from these other ones. But it has become a rather prolonged and salient problem, such that it warrants analysis on its own right.

The downturn in bank credit during recent years in Latin America is inscribed in a history of large swings in credit growth. High volatility in credit growth is of course not a new phenomenon in the region. It was as much of a feature in the 1980s as it was in the 1990s. But, as we shall see in greater detail later, a special trait of the 1990s and early 2000s is that the fluctuations in bank credit to the private sector have been somewhat synchronized across Latin countries. This is perhaps not altogether surprising, considering the ongoing process of international financial integration and the enormously important role that international capital flows have played in the Latin American economic history of the last decade. Be it as it may, the fact is that synchronization in credit movements across countries has important implications. It establishes that a common factor to the countries involved is likely to be at work. It also helps explain why the preoccupation among policy makers with the current downturn in bank credit growth has emerged simultaneously throughout countries in the region. And it suggests that empirical studies that use panel data—which pools time series data across various countries—could yield important insights to the understanding of the determinants of credit fluctuations in Latin America. (Traditionally, empirical studies on credit fluctuations have been performed at the level of individual countries.)

Despite the importance that Latin American policy makers tend to attribute to sharp movements in bank credit, particularly to downturns, the determinants of the fluctuations of bank credit in the region have been under-investigated. To be sure, credit movements have indirectly caught the attention of research on financial crises, which typically examines, to one degree or another, the behavior of credit before, during, and after the crisis.¹ The examination of credit fluctuations through the lens of financial crises has undoubtedly been fruitful. It has, for instance, highlighted the treacherous side of credit booms which, by exacerbating information asymmetry problems, can incubate significant vulnerabilities that lead, endogenously, to subsequent credit downturns and even banking crises (see, for

¹ Latin American economic history in the last decade or so was punctuated by numerous banking crises (defined by severe stress in a large segment of the banking system that led to bank interventions/failures and a significant use of public funds), which included Venezuela (1994), Brazil (mid-1990s), Mexico (1995), Argentina (1995 and 2002), Bolivia (1995), Ecuador (1996 and 1999), and Colombia (1999).
instance, Gavin and Hausmann 1996). It has also emphasized that much of credit fluctuations can be attributed to unsustainable expansion of imprudent bank credit fostered by widespread moral hazard in under-regulated and ill-supervised financial systems. Outside the studies of financial crisis, however, the Latin American phenomenon of sharp fluctuations in bank credit growth has not been subject to much research, as the review of literature later in this paper will show.

The paucity of research on bank credit oscillations *per se* should, in one sense, not come as a complete surprise. While high volatility—in its various manifestations (e.g., in capital flows, in terms of trade, in fiscal policies)—has been identified as a significant regional problem that inhibits development and raises serious policy challenges,\(^2\) volatility in the growth of credit to the private sector needs not trouble us *if* it mainly reflects variations in the private sector’s demand for credit. If households and enterprises can find as much credit as they want, on reasonable terms, and when they want it, the fact that the observed trajectory of bank credit displays wide swings would rather be a good thing—a sign of flexible credit markets that adapt smoothly to the level of activity of, and the associated demand for credit by, trade and industry. However, if the sharp fluctuations in bank credit are predominantly the result of supply factors, the story would be altogether different. In particular, a supply-driven sudden stop in credit, particularly one that follows a period of abundant credit supply, can cause havoc in the balance sheets of debtor households and firms, forcing them into painful adjustments and restructurings that can lengthen and magnify the business cycle.

Some disruptions of this latter sort appear to have been going on in connection with the pronounced slowdown or contraction in credit to the private sector observed in many Latin countries, particularly in the period after 1998. The problem may not be just one where low or stagnant GDP growth has reduced the demand for credit, but one where a (supply driven) credit crunch is also at work. In effect, the adverse feedback loops between the general slowdown in economic activity in the region and the disruptive balance sheet effects of a supply-driven downturn in bank credit may partly explain the persistence of the economic slump in a number of Latin countries. Such feedback loops may also help explain the recent phenomenon of “liquid banks that do not lend”—that is of stagnant or declining bank credit even as banks do not face a shortage of loanable funds but have, instead of lending to the private sector, mainly used the availability of loanable funds to increase their liquid asset positions. This latter situation of apparent bank unwillingness to lend has become an increasing source of irritation to policy makers, many of which would like to spark a resumption in GDP growth through an expansion in credit. But this, in turn, raises the question of what is the suitable policy response, especially in the monetary and prudential areas, to deal with the declining path in credit growth. And as will become clear throughout this paper, the appropriate policy response crucially depends on whether the bank credit behavior is mainly driven by supply or demand factors.

The relevance of this paper is highlighted by the analytical, empirical, and policy issues elaborated in the paragraphs above. The paper aims at contributing to the

understanding of fluctuations of bank credit to the private sector in Latin America and at
drawing relevant policy implications. To this end, rather than pursuing a comprehensive
study, we adopt a well-defined and relatively narrow focus, in terms of scope and approach.
The scope is circumscribed at identifying the relevant importance of supply and demand
factors in the determination of the path of bank credit in the region. The approach is
empirical—it proposes a number of hypotheses as to the determinants of credit growth and
tests them in the context of an equilibrium model of simultaneous equations for supply and
demand for credit, using cointegration/error correction econometric techniques to isolate
medium-run from short-run effects. We use quarterly panel data for 1990-2000 for a
relatively wide range of Latin American cases (Argentina, Brazil, Chile, Colombia, Costa
Rica, Ecuador, Mexico, Peru, and Venezuela). The techniques allow us to capture factors
that may be common across the region and factors that are country specific, as well as
possible structural changes that may have occurred in the data overtime.

The paper is organized as follows. Section 2 characterizes in some detail the features
of fluctuations in bank credit to the private sector in Latin American countries throughout the
last decade, with emphasis on four stylized facts. Section 3 provides a quick review of the
literature and indicates the ways in which this paper fills some of the existing gaps. Section 4
describes the hypotheses guiding our investigation.

Section 5 explains the methodological strategy used to test such hypotheses, a method
that allows us to probe into the determinants of bank credit fluctuations and capture
distinctions between medium-run relationships and short-run cyclical deviations from these
medium-run relationships. This section lays out the basic model, econometric techniques, and
data used. Our model imposes homogeneity of the response of countries in the long run
equilibrium, but allows a particular adjustment dynamics in the short run for each country.
This approach is well suited to capture systematic factors at work in cross-country panel data
and facilitates a discussion of more general policy implications.

Section 6 reports and interprets the results. They provide evidence that there is a
long-run stable relationship between bank credit to the private sector, lending capacity,
economic activity, and the interest rate across the region—as expected. But they also
confirm that the adjustment process towards that long-run equilibrium has been protracted
and painful for the typical Latin American country. It is noted, however, that the mentioned
stability in the long–run relationship implies nothing about credit depth, which is much lower
in Latin America compared to developed countries and the Asian emerging economies, and is
determined by institutional factors that change slowly over time and are not captured in our
econometric techniques. The results of our study also indicate that, in addition to the
expected relevance of demand factors (economic activity, the interest rate, excess
indebtedness, uncertainty) in the determination of the path of bank credit to the private
sector, supply factors have been crucial (and dominant in some countries) for both the long-
run and short-run behavior of credit. Relevant supply factors include, in addition to the
banks’ ability to lend (lending capacity) and the price of lending (interest rate), crowding out
by governments borrowing in the domestic markets as well as factors that affect willingness
to lend and lead to credit rationing. This latter evidence implies, in particular, that bank
credit downturns in Latin America, with the exception of a few countries, have tended to be
disruptive of business plans and economic activity, requiring substantial re-compositions of corporate and bank balance sheets.

Section 7 discusses policy implications. Among other things, it underlines the importance of macroeconomic stability to reduce uncertainty and, hence, to foster demand and supply for credit. It also emphasizes that a strengthening in the government’s budgetary process and debt management is crucial to reduce crowding out and thus enable a deeper and more stable supply of bank credit to the private sector. This is all the more important considering the restrictions that small and medium enterprises face in accessing sources of finance outside the domestic markets. The protracted nature of adjustment to the medium-run equilibrium credit path also points to the need for policies to enhance flexibility for balance sheet restructuring, both among banks and corporations. These policies can range from prudential buffers (such as counter-cyclical provisioning requirements that smooth the constitution of provisions in the midst of oscillating credit paths) to improved legal frameworks for corporate reorganization and bankruptcy. The section also highlights that the policy response to a situation of stagnant or falling credit must be based on a diagnosis of whether such situation is mainly the result of supply factors or of demand ones. In particular, attempts to stimulate credit growth through expansionary monetary policy where the slump in credit is mainly driven by supply factors (such as unwillingness to lend due to heightened risk perceptions) may backfire, leading instead to capital flight.

Section 8 concludes and suggests directions for further research.

2. Bank Credit Fluctuations in Latin America During the 1990s: Stylized Facts

The first stylized fact is that, in Latin America, oscillations in credit to the private sector have taken place around a low level of bank credit depth—low as compared to developed countries and to emerging economies in South East Asia. This is all the more worrisome considering that financing to the private sector through Latin American securities markets (debt and equity securities) has also been low and flat in the last 20 years. This is clearly depicted in Figures 1-3.

Over the last two decades, credit depth in Latin America, as measured by the ratio of bank credit to the private sector to GDP, displayed only a mild upward trend (rising from 20 percent in 1980 to 30 percent in 2001) and fell increasingly below the ratios observed in developed and South East Asian countries (Figure 1). In effect, bank credit to the private sector deepened considerably and steadily in developed countries, from about 50 percent of GDP in 1980 to nearly 100 percent in 2001. A similar trend is also observed in South East Asian emerging markets, where bank credit depth increased from 30 to 65 percent over the same period, although the financial crises that erupted in 1997 and punctured that region’s credit bubble marked a period of sharp credit fluctuation.

As a result, the gap in the depth of bank credit to the private sector between Latin American countries and East Asian and OECD countries widened sharply. In the early 1980s, bank credit depth in Latin America was about 67 percent of that in East Asian countries and 38 percent of that in developed countries. By the beginning of the new
century, despite the intervening process of financial sector liberalization and reform, Latin America had lost ground significantly, with its credit depth only 46 percent of that in South East Asia and 31 percent of that in developed countries (Figure 1).

Moreover, Latin American domestic securities markets have not compensated for the lack of significant deepening in bank credit to the private sector. As in bank credit markets, the depth of Latin markets for private (debt and equity) securities has remained very low and has fallen increasingly below that in developed and East Asian countries (Figure 2). At the beginning of the second millennium, stock market capitalization in Latin America was about 27 percent of GDP, compared to nearly 100 percent in both developed and South East Asian countries. Similarly, private sector bonds outstanding in domestic Latin markets constituted only 8 percent of GDP, compared to 40 and 33 percent in developed and South East Asian countries, respectively.

The lack of a significant and durable process of financial deepening in Latin America as a whole is reflected across many individual Latin countries, as illustrated in Figure 3. Of the 5 countries in Figure 3, Chile stands out as the only one where financial depth increased across all relevant markets (for bank credit, equity, and private sector bonds) throughout the 1990s, reaching levels comparable to those in East Asian countries and, in the case of stock market capitalization, even to those in developed countries. Argentina and Peru did join Chile in a process of bank credit deepening during the 1990s, although they reached much lower levels of depth than Chile (23 and 26 percent of GDP at the end of the 1990s for Argentina and Peru, respectively, compared to 62 percent for Chile) and, in the case of Argentina, the gains melted away after 2001, as a result of its devastating triple (bank, currency, and debt) crisis. Moreover, in the cases of Brazil and Mexico, the largest countries in the region, market finance to the private sector relative to GDP declined during the 1990s in at least one of the relevant (bank credit, equity, private sector bonds) markets.

The second stylized fact is the wide variance in the rate of growth of bank credit to the private sector. Figure 4 depicts the rates of real growth in bank credit to the private sector in 12 Latin American countries during the 1991-2001 period. It shows major swings—from periods of credit booms (with real credit growing at annual rates in the range of 30 to 60 percent during the first half of the 1990s for such diverse countries as Argentina, Bolivia, Brazil, Colombia, Costa Rica, Mexico, and Peru) to episodes of major credit busts, particularly in the context of banking crises (with real credit growth rates in the range of minus 40 to 50 percent per annum during the crises in Mexico and Venezuela in the mid-1990s; and similar rates in Argentina and Ecuador during their more recent crises). Even for countries that did not experience a full-blown banking crisis in the 1990s, real credit growth fluctuated widely.

A third stylized fact that can be gleaned from Figure 4 is that fluctuations in the rates of growth of real bank credit to the private sector appear somewhat synchronized across Latin countries. For one thing, coincident episodes of deceleration or contraction in bank credit can be observed in most countries since the mid-1990s and, in particular, after 1998. For another, a significant number of countries in the graph (Argentina, Bolivia, Brazil, Colombia, Ecuador, El Salvador, Guatemala, and Mexico) display a sort of “double hump”
pattern for the rate of rate of credit growth. That is, a first hump delineated by a credit boom in the first half of the 1990s followed by a major deceleration or contraction in the mid-1990s, and a second, although typically less pronounced, hump delineated by a resumption of credit growth during 1997-1998, followed this time by a more protracted stagnation or contraction in bank credit.3

The relative synchronization of fluctuations in bank credit growth rates across Latin countries suggests that a common factor is at work. International capital flows are the most obvious candidate for such common factor, and justifiably so. While capital flows respond to country specific factors, they also respond to common factors—for instance, a perception of region-wide risks shared by investors, or coordinated investor behavior relative to (a set of) emerging markets in response to international market liquidity conditions. Calvo (1998) has highlighted this synchronicity, particularly as regards the “sudden stop” in capital inflows that hit the Latin American region after the 1998 Russian crisis (see Calvo and Reinhart 1999). Moreover, as Figure 5 shows, non-FDI private capital inflows to Latin America (particularly the weighted average version) clearly display the same double-hump pattern discussed above in respect of domestic bank credit. The second panel of Figure 5 shows a strong co-movement between non-FDI private capital flows and the average rate of growth of real bank credit in Latin America during the 1990s.4

In addition, the path of capital flows to Latin America during the 1990s is also highly correlated with the regional rate of GDP growth, which is a variable expected to play a major role in the determination of the credit path. As Figure 5 shows, the synchronization between non-FDI capital flows, GDP growth, and bank credit growth for the Latin American region as a whole is a striking phenomenon of the 1990s. (Such synchronization is not discernible for the 1980s.) As we move to the level of individual Latin countries, the degree of synchronization between these variables during the 1990s, although still significant for many countries, is not as strong as the average for the region (Figure 6). In any case, the strong co-movement for the regional average of these variables provides a sufficient strong argument to justify an attempt to empirically analyze bank credit fluctuations on the basis of region-wide panel data.

The fourth stylized fact is that in the second half of the 1990s, and particularly after 1998, is the weakening of the connection between banks’ lending capacity (i.e., availability of loanable funds) and actual credit to the private sector. For the purposes of this paper, lending capacity is defined as in Catao (1997), as the sum of bank deposits (net of reserves held in the central bank), capital, and net foreign liabilities. Figure 7 clearly shows that, for Latin America as a whole, the association between the growth rates of bank credit to the private sector and bank lending capacity was the highest during 1990-1993, when lending

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3 The double hump pattern of bank credit growth was confirmed by decomposing the series into their trend and cyclical components. This was done using a Band Pass Filter as in Baxter and King (1995). Where available time series data were incomplete, a Hodrick-Prescott (1997) filter was used.

4 Capital inflows, and particularly non-FDI inflows, to Latin America in the 1990s were, to a large extent intermediated through the banking system. Hence, capital inflows can affect the volume of bank credit not only directly, through an increase in banks’ access to foreign trade and inter-bank lines, but also indirectly, through increased deposits. In either case, capital inflows boost banks’ capacity to lend, as defined below.
capacity and credit grew at about the same pace. Such association, however, loosens considerably thereafter, when the rate of growth of lending capacity significantly exceeds that of credit to the private sector. In particular, in the 1998-2001 period, the regional average annual growth in lending capacity exceeds by more than three percentage points the growth in bank credit to the private sector. Figure 8 indicates that this trend is observed across many individual Latin countries—as the excess in the level of bank lending capacity over bank credit to the private sector emerges and widens in the second half of the 1990s in the cases of Argentina, Brazil, Colombia, Costa Rica, Mexico, Peru, and Bolivia.

The fifth stylized fact denotes a phenomenon of “liquid banks that don’t lend”—i.e., stagnant or declining bank credit to the private sector even though there is no shortage of loanable funds. It is a phenomenon whereby, as capacity to lend (loanable funds) increases, banks increase their liquid asset positions significantly more than their credit to the private sector. The relatively higher increase in banks’ liquid asset position typically entails an increase in holdings of government debt securities (and, in some cases, also an increase in bank credit to the public sector, including to state and municipal governments). In fact, as is clear from Figures 7 and 9, the relaxation of the link between bank lending capacity and bank credit to the private sector—which took place mainly after 1998—was accompanied by a sharp rise in banks’ exposure to the public sector. The Latin American average ratio of claims on the public sector to total bank assets rose from less than 10 percent during 1992-98 to over 18 percent during 1999-2001.

The phenomenon of “liquid banks that don’t lend” may reflect one or a combination of at least three factors. First, crowding out—i.e., the shifting of bank loanable funds towards government debt instruments because of the attractive combination of (low) risk and (high) return these instruments offer. Second, an uncertainty-driven rise in the liquidity premium—i.e., a volatile macroeconomic and financial environment, including the possibility of sudden deposit withdrawals, lead banks to attach a higher value to liquid asset positions. And third, a rise in the actual or perceived risk of private sector debtors, which leads banks to reduce their relative exposure to them. The latter factor would typically result in banks being unwilling to lend to the private sector at the ongoing interest rate (or even at a higher interest rate) and may thus take the form of a credit rationing. (As opposed to a credit crunch, a term better used to denote a case where the contraction in credit is driven mainly by a drying-up or sudden stop in the availability of loanable funds, that is, by an abrupt reduction in banks’ capacity to lend.) In any case, any empirical analysis of credit fluctuations in Latin America should, among other things, aim at gauging the relative importance of the mentioned factors behind the recent phenomenon of “liquid banks that don’t lend.”

3. A Quick Review of the Literature

Before spelling out our guiding hypothesis and explaining the methodological approach taken by this paper, we provide in this section a brief review of the empirical literature on credit fluctuations. This review will make it clear to the reader that credit fluctuations in Latin America constitute a relatively under-researched field.
A number of recent empirical papers on credit fluctuations have characterized and explained the decline in credit activity after financial crises. Most papers in this group focus the fall in credit to the private sector in the context of the South East Asian crises, typically trying to assess the relative importance of demand or supply factors. Results across studies are often not consistent—thereby illustrating the difficulty in quantitatively isolating the relative roles played by supply and demand factors in different countries and at different points in time.

An influential paper by Gosh and Gosh (1999) estimates a switching regression model for Korea and Indonesia, finding that a credit crunch phenomenon was at work in both cases at the beginning of the credit contraction, but that subsequent declines in credit were caused primarily by demand factors.

Along the same lines, Agenor et al. (2000) analyze the Thailand case after the late 1990's crises. They propose a two-step econometric approach to assess the extent to which the reduction in credit activity was demand or supply driven. Based on the estimation of a demand function for excess liquid assets, they construct dynamic forecast for credit and compare it to actual values. The conclusion is that, in the Thailand case, demand factors were more important than supply ones in determining the post-crisis credit path.

Some other studies have used more micro data to analyze credit contraction in the aftermath of crises. Contrary to the Agenor et al. study, Ito and Pereira (1999) find evidence that Thailand experienced a credit crunch during 1997-1998. But Dollar and Hallward-Driemeir (2000) find little evidence supporting this hypothesis. They suggest that weak macroeconomic behavior and prospects explain the phenomena. Working with a larger sample (Indonesia, Korea, Malaysia, Philippines, and Thailand), Dwor-Frecaut et al. (2000) also find that the post-crises decline in credit activity is primarily explained by demand factors.

Domac and Ferri (1999) use a “credit view” of monetary policy to suggest that a supply-driven reduction in credit was present in East Asia immediately after the crises. In particular, they argue that the simultaneous widening in the gap between the lending interest rate and the rate on a risk free representative asset and a decrease in credit activity suggests that the supply of credit was declining at least as fast as the demand for it.

There exists a large set of empirical papers that analyze credit fluctuations in developed countries. For the case of Japan, Motonishi and Yoshikawa (1999) argue that one of the most important factors that explains the Japanese economic stagnation of the 1990’s is weak investment which, in turn, is explained by a credit crunch. Using indices of “real profitability” and “banks’ willingness to lend” reported in Bank of Japan surveys, they find that real factors are much more important determinants of investment and credit than banks' lending attitudes. In particular, they claim that the weak performance of credit and investment during the first half of the 1990's was primarily caused by worsening profit opportunities.
The phenomenon of credit crunch has caught the attention of many empirical studies of credit movements in developed countries. These studies have concentrated on explaining credit activity in the U.S. and Canada (for example, Melitz and Pardue 1973, Laffont and Garcia 1977, Sealy 1979) and have displayed the use of a wide range of econometric techniques and approaches. Some of these papers (for instance, Sealy 1979) argue that credit rationing was a significant part of the credit path during the 1960's and 1970's. Others (for instance, Berger and Udell 1992) conclude that credit rationing was not important during the 1970's and 1980's.

Peek and Rosengren (1995) analyze aspects of bank lending for a specific U.S. region, New England. They conclude that, faced with binding capital constraints as a result of significant loan losses (or low earnings) and assailed by problems of information asymmetry and adverse selection, new England banks chose to shrink, instead of raising new capital, in order to meet more strict regulations that called for a higher ratio of capital to risk-weighted assets.

More indirectly, the relationship between monetary policy and credit has been used to assess the possibility of a credit crunch. Some examples are McMallum (1991) and Bernanke and Gertler (1995).

Pazarbazioglu (1997) examines the apparent credit crunch phenomenon in Finland after the 1991-1992 banking crises. The author argues that the marked reduction in lending activity was primarily driven by declining cyclical demand, and exacerbated by banks’ unwillingness to supply funds as asset quality worsened and required capital levels were raised by the regulators.

Empirical studies of credit fluctuations in Latin America are few and far between. Catao (1997) focuses on the experience of Argentina. He suggests that liquidity in the banking system increased after the 1995 crisis, as a result of the reflow of deposits. Nevertheless, a recovery in the credit to the private sector was not observed simultaneously. He argues that both supply factors (mainly adverse selection mechanisms) and demand factors (pessimistic expectations regarding economic recovery) were behind this behavior.

More recently, in an important paper, Barajas and Steiner (2002) follow a disequilibrium approach to quantitatively assess the causes for credit slowdowns in Colombia, Mexico, and Peru. Though they find that the recent credit slowdowns in these countries do not yet qualify as “credit busts,” they suggest that these episodes may be signaling longer periods of low credit flows. As regards supply factors, the paper shows that, for the three countries, lending capacity played a key role and that credit risk and the tightening of regulatory norms adversely affected willingness to lend. On the demand side, macroeconomic conditions and certain alternative interest rates appear as important factors for the three countries. Barajas and Steiner also present evidence suggesting that while the credit slowdown in Colombia was characterized by similar shifts in the supply and demand curves, situations of excess supply and excess demand seem to have been present in Mexico and Peru, respectively.
From a more general perspective, Gourinchas et al. (2001) review and compare lending cycles in several emerging countries. They document, in particular, recent lending booms ending in Argentina in 1995 and in Mexico in 1994. They argue that lending booms in Latin America have been usually associated with episodes of financial liberalization and followed by banking and/or currency crises.

The low number of empirical studies of credit fluctuations in Latin America raises the relevance of this paper. Compared to existing studies of credit fluctuations in Latin America, ours is different in at least three respects. First, taking advantage of evidence that a common factor appears to be at work in determining credit fluctuations across countries, we use panel data (i.e., time series data for several Latin countries) to analyze the evolution of credit growth at a regional level, in addition analyzing it at a country-specific level. Second, in contrast with other studies, we employ an equilibrium (instead of a disequilibrium) model which, although less suited for a fine-tuned examination of credit rationing episodes in individual countries at different points in time, is arguably better suited to capture systematic factors at work in cross-country panel data and facilitates a discussion of more general policy implications. Third, it takes an approach that explicitly distinguishes between medium-run and short-run determinants of the path of credit growth.

4. Hypotheses

By combining economic theory with the stylized facts of bank credit fluctuations in Latin America during the 1990s (as described in Section 2) and with the lessons learned from previous empirical studies (as reviewed in Section 3), we submit in this section the main hypotheses regarding the determinants of supply of, and demand for, bank credit that guide our investigation and choice of methodological approach.

**Demand Side – The Basics:** The demand for credit is negatively related to the interest rate and positively related to economic activity and financial health of firms.

**Demand Side - Excess Indebtedness:** Caught with a relatively high level of indebtedness as unemployment and economic activity decline, debtor households and firms seek to de-leverage, curtailing their demand for credit, and avoiding additional borrowing. The need for working capital decreases. (Agenor et al. 2000, Gosh and Gosh 1999, Catao 1997, and Pazarbazioglu 1997).

**Demand Side - Uncertainty:** A weak macroeconomic and financial environment together with a credibility deficit in policy raise uncertainty regarding future household income and enterprise sales and profits. This, in turn, raises the option value of waiting, reducing the demand for credit by households and firms (Agenor et al. 2000, Gosh and Gosh 1999, Catao 1997, Pazarbazioglu 1997).

5 Another factor affecting the demand for bank credit is the availability and attractiveness of alternative financing sources, as equity or foreign finance. This substitution effect is tested in Barajas and Steiner (2002) by including stock market and EMBI indices in the regressions. However, as the authors point out, these variables may have a positive (instead of negative) impact on the demand for credit, as they are also indicators of the macroeconomic environment. Their mixed results for Mexico and Peru reflect these dual effects.
Supply Side – The Basics: The supply of bank credit is a positive function of lending capacity and the lending interest rate. A sudden stop in lending capacity may generate a “credit crunch.”

Supply Side - Credit Rationing: The rise in interest rates during turbulent times can exacerbate adverse selection problems, as the debtors that are most in need of funds are the ones most willing to pay higher interest rates. In times of crisis, the adverse selection problem can be reinforced by the loss of information on debtors’ creditworthiness resulting from the closure of some banks. It can also be reinforced by sharp declines in the value of collateral (Bester 1985, Bernanke, Gertler, and Gilchrist 1998, Agenor 2001). Reflecting all these factors, banks experience greater difficulty in screening borrowers and become unwilling to increase their exposure to private credit risk at the ongoing interest rate. As lending risk increases with the level of interest rates, the supply of credit will not rise accordingly, leading to an excess demand for credit (i.e., credit rationing) (Agenor 2001, Agenor et al. 2000, Gosh and Gosh 1999, Catao 1997, Stiglitz and Weiss 1981).

Supply Side – Bad Loan Burden: The drag of non-performing loans increase the cost of lending and banks’ risk aversion. Both lead to a reduction in the supply of credit (Catao 1997, Pazarbasioglu 1997). Unwillingness to lend may also arise to the extent that true NPLs are under-stated (true capital over-stated) in bank reports. In these circumstances, banks that are capital constrained may restrain from increasing their lending to the private sector while facing incentives to continue to window dress their statements.

Supply Side – Uncertainty: Increases in uncertainty will raise the premium banks place on liquidity. As a result, banks will seek to increase the share of liquid assets in total assets, reducing the supply of credit to the private sector in relative terms.


5. Methodological Approach

5.1. The Model

In order to test and gauge the relative importance of the hypotheses described above, an equilibrium model of supply of and demand for credit is proposed along the lines of Catao (1997). Our formulations of supply of, and demand for, credit may be derived from standard theoretical frameworks. For instance, the supply may be implicitly derived from a portfolio management approach, while the demand may be derived from an optimal demand for working capital by a firm (Freixas and Rochet, 1998).
We use a dynamic panel data/error correction approach to capture long-run and short-run effects. We attempt to capture common long-run relationships among financial and economic conditions in Latin America. Also, we try to identify the particular short-run responses of each country and their individual speed of adjustment towards a long-run equilibrium. In order to accomplish both objectives in a simultaneous estimation, we take advantage of the virtues of the Pooled Mean Group Estimator (PMG), proposed by Pesaran et al. 1997. The PMG constrains the long run coefficients to be identical, but allows for the short run coefficients and error variances to differ across groups.

We posit that credit supply is a positive function of lending capacity and the lending interest rate as well as a function of other variables, which reflect key financial and economic conditions, such as uncertainty, crowding out and loans portfolio quality:

\[ L^S = \phi^S(C_i, i^L, npl, \sigma^Y, i^{alt}) \]  
\[ L_{C}^0, L_{npl}^1, L_{alt}^2, L_{\sigma}^3 < 0 \]  (1)

where \( L^S \) equals supply of credit, \( C \) lending capacity, \( i^L \) the real interest rate, \( npl \) the ratio of non-performing loans to credit, \( i^{alt} \) is the interest rate on treasury bills or central banks debt instruments and \( \sigma^Y \) is a four-quarter moving standard deviation of an index of real effective exchange rate (a proxy for economic and financial uncertainty).

We also estate that the demand function is positively related to the economic activity, and negatively related to the interest rate and the level of economic and financial uncertainty:

\[ L^D = \phi^D(Y_i, i^L, \sigma^Y, npl) \]  
\[ L_{\sigma}, L_{npl}^1, L_{alt}^2 < 0 \]  (2)

where \( L^D \) equals demand of credit and \( Y \) an index of economic activity (for instance, real GDP).

In particular we formulate equations for the supply of and demand for credit broadly in line with our list of basic and non-basic hypotheses (see section 4) and under the estimation framework of the PMG estimator:

Supply:

\[ L_{i,t}^S = \lambda_{i,t}^S L_{i,t-1}^S + \beta_{i1}^S C_{i,t} + \beta_{i2}^S L_{i,t}^L + \beta_{i3}^S \sigma_{i,t}^Y + \beta_{i4}^S npl_{i,t} + \beta_{i5}^S i^{alt}_{i,t} + \mu_{i,t}^S + \epsilon_{i,t}^S \]  (3)

\[ i=1,...,N, t = 1,..., T_i \]

Demand:

\[ L_{i,t}^D = \lambda_{i,t}^D L_{i,t-1}^D + \beta_{i1}^D Y_{i,t} + \beta_{i2}^D i^L_{i,t} + \beta_{i3}^D \sigma_{i,t}^Y + \beta_{i4}^D npl_{i,t} + \delta Y_{i,t-1} + \mu_{i,t}^D + \epsilon_{i,t}^D \]  (4)

\[ i=1,...,N, t = 1,..., T_i \]
Note that in the demand equation, we also included a lagged variable for the level of economic activity, in order to help us deal with potential endogeneity problems. It is also convenient to define $\beta^D_{it} = \beta^D_{it*} + \delta$, for reasons that will become obvious later.

We make the following assumptions (Pesaran et al. 1997):

A#1: The distributions of $\epsilon^D_{it}$ and $\epsilon^S_{it}$ are independently distributed across $i$ and $t$, with zero means, strictly positive variances, and finite four-order moments. Also, the disturbances are distributed independently of the regressors.

A#2: Equations 3 and 4 are stable, in the sense that $\lambda^D_{it} < 1$ and $\lambda^S_{it} < 1$ (the roots lie outside the unit circle).

A#3: There exists a common long–run relationship ($\theta$) across countries between the dependent and the explanatory variables.

Assumptions 1 and 2 ensure that there exist a long–run relationship between $L$ and the set of regressors. Assumption 3 establishes that this relationship will be the same across groups. Therefore:

$$\theta^S_{im} = \theta^S_m = -\frac{\beta^S_{im}}{\lambda^S_i - 1} \quad i=1,..,N \quad m=1,..,5 \quad (6a)$$

$$\theta^D_{im} = \theta^D_m = -\frac{\beta^D_{im}}{\lambda^D_i - 1} \quad i=1,..,N \quad m=1,..,4 \quad (6b)$$

If we define $\phi_i^j = \lambda_i^j - 1; j = S, D$, then under assumptions 1 to 3, and expressing the variables in differences, the model can be written in “error correction form” as

$$\Delta L^S = \phi^S \xi^S_i (\theta^S) + \mu^S_i + \epsilon^S_i \quad \Delta L^D = \phi^D \xi^D_i (\theta^D) + \mu^D_i + \epsilon^D_i \quad (7a)$$

with $\xi^S_i (\theta^S) = L_{t-1}^S + \theta^S_{1i} C_{it} + \theta^S_{2i} L_{it} + \theta^S_{3i} D_{it} + \theta^S_{4i} npl_{it} + \theta^S_{5i} i_{it}$

$$\Delta L^D = \phi^D \xi^D_i (\theta^D) + \mu^D_i + \epsilon^D_i \quad (7b)$$

with $\xi^D_i (\theta^D) = L_{t-1}^D + \theta^D_{1i} Y_{it} + \theta^D_{2i} L_{it} + \theta^D_{3i} D_{it} + \theta^D_{4i} npl_{it}$

where $\xi^j_i (\theta^j) ; j = S, D$ is the error correction component$^6$. In this sense, equation 7 summarizes both the long–run and short–run dynamics of the supply of and demand for credit. As is commonly accepted, credit markets experience episodes in which they deviate

$^6$ The error correction component in this case is defined as the estimated short–run deviation of the supply of (demand for) credit from its expected long–run value.
from their long-run equilibrium trends. These episodes may be caused by changes in the explanatory variables that can’t be instantaneously assimilated by the market. In the long-run, though, market forces pull the system back into its long-run equilibrium. The speed at which this convergence occurs in each country is captured by the parameter $\phi_i$, the “speed of adjustment” in equations 7a and 7b.

Changes in interest rate, which is part of the set of explanatory variables in equation 7, are not entirely exogenous. Therefore, changes in this variable need to be “instrumentalized” through an additional equation that models the interest rates' changes as a function of predetermined variables:

$$r = f(C, npl, i^{alt}, \sigma^y, Y)$$  \hspace{1cm} (8)

We instrument the interest rate also using a PMG estimator imposing long-run homogeneity in all the parameters.\(^8\)

The supply and demand equations in differences described by (6a,b) and (7a,b), together with equation (8), form the basic system to be estimated. Given this model, the testing of the hypotheses is relatively straightforward. For example, the hypothesis of excess indebtedness on the demand side would be corroborated if the coefficient of the demand error correction term in Equation 7 were negative and statistically significant.

5.2. Tests, panel techniques, and data

Before running the model, we analyzed for stationarity of the regressors, since the underlying assumptions are different depending on them being integrated of order zero or one. We found evidence that the variables in the Latin American Panel are not stationary, but are cointegrated (see Appendix 1).

There are, in addition, a number of data issues and constraints we face in the analysis of credit in Latin America. One is the lack of relatively long time series data. This limitation, plus the low power of some tests (time series ones) in small samples, may be behind some of the mixed results in previous studies (see Section 3). Also, some of the variables (such as real credit, real GDP, or lending capacity) exhibit a trend (an upward one) in most of the

\(^7\) Our “instrumentalized” interest rate, obtained by regressing its value on the remaining explanatory variables, has the virtue of avoiding the endogeneity problem. It also allows us to isolate in it the factors that affect the supply of and demand for credit that can be only attributed to the interest rate and not to the other explanatory variables.

\(^8\) As indicated by Catao (1997), we should note that realized GDP may not be completely exogenous. In this case, the estimation of Equation (7) is aimed only to test the existence of a stable long/short run relationship among credit, income, lending capacity, and interest rate, and to country specific responses for the same variables. A comprehensive macroeconometric model would include also an equation for income. Other studies have also used different measures of economic activity, like the output gap or expected output, trying to incorporate the fact that demand for credit is a function of expectations on economic activity. Due to the quarterly nature of our data and given the fact that figures for GDP and credit demand correspond to flows generated throughout the three month period, we opted to choose realized GDP.
countries. Finally, the cyclical components of some variables seem to display some co-
movement (as suggested by the third stylized fact described in Section 2). Fortunately, the
PMG estimator is suitable to tackle these data issues and limitations (Pesaran et al.)

To run the model we use panel data for ten Latin American countries (Argentina,
Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Peru, and Venezuela). The
data has quarterly periodicity and covers the periods 1990-2001. A complete description of
the variables and some comments on them and their sources is presented in Appendix 2.
Except for the rates and ratios, variables are used in logarithms.

We estimated the system in two steps. First, we instrumentalized for the lending real
interest rate and then estimated the PMG estimators of the parameters of equations 7
independently for the supply of and demand for credit, respectively. Under A#1 and A#3, the
likelihood of the panel data model implied by these equations can be written as the product of
the likelihood for each group, incorporating the cross-equation parameter restrictions implied
by the homogeneity of the long run coefficients, $\theta^j$. The concentrated log-likelihood function
is then maximized using a Newton–Raphson algorithm with the Mean–Group Estimators as
starting values.9

In addition, two stage Mean-Group Estimators (MG), Fixed Effects Estimators (FE)
and Dynamic Fixed Effects Estimators (DFE) are presented for the long-run relationships.
The MG estimation imposes no restrictions, whereas the FE and DFE constrain all the slopes
coefficients and error variances to be the same. These methods are widely adopted in similar
applications and will be useful for comparison purposes. Since data on interest rates of
government securities is not available for all countries, we estimated one regression for the
full sample without $i_{alt}$ and a separate regression with $i_{alt}$, which includes only Bolivia, Brazil,
Chile, Costa Rica, Colombia, Ecuador, Mexico and Venezuela. In this case, we didn’t impose
long–run homogeneity for the interest rate on government debt instruments.10

6. Main Results

Table 1a, 1b and 2 summarize the main results regarding the long–run coefficients
($\theta$ s). All the variables in our chosen PMG specifications have the expected sign and all are
statistically significant with the exception of the proxy for economic uncertainty in the
supply equations. We find that the PMG, FE and DFE techniques have the expected sign for
all the variables. The MG estimator, though, exhibit the “wrong” sign in some key variables.
This reinforces our choice of the PMG estimation instead of a simple average, since it takes
advantage of the extra information contained in the panel data.
Lending capacity, the interest rate and the level of economic activity, are statistically
significant variables, as it was suggested by our “basic” hypotheses. The table also suggests
that—as expected—the level of non–performing loans and our proxy for economic uncertainty

9 Mean Group Estimators are simply the average value of the parameters of country by country estimations.
10 Different specifications on the model, not reported here, rejected the hypothesis of long–run homogeneity of
$i_{alt}$. It is worth noting that the variable in this case exhibits considerable “noise” and heterogeneity, given the
different proxies that were used to measure it (See Appendix 2).
negatively impact the supply of and demand for credit. In the long run, the results strongly suggest that that lending capacity is a major determinant of the supply of credit, with elasticity close to unity.

Tables 3a, 3b and 4 present tests for homogeneity of the long–run coefficients in the supply (with and without $i^{alt}$) and demand equations. In general, Haussmann type tests which evaluate the difference between the average of the estimators in a country basis (the Mean-Group Estimator) and the PMG estimators seem to indicate the appropriateness of imposing joint homogeneity on the demand equation, since the hypothesis of equal long run coefficients cannot be rejected at standard significance levels. The same result is obtained for the supply equation, which includes $i^{alt}$ as a regressor. In the case of the supply equation for the whole panel (without $i^{alt}$), homogeneity for each variable is not rejected, as well as the joint hypothesis of long-run homogeneity at the 95%. Nevertheless, joint long-run homogeneity is rejected at the 99% level.

The more demanding Likelihood Ratio test for joint homogeneity rejects the null hypothesis in all of the three equations. As is noted by Pesaran et al. (1997), it is possible that the group specific estimates are biased because of sample-specific omitted variables or measurement errors correlated with the regressors. They stress that when estimating equations for a large number of groups, where no other data is available in many cases, the option of experimenting with different specifications or alternative data is not available. If the coefficients are indeed the same and the bias inducing correlations is not systematic, then a pooled estimation will be appropriate despite the homogeneity restrictions being rejected. In our case, we believe that our panel cointegration tests (See Appendix 1), the results of the Haussman tests and the comparisons between the PMG estimators and other methods shown in Tables 1a, 1b and 2 provide evidence that this might be the case.

In all, the long–run results suggest that there is a long–run stable (equilibrium) and positive relationship between credit and financial and economic variables such as the level of economic activity and lending capacity. It also points to the fact that bad loan quality and economic uncertainty negatively affects the growth of credit in the long–run. Yet, it seems that the adjustment toward the long-run equilibrium has been protracted and difficult (see below). This slow adjustment, as we will see, may explain some of our stylized facts, like the observation that the rate of growth of lending capacity outpaced the one of the credit to the private sector (Fig. 7 in Section 2).

The results of the short–run supply coefficients ($\phi$ and $\beta$) are presented in Tables 5a and 5b. All the estimates for each country in both equations have the expected sign. Lending

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11 This is specially limiting if we want to introduce some dummy variables that reflect the occurrence of some country specific events, like changes in regulation, or episodes of banking crises. Since the type of events vary from country to country and not all experience them, dummies of this sort can’t be implemented in our setting. In our particular case, episodes of financial trouble like the ones of Venezuela in 1994, Mexico in 1995, Brazil in 1996, Colombia and Ecuador in 1999 and Argentina in 2000 are not explicitly modeled here.
capacity, non-performing assets, and interest rate seem to be important in explaining the behavior of credit supply. Finally, a higher volatility of the real exchange rate (used as a proxy for economic/financial uncertainty) induces a reduction in the supply of credit. Given the availability of data on treasury/central bank bills, Peru and Argentina are not considered in the panels including this variable (Table 5b). As some numbers suggests, relatively high returns on low (or zero) risk treasuries produced a shift in the supply of credit from the private sector to the public sector. This effect is statistically significant in Chile, Ecuador, Mexico and Venezuela.

Table 6 presents the results for the short-run demand side coefficients ($\phi$, $\beta$ and $\delta$). All the coefficients for every country have the expected sign, even though the real interest rate shows low statistical significance in some cases. Current economic activity and the indebtedness hypothesis (measured by the error-correction term) are important. Also, greater uncertainty about the economic and financial environment seems to induce a reduction in the demand for credit.

Overall, lending capacity, the interest rate and non-performing loans seem to be the most important determinants of credit supply. Regarding the demand side, the level of economic activity and the financial situation of firms (measured by the level of non-performing loans) appear to be the key determining factors.

Our results indicate that supply and demand factors are important in explaining the path of real credit. What do they say about their qualitative impact, on average? Given that our original variables are in logarithms or percentages, the results may be interpreted as elasticities or semi–elasticities. This leads to measures that could serve, with the appropriate caveats, as useful reference points.

In the case of the supply side, the unweighted average short–run elasticity of the supply of real credit with respect to real lending capacity equals 0.17. That is, a one percent increase in the capacity of banks to lend will produce, on average, a less than proportional increase in the supply of credit of 0.17 percent. Results vary across countries, though. For instance, Colombia, Costa Rica and Venezuela seem to be more sensitive to these expansions, whereas Argentina, Chile, Ecuador and Mexico show a lower than average response.

The average short run semi-elasticity of supply with respect to the real lending interest rate is 0.07. In other words, an increase of 100 basic points (one percent) in this rate would induce an increase in the supply of real credit of 0.7 percent. The average semi–

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12 Lending capacity variable may be overestimating the true ability of banks to lend due to the fact that, in some cases, they do not correctly report non-performing assets and provisions. However, it is likely that the proportion of provisions not reported has remained relatively constant over time.

13 Insert here your comment regarding the noise in the interest rate.

14 When analyzing the supply equation, unless we refer to changes induced by the real interest rate on government securities, we will use the results of Table 5a, which comprises a more complete panel.

15 This should not come as a surprise, once we note the difference in the speed of adjustment among countries.
elasticity of supply with respect to our measure of economic/financial volatility (–0.016) suggests that an increase of 1 unit in the standard deviation of our index of real exchange rate would induce a reduction in the supply of credit equal to 2.6 percent.

The average short–run semi-elasticity of supply with respect to non-performing loans equals –0.19. That is, an increase of one percent in the proportion of non-performing loans (over total loans) will affect the willingness of the banks to lend, and therefore will induce a reduction in the supply of credit equal to 0.2 percent, a proportionally large entrenchment. Countries like Colombia and Venezuela appear to react more pronouncedly, with semi–elasticities of -0.4 and –0.3, respectively.

Finally, the average short run semi–elasticity of the supply with respect to the real Treasury/Central Bank bill rate (–0.095) indicates that an increase of 100 points (or equivalently one percent) in this alternative rate, will induce a reduction of credit equal to 0.95 percent, once again a substantial shift towards a relatively risk-free lending. This crowding out effect seems to be especially important in Chile, Ecuador and Mexico perhaps reflecting a greater level of confidence in the government’s ultimate willingness or capacity to service public debt. In these three countries, the coefficient on \( r^\text{alt} \) is significant at a 95% level and of a higher magnitude.

Note that the speed of adjustment for is, on average, 0.24 per quarter (absolute value), but some countries adjust faster than others, with this variable ranging from 0.43 to 0.007. It is interesting to notice that big economies, such as Mexico, Brazil and Argentina adjust slower than the average.

Regarding the demand side, a one percent increase in the real GDP\(^{16} \) will induce on average an increase in the demand for credit equal to 0.29 percent in the short run. It is worth mentioning that this parameter is much higher for Brazil (0.87), Costa Rica (0.39), and Venezuela (0.32). Also note that the average error-correction term coefficient equals –0.13, which indicates that the agents “adjust” their current demand towards the optimal equilibrium value in 13 percent per quarter. However, this adjustment is much slower for countries like Mexico (-0.001), Ecuador (-0.049) and Argentina (-0.05).

Finally, it is worth mentioning that the average speed of adjustment of the supply for credit is considerable higher than the one of the demand for credit, irrespective of using the results of table 5A or 5B. This discrepancy can have important effects in terms of market equilibrium and the analysis of the phenomenon of “liquid banks that not lend”. Barajas and Steiner (2002) examine a pattern of substantial slowdown in credit to the private sector, which in several instances has followed episodes of “credit booms”. They also pinpoint that the earlier experience in the region suggest that credit slumps can be quite protracted. Our results with respect to the different speeds of adjustment can help depict a story behind this fact: After a period of boom, when unfavorable economic conditions arise (e.g. economic uncertainty, worsening of the quality of the loan portfolio) credit supply will adjust downwards much faster than demand. If this happens when lending capacity is not falling as

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\(^{16}\) As mentioned above, indexes of real GDP, economic activity or industrial production were used in the panel estimations.
fast as other variables, credit shortage in the context of “liquid banks that not lend” will occur.

This last assertion is significant and seems to be backed up by our previous analysis in section 2. The apparent disruption after 1998 of the co-movement between real credit and lending capacity is depicted in Figures 7 and 8. We also compared the rate of growth of the credit determinants in two different periods: Before and after 1998. We analyzed if every variable showed an improvement or a deterioration post-1998 versus pre-1998 and quantified it as the percentage change with respect to its previous growth rate\(^{17}\). Using our finding that credit supply seems to adjust much faster than credit demand, we posit the following: If there is clear evidence that economic conditions worsened, but lending capacity didn’t deteriorate as severely as other variables (specially those affecting credit supply), then the country is a potential candidate to have “liquids banks that not lend”.

Table 7 shows our findings. On average, the region as a whole seems to be experiencing the aforementioned phenomenon. While banks’ lending capacity conditions worsened by only 84% in the region (a magnitude similar to that of the level of economic activity), the other determinants of credit supply – non performing loans and our proxy for economic uncertainty— worsened by a sizeable 189% and 478%, respectively. These conditions might be conducive to rationing of credit regardless of the apparent excess of loanable funds. In particular, Argentina, Bolivia, Brazil, Chile and Ecuador appear especially vulnerable to this situation. All them show worsening credit conditions that go well beyond the reduction in the growth rate of loanable funds\(^{18}\).

Our results can contribute to suggest some hypotheses regarding the effectiveness in affecting credit activity. The interpretation, however, has to be done cautiously. For instance, it would at first glance appear that policies aimed at increasing lending capacity, such as the reduction in legal reserve requirements, may be more effective in countries with a higher elasticity with respect to this variable. Nevertheless, lending capacity and actual credit do not necessarily move in tandem, and unwillingness to lend may emerge. Hence, in assessing the impact of policies on credit activity we should consider not only the elasticity of credit with respect to lending capacity, but also, and necessarily, the coefficients of our variables proxying bank’s unwillingness to lend (like non-performing assets) as well as the variable that stands out for crowding-out. Once that is done, it is no longer obvious that an expansionary monetary policy (e.g., a policy of reducing legal reserve requirements) would result in a significant expansion in credit where supply factors other than lending capacity are at work. Continued uncertainty, rising non-performing loans, and rising risk perceptions may offset the rise in credit that and increase in lending capacity could have otherwise resulted in. In other words, expansionary monetary policy may not help to deal with the phenomenon of “liquid banks that don’t lend”, and may, in the extreme, backfire leading banks only to higher liquid asset positions, or to capital flight.

\(^{17}\) In the case of lending capacity and the level of economic activity, a higher rate of growth would be considered and improvement, whereas in the case of non performing loans and the proxy for uncertainty, it would be considered a deterioration.

\(^{18}\) Chile even experienced an increase in the growth rate of loanable funds, while the rest of variables showed deterioration.
Table 5b suggests that a policy of strengthening the fiscal position, so as to enable the
government to borrow less in domestic markets (and thus contribute to lower interest rates on
government debt instruments), could lead to an expansion in credit to the private sector.
However, Tables 5a and 5b also show that this would happen mainly to the extreme that
uncertainty and non-performing loans do not rise to offset the salutary effect of a reduction in
crowding-out.

7. Policy Discussion

Aggregate credit fluctuations, which have been large in Latin America during the last
decade, have been somewhat synchronized across countries. Capital flows are the main
suspect as the “common factor” behind this phenomenon, for they have tended to affect
countries in the region in a synchronized fashion. Since capital flows have largely been
intermediated through the banking system, the microeconomics of bank credit matters for
macroeconomic policy. But academicians and policy makers continue to rely on Mundell-
Fleming type models to make sense of the macroeconomics of capital flows—as if banks did
not matter much and as if fluctuations in money demand could be separated from credit
availability to households, enterprises, and the government. As if, in short, capital mobility
automatically implied that the supply of credit is fairly horizontal at a given interest rate.
The results of this paper strongly remind us of the limitations of such approach. Supply
factors—and not just banks’ capacity to lend and the price of lending (interest rate), but also
factors that affect banks’ willingness to lend—are key in understanding bank credit
fluctuations in Latin America.

The paper finds evidence that the higher the burden of bad loans, the less banks are
willing to lend. This is not surprising—loan portfolio decay raises provision needs (i.e., the
cost of lending) and perceptions of risks. But this has important implications for policy,
especially in times of stagnant or contracting economic activity when policy makers would
like to believe that providing liquidity into the banking system (i.e., lowering the interest
rate) would lead to a resumption of credit which, in turn, would spark an economic recovery.
The results in the paper add another angle to the discussion: liquidity expansion alone,
regardless of whether the source is the central bank or foreign inflows, may just lead banks to
buy more liquid assets, rather than lend more, even if there is no capital flight. Other factors
may more than offset the positive effect on credit supply of greater capacity to lend. One
implication is that the cleaning of banks’ balance sheets is a precondition for credit to resume
in a country. But such cleaning means fresh capital injections (which is costly and not
always available), higher profitability (difficult to generate in bad times), or shrinkage (less
lending by definition).19

The paper confirms that banks would readily reduce credit to the private sector if they
can lend to the government at an attractive interest rate. In countries where governments

19 Besides, as is sometimes observed in Latin American countries, depositors may mistreat those banks that
engage in aggressive balance sheet clean-up, i.e., in proactive recognition of losses. This is a “cost of virtue”
that can lead banks to become unwilling to clean-up their balance sheets, even where there is capacity to lend,
further delaying the resumption of credit.
offer such a low risk/high return proposition, “crowding out” occurs, in the sense that banks choose to weigh more heavily their asset portfolios with claims on the government. Mexico and Brazil are examples of this type of displacement of the private sector, with the public sector relying on the domestic market (mainly on banks, and such institutional investors as mutual and pension funds) to raise funds and roll-over its debt. In times of turbulence, rolling over the debt with domestic, quasi-captive creditors has been easier for Latin governments compared to rolling over debt with investors in Wall Street. The extreme case can be seen in the experience of Argentina in December 2001.

The “crowding out” cost of this apparent advantage for debtor governments is significant and includes an odd disruption of comparative advantages. On the one hand, the government, which is the strongest debtor in a country and relatively better able to manage risks, forces the private sector either to have less overall access to credit or to borrow abroad and manage the associated complex risks, for which it is relatively less capable. On the other, the installed capacity of banks to screen and monitor debtors (and their stock of information on debtors) becomes underutilized as banks move to make an easy buck by lending copiously to the sovereign.

The fiscal position of a number of countries in the same reflects a more generalized phenomenon that is observable in Latin America. Banks can earn very handsome returns on relatively risk-free public assets, which, when combined with a weak competitive environment for depositors, leads to large spreads for banks. In addition, as fiscal deficits rose and external borrowing to finance them has become both harder and less advisable, the pressure to fund the government has risen. Real interest rates on government paper have been important in some cases and banks have become the financiers of government rather than businesses. Thus, working capital has largely dried up in Latin America. This, together with uncompetitive transport costs, has hampered the region’s competitive position and locked it into a low growth trap.

The paper shows that the adjustment of credit to its longer-run path has been a complicated affair in Latin America over the last decade, featuring pronounced fluctuations. One phenomenon worth mentioning is the asymmetric behavior of banks during business cycles. As noted elsewhere (Laeven and Majnoni 2002), banks rarely overprovision in the upside when profits look juicy and asset values are inflated.20 On the downward side, however, they need to provision rapidly, a practice we support. Yet, the incentive to provision more without recalling loans and worsening the quality of the portfolio means that the response to a shock is to curtail all new credit. This can make a small shock larger, especially since banks do not necessarily discriminate between exporting firms and those engaged in non-tradables and the shocks may imply asymmetric risks.

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20 Laeven and Majnoni (2002) show that banks around the world, on average, tend to delay provisioning for bad loans until too late, when cyclical downturns have already set in, possibly magnifying losses and the size of negative capital shocks. They also find an undesirable negative relation of loan loss provisions with loan growth and GDP growth (banks are less prudent during periods of rapid credit growth, and they provision during and not before economic recessions). These patterns, however, vary considerably within and across different countries.
Regulatory (prudential) policy could take this explicitly into account, which implies going beyond Basle standards in some cases. In particular, there is clearly a need for counter-cyclical prudential norms to create better liquidity and solvency buffers in the banking system, thereby dampening credit fluctuations and partially insulating the domestic credit path from the vagaries of capital flows. Counter-cyclicality could and should be built, for instance, into bank liquidity requirements—these could be raised in “good” times of high deposit growth, and lowered in “bad” times, thereby stabilizing credit flows. Similarly, and following the recent example of Spain, banks could be required to build counter-cyclical provisions (in addition to the commonly required generic and specific provisions) during good times, which could be converted in specific provisions in bad times as loan quality deteriorates, thereby stabilizing bank solvency over the cycle.

8. Final Remarks

The purpose of this paper has been to examine the factors that have driven the path of real credit to the private sector in Latin America in the last decade. We used a simple framework of supply of and demand for credit and recently developed panel techniques to test some hypotheses regarding the behavior of credit: Is credit driven predominantly by demand or supply factors? Have banks had the capacity to lend to the private sectors? If so, what about their willingness to do it?

Our results suggest that the behavior of real credit may be explained, in general, by both supply and demand factors. On the supply side, banks’ capacity and willingness to lend play a role. For the region as a whole, a sort of adverse selection mechanism that resulted in some forms of credit rationing process apparently occurred after the 1994 crisis. In addition, the alternative of buying government bills negatively affected the flow of credit to the private sector.

On the demand side, current economic conditions, as well as perspectives about them, have significantly influenced debtor behavior. Moreover, when relatively over-indebted (with respect to long-run equilibrium values), debtors curtailed their demand for credit, but adjusted gradually.

Although our results appear reliable, there is considerable room for further research, mainly along the following lines. First, given the high degree of financial dollarization in many Latin countries, future studies of credit fluctuations should take financial dollarization explicitly into account. Second, the robustness of the results may be further tested. For example, there would seem to be considerable room to improve on the proxy for uncertainty (e.g., volatility in short-term interest rates seem to be better proxy compared to the one we used, but was not employed because of limitations in data availability). Third, in studying credit movements over the long–run, it would make sense to try to gauge the importance of institutional and legal factors affecting the adequacy and enforceability of creditor rights for credit supply. Finally, the possible substitution between bank credit and credit from abroad or funding in the securities markets should be explicitly incorporated.
APPENDIX 1

This Appendix is organized as follows. In the first section, we present the results of the tests for unit roots, panel cointegration, country heterogeneity, and stability over time of the parameters. In the second section, we describe some of the techniques used to perform such tests.

1. Results of Formal Tests

   Panel Unit Root Tests. We test for the presence of unit roots on the series in Equation 7, following the strategy suggested by Im, Pesaran and Smith (1995), instead of applying the low-power country-by-country test. Im et al. developed a panel unit root test for the joint hypothesis that every series in the panel is non-stationary (see next section for some detail). To implement the test we need to remove any possible common time-effects prior to applying the ADF regressions. The individual unit root test for the series in levels includes a time-trend and one lag. Note that given that series for real GDP are not available for all the countries, we use an index of economic activity for all of them. The indices are either those available in IFS or country sources, or those constructed using the actual series of real GDP or the series for industrial production.

   Appendix Table 1 shows the results for the series in levels and in first differences. As some numbers suggest, we cannot reject the null hypothesis of non-stationarity for the series of real credit, lending capacity, and real GDP in levels. Nevertheless we can reject the null hypothesis of non-stationarity for these series in first differences, and for the levels of the lending interest rate. Therefore, we find evidence that, except for the interest rate, our series are integrated of order one.

   Panel Cointegration Tests. Before presenting the results of the estimations, we need to test for cointegration in our panel. Several tests have been developed in the last years. In this paper we test for cointegration using the methodologies suggested by Kao (1999), Pedroni (1995), and Pedroni (1999). Appendix Table 1 presents our results.

   We use multiple tests in order to assess the robustness of the results. We find that all the tests are statistically significant (Appendix Table 1). Therefore, the hypothesis of no cointegration is strongly rejected, providing some evidence that cointegration, a stable medium-run relationship exists among real credit, real lending capacity, economic activity, and real interest rate in the region.

2. Panel Techniques

   Panel Unit Root Tests. Im, Pesaran, and Shin (1995) propose a test that averages all individual unit root test statistics. Their basic framework suggests that a series follows a process such as:

\[ y_{it} = \rho_i y_{i,t-1} + \sum_{k=1}^{p_i} \phi_{ik} \Delta y_{i,t-k} + z_{it} \Gamma + \xi_{it} \]  

(8)
with the null hypothesis of non-stationarity (H0: \( \rho_I = 1 \), for all \( i \)), and the alternative of stationarity for some \( i \) (H1: \( \rho_I < 1 \), for some \( I \)). The statistic computed as an average of individual Augmented Dicky-Fuller statistics is the following:

\[
\bar{t} = \frac{1}{N} \sum_{i=1}^{N} t(\rho_i) \quad (9)
\]

where \( t(\rho_I) \) are the individual ADF statistics. For some comments on the power of the test and some alternatives see Calderon (2001).

Panel Cointegration Tests. Kao (1999) has developed two types of panel cointegration tests: four Dickey-Fuller-type test and an ADF-type test. Some of them are based on the strong exogeneity of the regressors and the errors, and some test for cointegration in the presence of endogenous regressors. The author found that the asymptotic distribution of these statistics converge to a standard normal distribution.

Pedroni (1995) also developed two sets of tests allowing for considerable heterogeneity. The first set involves averaging test statistics for cointegration in the time series across individuals which included an average of the Phillips and Ouliaris (1990) statistics. The second set performs the averaging by pieces, so that the limiting distributions are based on limits of piece-wise numerators and denominators. The rejection of the null hypothesis suggests that enough of the individual cross-sections have statistics far away from the theoretical predicted means if they were generated under the null. Finally, Pedroni (1999) developed some tests when multiple regressors are present.
The variables, their sources, and some data issues are presented below.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital</td>
<td>Capital</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Credit to the private sector</td>
<td>Nominal credit deflated by CPI</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Deposits</td>
<td>Demand, time, and savings deposits</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>GDP</td>
<td>Nominal GDP deflated by CPI, or real GDP, or an index of economic activity or industrial production depending on the availability</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Interest rate on government securities</td>
<td>Nominal treasury bill deflated by country’s CPI index. (Annual)</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Lending capacity</td>
<td>As in Catao (1997), it is defined as deposits plus capital minus reserves. Alternatively, it may include net foreign liabilities</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Lending interest rate</td>
<td>Nominal interest rate deflated by countries CPI index. (Annual)</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Net foreign liabilities</td>
<td>Foreign assets minus foreign liabilities</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Non-performing loans</td>
<td>Non-performing loans over total loans</td>
<td>National sources</td>
</tr>
<tr>
<td>Real exchange rate volatility</td>
<td>Four-period moving standard deviation of an index of real effective exchange rate</td>
<td>The World Bank</td>
</tr>
<tr>
<td>Reserves</td>
<td>Cash and deposits with the monetary authorities.</td>
<td>IFS and national sources</td>
</tr>
<tr>
<td>Treasury/central bank bill rates</td>
<td>Nominal treasury/central bank rate minus CPI inflation. (Annual)</td>
<td>IFS and national sources</td>
</tr>
</tbody>
</table>
For the construction of some variables national sources were used. The following table summarizes the information on the sources and present some comments for individual country-specific variables.

<table>
<thead>
<tr>
<th>Country</th>
<th>Sources</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argentina</td>
<td>Central Bank</td>
<td></td>
</tr>
<tr>
<td>Bolivia</td>
<td>Superintendence of Banks</td>
<td></td>
</tr>
<tr>
<td>Brazil</td>
<td>Central Bank</td>
<td>Real GDP has been replaced by an index of industrial production</td>
</tr>
<tr>
<td>Chile</td>
<td>Central Bank. Superintendence of Banks and Financial Institutions</td>
<td></td>
</tr>
<tr>
<td>Colombia</td>
<td>Bank of the Republic. Superintendence of Banks</td>
<td>Real GDP has been replaced by an index of industrial production</td>
</tr>
<tr>
<td>Costa Rica</td>
<td>National sources</td>
<td></td>
</tr>
<tr>
<td>Ecuador</td>
<td>Central Bank. Superintendence of Banks</td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>Bank of México</td>
<td>Nominal GDP (seasonally adjusted from IFS)</td>
</tr>
<tr>
<td>Peru</td>
<td>Superintendence of Banks and Insurance</td>
<td></td>
</tr>
<tr>
<td>Venezuela</td>
<td>Central Bank. Superintendence of Banks and Financial Institutions</td>
<td></td>
</tr>
</tbody>
</table>
References


