

Financial development and credit crunches: Latin America and the world

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Introduction

Following the Asian and especially the Russian crises, bank credit in many Latin American countries collapsed. The strong rates of real credit growth—even credit booms—that characterized the early and mid-1990s generally have decreased since 1998. Moreover, in most countries, this has been the case for two and a half to three years and, by mid-2001, had not shown obvious signs of reversal. As we shall see, the 1999–2000 credit crunch is common throughout the region and is second in impact only to the 1982 crunch that coincided with the debt crisis. This state of affairs comes as a major disappointment, given the important financial reform efforts implemented in the region over the last decade.

As is well known, Latin America has been undergoing an important reform process since the late 1980s, during which financial aspects of the region were heavily emphasized.¹ In addition to amply documented successes in inflation stabilization, fiscal consolidation, trade and capital account liberalization, privatization, and social security reform, improvements in financial market reform figured prominently in the reform agenda. In particular, banking systems were privatized, interest rates were freed, and mandatory credit allocation schemes were eliminated to allow market forces to allocate credit. After a string of banking crises in the mid-1990s in several countries, Basel-style regulation and supervision were strengthened. In the second half of the 1990s, the financial systems became heavily internationalized, with major foreign banks purchasing the largest local banks.

An improved macro picture and better financial policies could reasonably have been expected to lead to better-functioning credit markets that could encourage financial investment, while at the same time providing the ability to smooth out shocks. The recent credit crunch indicates that these hopes were not fulfilled.

It is evident from table 1 that financial markets in the region remain very shallow and expensive. The bank credit to the private sector over GDP ratios—a measure of a country's financial depth—amounts to less than one-third the common ratios for the developed countries, and are on average only higher than sub-Saharan Africa. Although there are ample differences in the extent of financial development among Latin American economies, the general picture holds. In fact, leaving aside the fiscal paradise of Panama, only two of eighteen countries (Chile and Bolivia) reach levels comparable to those in the Middle East, North Africa, and South and East Asia. The costs of the system—in terms of both overhead and net interest margins—are twice those in non-African, non-transition countries. Equity markets throughout the region also appear very small compared with other emerging economies. Moreover, the role of these markets in financing private investment is exaggerated if one looks only at market capitalization, since the fraction of the shares effectively floating—that is, not in hands of the controlling party—is especially low in the region. In fact, not only is the amount of capital raised through the equity market in Latin America negligible, but the number of companies listed has fallen almost everywhere lately. Further, the stock market does not serve well to signal investment opportunities because liquidity is extremely low. Given the highly underdeveloped state of equity and fixed-income markets throughout Latin America, bank credit carries

Table 1
Financial markets development indicators: Latin America and the world

Country	Percent				
	Bank credit to private sector over GDP	Overhead costs	Net interest margin	Stock market capitalization over GDP	Stock market value traded over GDP
Argentina	17.1	8.1	5.6	14.0	3.82
Bolivia	43.2	4.8	4.1	1.7	0.01
Brazil	25.8	9.8	11.5	24.7	17.03
Chile	48.3	3.1	4.1	99.8	11.10
Colombia	17.2	8.4	6.6	17.8	1.90
Costa Rica	15.4	6.2	5.1	7.3	0.15
Dominican Republic	16.0	6.3	6.1		
Ecuador	21.0	7.7	7.5	10.4	1.33
Guatemala	13.2	5.9	5.9	0.9	0.02
Honduras	20.5	4.2	7.0	4.9	2.00
Haiti	12.3	3.6	1.9		
Mexico	24.2	4.9	4.7	38.1	14.69
Nicaragua	28.7	5.9	4.5		
Panama	64.7	2.0	2.5	8.6	0.35
Peru	12.8	8.6	7.2	16.4	5.85
Paraguay	19.2	6.6	6.7	2.0	0.17
El Salvador	27.5	3.2	3.7		0.10
Uruguay	24.0	6.3	5.9	1.4	0.05
Venezuela	9.5	7.3	10.2	10.7	2.37
Latin America	24.2	5.9	5.8	17.2	3.81
Minimum	9.5	2.0	1.9	0.9	0.01
Maximum	64.7	9.8	11.5	99.8	17.03
Standard deviation	14.0	2.1	2.4	25.0	5.54
Developed countries	75.9	2.6	2.5	65.9	42.18
Less-developed countries (excluding Latin America)	23.3	4.7	4.9	31.1	11.38
Caribbean	43.2	4.7	4.5	29.0	2.67
Middle East and North Africa	41.0	2.3	2.7	36.0	12.68
South and East Asia	44.3	2.6	3.1	81.6	45.99
Sub-Saharan Africa	14.4	5.5	5.7	16.3	1.66
Transition economies	26.4	5.6	5.4	14.3	25.92

Note: The table presents the average of available values for each variable in the 1993-1997 period. Based on: Barth, Caprio and Levine (2001).

almost all of the burden in providing financial services for these economies. In addition, these economies with relatively scarce capital get access to international capital markets primarily through banks. Credit crunches imply a breakdown in international financial integration. Furthermore, there is ample evidence that well-functioning financial markets are critical for long-term growth. Hence, the current situation may have longer-term implications for these economies.

In this chapter we look at the recent credit crunch in Latin America in the context of worldwide experience with this phenomenon. We first define the event in precise terms to facilitate empirical analysis. Then we describe the crunches and compare the Latin American experience with those of other regions of the world. We then move to an analysis of the causes and consequences of credit crunches and conclude with a discussion of the policy implications for financial policies in the region.

Credit crunch: Definition and measurement

In this section, we define credit crunch and describe the data we use to identify the events. We think of a credit crunch as a collapse in the net funds borrowers have access to from the banking system. We propose as our basic indicator *the evolution of the net flow of funds from banks (lenders) to borrowers*, which we will use to define and identify a credit crunch. We measure this flow as the difference between the rate of growth of the stock of credit to the private sector and the interest rate on loans. A positive figure means that private-sector borrowers have access to more than enough funds from the banking system to pay for all accrued interest, allowing them to expand their activities without diverting any cash flow to their lenders. This situation, common during credit booms, is not sustainable. If it persists, debt would grow uncontrollably, and lenders would never experience a positive flow for their savings—a condition known as a Ponzi scheme. So, positive net flows cannot be sustained for long periods. The net flow cannot become negative either, given that credit cannot become negative. Hence, net flows cannot become so negative as to cause the stock of credit to disappear.

We think of a credit crunch as a phenomenon in which the net flow to borrowers becomes significantly negative. But how much is that? To implement this idea, we need to define a threshold level of net flow that we consider indicative of a credit crunch. Once we determine that a credit crunch has occurred, a second threshold identifies the beginning and end of the event. We use International Financial Statistics as our data source.² For developed countries, the median net flow over the last twenty years has averaged -1.3 percent. Ninety percent of the values are between -11.3 percent and 16.4 percent, and half are between -5.2 percent and 4.4 percent. So, in developed countries, we observe numbers below -11.3 percent less than 5 percent of the time. Based on this, we consider that a crunch exists whenever the net flow reaches a value below -12 percent. If this is the case, we define the beginning of the crunch as the moment when net flows become lower than -5 percent, and the end when net flows return to values higher than -5 percent.³ If a credit crunch identified in this way is followed by a new episode in less than three months, we consider both events to be part of a single crunch.

To make identification of crunch cases independent of the strong seasonality of credit data, we work with year-to-year changes. In particular, each month we compute the year-to-year growth rate of credit. For the interest rate, however, consistency requires the lending rate to be the average of the figures during the corresponding twelve-month period. Data are checked manually to ensure continuity of the series. More recent data were used when a series changed, and the older data were discarded. Periods of hyperinflation were not

included to avoid the analysis and its results being too dependent on a few outlier observations.

We ended up with a sample comprising 14,397 country-month data points—1,481 corresponding to developed economies (73 percent of them in the 1990s) and 12,916 to less-developed countries (68 percent in the 1990s). Of these, 1,624 are in Latin America (76 percent in the 1990s) and 2,937 are in the Caribbean (61 percent corresponding to the 1990s). There are ninety-four countries, ten of which are industrial and 84 are developing. Thirteen of these economies are Latin American and fourteen are Caribbean.

Table A1 in the appendix presents the credit crunch episodes determined by applying the above definition on the data just described. Table 2 summarizes the basic characteristics of a credit crunch and explores its differences across regions.

Credit crunches: Stylized facts

What do the data tell us about credit crunches in general, and the Latin American experience in particular? In this section, we discuss some of the stylized facts.

Latin America is prone to credit crunches. We identified 174 credit crunch episodes involving seventy-four countries. Of these, five are industrial and sixty-six are developing. Of the thirteen Latin American countries in the sample, twelve countries suffered twenty-four crunches.⁴ While industrial countries on average spend only 10 percent of the time in a credit crunch, the typical developing country experiences a credit crunch approximately 30 percent of the time. Latin American countries in the sample spent 40.6 percent of the time in a crunch, slightly less than the former socialist economies. By contrast, Caribbean nations experience a crunch only about 17.6 percent of the time.

Crunches in Latin America are relatively long-lived, lasting on average between eighteen months and two years. Although some can be as short as three months, a few have lasted longer than seven years. In fact, one-fourth of the crunches in the region last longer than four years, almost twice the share observed in the rest of the world.⁵

By developing-country standards, Latin America credit crunches are deep. Credit crunches are deeper in developing countries than in industrial ones. Depth is measured by the integral of net flows during the credit crunch. In Latin America, they are particularly deep, measuring 63 percent more than the industrial country average and comparable only to Africa. The Caribbean—by contrast—has shorter and shallower crunches than do industrial countries.

Credit crunches in Latin America and in the world exhibit co-movement. Table 3 explores the temporal pattern of credit crunches. When one looks at the sample as a whole, the

Table 2
Credit crunch episodes by region

Region	Number of countries	Number of cases	Countries affected	Frequency (percent)	Duration (years)	Depth
Developed countries	10	8	5	10.0	1.9	2.8
Less-developed countries	84	166	66	30.4	1.6	3.6
Latin America	13	24	12	40.6	2.0	4.6
Caribbean	14	28	10	17.2	1.4	2.3
Middle East and North Africa	5	5	2	11.9	0.7	2.8
South and East Asia	13	13	8	14.1	1.6	3.4
Sub-Saharan Africa	23	58	19	38.6	1.8	4.6
Transition	11	15	10	43.5	1.2	3.0
Other	5	23	5	35.4	1.3	2.5

Notes: Frequency corresponds to the number of months with credit crunch over the total of months for which we have data. This table includes only the crunches that do not begin before we have data.

Table 3
Credit crunch characteristics: Latin America and the world

Year	Latin America					Developing countries outside Latin America					All countries				
	Data points	Number of months in a crunch	Frequency (percent)	Average duration	Average depth	Data points	Number of months in a crunch	Frequency (percent)	Average duration	Average depth	Data points	Number of months in a crunch	Frequency (percent)	Average duration	Average depth
1982	25	9	36.0	2.3	7.2	339	28	8.3	0.4	0.9	400	39	9.8	0.4	0.9
1983	40	12	30.0			374	94	25.1	1.0	1.5	453	118	26.0	1.2	2.1
1984	52	8	15.4			430	76	17.7	0.7	1.4	530	95	17.9	0.7	1.4
1985	53	12	22.6	2.3	4.0	423	98	23.2	1.4	2.4	524	110	21.0	1.6	2.6
1986	59	23	39.0	0.8	1.2	446	130	29.1	1.6	2.8	553	159	28.8	1.5	2.7
1987	60	10	16.7			509	130	25.5	0.8	1.5	621	156	25.1	1.0	1.8
1988	60	12	20.0	0.8	0.8	528	86	16.3	0.9	2.2	648	110	17.0	0.9	1.9
1989	60	12	20.0			541	72	13.3	2.1	3.0	664	87	13.1	2.1	3.0
1990	62	22	35.5	1.7	3.9	545	103	18.9	1.1	1.6	679	150	22.1	1.1	1.9
1991	72	35	48.6			523	138	26.4	1.8	4.2	667	193	28.9	2.4	4.8
1992	73	14	19.2	2.8	5.2	541	161	29.8	1.7	4.6	692	187	27.0	1.9	4.7
1993	78	5	6.4	1.1	1.7	619	176	28.4	2.3	7.3	791	197	24.9	2.2	6.7
1994	93	16	17.2			653	149	22.8	2.0	4.0	842	189	22.4	2.0	4.0
1995	95	23	24.2	1.4	3.7	730	138	18.9	2.0	5.9	933	179	19.2	1.9	5.0
1996	98	35	35.7	1.6	3.2	774	232	30.0	1.9	5.8	982	267	27.2	1.8	5.6
1997	112	28	25.0	1.0	1.3	831	278	33.5	1.6	3.1	1,063	306	28.8	1.5	2.9
1998	141	28	19.9			846	220	26.0	1.7	3.9	1,107	251	22.7	1.7	3.9
1999	144	92	63.9	2.3	5.8	852	288	33.8	1.4	3.8	1,116	392	35.1	1.7	4.2
2000	140	87	62.1	1.2	1.7	738	273	37.0	1.2	2.3	975	360	36.9	1.2	2.2

Notes: Frequency corresponds to the number of months with credit crunch over the total of months for which we have data. Average duration and depth correspond to the average of those credit crunches for which the net flow became lower than -12 (entered the resolution phase) during the corresponding year. The table excludes Bolivia and includes only the crunches that do not begin before we have data.

frequency of credit crunches, although not constant, appears relatively stable. By contrast, in Latin America, there is a more unstable time pattern, with yearly changes in frequency more than double the world average. This suggests that national credit crunches in Latin America exhibit more co-movement, meaning that they seem to happen at the same time in different countries. Also interesting is the fact that there is a 40 percent correlation between the frequency of crunches in Latin America and in other developing countries, also an indication of co-movement.

The recent series of crunches have been much more inclusive than before, particularly in Latin America. Indeed, while the frequency of credit crunches has increased by around ten percentage points to 32.5 percent in other developing economies, it has more than doubled in Latin America, exceeding 60 percent. The recent episode is also deeper. With the exception of 1982,⁶ there has been no crunch in Latin America deeper than the one calculated for 1999. Moreover, several of the crunches had not ended by the last month for which we have data. Hence, given that some of the crunches are ongoing, these later credit crunches are also deeper in magnitude than reported in table 3.

The anatomy of credit crunches: Stylized facts

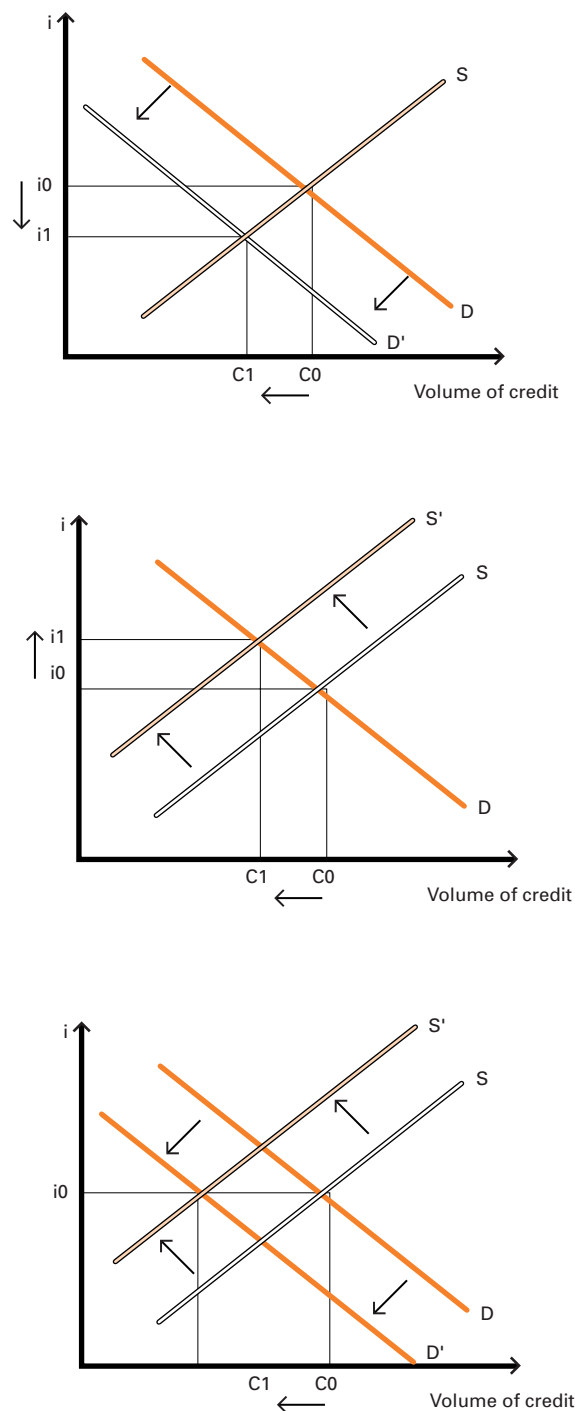
What could cause a precipitous decline in the flow of funds from banks to borrowers? Could the decline be triggered by a fall in demand for loans from the private sector, perhaps as a consequence of lower-than-expected growth depressing the demand for investment? Or is it explained by a reduction in the supply of funds available for loans?

Figure 1 compares these two alternative scenarios in a standard supply-and-demand context. In the first case, if the downward-sloping demand curve were to move, one would expect interest rates to decline, especially on deposit and money market rates, as the lower demand for funds would make these relatively abundant. The implication for lending rates is less clear because the lower-than-expected returns may cause risks and lending spreads to go up. In the second case, when the upward-sloping supply curve shifts to the left, one would expect interest rates to rise, as funds available for loans become relatively scarce. What is the typical pattern we observe in practice?

To answer this question we split the data into five types of periods:

- Normal: periods with no crunch.
- Previous phase: three-month period before the start of a crunch.
- Build-up phase: defines the period in which net flows are greater than -5 percent and less than -12 percent.

Figure 1
Credit crunch: Supply or demand?



- Resolution phase: the period between the end of the build-up period and the time in which net flows recover to more than -5 percent.
- Following phase: three-month period following the end of the crunch.

We ran a series of regressions with certain variables of interest against dummies for each of the last four phases.⁷ We also included country and year dummies as well as a dummy for Latin America, which we interacted with each of the phases.

This permits us to define the typical pattern of credit crunches and any differences that may characterize Latin America. The relevant regressions are presented in table A2 in the appendix.

Figure 2 presents these results graphically. It shows the evolution of financial variables during the credit crunch and asks whether Latin America differs significantly from the rest of the world. In each case, we present the change of the variable of interest with respect to “normal” times, as defined above.⁸

During credit crunches, net flows in Latin America decline slightly less than in other regions. The first graph shows the typical fall in the net flow of funds during a credit crunch. It indicates that during both the build-up and resolution phases, net flows average about –25 percent. The numbers for Latin America, although statistically different, are only slightly less pronounced⁹. Both the preceding and following periods are close to the threshold value of 5 percent for both regions.

Contrary to the international experience, the decline in net flows in Latin America is influenced more by increases in lending rates. Decomposing the fall in net flows into its two components—decline in nominal credit growth and increases in lending rates—yields greater variation across regions. For the world as a whole, the collapse in net flows is dominated by a fall in nominal credit growth of about 23 percent during the crunch and an increase in interest rates of about 2 percent. The decline in credit growth is clearly observable in the three months preceding the crunch. By contrast, in Latin America, interest rates play a much more important role. In fact, interest rates in the region increase just before the start of the crunch and jump on average by about 9 percent in the build-up phase. In the resolution phase, interest rates come back down, but nominal credit growth falls more dramatically, declining by almost 20 percent.

Credit crunches in Latin America are associated with larger declines in deposits. While real credit growth seems to fall less in Latin America than in other regions during credit crunches, deposits in the region do fall more and sooner. In fact, in the period before the start of the credit crunch, deposits decline by about 2 percent more in Latin America than in the rest of the world, and this difference grows during the build-up and resolution phases. Consistent with this finding, the gap between credit and deposit growth rates shows a different pattern in Latin America from the rest of the world. In other regions, credit declines more than deposits by a much wider margin, suggesting that in Latin America, the decline in deposits plays a larger role in the making of the credit crunch. In fact, in the three-month period before the start of the crunch, deposits are already falling in Latin America even though credit is not, explaining the positive difference in this period. It is not until the resolution

period that credit actually falls significantly faster than deposits in the region. In some sense, banks in Latin America can be said to protect borrowers from the decline in deposits.

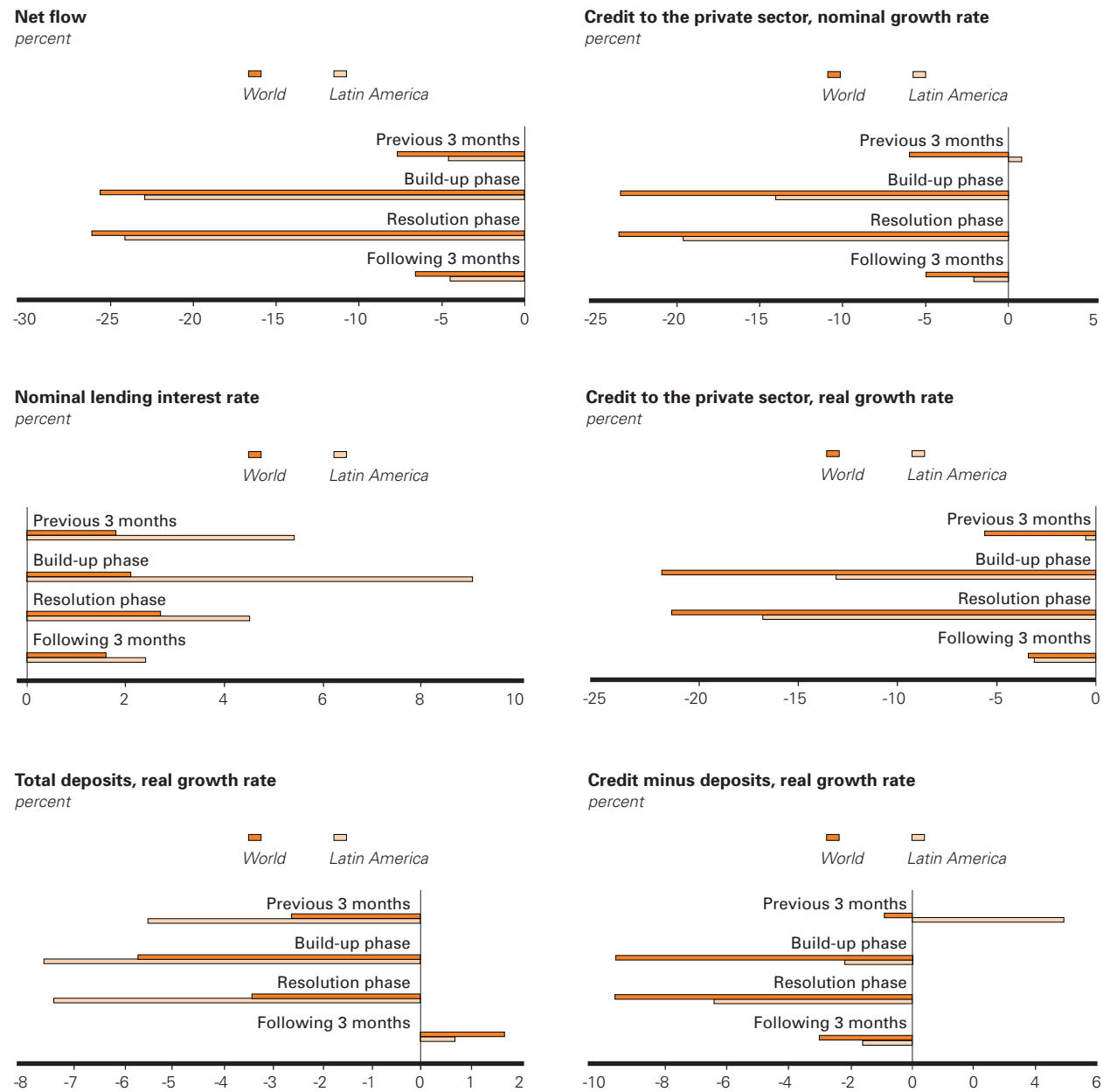
Interest rate spreads grow more in Latin America than elsewhere during credit crunches. While banks in Latin America are more willing to lend during crunches, they do charge a larger spread in interest rates during these episodes. Spreads between lending and deposit rates rise between 2.5 percent and 3 percent throughout the credit crunch in Latin America. By contrast, in other regions the increase is significantly smaller. The increase in the spread in Latin America is due to a greater extent to the rise in the money market rate, as can be seen by comparing the pattern of spreads among lending, money market, and deposit interest rates.

Banks become more liquid during credit crunches, but less so in Latin America. As the credit crunch develops, banks reduce their credit growth and increase their purchases of government securities. This can be seen by the faster declines in credit than in deposits, and the fact that banks invest more in government securities. Bank liquidity rises, particularly in the resolution phase, a period during which lending rates fall. This means that the resolution phase is characterized by the presence of very liquid banks that do not lend to the private sector. All these features are less severe in Latin America.

These observations imply that, especially in Latin America, credit crunches are associated with—or triggered by—declines in the supply of funds available to lend. This can be discerned from the fact that deposits tend to fall before lending does, interest rates increase more significantly and sooner than elsewhere, and banks become less liquid in the process. As the crunch progresses, banks curtail their supply of credit and increase their liquid assets, perhaps as a precaution.

The fact that during a credit crunch the decline in net flows is dominated by a contraction in the volume of lending, and not by an increase in interest rates, suggests that both supply and demand for funds decrease. A move by both of the curves in figure 1 would be consistent with the fact that so much of the adjustment falls on the quantities of loans more than on their cost. This means that, as the shock that causes the crunch is transmitted to the economy, changes tend to take place that eventually reduce both the demand and the supply of funds available for lending. For example, while an initial decline in loanable funds causes interest rates to go up and spending to decrease, the slowdown in the economy reduces investment demand further and makes lending riskier causing a decline in the demand for loans and banks’ willingness to make them. It would appear that, especially in Latin America, the supply curve shifts first, and the demand curve shifts later, during the resolution phase.

Figure 2
The anatomy of credit crunches



Credit crunches: Theories about causes

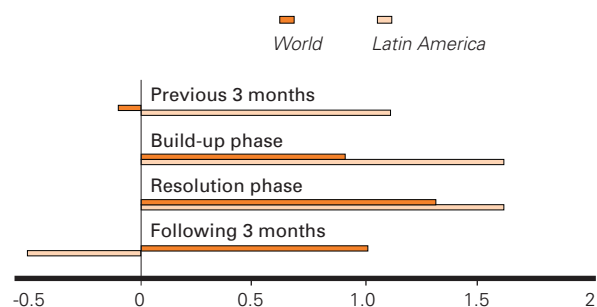
So far we have identified a series of stylized facts about credit crunches. We turn now to the potential causes of the phenomenon. Do certain events presage a coming credit crunch? What factors, if any, affect the likelihood of crunches?

First, however, it is important to illuminate our search with some theoretical lampposts. Credit markets react to exogenous shocks that ultimately affect the demand and supply of funds, but credit markets are notorious in terms of the information-related distortions that affect them.

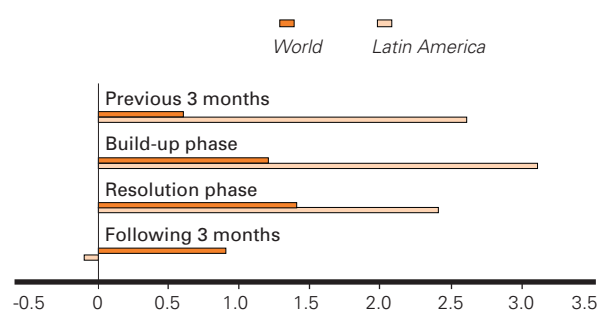
On the one hand, banks tend to suffer from moral hazard, the tendency to take on more risk than is warranted because those making the decisions are not bearing the full cost of their actions. Banks are good candidates for moral hazard because they have limited liability and high leverage. This means that they gain from any good outcome in their risky investments, but have limited downside risk because, at most, they lose the capital they have in the bank. Depositors lose the rest. This behavior is exacerbated if governments feel compelled to save banks because of the negative effects their closing may have on the rest of the economy. Knowing that they will be saved, banks take on even larger risks. To avoid this state of affairs, banks are required to have suffi-

Figure 2 (continued)
The anatomy of credit crunches

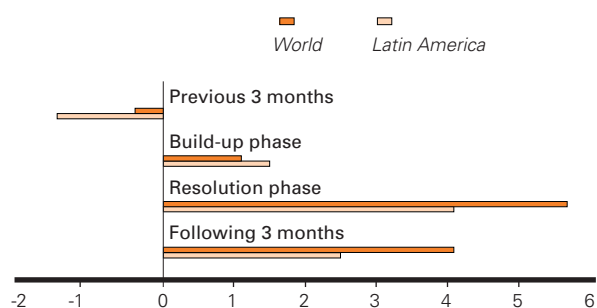
Lending - money market real spread
percent



Lending - deposits real spread
percent



Claims on central government over total credit
percent



cient capital to ensure that any losses at the margin are borne by shareholders, not depositors. Regulators are empowered to determine how much capital is enough, and to check that these amounts are actually there. To achieve this goal, the government supervises banks and takes them over when capital is insufficient.

If banks are perceived as risky or poorly supervised, depositors may lose confidence in them in bad times. Hence, for a given crunch, the amount of the decline in deposits may depend on the quality of bank regulation and supervision. If depositors trust that their money is safe, deposit demand will be more stable, making banks more able to help borrowers

during bad spells. Hence, the ability of banks to provide financing needed to smooth out economic shocks depends to a large extent on depositors' perception of the soundness of the banking system.

On the other hand, credit markets also suffer from time inconsistency. Borrowers are willing to promise many things to get a loan, but those promises are not readily credible. Unless compelled by other reasons, borrowers are better off keeping the proceeds of the loan than returning the money. This so-called willingness-to-pay problem needs to be addressed through coercive devices such as credible contract enforcement. If this is not done, lenders will charge interest rates that will insure them against the perceived risk that borrowers will not repay. But this is likely to make matters worse, because both willingness and ability to repay are affected negatively by higher interest rates. Moreover, this will attract borrowers with little intention to repay, so they are not deterred by the higher interest rate. With poor contract enforcement, interest rates tend to be high and the credit market fickle.

One instrument that ensures willingness to repay is collateral. If assets with secure resale value can be pledged for a loan, and if these assets are of greater value than the loan, the borrower no longer has an incentive not to repay: defaulting would lead to the loss of ownership of assets whose value is greater than what the borrower owes. For collateral to be a useful device, property title has to be clear, so registries should keep track of all liens on the assets. Moreover, claiming the collateral in an event of default should be fast and inexpensive. If these conditions are not present, the credit market likely will be limited by the lack of collateral.

In addition, the value of collateral is not independent of the state of the economy. If a negative shock hits a country, asset values may be affected negatively and, with that, their value as collateral. This makes lack of collateral a bigger constraint in bad times, potentially causing the amount of available credit to decrease, just when it should expand for intertemporal smoothing. Hence, credit crunches may be caused by lack of collateral at critical points during bad episodes.

Other mechanisms that can ensure willingness to repay are based on either coercion or reputation. If the law is lax in protecting creditors vis-à-vis debtors, the latter will not be able to commit to repay, and credit markets will remain small and fickle. If, on the other hand, creditors can commit to share with other lenders their information on past bad performance of borrowers—for example, through credit bureaus—the latter will have greater incentive to repay to protect their credit histories. All in all, the institutions that support the credit market are designed to overcome any willingness to pay problems in credit markets, or moral hazard problems in banks. Their absence may prevent credit markets from operating efficiently, especially in bad times.

Another element often referred to in the literature is the notion that monetary policy is intrinsically connected to the choice of exchange rate regime. If a country decides to peg its exchange rate, then that becomes the goal of the central bank. If the country experiences a bad shock, the monetary authority has no discretion to adopt a softer stance by lowering interest rates and expanding liquidity because this would lead to capital outflows that would defeat the central bank's intentions and endanger its ability to hold on to the peg. By contrast, flexible regimes have an additional degree of freedom. If they choose to adopt a more accommodating monetary policy, they can let the exchange rate depreciate. Hence, a commonly held view would associate pegged exchange rates with tougher monetary conditions in bad times and, therefore, with greater probability of credit crunches.

However, different literature argues instead that floating regimes in developing countries do not exhibit the anticyclical stabilizing policies that are suggested by the above reasoning because of low credibility, liability dollarization, or a high pass-through of exchange rates into prices. These factors tend to make central banks act pro-cyclically by tightening monetary conditions in bad times, even more than in fixed-rate countries.¹⁰

Another element often discussed is the role of foreign ownership of banks. On the one hand, some argue that internationalization of bank ownership allows greater competition, faster improvements in banking technology, and easier access to international liquidity and capital through the relationship of local subsidiaries with their financial group. On the other hand, others argue that foreign ownership may lead to more conservative banking, less willingness to extend credit in bad times, and less commitment to local firms.

All of these elements suggest that credit crunches may be related to shocks of one kind or another, transmitted through the financial market—depending on its level of development, the institutions that support it, the exchange rate regime, and the structure of banking.

Causes of credit crunches: An empirical investigation

To explore the causes of credit crunches empirically, we constructed an annual dataset that contains a dummy variable that takes the value of 1 for every year that net flows reach less than -12 percent and 0 when the economy is not experiencing a credit crunch.¹¹ The issue lends itself to empirical analysis using probit equations that attempt to explain the occurrence of a crunch—that is, that have the credit crunch dummy as the variable to be explained. In this section, we describe our main findings. The equations are included in table A3 in the appendix. Table A4 presents descriptive statistics of the main samples used.

Financial development reduces the likelihood of credit crunches. Negative shocks to the terms of trade, the deposit base and capital flows increase the likelihood of a credit crunch. Equations 1 and 2 in table A3 run regressions explaining the incidence of a credit crunch based on the following three variables:

- the change in the terms of trade in the previous year;
- the share of liquid liabilities in GDP (also known as financial depth) the previous year; and
- the change in capital flows the previous year.

We use variables for the previous year to clearly establish that these shocks occurred before the onset of the credit crunch. The share of liquid liabilities can be understood in two ways. First, it can be seen as a measure of financial development—a higher number implies deeper, more developed markets. This interpretation favors the difference in levels of financial development across countries. Alternatively, it can be taken as a shorter-run measure of the evolution of liquidity in the system, emphasizing the changes over time in each country. Which interpretation we assign to it depends on the context of the equation. In particular, it depends on whether other variables capture differences in countries that are relatively stable over time. This is precisely the main difference between equation 1 and equation 2. In the first equation, no other variables are put as explanatory variables that may capture other not-modeled differences between countries or internationally common factors. The second equation includes dummy variables for each country and each year that do precisely this. These dummies will absorb any stable differences across countries or common factors that are specific to any given year, making the included variables explain primarily the variation over time in each country, not the cross-country difference.

The results suggest that both interpretations of the role of financial depth are warranted:

- A deeper financial system is less likely to suffer from credit crunches. A 10 percent increase in financial depth reduces the likelihood of a crunch by 4 percent per year. It is important to point out that these probabilities are annual. Over the course of a decade, that same increase in financial depth implies a 48 percent lower chance of a credit crunch.¹²
- A short-term decrease in financial depth increases the likelihood of a credit crunch. A decline in liquid liabilities of 10 percent of GDP in a given country increases the likelihood of a crunch by almost 6 percent.

In addition, declines in the terms of trade increase the likelihood of a credit crunch. If we focus on equation 2, we conclude that:

- a 1 standard deviation negative shock to the terms of trade (about 10 percent) increases the likelihood of a credit crunch by around 4.5 percent.

Also, capital flow reversals are associated with the likelihood of a credit crunch. In particular, equation 2 implies that:

- a 1 standard deviation negative shock to capital flows (between US\$2.6 billion and US\$4.9 billion, depending on the sample) increases the likelihood of a credit crunch by 6 percent to 11 percent (2.3 percent per billion dollars).

Hence, shocks to the terms of trade, the deposit base, and capital flows significantly affect the likelihood of a credit crunch. Financial development helps to tame it.

Overall, Latin America conforms to the international experience, but it does have a special problem with terms of trade shocks

Is Latin America different from the rest of the world in terms of the causes of credit crunches? We explore this question in equations 4 and 5 in table A3. Equation 4 asks whether Latin America is more prone to credit crunches after accounting for its shocks to the terms of trade, capital flows, and the deposit base. The answer is in the negative. If anything, Latin America is 3 percent less likely to get a credit crunch, although this effect is not statistically different from zero. Hence, the credit crunch problem is not specifically a Latin American phenomenon. If crunches are more frequent in the region, it is as a consequence of larger shocks to the system.

We then ask, in equation 5, whether any of the shocks are particularly more likely to create crunches in Latin America. We do this by interacting the Latin American dummy with the shock variables. We find that there is nothing special about shocks to capital flows; the estimated coefficient of the interaction term, although negative, is very small and not statistically significant. However, we do find that terms of trade shocks are more likely to lead to credit crunches in Latin America than elsewhere. In fact, inclusion of this term makes the estimated effect of terms of trade shocks on credit crunches 5.9 times greater for Latin America, while the effect for the rest of the world declines to one-quarter of its previously estimated level and is not statistically significant. A 10 percent decline in the terms of trade is estimated to increase the likelihood of a credit crunch in Latin America by 26 percent, while it only increases the likelihood of a crunch by 1.1 percent in other regions. This suggests that Latin America is particularly vulnerable to terms of trade shocks.

Better creditor rights are associated with a lower likelihood of credit crunches

We now explore whether, as predicted by our theoretical discussions, an improved environment for creditor rights reduces the likelihood of a credit crunch. This question is addressed by equation 3. Unfortunately, the measurement of creditor rights we use includes fewer observations, reducing our sample significantly and making the analysis more

dependent on cross-country variations than on time series changes. Nevertheless, the results are indicative of a strong negative association between the protection of creditor rights and the likelihood of credit crunches. This association is robust to the inclusion of financial depth, meaning that the effect of creditor rights on credit crunches goes beyond its well-known impact on financial depth. This suggests that improving creditor rights may have important effects on the stability of credit in bad times.¹³

Foreign ownership of banks does not produce credit crunches

We argue above that there are two schools of thought about the potential impact of foreign ownership of banks on credit stability. Are foreign banks more risk averse and do they tend to cut credit lines at the first sign of trouble, or does the effect they might have on competition, efficiency, and access to capital and liquidity increase the stability of credit? We explore this issue in equation 3, table A3. We find some evidence in favor of the view that foreign ownership of banks reduces the likelihood of a credit crunch. The estimated effect implies that a system that is fully owned by foreign banks is 5.7 percent less likely to have a credit crunch in any given year (74 percent in any given decade) than one that does not have any foreign presence.

We find no evidence that flexible exchange rate regimes lower the likelihood of credit crunches

Do floating exchange rate regimes avoid credit crunches? We explore this question in equations 6 and 7 in table A3. We use the database on exchange rate system developed by Levi-Yeyati and Sturzenegger (2001), which classifies countries on the basis of actual behavior instead of formal announcements. We use a dummy variable, which takes the value of 1 when a country-year is classified as floating.

Equation 6 finds that when controlling for terms of trade, financial depth, and capital flows, and using both time and year dummies, we find no evidence that floating regimes are less likely to generate credit crunches. The estimated coefficient is positive, but not statistically significant. It implies that floating regimes are 3.4 percent per year (40 percent per decade) more likely to have a credit crunch.

We also ask in equation 7 whether the channels through which the credit crunches are generated in a floating regime are different from alternative exchange rate arrangements. To study this, we interact the floating rate dummy with the shock variables to see if floating regimes are better able to cope with external shocks in a manner that avoids credit crunches. We find that the estimated effects are not statistically significant, but, if anything, floating regimes are more likely to create credit crunches when hit by either terms-of-trade shocks or capital flow reversals.

Are credit crunches bad for growth?

Earlier we asked what variables affect the likelihood of suffering a credit crunch. In this section we explore whether credit crunches have an independent effect on growth. At issue is whether credit crunches are just associated with the same things that cause low growth, such as terms of trade reductions and capital flow reversals, or instead, whether they have a significant impact on growth even after controlling for likely causes of the crunch. These questions are addressed in equations 8–11 in table A3.

Our dependent variable is the rate of growth of GDP. We control for variables that are common in the literature on growth, and we include:

- ratio of investment to the previous year's GDP;
- previous year's inflation rate;
- previous year's volume of trade;
- previous year's income per capita;
- country dummies, to take care of unmodeled country specific characteristics; and
- year dummies, to account for any worldwide time effects.

We also include the three variables that are associated with the generation of a credit crunch:

- previous year's level of financial depth;
- previous year's shocks to the terms of trade; and
- previous year's shocks to capital flows.

In addition, we include as an explanatory variable a dummy for the presence of a credit crunch in the previous year.

Credit crunches have an independent and major negative effect on growth.

As shown in equation 8, all control variables, except level of investment, have the expected sign and are significant. More important, our variable of interest—the credit crunch dummy—has a major negative effect on growth. The effect is estimated to cause a reduction in GDP growth of 1.4 percent in the year following the crunch. It is important to point out that we are controlling for many of the shocks that cause credit crunches. Hence, this result implies that the crunch itself has a large independent effect on future growth. This suggests that shocks become much more damaging when they affect the credit market.

Latin America is not significantly different from other regions in terms of the impact of credit crunches on growth.

We ask again whether Latin America is an exception to this conclusion. To study this question, we first introduce a Latin

American dummy to ask whether, after accounting for the control variable, there is a different growth experience in Latin America. Usually inclusion of this variable leads to a negative and significant effect, meaning that there is a “growth puzzle” in the region. However, in our framework we find no such effect. To the contrary, Latin America grows faster than would be expected, given the variables we control for (equation 10). Moreover, inclusion of this variable does not affect the estimated effect of the credit crunch dummy.

Finally we interact the Latin American dummy with the credit crunch dummy to ask whether crunches are more costly in Latin America in terms of their growth effects. We find that the equation leaves the estimated impact of the credit crunch on growth essentially unchanged and highly significant, and that Latin America is not statistically different from other regions in terms of the growth impact of credit crunches. In fact, the estimated effect is positive, implying a lower negative effect of credit crunches on growth in Latin America than elsewhere. The point estimate suggests that, elsewhere, credit crunches reduce growth by 1.5 percent, while they lower it by 1.2 percent in Latin America, although the difference is not statistically significant.

Conclusions

During the 1990s, Latin America made a very significant and deep reform effort in finance. Besides lowering inflation, improving fiscal solvency, and liberalizing international capital flows, the region privatized public banks; eliminated interest rate controls, slashed mandatory credit allocation schemes, and improved the regulation and supervision of capital adequacy requirements. This effort was predicated, in part, on the expectation that it would lead to improved access to funding. However, the region ended the 1990s mired in a severe credit crunch, arguably the worst since 1982. The problem has been endemic in the region, to an extent not seen before, and is suggestive of contagion. What interpretation should we make of it? Is this a condemnation of the financial reform efforts adopted? Or are we seeing other factors emerge?

According to our empirical results, Latin America does have a higher incidence of credit crunches, but this can be accounted for by the greater importance of terms of trade shocks, capital flow reversals, and low financial depth. The situation is aggravated by poor protection of creditor rights. The recent internationalization of bank ownership is not one of the causes of the recent credit crunch, but, in fact, it is a mitigating factor. In fact, credit crunches in Latin America are not caused by unusually risk-averse bankers.

We can see from table 4 that the average Latin American country is not particularly characterized by much higher volatility of terms of trade or capital flows than the rest of the less-developed world. However, in both cases, the figure is

Table 4
Vulnerability to credit crunch episodes

Country	Percent				Creditor rights (4)	Percent Frequency of credit crunches (5)
	Standard deviation terms of trade (1)	Standard deviation capital flows over GDP (2)	Liquid liabilities over GDP (3)	Foreign ownership of banks (% assets) (3)		
Argentina	18.0	4.1	18.5	18.8	-1	43.2
Bolivia	16.3	6.6	41.2	29.5		66.2
Brazil	33.3	3.0	26.6	5.6	-2	
Chile	41.6	8.2	38.7	4.5	-1	40.4
Colombia	11.4	2.6	33.1	14.9	-2	55.1
Costa Rica	11.5	4.0	36.5	5.4		41.5
Dominican Republic	18.6	2.6	25.8	18.6		0.0
Ecuador	37.9	7.4	27.7	6.2		
Guatemala	20.4	3.4	23.3	5.0		23.7
Honduras	9.8	4.3	29.2	21.0		7.9
Haiti	13.9	2.8	36.9			57.5
Mexico	18.4	4.2	27.3	0.9	-2	68.6
Nicaragua	35.5	19.1	26.3	36.4		
Panama	3.3	11.6	60.4	30.3		
Peru	16.5	6.3	17.7	36.9	-2	
Paraguay	22.5	4.4	27.4	38.6		50.0
El Salvador	17.7	2.5	40.1	1.1		
Uruguay	22.2	1.9	36.5	19.9		
Venezuela	24.6	4.2	24.9	21.9		59.4
Latin America	20.7	5.4	31.5	17.5	-1.67	42.8
Minimum	3.3	1.9	17.7	0.9	-2.00	0.0
Maximum	41.6	19.1	60.4	38.6	-1.00	68.6
Standard deviation	10.1	4.1	9.8	12.9	0.52	22.0
Developed countries	8.3	2.5	86.9	13.3	-0.59	10.0
Less-developed countries (excluding Latin America)	23.0	7.2	38.6	26.9	0.50	28.5
Caribbean	9.2	8.6	59.1	53.4		17.2
Middle East and North Africa	38.1	14.6	75.7	21.6		11.9
South and East Asia	16.8	4.6	60.7	26.1		14.1
Sub-Saharan Africa	29.7	6.9	27.8	37.4		38.6
Transition Economies	12.7	4.7	40.8	16.1		43.5

Notes: The values for the regions correspond to the average. (1) Over the value of 100 in 1995. (1) and (2): using available data for the 1981–2000 period. (3) Average of available values for the 1993–1997 period. (5) Frequency corresponds to the number of months with credit crunch over the total of months for which we have data. Based on: (1) and (2): Global Development Network Growth Database (Easterly and Sewaden, www.worldbank.org). (3): Barth, Caprio, and Levine (2001). (4) Beck, Levine, and Loayza (2000).

more than twice that of developed nations. Moreover, financial markets in the region are much less developed and internationalized, and creditor rights are less-than-appropriately protected. This, in turns, explains the higher incidence (or frequency) of credit crunches in the region.

This analysis suggests that, in Latin America, credit crunches most likely are triggered by declines in the supply of funds available for lending. They also seem to have a special relationship with terms of trade shocks. It may well be that expected income from export products acts as collateral for the provision of international credit. In such a situation, a

decline in the terms of trade would cause a scarcity of international collateral and, thus, would lower the supply of external finance. Moreover, declines in the terms of trade increase the probability of devaluation, negatively affecting the supply of domestic savings to the banking system. This might explain why terms of trade shocks damage credit supply so much.

Our analysis suggests that credit crunches are not just an associated secondary symptom of external shocks; they have an independent major effect on output growth. Avoiding them, even in the context of shocks, will prevent the banking system from exacerbating external disturbances. Banks that are better able to withstand shocks without generating credit collapses have important growth benefits.

Latin America has moved recently toward flexible exchange rate regimes. While some theoretical arguments suggest that this may generate a better environment to avoid credit crunches because it frees monetary policy from the constraints of maintaining a given currency peg, we find no evidence that floating regimes are better suited to avoiding credit crunches.

Capital flow reversals were a common international feature of the 1990s. The recent credit crunch probably became so widespread in the region because it was related to the Russian crisis and its impact on emerging markets. Occurring at a time when the terms of trade were falling, this credit crunch represented especially dire circumstance for domestic banking systems. Our analysis points to the need for a better understanding of the precise links between terms of trade shocks and domestic credit collapses. We need to identify which policy interventions are likely to weaken this link and allow credit to become more stabilizing, especially in bad times.

In the meantime, our findings suggest that better protection of creditor rights, a more internationalized banking system, and deeper financial markets are part of the solution. Policies aimed at achieving these goals are especially urgent in countries with the highest volatility of terms of trade and capital flows (such as Chile, Brazil, Ecuador, and Nicaragua), and the lowest financial development (Argentina, Guatemala, Peru, and Venezuela). There is ample scope for opening up the financial systems in Brazil, Chile, Costa Rica, Ecuador, Guatemala, El Salvador, and, especially, Mexico.

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Endnotes

- 1 Reforms in the financial sector in Latin America and the Caribbean were reviewed in the 1996 and 1997 Economic and Social Progress Reports of the Inter-American Development Bank.
- 2 We use monthly data for 1981–2000 from International Financial Statistics, May 2001 (CD-ROM), published by the International Monetary Fund. For the rate of growth of credit, we use the claims of deposit
- 3 Obviously, these values are arbitrary; however—although not explicitly reported here—the results do not change significantly by varying these thresholds.
- 4 Only Dominican Republic appears not to have had a crunch. This is in part due to the fact that we only have data for this country for a period of slightly more than three years, starting in November 1996. Brazil is missing from the dataset because the IFS does not have data on interest rates.
- 5 Some countries are experiencing an ongoing crunch as of the last observation, implying that the duration estimates are biased downward. Some of the countries involved are Argentina, Bolivia, Colombia, El Salvador, Paraguay, Guyana, and Belize.
- 6 Our panel of countries is not constant over time. In 1982, the year in which the debt crisis erupted in Latin America, we have only twenty-five country-month observations in Latin America, the equivalent of just over two country-years. By contrast, the recent episode has data for twelve countries. Hence, comparison to the 1982 period should be considered only indicative.
- 7 The general constant of the equation captures the average for normal periods in which there are no crunches. However, the equation also includes country and year dummies, so interpretation of the coefficient is not straightforward.
- 8 All the variables come from IMF May 2001. In the case of the money market rate, when this is not available, we use the interbank rate; when this is also unavailable, we use the discount rate.
- 9 The fact that this analysis indicates that, on average, the crunches are not deeper in Latin America suggests that the year dummies account for part of the reason why on average these crunches are larger.
- 10 For a discussion of this latter view see Calvo and Reinhardt (2001) and Hausmann, Panizza, and Stein (2001). Arteta and Eichengreen (2000) find that banking crises are not correlated with the choice of exchange rate regime.
- 11 In this way we leave aside the country-year data points when a credit crunch has already started its resolution phase but has not yet ended. We do this to focus the analysis on events that precede the phenomenon instead of those that accompany it.
- 12 We checked to see if financial depth was really capturing general features associated with the level of development. For this purpose, we ran a regression containing both the level of financial depth and the income per capita of the economy. We found that financial depth remained a large and significant determinant of crunches, while income per capita did not. We take this to mean that it is not development in general that matters for credit crunches, but financial development in particular.
- 13 Using a different definition of credit crunch, Micco and Galindo (2001) obtained a similar result.

Table a1
Credit crunch episodes identified

Country	Data available		Build-up phase				Resolution phase				Duration (years)	Depth (index)		
	from	to	from	to	from	to	from	to						
United Kingdom	1987	9	2000	12	—	—	—	—	—	—	—	—		
Switzerland	1996	11	2000	12	—	—	—	—	—	—	—	—		
Canada	1982	1	2000	11	1982	11	1983	6	1983	6	1984	11	2.0	3.2
					1986	7	1987	3	1987	3	1987	4	.8	0.8
Japan	1982	1	2000	8	—	—	—	—	—	—	—	—	—	—
Greece	1982	1	1999	12	1987	1	1987	12	1987	12	1989	3	2.2	4.6
					1990	7	1991	9	1991	9	1995	6	4.9	7.0
Iceland	1983	10	2000	12	1990	1	1990	6	1990	6	1991	2	1.1	1.3
					1993	9	1995	1	1995	1	1995	12	2.3	3.0
Malta	1995	1	2000	7	—	—	—	—	—	—	—	—	—	—
Australia	1993	3	2000	12	—	—	—	—	—	—	—	—	—	—
New Zealand	1989	10	2000	12	1990	6	1990	11	1990	11	1991	6	1.0	1.4
South Africa	1992	1	2000	11	1998	10	1999	5	1999	5	1999	12	1.2	1.3
Argentina	1994	3	2000	11	1995	4	1995	10	1995	10	1996	7	1.3	2.3
					1999	5	2000	7	2000	7	2000	11	1.5	2.4*
Bolivia	1987	12	2000	12	1988	1	1988	3	1988	3	1988	11	.8	1.7
					1993	4	1996	8	1996	8	2000	12	7.7	26.2*
Chile	1982	1	2000	12	1982	4	1983	10	1983	10	1984	8	2.3	7.2
					1985	1	1985	12	1985	12	1987	5	2.3	4.0
					1990	3	1990	12	1990	12	1991	11	1.7	3.9
					1998	11	1999	6	1999	6	1999	11	1.0	1.2
Colombia	1992	12	2000	12	1995	12	1996	10	1996	10	1997	7	1.6	3.2
					1998	8	1999	10	1999	10	2000	12	2.3	7.3*
Costa Rica	1982	12	2000	12	1986	1	1986	3	1986	3	1986	11	.8	1.2
					1988	6	1992	1	1992	1	1992	8	4.2	7.8
					1994	6	1995	8	1995	8	1995	12	1.5	5.2
Dominican Republic	1996	11	2000	12	—	—	—	—	—	—	—	—	—	—
El Salvador	1983	12	2000	12	1987	8	1988	4	1988	4	1988	5	.8	0.8
					1999	6	2000	12	2000	12	2000	12	1.5	1.6*
Guatemala	1982	2	2000	12	1991	1	1992	1	1992	1	1992	6	1.4	2.6
					1993	8	1993	11	1993	11	1994	9	1.1	1.7
					1996	9	1997	5	1997	5	1997	9	1.0	1.3
					2000	3	2000	6	2000	6	2000	10	.6	1.0
Haiti	1997	9	2000	12	1998	8	1999	7	1999	7	2000	6	1.8	2.7
Honduras	1982	12	2000	11	1999	7	2000	4	2000	4	2000	11	1.3	1.9
Mexico	1998	1	2000	11	1998	12	1999	8	1999	8	2000	11	1.9	5.8
Paraguay	1990	11	2000	12	1995	12	1999	4	1999	4	2000	12	5.0	12.3*
Venezuela	1998	4	2000	11	1998	10	1999	6	1999	6	2000	4	1.5	5.6
Antigua and Barbuda	1984	2	2000	11	—	—	—	—	—	—	—	—	—	—
Bahamas	1982	1	2000	11	—	—	—	—	—	—	—	—	—	—
Aruba	1987	1	2000	9	—	—	—	—	—	—	—	—	—	—
Barbados	1982	1	2000	10	1984	9	1985	2	1985	2	1985	12	1.3	1.5
					1990	6	1990	10	1990	10	1991	3	.8	1.1
					1991	11	1992	8	1992	8	1993	7	1.7	2.9
Dominica	1983	11	2000	11	1986	3	1986	9	1986	9	1987	4	1.1	1.7
Grenada	1983	11	2000	11	—	—	—	—	—	—	—	—	—	—
Guyana	1982	1	2000	11	1993	4	1993	5	1993	5	1993	11	.6	1.8
					1999	9	2000	7	2000	7	2000	11	1.2	1.8*
Belize	1986	7	2000	11	1993	10	1994	7	1994	7	1995	7	1.8	2.3

*The episode has not finished yet.

Table a1 (continued)

Credit crunch episodes identified

Country	Data available				Build-up phase				Resolution phase				Duration (years)	Depth (index)
	from	to	from	to	from	to	from	to						
Jamaica	1982	1	2000	11	1999	6	2000	1	2000	1	2000	11	1.4	1.8*
					1985	5	1986	6	1986	6	1987	1	1.7	3.4
					1990	6	1990	10	1990	10	1991	9	1.3	2.1
					1992	4	1992	11	1992	11	1993	3	0.9	2.0
					1994	11	1995	6	1995	6	1995	6	0.6	0.9
					1995	12	1996	9	1996	9	1997	2	1.2	2.2
					1997	6	1998	5	1998	5	1998	10	1.3	4.0
Netherlands Antilles	1982	1	2000	7	1984	8	1986	4	1986	4	1986	12	2.3	7.1
					1996	12	1997	9	1997	9	1999	10	2.8	3.9
St. Kitts & Nevis	1982	1	2000	11	1986	1	1986	2	1986	2	1986	3	0.2	0.5
					1986	11	1987	7	1987	7	1987	10	0.9	0.8
					1996	10	1997	4	1997	4	1997	6	0.7	0.7
St. Lucia	1982	11	2000	11	1983	4	1983	7	1983	7	1984	1	0.8	1.0
					1985	6	1986	3	1986	3	1986	7	1.1	1.2
St. Vincent & Grens.	1982	1	2000	11	1982	11	1983	7	1983	7	1983	8	0.8	1.7
					1985	8	1986	6	1986	6	1987	4	1.7	2.1
Trinidad & Tobago	1983	11	2000	10	1985	2	1989	4	1989	4	1990	1	4.9	7.2
					1990	5	1990	9	1990	9	1991	4	0.9	1.3
					1992	5	1995	2	1995	2	1995	9	3.3	5.4
Cyprus	1982	1	2000	12	—	—	—	—	—	—	—	—	—	
Israel	1987	1	2000	11	—	—	—	—	—	—	—	—	—	
Kuwait	1982	1	2000	12	1983	4	1983	8	1983	8	1984	4	1.0	1.5
					1992	3	1992	3	1992	3	1992	11	0.7	7.8
					1993	4	1993	11	1993	11	1993	11	0.6	1.2
Egypt	1982	1	2000	11	1992	4	1992	4	1992	4	1992	9	0.4	0.9
Yemen, Republic of	1996	11	2000	10	—	—	—	—	—	—	—	—	—	
Bangladesh	1982	1	2000	10	1991	7	1992	11	1992	11	1993	10	2.3	3.3
Myanmar	1982	1	2000	9	1982	7	1983	1	1983	1	1983	7	1.0	1.3
					1984	7	1984	12	1984	12	1985	2	0.6	0.8
					1987	12	1988	4	1988	4	1989	2	1.2	3.2
Cambodia	1995	6	2000	12	1998	10	1999	6	1999	6	1999	11	1.1	1.6
Sri Lanka	1982	3	2000	9	—	—	—	—	—	—	—	—	—	
Hong Kong SAR	1991	12	2000	11	1998	5	1999	11	1999	11	2000	11	2.5	4.4*
India	1982	1	2000	11	—	—	—	—	—	—	—	—	—	
Indonesia	1987	4	2000	8	1991	9	1993	1	1993	1	1993	6	1.8	2.0
					1999	1	1999	6	1999	6	2000	8	1.6	12.6*
Korea	1982	1	2000	11	—	—	—	—	—	—	—	—	—	
Malaysia	1982	2	2000	11	—	—	—	—	—	—	—	—	—	
Nepal	1982	1	2000	8	1982	5	1983	5	1983	5	1984	6	2.1	3.0
Philippines	1982	1	2000	11	1984	12	1986	12	1986	12	1986	12	2.0	1.1
					1991	3	1991	9	1991	9	1992	2	0.9	1.6
					1998	5	1999	1	1999	1	2000	6	2.1	4.2*
Singapore	1982	1	2000	12	—	—	—	—	—	—	—	—	—	
Thailand	1982	1	2000	12	1998	7	2000	9	2000	9	2000	12	2.4	5.0*
Botswana	1982	1	2000	12	1982	9	1982	12	1982	12	1983	5	0.7	1.5
					1985	8	1985	11	1985	11	1986	7	0.9	2.0

*The episode has not finished yet.

Table a1 (continued)

Credit crunch episodes identified

Country	Data available				Build-up phase				Resolution phase				Duration (years)	Depth (index)
	from	to	from	to	from	to	from	to						
					1995	1	1996	7	1996	7	1997	9	2.7	4.5
Cape Verde	1994	9	2000	11	—	—	—	—	—	—	—	—		
Central African Rep.	1989	7	2000	10	1990	10	1993	9	1993	9	1994	11	4.1	14.2
					1996	1	1997	7	1997	7	2000	7	4.5	8.6
Chad	1989	6	2000	10	1989	11	1991	5	1991	5	1992	2	2.3	4.9
					1992	7	1993	1	1993	1	1994	9	2.2	8.4
					1996	3	1996	4	1996	4	1997	2	.9	2.0
					1997	10	1998	3	1998	3	1999	2	1.3	3.6
					1999	10	2000	10	2000	10	2000	10	1.0	2.1*
Congo, Republic of	1990	8	2000	10	1991	7	1993	1	1993	1	1993	12	2.4	11.0
					1996	3	1996	6	1996	6	1997	3	1.0	1.3
					1997	7	1998	7	1998	7	1998	12	1.4	2.8
					2000	1	2000	1	2000	1	2000	4	.3	0.4
Ethiopia	1986	11	2000	5	1989	11	1990	4	1990	4	1991	7	1.7	2.8
Gabon	1982	1	2000	10	1987	2	1993	2	1993	2	1994	12	7.8	22.0
					1996	1	1996	7	1996	7	1997	2	1.1	3.3
					1998	9	2000	2	2000	2	2000	10	2.1	5.3*
Gambia, The	1985	12	2000	9	1986	1	1992	8	1992	8	1993	5	7.3	19.3
					1994	7	1996	6	1996	6	1997	8	3.1	10.3
					1998	10	1999	6	1999	6	1999	7	.8	1.3
					2000	9	2000	9	2000	9	2000	9	.0	0.2*
Kenya	1982	1	2000	12	1983	1	1983	8	1983	8	1984	11	1.8	2.2
					1987	4	1987	4	1987	4	1988	3	.9	1.2
					1990	5	1990	11	1990	11	1991	2	.8	1.0
					1993	7	1994	3	1994	3	1995	1	1.5	4.1
					1996	10	1997	6	1997	6	1997	8	.8	1.0
					1997	12	1999	2	1999	2	2000	12	3.0	6.5*
Lesotho	1982	1	2000	12	1983	3	1983	5	1983	5	1983	7	.3	0.8
					1986	9	1987	3	1987	3	1987	4	.6	0.8
					1989	5	1989	5	1989	5	1989	9	.3	0.4
					1995	7	1996	6	1996	6	1997	4	1.8	4.7
					1997	10	1998	9	1998	9	2000	12	3.2	5.2*
Malawi	1982	1	2000	10	1984	6	1985	5	1985	5	1986	4	1.8	5.3
					1986	8	1987	10	1987	10	1988	5	1.8	4.4
					1993	4	1993	10	1993	10	1994	7	1.3	4.2
					1995	7	1996	4	1996	4	1998	4	2.8	9.3
					1999	8	1999	12	1999	12	2000	10	1.2	3.3*
Mauritius	1982	1	2000	11	1995	6	1996	4	1996	4	1997	5	1.9	2.7
Mozambique	1998	7	2000	12	—	—	—	—	—	—	—	—		
Nigeria	1992	11	1999	12	—	—	—	—	—	—	—	—		
Zimbabwe	1986	9	2000	12	1993	8	1993	11	1993	11	1993	11	.3	0.6
					1994	12	1995	5	1995	5	1995	12	1.0	1.6
					1996	12	1997	7	1997	7	1997	10	.8	2.4
					1999	4	1999	11	1999	11	2000	12	1.7	6.6*
Sao Tome & Principe	1996	12	1999	12	1999	11	1999	12	1999	12	1999	12	.1	0.3*
Seychelles	1997	2	2000	9	—	—	—	—	—	—	—	—		
Sierra Leone	1993	1	2000	11	1993	12	1994	10	1994	10	1998	7	4.6	10.5
					1998	12	1999	10	1999	10	2000	11	1.9	4.5*
Namibia	1991	12	2000	12	1998	7	1999	6	1999	6	2000	5	1.8	2.9
Swaziland	1982	1	2000	11	1982	9	1983	2	1983	2	1983	3	.5	0.7
					1983	8	1983	8	1983	8	1984	1	.4	0.5

* The episode has not finished yet.

Table a1 (continued)

Credit crunch episodes identified

Country	Data available		Build-up phase				Resolution phase				Duration (years)	Depth (index)		
	from	to	from	to	from	to	from	to						
			1984	6	1985	2	1985	2	1986	12	2.5	2.3		
			1992	7	1992	11	1992	11	1993	10	1.3	2.4		
			1995	11	1996	8	1996	8	2000	4	4.4	7.1		
Tanzania	1993	6	2000	11	1994	10	1996	5	1996	5	1997	7	2.8	17.4
					2000	3	2000	11	2000	11	2000	11	.7	1.4*
Uganda	1995	5	2000	12	1997	3	1998	1	1998	1	1998	3	1.0	2.5
					1999	10	2000	6	2000	6	2000	12	1.2	1.8
Zambia	1992	12	2000	10	1996	12	1998	1	1998	1	1998	12	2.0	8.9*
					1999	5	2000	3	2000	3	2000	9	1.3	2.3
Solomon Islands	1982	1	2000	10	1983	8	1984	3	1984	3	1984	7	.9	2.2
					1986	12	1987	3	1987	3	1987	12	1.0	2.2
					1990	7	1991	5	1991	5	1993	7	3.0	8.9
					1996	7	1997	6	1997	6	1997	12	1.4	1.8
					1999	8	1999	8	1999	8	1999	12	0.3	0.5
Fiji	1982	11	2000	12	1987	12	1988	7	1988	7	1989	1	1.1	2.6
					1996	12	1998	8	1998	8	1999	12	3.0	5.5
Vanuatu	1982	7	2000	12	1982	11	1983	9	1983	9	1983	12	1.1	2.1
					1984	4	1986	4	1986	4	1987	8	3.3	6.8
					1988	7	1988	9	1988	9	1988	12	.4	0.8
					1991	2	1991	2	1991	2	1992	1	.9	1.5
					1993	9	1994	5	1994	5	1995	1	.3	2.0
					1995	7	1995	10	1995	10	1995	11	.3	0.4
					1997	2	1997	7	1997	7	1998	1	.9	1.6
					2000	3	2000	12	2000	12	2000	12	.8	0.8*
Papua New Guinea	1983	12	2000	6	1990	5	1994	2	1994	2	1994	11	4.5	8.0
					1995	10	1996	9	1996	9	1996	12	.2	1.9
					1999	3	1999	11	1999	11	2000	6	.3	2.4*
Samoa	1983	12	2000	12	1985	1	1985	6	1985	6	1985	8	.6	0.8
					1987	1	1987	2	1987	2	1987	4	.3	0.4
					1989	1	1989	10	1989	10	1989	12	.9	1.5
					1991	11	1992	2	1992	2	1992	3	.3	0.5
					1994	4	1994	12	1994	12	1995	3	.9	1.6
Armenia	1996	3	2000	12	1999	8	2000	1	2000	1	2000	12	.3	3.1*
Georgia	1996	11	2000	12	1998	9	1998	10	1998	10	1998	12	.3	0.5
					2000	1	2000	2	2000	2	2000	3	.2	0.4
Czech Republic	1994	1	2000	11	1998	2	2000	2	2000	2	2000	11	2.8	4.8*
Slovak Republic	1997	1	2000	11	1998	9	2000	4	2000	4	2000	11	2.2	6.1*
Estonia	1995	1	2000	12	1998	12	1999	4	1999	4	1999	11	.9	1.6
Latvia	1994	7	2000	12	1995	4	1996	4	1996	4	1997	2	.8	11.6
Lithuania	1994	10	2000	12	1996	1	1996	9	1996	9	1997	10	.8	4.6
					2000	3	2000	8	2000	8	2000	12	.8	1.8*
Croatia	1994	12	2000	12	1996	12	1996	12	1996	12	1997	5	.4	0.9
					1999	5	2000	1	2000	1	2000	11	.5	3.1*
Slovenia	1992	12	2000	12	1993	12	1994	1	1994	1	1994	11	.9	1.9
					1997	1	1997	6	1997	6	1998	2	.1	1.2
Macedonia, FYR	1994	12	2000	9	2000	3	2000	5	2000	5	2000	9	.5	0.9
Poland	1993	1	2000	12										

* The episode has not finished yet.

This table includes only the crunches that had not started before we have data.

Table a2
Anatomy of credit crunches regressions

Dependent variable	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
	Net flow		Nominal private credit growth (YoY)		Nominal lending rate) (Avg. prev.12 months)	
Previous 3 months	-0.07714	-13.058	-0.0596	-9.516	0.01753	7.188
Build-up phase	-0.25662	-70.962	-0.23548	-61.421	0.02113	14.152
Resolution phase	-0.26221	-67.656	-0.23552	-57.321	0.02668	16.673
Following 3 months	-0.066	-11.047	-0.05039	-7.956	0.01561	6.326
Previous 3 months / Latin America interaction	0.03126	1.983	0.06803	4.071	0.03676	5.648
Build-up phase / Latin America interaction	0.02622	3.057	0.09492	10.437	0.0687	19.395
Resolution phase / Latin America interaction	0.02033	2.055	0.03818	3.64	0.01785	4.371
Following 3 months / Latin America interaction	0.02103	1.182	0.0292	1.548	0.00817	1.112
Latin America	-0.18504	-5.424	-0.47698	-13.189	-0.29194	-20.726
# Obs	14204		14204		14204	
R ²	0.5148		0.5089		0.7546	
	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
	Credit to central government/total credit		Total deposits growth (YoY)		Total deposits / total credit	
Previous 3 months	-0.00397	-0.981	-0.02624	-4.367	-0.02355	-2.863
Build-up phase	0.0113	4.559	-0.0569	-15.153	0.01842	3.66
Resolution phase	0.05699	21.398	-0.03364	-8.373	0.0966	17.872
Following 3 months	0.04082	9.962	0.01666	2.676	0.0449	5.394
Previous 3 months / Latin America interaction	-0.01102	-1.039	-0.0289	-1.978	-0.00507	-0.236
Build-up phase / Latin America interaction	0.00393	0.681	-0.01934	-2.409	0.00391	0.334
Resolution phase / Latin America interaction	-0.01616	-2.427	-0.04055	-4.368	-0.04157	-3.084
Following 3 months / Latin America interaction	-0.01554	-1.3	-0.00978	-0.588	-0.02878	-1.189
Latin America	0.06993	2.704	-0.32355	-5.757	0.54151	13.091
# Obs	13652		11532		13585	
R ²	0.7504		0.2202		0.831	

OLS regressions. The independent variables correspond to dummies associated with the timing of each credit crunch and the Latin American region. All regressions include both year and country dummies, and a constant.

Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Real private credit growth (YoY)		Real lending rate		Real deposit rate		Real money market rate		Reserves / deposits	
-0.05581	-8.069	-0.45346	-0.399	-0.45967	-0.402	0.02674	0.85	-0.00053	-0.112
-0.21939	-51.625	-0.43049	-0.62	-0.45302	-0.643	0.03784	1.966	-0.00102	-0.349
-0.21401	-46.956	-0.36893	-0.496	-0.37948	-0.508	-0.00263	-0.129	0.0058	1.852
-0.03446	-4.814	-0.3246	-0.28	-0.32478	-0.281	-0.02433	-0.752	0.02253	4.693
0.05062	2.974	0.41353	0.148	0.39442	0.142	0.04307	0.499	0.01579	1.259
0.08817	9.465	0.44112	0.289	0.43381	0.285	-0.03281	-0.713	0.02106	3.081
0.04628	4.292	0.56864	0.321	0.5575	0.317	-0.01642	-0.305	-0.00505	-0.641
0.00341	0.176	0.51151	0.161	0.51147	0.162	0.0157	0.169	-0.01527	-1.079
-0.1618	-2.951	-0.23507	-0.038	-0.25017	-0.041	-0.29385	-2.26	-0.388	-14.316
12140		12247		11686		7054		13784	
0.37		0.0071		0.0072		0.0349		0.5345	

Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat	Coefficient	t-stat
Credit minus deposits growth (YoY)		Lending–money market rate spread		Deposit–money market rate spread		Lending–deposits rate spread		Total credit over capital ratio	
-0.0091	-1.506	-0.0011	-0.413	-0.00187	-0.86	0.00621	4.206	0.87692	0.554
-0.09573	-25.731	0.00877	5.408	0.00082	0.607	0.012	13.195	0.24279	0.246
-0.09561	-23.871	0.01286	7.477	0.00126	0.889	0.01406	14.597	-0.11031	-0.101
-0.03025	-4.829	0.00993	3.642	0.00228	1.025	0.00906	6.069	-0.10502	-0.065
0.05846	4.024	0.01223	1.681	-0.00775	-1.316	0.01958	5.461	1.48628	0.406
0.0742	9.315	0.0074	1.907	0.00095	0.303	0.01936	9.852	-1.85923	-0.921
0.03111	3.375	0.00673	1.483	0.00627	1.707	0.01022	4.503	2.20874	0.943
0.01414	0.856	-0.0152	-1.941	0.00124	0.195	-0.00962	-2.366	4.08554	0.984
-0.16601	-3.564	0.17792	16.239	-0.0006	-0.056	0.0321	4.079	49.8887	3.576
11532		7054		6746		11686		9389	
0.1745		0.6084		0.5319		0.707		0.0651	

Table a3

Credit crunches: Causes and consequences regressions

	(1)	(2)	(3)	(4)	(5)
	Credit crunch dummy	Credit crunch dummy	Credit crunch dummy	Credit crunch dummy	Credit crunch dummy
Dependent variable	Marginal effect on probability	Marginal effect on probability	Marginal effect on probability	Marginal effect on probability	Marginal effect on probability
Terms of trade change (%)	-0.3067763* (0.16)	-0.439686** (0.22)	-0.1470347** (0.18)	-0.439686** (0.22)	-0.1096331 (0.22)
Liquid liabilities over GDP	-0.4156362** (0.07)	-0.5892884** (0.24)	-0.0358413** (0.04)	-0.5892884** (0.24)	-0.5649392** (0.23)
Change in capital flows (absolute, in billion US\$)	-0.0132** (0.0051)	-0.0232** (0.0083)	-0.00152** (0.0017)	-0.0232** (0.0083)	-0.0181** (0.0084)
Latin America dummy				-0.0355899 (0.33)	0.0080748 (0.24)
Latin America/terms of trade					2.486826** (0.79)
Latin America/change in capital flows interaction					-0.0357 (0.038)
Latin America/credit crunch dummy interaction					
Floating exchange rate regime dummy					
Floating rate/terms of trade change interaction					
Floating rate/change in capital flows interaction					
Creditor rights			-0.0121303** (0.013)		
Foreign ownership of banks (share of assets)			-0.0574* (0.063)		
Credit crunch dummy					
Gross domestic investment (% of GDP)					
Inflation rate (annual %)					
Volume of trade (% of GDP)					
Ln (per capita GDP)					
Country fixed effects	No	Yes	No	Yes	
Year fixed effects	No	Yes	No	Yes	Yes
Constant	Yes	Yes	Yes	Yes	Yes
Estimation method	Probit	Probit	Probit	Probit	Probit
# of observations	536	402	151	402	402
R ²	—	—	—	—	—
Likelihood ratio	43.8	96.3	47.6	96.3	108.9
Log likelihood	-230	-168	-27	-168	-162

The independent variables correspond to the year before a credit crunch episode begins its resolution phase (the net flow reaches -12%).

Standard deviations in parentheses. * Significant at 10%. ** Significant at 5%.

Data sources: Credit Crunch Dummy: Author's calculation (see text).

Change in Capital Flows: Author's calculation based on IFS's data on Current Account Deficit and Reserves accumulation.

Floating Exchange Rate Regime Dummy (de facto classification): Levi-Yeyati and Sturzenegger (2001)

Creditor Rights: Beck, Levine, and Loayza (2000). Liquid Liabilities and Foreign Ownership of Banks: Barth, Caprio, and Levine (2001).

All other variables: Global Development Network Growth Database (Easterly and Sewaden, www.worldbank.org)

(6)	(7)	(8)	(9)	(10)	(11)
Credit crunch dummy	Credit crunch dummy	Per capita GDP growth	Per capita GDP growth	Per capita GDP growth	Per capita GDP growth
Marginal effect on probability	Marginal on probability	(percentage points) coefficient	(percentage points) coefficient	(percentage points) coefficient	(percentage points) coefficient
-1.112648** (0.38)	-1.069206** (0.44)	3.738916** (1.73)	4.320822** (1.74)	3.738916** (1.73)	3.788142** (1.74)
-0.4351395 (0.32)	-0.4351649 (0.32)	17.03576** (3.50)	19.22323** (3.78)	19.34029** (3.74)	19.31021** (3.75)
-0.025** (0.0101)	-0.019 (0.0114)	0.0918** (0.0330)	0.0924** (0.0333)	0.0918** (0.0330)	0.0922** (0.0330)
			23.604480 ** (5.84)	23.424850** (5.79)	23.373040** (5.80)
					0.356938 (1.16)
0.0343952 (0.098)	0.0195668 (0.10)				
	-0.2062762 (0.83)				
	-0.026 (0.027)				
		-1.400014** (0.49)		1.400014** (0.49)	-1.479315** (0.55)
		-0.0758674** (0.04)	-0.0786505** (0.04)	-0.0758674** (0.04)	-0.0756794** (0.04)
		-0.0690789** (0.02)	-0.0724335** (0.02)	-0.0690789** (0.02)	-0.069152** (0.02)
		0.0841325** (0.02)	0.0828346** (0.02)	0.0841325** (0.02)	0.0840813** (0.02)
		-8.909049** (1.73)	-8.587262** (1.74)	-8.909049** (1.73)	-8.910358** (1.73)
Yes	Yes	Yes	Yes	Yes	Yes Yes
Yes	Yes	Yes	Yes	Yes	Yes
Yes	Yes	Yes	Yes	Yes	Yes
Probit	Probit	OLS	OLS	OLS	OLS
232	232	483	483	483	483
0.41	0.41				
65.1	66.1	—	—	—	—
-105	-105	—	—	—	—

Table a4
Summary statistics

Variable	Obs	Mean	Std. dev.	Min	Max
Credit crunch dummy	402	0.228856	0.42062	0	1
Terms of trade change (%)	402	0.004005	0.102921	-0.37829	0.632445
Liquid liabilities over GDP	402	0.453688	0.212249	0.074252	1.120607
Change in capital flows (absolute, in US\$ billion)	402	0.044501	2.683443	-32.0875	15.26095

Corresponds to the sample used in equations (2), (4) and (5).

Variable	Obs	Mean	Std. dev.	Min	Max
Per capita GDP growth	483	2.312102	3.952235	-19.8164	22.87266
Terms of trade change (%)	483	0.005585	0.095755	-0.37829	0.632445
Liquid Liabilities over GDP	483	0.527134	0.335059	0.074252	1.913605
Change in capital flows (absolute, in US\$ billion)	483	0.087279	4.805123	-35.3600	52.5600
Credit crunch dummy	483	0.153209	0.360562	0	1
Gross domestic investment (% of GDP)	483	24.86931	9.893812	7.697408	89.24961
Inflation rate (annual %)	483	10.27114	10.05635	-9.80876	84.22195
Volume of trade (% of GDP)	483	81.51621	60.91967	13.49666	402.4977
Ln (per capita GDP)	483	7.957774	0.940911	5.611567	9.771327

Corresponds to the sample used in equations (8) to (11).

Data sources: Credit crunch dummy: Author's calculation (see text).

Change in capital flows: Author's calculation based on IFS's data on current account deficit and reserves accumulation.

Floating exchange rate regime dummy (de facto classification): Levi-Yeyati and Sturzenegger (2001)

Creditor rights: Beck, Levine, and Loayza (2000). Liquid liabilities and foreign ownership of banks: Barth, Caprio, and Levine (2001).

All other variables: Global development network growth database (Easterly and Sewaden, www.worldbank.org)

