

ARE CREDIT BOOMS IN EMERGING MARKETS A CONCERN?

Credit has expanded rapidly in several emerging market countries in the recent past. For example, real credit to the private sector has grown faster than 20 percent a year in some east Asian and eastern European countries in the past two years. While these rapid credit expansions have generally been associated with cyclical upturns, favorable external financing conditions, financial deepening, or improved medium-term prospects (or some combination thereof), they have raised concerns because of the role of excessive credit growth in previous financial crises in emerging markets. This chapter focuses on the following key questions.

- What are the main reasons for rapid credit growth? What are the roles of balance sheet effects and shifts in the price and production of nontradable goods relative to tradable goods?
- What do credit booms look like? Are they more strongly associated with consumption or investment booms? How is the composition of banks' assets and liabilities affected? What happens to the nontradable corporate sector?
- How risky are credit booms in emerging market countries? Are they associated with typical cyclical fluctuations, or do they usually entail sharp economic downturns and financial crises? How should policymakers respond?

This chapter studies credit booms in emerging markets between 1970 and 2002. Building on the growing theoretical literature, the following section discusses how credit booms differ from other episodes of rapid credit growth. An empirical definition of credit booms is then proposed, and stylized facts regarding the behavior of macroeconomic, financial, and firm-level vari-

ables during credit booms are developed. The final section presents some conclusions and policy implications.

What Are Credit Booms and How Are They Propagated?

Credit can grow rapidly for three reasons: financial deepening (trend), normal cyclical upturns, and excessive cyclical movements ("credit booms"). This section examines the main factors behind credit booms and the principal propagation mechanisms behind such booms. At the outset, it is important to recognize that credit typically grows more quickly than GDP as an economy develops, a process known as financial deepening. Indeed, over 30 years ago, Goldsmith (1969) pointed out that the level of financial intermediation moved in tandem with the level of development of an economy (Figure 4.1). One issue that Goldsmith did not address, however, was the direction of causality—does economic development lead to more financial deepening or does financial deepening spur economic development? A large literature has tried to address this issue and by now most of the evidence favors the view that a more developed financial sector helps to boost economic growth (see Box 4.1). The challenge is then how to foster the development of the financial sector. There is a consensus that, in addition to a well-planned process of financial liberalization, improvements of the domestic legal system and transparency are of critical importance.¹

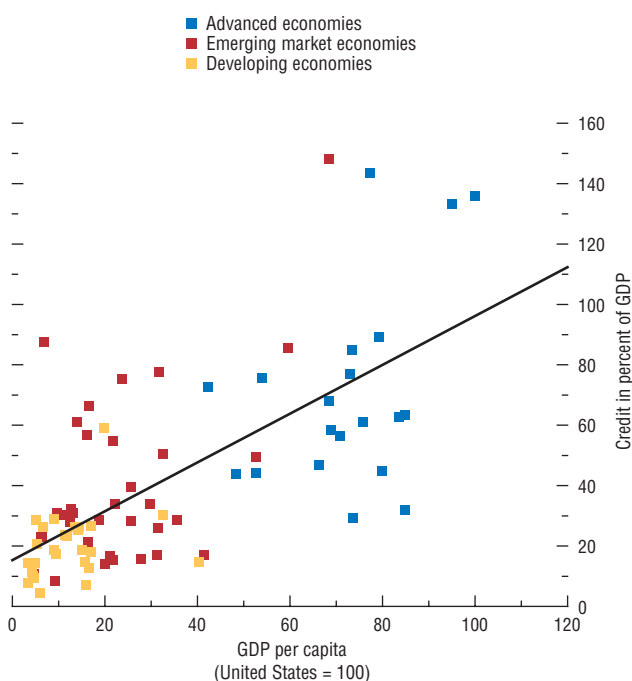
Beyond financial deepening, credit can temporarily expand more rapidly than GDP because firms' investment and working capital needs fluctuate

Note: The main author of this chapter is Marco Terrones, with support from Enrique Mendoza. Bennett Sutton provided research assistance.

¹However, the implementation of these changes is not easy as there is often stiff opposition from those interest groups that profit from the status quo.

Figure 4.1. Financial Deepening and Development¹

Financial development and economic development move in tandem.



Sources: IMF, *International Financial Statistics*; and Penn World Tables.
¹Average values 1970–2000.

tuate with the cycle. In some emerging market countries, working capital—i.e., funds needed to pay in advance for production inputs—can constitute a large part of total credit (60 percent of loans in Indonesia).² To the extent that credit is associated with larger fluctuations in private absorption than output, because export firms tend to be larger and much less dependent on bank credit (Tornell and Westermann, 2003), credit and the current account balance in these economies would move in opposite directions. These possibly large fluctuations are not unusual as they are induced by the need for investment and working capital financing.

By contrast, an excessive credit expansion (a “credit boom”) is one that is unsustainable and eventually collapses of its own accord.³ One important and familiar mechanism that can lead to a credit boom is the financial accelerator, where shocks to asset prices get amplified through balance sheet effects.⁴ The financial accelerator results from financial market imperfections, which can arise from information asymmetries, institutional shortcomings, or perverse incentives facing borrowers and lenders, and which imply that borrowers may face constraints.⁵

²Fuerst (1995) and Oviedo (2004) study how, in economies with working capital, credit, output, and demand tend to move together.

³Excessive credit expansions can be the result of many factors, including herding behavior by banks (Kindleberger, 2000); agency problems that lead to the implementation of lending policies by some banks that may be affected by others (Peterson and Rajan, 1995); explicit or implicit government guarantees (Corsetti, Pesenti, and Roubini, 1999); and lack of credible economic policies (Calvo, 1986), among others.

⁴Fisher (1933) and Keynes (1932) provide two early examples of the financial accelerator. More recently, Bernanke and Gertler (1995); Bernanke, Gertler, and Gilchrist (1996); Kiyotaki and Moore (1997); and Aiyagari and Gertler (1999) have developed modern versions of the financial accelerator.

⁵Similar financial frictions have been emphasized by the literature on emerging market crises. See, for instance, Allen and others (2002); Aghion, Bacchetta, and Banerjee (2000); Caballero and Krishnamurthy (2001); Calvo (1998); Cespedes, Chang, and Velasco (2000); Edison, Luangaram, and Miller (2000); Mendoza (2003); Mendoza and Smith (2003); Paasche (2001); and Christiano, Gust, and Roldos (2002).

Box 4.1. Does Financial Sector Development Help Economic Growth and Welfare?

As economies grow and develop, so do financial markets and institutions. But which way does causality go? In principle, it could be both ways. As the economy grows and becomes more complex, a demand for various financial services emerges, and the financial sector may simply develop to fulfill that demand. In this framework, growth depends only on technological progress and the availability of factors of production (Solow, 1956). By contrast, Schumpeter (1949) emphasized that finance is necessary to channel resources to entrepreneurs, by observing that “*He can only become an entrepreneur by previously becoming a debtor . . .*” In a similar vein, Gerschenkron (1962) highlighted the essential role of banks in financing industrialization in continental Europe.

A rapidly growing body of research takes advantage of the most recent advances in economic theory, empirical methodologies, and data collection to shed light on whether financial development can stimulate growth.¹ This box provides a selected survey of this work.

Overall, two conclusions can be drawn:

- the view that financial sector development accelerates general economic growth tends to be supported by theoretical and empirical studies, and
- policies to foster financial development through financial liberalization, though, need to be undertaken alongside institutional reforms, because otherwise they may increase financial fragility.

Theoretical Insights

Key frameworks in considering the interaction between finance and growth are the following.

- Providing financial services, such as insurance and screening of investment projects, involves fixed costs. These costs decline as the economy develops, while the availability

of more financial services, in turn, increases investment, growth, and welfare. Thus, finance and growth reinforce each other, creating a virtuous circle (Greenwood and Jovanovic, 1990).

- Another virtuous circle between finance and growth can occur because, as more investment projects are undertaken, it is easier to diversify risk through financial markets, and more money is invested (Acemoglu and Zilibotti, 1997). In this framework, if starting a firm requires a sizable upfront cost, then too few firms are established and financial markets develop too slowly if there is no policy intervention.
- While these approaches point to the mutually beneficial interaction between finance and growth, others suggest that financial development may *decrease* growth while it improves economic welfare. This may occur if, for example, the introduction of insurance markets reduces precautionary savings, curtailing the resources available to finance investment (Devereux and Smith, 1994).

Empirical Studies

Three basic approaches have been used to test whether financial development causes growth: regressions of growth on financial development indicators, a more disaggregated approach that exploits differences in sectoral data, and an approach that uses data to calibrate an explicit theoretical model.

- *Regressions of growth on financial development.* Economic growth is regressed on the initial level of financial depth, measured by the ratio of broad money to GDP or the ratio of credit to the private sector to GDP, while controlling for the traditional determinants of growth (King and Levine, 1993). The results are typically that financial development does cause growth, although some questions remain about the robustness of the results (Favara, 2003). The effects also appear to be large: increasing financial depth, measured by the ratio of M2 to GDP, from 20 percent (the mean of the slowest-

Note: The main authors of this box are Enrica Detragiache and Kenichi Ueda.

¹Levine (1997) is an early survey of this literature.

Box 4.1 (concluded)

growing quartile of countries) to 60 percent (the mean of the fastest-growing quartile of countries) would increase output growth by 1 percent a year. Moreover, the evidence suggests that financial development seems to affect growth by increasing productivity, rather than capital accumulation or savings (Beck, Levine, and Loayza, 2000).

- *A disaggregated approach.* Another strategy to minimize concerns of reverse causality is to exploit differences in the corporate financial structure. Some industries are unable to meet their investment needs through internally generated cash and depend crucially on external resources provided by financial markets. If financial development affects economic growth, then these industries should grow more slowly than others in countries with less-developed financial markets, a prediction borne out by the data (Rajan and Zingales, 1998). A related finding is that economies with more developed financial markets tend to specialize in sectors more dependent on financial markets in the long run, and to allocate more resources to sectors with higher growth opportunities in the short run (Fisman and Love, 2003).
- *Calibration exercises.* With this approach, a specific theoretical model of the interaction between finance and growth is simulated using numerical parameters estimated from country data. The advantage is that a specific theory of how finance affects growth can be tested. In addition, it does not utilize standard cross-country regressions, which are not well suited to study the transitional phenomena, such as the effect of financial deepening on growth, which occur while the economy is catching up toward its long-run growth path. Calibration exercises are still at an early stage, but have found evidence supporting theories in which financial deepening and growth mutually reinforce each other (Townsend and Ueda, 2003).

*Policies to Promote Financial Development:
Some Caveats*

If finance does cause growth, then policymakers should promote financial development and, at a minimum, not stifle it through financial repression, as long advocated by McKinnon (1973). But how should financial development be promoted? How should the transition away from financial repression be carried out? In practice, liberalizing repressed financial markets has not been easy.

- In a number of countries, lax supervision and rudimentary regulation of newly liberalized financial institutions, often combined with a volatile macroeconomic environment, have led to a proliferation of banking sector problems and numerous systemic crises (Lindgren, Garcia, and Saal, 1996; Caprio and Klingebiel, 2003).
- Econometric studies have shown that banking crises are more likely in countries with liberalized credit markets, the more so the weaker the institutional environment (Demirgüç-Kunt and Detragiache, 1999). In addition, banking crises tend to depress financial development indicators, undoing some of the benefits of financial liberalization.
- The stock market boom-bust cycles in emerging markets are more pronounced in the early aftermath of liberalization, although the opposite is true in the long run (Kaminsky and Schmukler, 2003).

While policies to foster financial development by liberalizing financial markets can yield substantial benefits in terms of higher growth, financial liberalization and institutional reform should proceed apace. Strong supporting institutions, such as appropriate prudential regulation and supervision of banks and securities markets, strong creditor rights, contract enforcement, and good accounting practices, are needed to limit financial fragility. However, an excessive emphasis on institution building as a precondition to financial liberalization may prevent the process from ever getting started.

For example, over-optimism about future earnings could boost asset valuations, which enhances the net worth of firms that hold the assets, which in turn increases firms' capacities to borrow and spend. However, this process is unsustainable to the extent that performance cannot satisfy these over-optimistic expectations, which then get revised down, depressing asset prices and pushing the financial accelerator into reverse.

Recent work has emphasized that balance sheet effects can result not only from shocks to asset prices but also from shocks to the prices of goods and services (Calvo and Mendoza, 2000; and Caballero and Krishnamurthy, 2001).⁶ As the supply of nontradable goods is less price elastic than that of tradables, which can be readily obtained from the rest of the world, the focus here is on the price of nontradables relative to tradables. An increase in the relative price of nontradables could result from an increase in demand triggered by, say, a surge in capital inflows. If firms that produce nontradables are highly leveraged and tend to borrow in foreign currency (or in de facto foreign currency-indexed instruments), then this increase in relative price improves their earnings and strengthens their balance sheets, so that lenders are willing to provide additional financing to expand investment and production (the "financial accelerator").⁷ However, as capital inflows wane, relative prices fall back, reversing the process and causing lenders to seek to substantially reduce their exposure (the accelerator working in reverse).⁸

⁶Indeed, Fisher (1933) was the first one to recognize the possibility that asset and good prices could fall into a downward spiral (the so-called "Fisherian deflation").

⁷The existence of liability dollarization and highly leveraged firms is a key requirement for observing large credit expansions in response to an increase in the relative price of nontradables; see Mendoza and Terrones (2004).

⁸Banks are also affected by liability dollarization as they borrow in foreign currency and lend in domestic currency (see, for instance, Choi and Cook, 2002).

⁹This threshold is motivated by the fact that, if the yearly credit deviations from trend were normally distributed, there would be a 5 percent probability of observing these extreme values. The results are robust to using thresholds of 1.5 and 2.

¹⁰This is a commonly used filter that generates a smooth long-term trend of a given series. The filter requires the specification of a penalty parameter that depends on the frequency of the series. For annual series, this parameter is usually set at 100. This methodology requires long time series (i.e., in excess of two decades for yearly data) to draw sensible conclusions.

¹¹Credit can grow rapidly for three reasons: financial deepening, normal cyclical upturns, and excessive cyclical movements, only the last of which constitutes a credit boom. Empirically, credit booms are identified as large deviations from trend, so they usually require a deceleration in credit growth.

What Do Credit Booms Look Like?

This section examines credit booms in 28 emerging market economies during the period from 1970 to 2002 (see Appendix 4.1). For the empirical analysis, a credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around trend by a factor of 1.75.⁹ Following the literature on credit booms, the trend is estimated here using the Hodrick-Prescott (H-P) filter.¹⁰ Once a credit boom is identified, the macroeconomic and financial conditions that prevailed before, during, and after these episodes are examined. To gauge the robustness of the results, the behavior of the typical credit boom (the median) is shown along with that of the upper and lower quartiles.

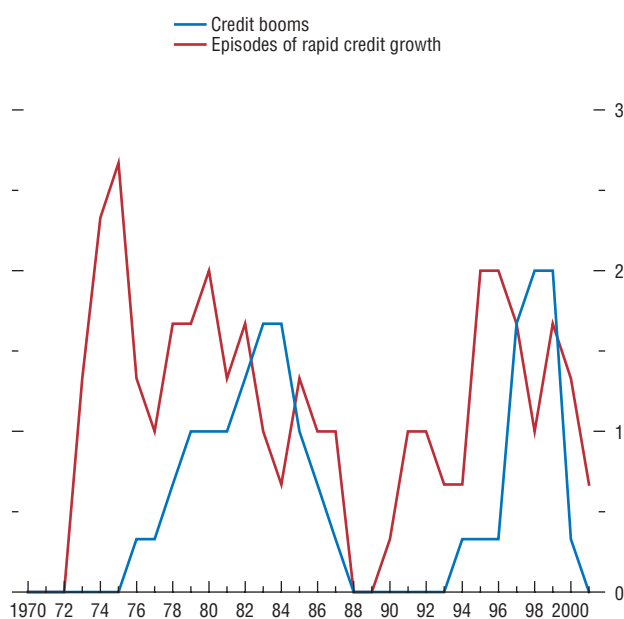
Credit booms in emerging market countries have five key characteristics.

- *They are much less common than episodes of rapid credit growth.* The sample contains 18 credit booms, so the probability of observing a credit boom in a given country and year is close to 3 percent. By contrast, there are 36 episodes of rapid credit growth (defined as periods where average real credit growth over three years exceeded the median rate of real credit growth in credit booms—17 percent; see Appendix 4.1). Only one-fourth of these episodes were credit booms (Figure 4.2).¹¹
- *They are synchronized across countries.* About 40 percent of the credit booms were observed in east Asia, mostly bunched around the crisis of the late 1990s, and 35 percent in Latin America, mostly around the time of the debt

Figure 4.2. Credit Booms Versus Episodes of Rapid Credit Growth

(Number of episodes; 3-year moving average)

Credit can grow rapidly for three reasons: financial deepening, normal cyclical conditions, and excessive cyclical movements (credit booms). In fact, credit booms are much less common than episodes of rapid credit growth.



Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

crises of the early 1980s (Figure 4.3). This synchronization of credit booms across countries suggests that common influences on capital flows and financial liberalization likely played important roles. Indeed, credit booms were preceded by strong capital inflows more than half of the time, by financial liberalization about one-sixth of the time, and by both, about one-tenth of the time (Table 4.1). By contrast, capital inflows played a smaller role in episodes of rapid credit growth.

- *They are somewhat asymmetric.* The duration of the average boom is three and a half years, with a range of two to five years.¹² The buildup phase has an average duration of two years, while the ending phase has a duration of one and a half years. In the buildup phase of the boom, real credit gradually increases above trend, reaching a median deviation from trend of 25 percent at the peak (Figure 4.4), before falling below trend at the end of the episode. The deviations from trend are sometimes very large, as highlighted by the upper and lower quartile lines.
- *There is almost a 70 percent probability that a credit boom coincides with either a consumption or investment boom. However, the probability that a credit boom coincides with an output boom is less than 50 percent.* This finding suggests that credit booms are often associated with unusually large movements—i.e., fluctuations in excess of 1.75 standard deviations—in private absorption and to a lesser extent in output (and deterioration in the current account balance).
- *They are often associated with banking and currency crises.*¹³ About 75 percent of the credit

¹²Duration here is measured as the number of years real credit exceeds its trend by at least one standard deviation, provided that this observation qualifies as, or is contiguous to, a boom. By contrast, episodes of rapid credit growth lasted six years on average.

¹³Information on banking and currency crises has been taken from Demirgüç-Kunt and Detragiache (2002); and Eichengreen and Bordo (2002). Because of difficulties in precisely timing these crises, in some cases a crisis preceded the peak of the boom. Finally, given the small number of credit booms that were not associated with crises, it is difficult to draw useful inferences from them.

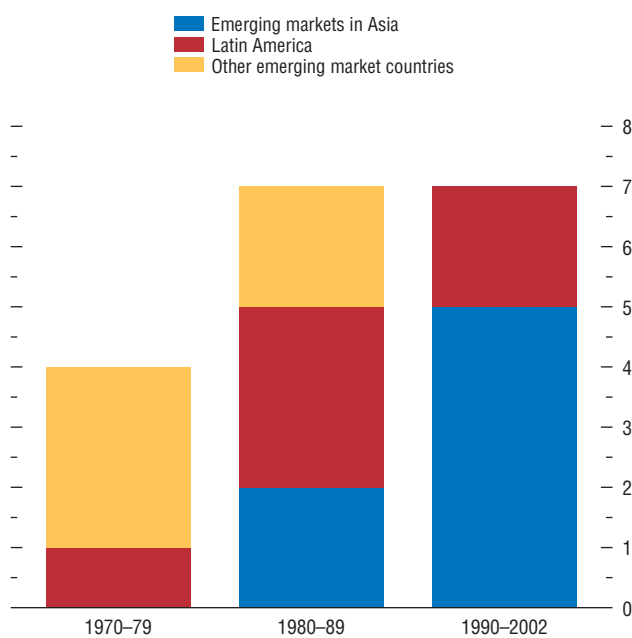
booms in emerging market economies were associated with a banking crisis, while 85 percent of the booms were associated with currency crises.¹⁴

As discussed above, credit, output, and aggregate demand could be expected to move together over the business cycle. The emerging market experience over the 1970–2002 period shows that this is indeed the case, as the cross-country correlations between real credit and output and consumption or investment are all positive (Table 4.2, column 1). Real credit also moves together with relative prices in emerging market economies: the correlation between real credit and the relative price of nontradables to tradables (and with the real effective exchange rate) is about 0.2, suggesting that an expansion of real credit is associated with an appreciation of the domestic currency. Consistent with these findings, the correlations between real credit and the current account balance and between real credit and domestic saving are both negative. Perhaps more interestingly, the cross-country correlation between real credit and output of nontradable goods, proxied as production of services, is higher than that between real credit and total output. This finding seems to corroborate the idea that the nontradable sector in emerging market economies is more heavily dependent on domestic credit (see, for instance, Tornell and Westermann, 2003).

At the peak of a credit boom, the strength of the cross-country correlation between real credit and relative prices increases threefold. This suggests that this mechanism could indeed be a key explanation for these booms in emerging market economies; consistent with this, the correlations between real credit and output of nontradables and real credit and investment also

Figure 4.3. Emerging Market Credit Booms, 1970–2002
(Number of events)

The number of credit booms has increased in the past two decades, particularly in Southeast Asia.



Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

¹⁴These results differ from some others in the literature (such as Gourinchas, Valdes, and Landerretche, 2001) because this chapter considers just emerging market countries (and not industrial and other developing countries), distinguishes between financial deepening and credit booms, and focuses on extreme credit expansions (the worst 5 percent)—see Appendix 4.1 for more details.

Table 4.1. Credit, Capital Inflows, and Financial Liberalization*(Frequency distribution, percent)*

	Capital Inflows ¹	Financial Liberalization ²	Capital Inflows and Financial Liberalization	Neither Capital Inflows nor Financial Liberalization
Credit booms				
1970–2002	55.6	16.7	11.1	16.7
1970–1979	11.1	5.6	—	5.6
1980–1989	16.7	11.1	5.6	5.6
1990–2002	27.8	—	5.6	5.6
Episodes of rapid credit growth				
1970–2002	30.6	22.2	5.6	41.7
1970–1979	5.6	11.1	—	27.8
1980–1989	11.1	—	2.8	5.6
1990–2002	13.9	11.1	2.8	8.3

Source: Abiad and Mody (2003) and staff calculations.

¹The annual net capital flows to the private sector rank in their top quartile in the emerging market sample.²The three-year change in the financial liberalization index in Abiad and Mody (2003) ranks in their top quartile in the emerging market sample.

increased significantly (see Table 4.2, column 2). By contrast, the correlations between credit and output and credit and consumption at the peak of the boom remained virtually unchanged from their normal business cycle levels. Finally, the correlation between real credit and the current account balance became more negative, perhaps reflecting the fact that most investment goods are imported and that capital inflows are an important source of credit, as noted in the literature on emerging market crises.

To determine whether or not credit booms in emerging markets coincide with large macroeconomic fluctuations, the chapter examines next the behavior of key macroeconomic aggregates, relative prices, and banking sector information in a seven-year window centered around the time of the peak of the boom (see Figures 4.5 and 4.6; the dark line represents the median while the light lines denote the upper and lower quartiles, respectively). The main conclusions derived from this analysis are the following.

- *Credit booms are associated with a cyclical upturn, followed by a sharp downturn, in economic activity*

and private absorption. This suggests that credit booms have strong negative effects on the economy; indeed, in the worst cases they are associated with serious recessions (see the lower quartile light lines).¹⁵

- *Credit booms are associated with a rapid increase, and subsequent fall, in the price of nontradables relative to tradables, consistent with the predictions of the literature surveyed earlier.* Moreover, the fact that both the real exchange rate and the relative price of nontradables reach their peaks earlier than real credit is also consistent with balance sheet effects induced by movements in the relative price of nontradables. Not surprisingly, changes in the production of nontradables are more pronounced than those observed in total output, as highlighted by the position of the upper/lower quartile lines (a related result is reported in Tornell and Westermann, 2002).
- *Credit booms are accompanied by an increase in real stock prices and a subsequent dramatic drop.* During the three years prior to the peak of the credit boom, real stock prices are consistently above their trend by wide margins, suggesting

¹⁵It is also interesting to note that both output and investment peak together with credit, while consumption peaks one year earlier. This finding explains in part the fact that the contemporaneous correlation between credit and consumption remained unchanged at the peak of the boom reported earlier.

Table 4.2. Cyclical Correlations with Real Credit in Emerging Market Economies¹

	1970–2002	Credit Boom Peak
Output	0.32	0.36
Private consumption	0.30	0.29
Private investment	0.35	0.42
Output nontradables	0.38	0.54
Real exchange rate	0.21	0.63
Relative price (nontradables/tradables)	0.16	0.50
Current account balance (percent GDP)	-0.22	-0.56
Domestic saving (percent GDP)	-0.34	-0.62

Source: IMF staff calculations.

¹Series were detrended using the Hodrick-Prescott filter. Cross-country correlations; includes only emerging market countries that experienced a credit boom during 1970–2002.

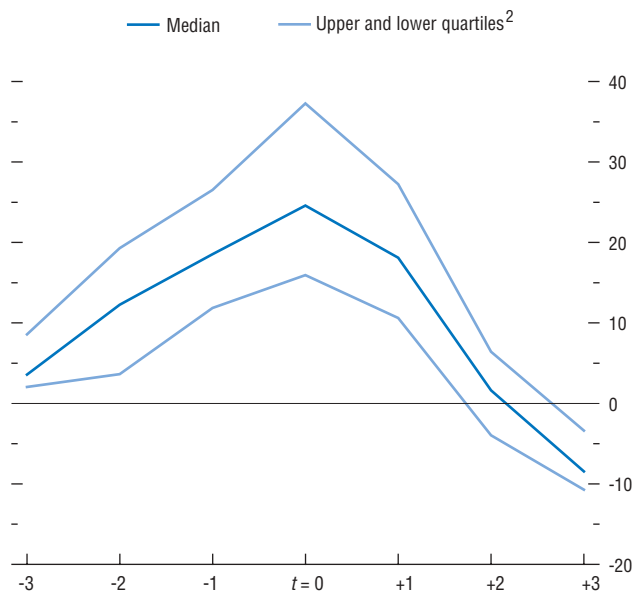
that these prices might have been mainly driven by strong capital inflows.¹⁶ After reaching their peak a year earlier than credit, real stock prices fall sharply below trend and remain so for about two years.

- *Credit booms do not have a major effect on inflation, partly reflecting the high degree of trade openness of these economies.* This suggests rising domestic demand imbalances are vented mainly through the current account and an appreciating exchange rate. Therefore, maintaining price stability—particularly for those countries that have adopted an inflation-targeting framework—does not prevent a credit boom/bust.
- *Banks expand credit to the private sector by changing the composition of their assets and by increasing their external borrowing.* The behavior of the ratios of bank credit to assets and credit to M2 suggests that during credit booms banks expand credit by tilting their asset composition in favor of private sector credit—reflecting in part changes in the prices of nontradables relative to tradables—and by

¹⁶This contrasts with the experience of some industrial countries where rapid credit expansion is often associated with asset price “bubbles.” See, for instance, Allen and Gale (2000) and Helbling and Terrones (2003). Credit booms in emerging markets are, however, more likely to be associated with real estate bubbles. See Collyns and Senhadji (2002).

Figure 4.4. Credit Booms in Emerging Markets¹
(Percent deviation from trend)

Credit booms are somewhat asymmetric, with sharper downturns.



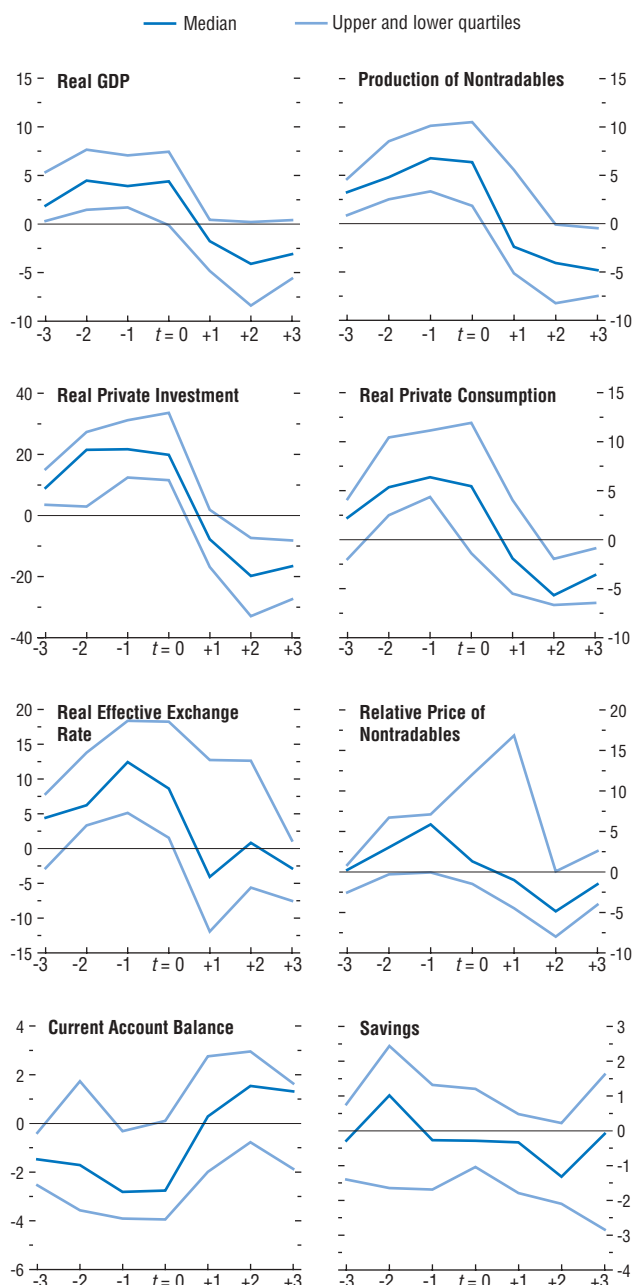
Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

¹A credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around its Hodrick-Prescott trend by a factor of 1.75.

²The upper quartile is the smallest value of the highest 25 percent of all observations in each year. The lower quartile is the largest value of the lowest 25 percent of all observations in each year.

Figure 4.5. Selected Macroeconomic Variables During Credit Booms¹
(Percent deviation from trend)

Credit booms are followed by significant reversals in key macroeconomic variables.



Sources: IMF, *International Financial Statistics*; Penn World Tables; World Bank, *World Development Indicators*; national authority publications; and IMF staff calculations.
¹A credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around its Hodrick-Prescott trend by a factor of 1.75.

nondeposit borrowing.¹⁷ These two ratios fall abruptly when a credit boom ends, reflecting the weakening of the financial position of the banks, as suggested by a reduction in the profitability of these entities and reversals of external flows.¹⁸

Firm-level data for the nonfinancial private sector show that high levels of leverage, liability dollarization, and large changes in the relative price of nontradables were all present during recent credit booms. The analysis considers median values of four financial ratios: two measures of leverage—a measure of solvency (ratio of total debt to the market value of equity)¹⁹ and a measure of liquidity (ratio of current obligations due to sales)—a measure of profitability (the ratio of market to book value of equity, a rough proxy for Tobin's *Q*),²⁰ and a measure of financing costs (the effective average interest cost of all contracted financial obligations) (see Appendix 4.1 for details). The main results of this analysis are as follows.

- All four financial ratios worsen markedly during the buildup phase of credit booms. The leverage ratio then collapses, the effective interest rate falls somewhat, and profitability stabilizes during the ending phase of the boom. Figure 4.7 plots the behavior of the financial indicators of the nontradables sector during boom periods. Following the increase in the relative price of nontradable goods, the leverage and profitability measures worsen markedly in the buildup phase of the booms. This is particularly true of the ratio of

¹⁷This is consistent with the rise in banks' external borrowing prior to the emerging market crises of the 1990s (see, for instance, Kaminsky and Reinhart, 1999). To the extent that bank lending to the nontradables sector is significant (which, as noted by Tornell and Westermann, 2003, is a feature of emerging markets), an increase in the relative price on nontradables improves the balance sheet of banks, allowing them to expand credit (Mishkin, 2001, develops a related argument but for real estate price variations).

¹⁸Data on bank profitability were available from *Bankscope* only for the 1990s.

¹⁹Similar results are obtained with alternative measures of solvency, such as the ratio of debt to assets.

²⁰Similar results are obtained with alternative measures of profitability, such as the return on assets.

total debt to market value of equity, which doubles in the two years before the credit booms are at their peak. After the collapse of the nontradables prices, the leverage ratios fall sharply and the profitability indicators stabilize.²¹

- *The phenomenon of liability dollarization is reflected in the fact that the ratio of debt to equity of the nontradables sector rises faster and higher than that of the tradables sector.* Figure 4.8 plots the ratio of total debt to market value of equity for both the tradables and nontradables sectors. The effects of debt denomination imbalance are also visible in the large increases in the liquidity-based measures of leverage observed at the peak of credit booms, and in their very sharp reversals in the periods that followed. This is particularly notable in the ratio of current liabilities due to sales, which follows this pattern in all the countries (see Figure 4.7).

To assess the effects of the relative price of nontradables on corporate leverage, a dynamic panel estimation framework was used (see Appendix 4.1 for details). This analysis yielded two main conclusions. First, there is a positive and significant relationship between the relative price of nontradables and leverage of the nontradable corporate sector in emerging markets. Second, this relationship is robust to the inclusion of firm- and macroeconomic-specific factors, thus ruling out the possibility of spurious relationship.

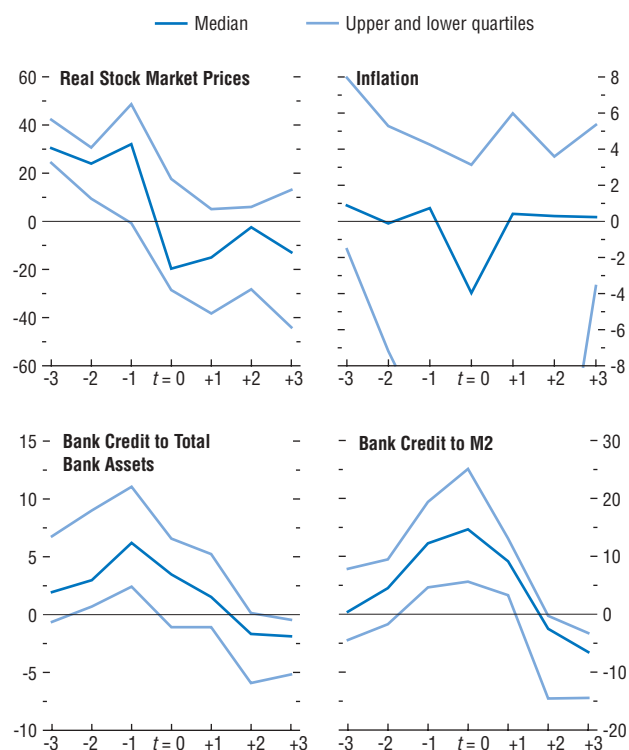
Conclusion

Credit booms pose significant risks for emerging market countries, because they are typically followed by sharp economic downturns and financial crises. Although the role of credit in the emerging market crises of the past decade has received some attention, the severe economic

Figure 4.6. Selected Financial Variables During Credit Booms¹

(Percent deviation from trend)

During credit booms, banks increase their non-deposit debt while consumer price movements are muted.



Sources: IMF, *International Financial Statistics*; and IMF staff calculations.

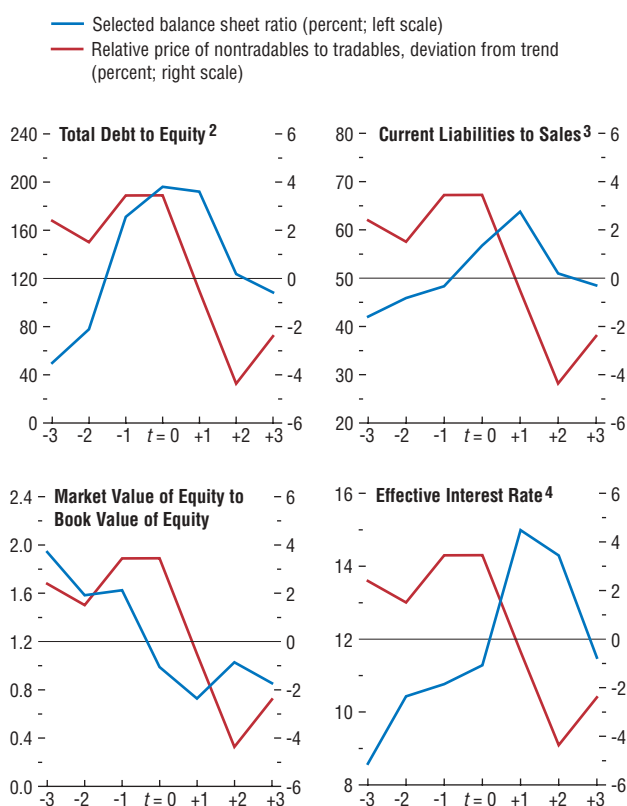
¹A credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around its Hodrick-Prescott trend by a factor of 1.75.

²¹The timing of the peaks in some of the graphs does not coincide exactly with the dates of the peaks of the credit booms, in part because *Worldscope* data are reported on a corporate fiscal year, rather than a calendar year, basis.

Figure 4.7. Selected Microeconomic Variables of the Nontradable Corporate Sector¹

(Percent)

Leverage and other financial indicators in the nontradable sector are closely tied to movements in the relative price of nontradables during boom periods.



Sources: Thomson Analytics; and IMF staff calculations.

¹A credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around its Hodrick-Prescott trend by a factor of 1.75.

²Total debt to market value of equity.

³Current liabilities defined as liabilities due within one year.

⁴Total interest expense in percent of total debt outstanding.

cost and empirical characteristics of credit booms have not heretofore been systematically documented. Specifically, real GDP usually falls about 5 percent below trend after a credit boom, reflecting severe contractions in consumption and—especially—investment. At the same time, about three-fourths of credit booms are associated with a banking crisis while almost seven-eighths are associated with a currency crisis.

Credit booms are not easy to identify when they are happening, calling for policymakers to make difficult judgments. In general, policymakers should be most concerned if a rapid credit expansion is accompanied by other telltale signs of growing macroeconomic, financial, and corporate imbalances. Credit booms are often linked to investment booms, current account deficits, and increases in the relative price of nontradables, but not—notably—to a rise in inflation. At the same time, banks tend to raise the share of their assets devoted to private credit and increase the share of their nondeposit liabilities. Finally, the nontradable corporate sector usually experiences increases in leverage and short-term debt, and a decline in their expected profitability, as reflected in the ratio of market-to-book value of equity.

If the preponderance of the evidence suggests that there is a significant risk of a credit boom developing, then policymakers need to consider one or more of the following actions.

- Improving surveillance of the banking system. As credit booms often involve a shift toward private credit whose quality turns out to be worse than initially thought, as well as an increase in the share of nondeposit liabilities, bank supervisors could consider improving the enforcement of capital adequacy requirements and better monitoring of borrowing, as well as—in some cases—reducing the incentive for short-term external borrowing.
- Increasing scrutiny of corporate borrowing. As credit booms are usually associated with rapid increases in corporate leverage, it could be desirable to enhance monitoring of firms' accounting practices and assess whether they are fully satisfying disclosure requirements.

- Tightening macroeconomic conditions, even though inflation is quiescent. A credit boom is typically accompanied by an unsustainable strengthening of domestic demand and followed by a severe contraction in domestic demand, so in some cases it may be appropriate to restrain credit growth by tightening monetary policy.

Finally, to reduce the potential risk of future credit booms, policymakers in emerging market countries should strive to improve institutional frameworks. Credit booms are less frequent and—if they occur—less costly in industrial countries, largely reflecting stronger institutional frameworks. The priorities should be to improve macroeconomic policies, financial sector regulation and supervision (to encourage prudent risk management), corporate sector transparency, and statistics (to ensure timely, comprehensive, and high-quality macroeconomic, financial, and corporate sector data). Such efforts would not only serve as preemptive strikes against credit booms but also help foster financial development and thus economic growth.

Appendix 4.1. Definitions, Data Sources, Methodology, and Results

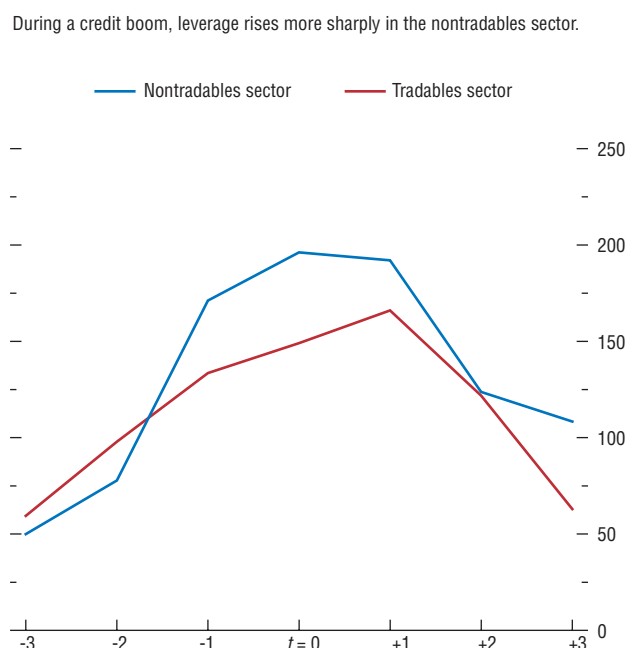
The main author of this appendix is Marco Terrones.

This appendix provides details on the event study analysis and the econometric analysis.

Event Study Analysis

- The sample of emerging market countries used in the chapter consists of the following 28 countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Côte d'Ivoire, Ecuador, Egypt, Hong Kong SAR, India, Indonesia, Israel, Jordan, Korea, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, the Philippines, Singapore, South Africa, Thailand, Turkey, Uruguay, and Venezuela.
- Credit to the private sector. This series has been calculated as the sum of claims on the

Figure 4.8. Corporate Leverage During a Credit Boom¹
(Total debt to market value of equity, percent)



Sources: Thomson Analytics; and IMF staff calculations.

¹A credit expansion in a given country is identified as a boom if it exceeds the standard deviation of that country's credit fluctuations around its Hodrick-Prescott trend by a factor of 1.75.

private sector by deposit money banks (IMF, International Financial Statistics (IFS), line 22d) and, whenever available, claims on the private sector by other financial entities (IFS, line 42d). Because credit is a stock variable, real credit was calculated as the average of two contiguous end-of-year stocks deflated by the end-of-year consumer price index. For most of the countries in the sample, the real credit series started in the early 1960s.

- Methodology to calculate the relative price of nontradables. Under the assumption that the consumer price index, P , is a geometric average of the price indexes of tradables, P_T , and nontradables, P_{NT} :

$$P = P_T^\alpha P_{NT}^{(1-\alpha)}, \quad (1)$$

where α and $(1 - \alpha)$ are the weights of these price indexes. The price of nontradables relative to tradables can then be calculated using the following relationship:

$$\frac{P_{NT}}{P_T} = \left[\frac{P_{NT}}{P} \right]^{(1/\alpha)}. \quad (2)$$

As P is readily available, the only two pieces of information missing to complete the calculation of the relative price of nontradables are the weight of the tradable price index (α) and a price index for the nontradable goods (P_{NT}). α has been estimated as the difference between 1 and the ratio of value added of the services sector to total consumption (i.e., the sum of private and government consumption). These data have been obtained from the World Bank's *World Development Indicators*. The price index for the nontradable goods has been estimated as a geometric average of the price indexes of subgroups of nontradable goods (of which education, transportation, housing, health care, and entertainment are the most important). The weights for each of these price indexes is $1/i$, where i is the number of subgroups of nontradable goods available for each country—which, because of information availability, varies from country to country. These data have been obtained primarily from national authorities.

- Corporate sector data. The corporate data set used in this chapter is based on information from nonfinancial publicly traded firms and reported in the *Worldscope* database. This data set, which covers the 1992–2002 period, includes information for the emerging market countries that experienced a credit boom during the 1990s (see below). Firms are then classified as belonging to the nontradable or tradable corporate sector. The nontradable corporate sector was defined here as comprising the following industries: construction, printing and publishing, recreation, retailers, transportation, utilities, and miscellaneous. The tradable corporate sector was defined as comprising the following industries: aerospace; apparel; automotive; beverages; chemicals, diversified; drugs and cosmetics; electrical; electronics; food; machinery and equipment; metals; metal products manufacturing; oil; gas; and coal, textiles, and tobacco. Adding up across all countries, there were data for 3,194 firms in the nontradables sector and 5,245 firms in the tradables sector. The data are then used to construct ratios of leverage, profitability, and financing costs for each firm, and the firm-level ratios are then aggregated by sector (tradables and nontradables) and countries using median values.
- Timing of emerging market credit booms. Credit booms in a given country are defined as those credit expansions that exceed a given threshold (equivalent to 1.75 times the standard deviation of that country's credit fluctuations around trend). The timing of a credit boom is then identified as the year in which the credit expansion reaches its peak above the boom threshold. Based on this method, the timing of credit boom events is as follows: 1970s: Turkey (1976), Côte d'Ivoire (1978), Costa Rica (1979), and Israel (1979); 1980s: Chile (1981), Argentina (1982), Uruguay (1982), Nigeria (1983), the Philippines (1983), Singapore (1984), and South Africa (1985); 1990s: Mexico (1994), Colombia (1997), Indonesia (1997), Malaysia (1997), the

Philippines (1997), Thailand (1997), and Korea (1998).

- Credit growth before a credit boom. The median real credit growth in the three years preceding the peak of a typical credit boom was 17 percent. This suggests that a large proportion of credit booms were associated with rapid credit growth.
- Episodes of rapid and sustained credit growth. Defined here as those episodes for which average real credit growth exceeded 17 percent over a three-year period. In the sample of 28 emerging market economies studied in this chapter there were 36 such episodes during the 1970–2002 period. Only 9 of these 36 episodes coincided with a credit boom. This suggests that not all episodes of rapid credit growth were associated with credit booms. The average duration of the episodes of rapid credit growth was six years (with a maximum duration well over a decade), showing that economies can sustain rapid real credit growth for extended periods of time.
- Methodological differences with other empirical studies on credit booms. This chapter has several methodological differences from the existing empirical literature on credit booms. For instance, there are four key differences with respect to Gourinchas, Valdes, and Landerretche (2001). First, credit booms refer here to excessive expansions in real credit—as opposed to the credit-to-GDP ratio. This allows real credit and real GDP to have different trends, which is important if countries are undergoing a process of financial deepening. Second, the Hodrick-Prescott (H-P) filter has been applied here to the real credit series covering the 1960–2002 period, with a penalty parameter equal to 100—as opposed to a rolling H-P filter with a penalty parameter equal to 1,000. This is important since the rolling H-P filter distorts the characterization of credit cycles by shifting them over time.

Third, the credit boom thresholds here are country specific—as opposed to a uniform fixed threshold that applies to all countries. This is also important because it can bias the sample of events. Fourth, this chapter focuses on a relatively homogenous sample of countries (emerging market countries) as opposed to countries at different levels of development. Similarly, there is a key difference with Tornell and Westermann (2002), who document the behavior of credit around the timing of twin-crises (i.e., when a currency crisis coincides with a banking crisis).

Econometric Analysis

The main objective of this section is to assess the importance of the relative price of nontradables as a determinant of nontradable firms' capital structure. The analysis extends earlier work on corporate capital structure (Rajan and Zingales, 1995, and Chapter II of the September 2002 *World Economic Outlook*) by using a dynamic panel estimation framework (see, for instance, Arellano and Honoré, 2000) and by exploring the importance of the relative price of nontradables.

The sample includes information on the non-financial nontradable firms of the seven emerging market economies that experienced a credit boom during the 1990s. Thus, the database covers over 600 nonfinancial firms over the 1992–2002 period. Corporate capital structure is defined here as the ratio of debt to book value of assets or the ratio of current liabilities to the book value of assets.²² For each of these alternative definitions of capital structure, the following dynamic panel data model was estimated:

$$y_{it} = \alpha y_{i(t-1)} + X_{it}\beta + \delta_t + \eta_i + v_{it} \quad (i = 1, \dots, N; t = 2, \dots, T), \quad (3)$$

where y_{it} is one of the capital structure ratios defined earlier for firm i in period t , X_{it} is a

²²Alternative measures of corporate market structure, such as the ratio of debt to market value of equity, have been used. Although the results are broadly consistent with the ones reported above, the model specification fails the Sargan test of overidentifying restrictions.

matrix comprising information on the explanatory variables for firm i in period t ; δ_t is a time-specific effect; and η_i is a firm-specific effect. The explanatory variables included in the regression analysis were of three types.

- *The relative price of nontradables.*²³ According to the discussion presented in the main text, increases in the relative price of nontradables, above its trend, are expected to lead to an increase in the leverage of the nontradables sector firms (i.e., debt-to-asset ratio and the ratio of current liabilities to assets).
- *Firm-specific factors.* The econometric analysis focuses on five firm-specific factors: firm size (as proxied by the logarithm of sales), profitability (proxied by the ratio of net income to total assets), the ratio of market to book value, tangibility of assets (proxied by the ratio of fixed to total assets), and effective interest rate (proxied by total interest expense in percent of total debt outstanding). The importance of the first four of these firm-specific factors has been extensively examined in the context of the advanced countries' experience (see, for instance, Rajan and Zingales, 1995).²⁴ For instance, it has been found that in the most advanced countries the size of a firm is positively correlated with a firm's leverage, although the theoretical reasons for this positive correlation are not yet well understood; profitability is negatively correlated with leverage, which suggests that more profitable firms would prefer internal financing; tangibility is positively correlated with leverage as firms with more tangible assets can serve as better collateral; and market to book value is negatively correlated with leverage as firms with higher expected growth are more likely to rely on equity financing. Finally, corporate leverage is

expected to be negatively correlated with the effective interest rate, a proxy for a firm's leverage cost.

- *Macroeconomic and institutional factors.* The econometric analysis also explored the importance of a country's economic performance (as proxied by output growth), a country's stock market development (as proxied by stock market capitalization), and the quality of a country's institutions (as proxied by a geometric average, with equal weights, of bureaucracy quality, anti-corruption efforts, higher democratic accountability, and observation of law and order²⁵) on the leverage of the nontradable sector firms. Although the a priori effects of these three factors on leverage are ambiguous, there is some evidence that economic performance and institutional quality are negatively correlated with a firm's leverage (see, for instance, Chapter II of the September 2002 *World Economic Outlook*).

The dynamic panel model in Equation (3) has been estimated using the Generalized Method of Moments estimator as suggested by Arellano and Bond (1991). Under the assumption that the explanatory variables are weakly exogenous, this method estimates the coefficients of Equation (3) in first differences using values of the lagged explanatory variables as instruments. The econometric results (Table 4.3) suggest the following key facts.

- *Lagged dependent variable.* The statistical significance of the lagged dependent variable suggests that the leverage and debt structure of a firm adjust gradually.
- *Relative price of nontradables.* As predicted by the theory discussed in the main text, there is a positive and statistically significant relationship between the leverage of the non-

²³This variable measures the deviations of the relative price of nontradables from its trend (estimated using the Hodrick-Prescott filter).

²⁴There are differences with some of the measures used by Rajan and Zingales; for instance, they use the log of net sales as a proxy for firm's size and earnings before interest, taxes, depreciation, and amortization to calculate a firm's profitability.

²⁵The institutional quality measures are scaled from 0 (low quality) to 12 (high quality) and were obtained from the PRS Group's International Country Risk Guide.

Table 4.3. Emerging Market Economies, Nontradables Sector¹
(Summary of empirical results, 1992–2002)

	Dependent Variable			
	Debt to assets		Current liabilities to assets	
Lagged dependent variable				
Debt to assets (–1)	0.60938 (0.05542)***	0.56157 (0.05677)***
Current liabilities to assets (–1)	0.39475 (0.04816)***	0.41662 (0.05433)***
Relative price of nontradables				
P_{nt} to P_t	0.17057 (0.05209)***	0.13991 (0.05236)***	0.18438 (0.06206)***	0.15765 (0.06679)**
Firm factors				
Sales, log	0.28407 (0.71696)*	0.02080 (0.74021)	0.64497 (0.76668)***	0.77814 (0.81271)***
Profitability	–0.38965 (0.07963)***	–0.36285 (0.08185)***	–0.25357 (0.04181)***	–0.28598 (0.04282)***
Tangibility	0.00171 (0.04344)	–0.01123 (0.04422)	–0.06026 (0.03991)*	–0.05308 (0.04230)
Market-to-book	–0.59112 (0.52210)	–0.62851 (0.55714)	0.45612 (0.48397)	0.46761 (0.52566)
Effective interest rate	–0.02091 (0.00686)***	–0.02881 (0.00875)***	–0.00827 (0.00456)*	–0.01716 (0.00541)***
Macro and institutional factors				
Output growth	...	–0.12625 (0.07887)	...	–0.15088 (0.09434)
Stock market capitalization	...	0.01160 (0.01510)	...	–0.00779 (0.01453)
Institutional quality	...	0.11105 (0.10371)	...	0.04202 (0.09568)
<i>Memorandum</i>				
Number of observations	2,078	1,727	1,983	1,641
Sargan test ²				
p -value	0.29	0.17	0.32	0.37
Arellano-Bond test ³				
p -value	0.86	0.90	0.82	0.45

Sources: Thomson Financial Worldscope database; IMF, *International Financial Statistics*; International Risk Guide; and Beck, Demirgüç-Kunt, and Levine (1999).

Note: Robust standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at the 10, 5, and 1 percent level, respectively. The regressions also included time effect dummies, which are not reported.

¹Includes countries that experienced a credit boom during the 1990s.

²Test of the validity of over-identifying restrictions.

³Test of no second-order autocorrelation.

tradable firms and the relative price of nontradables.²⁶

- *Firm-specific factors.* Increases in the firm's effective interest rate are associated with a reduction of the firm's leverage, as expected. Similarly, increases in a firm's profitability or growth prospects lead firms to reduce their reliance on debt. Firms' size has a positive effect on leverage; however, it is not statistically significant. Finally, tangibility does not

seem to play a role in the nontradable firms' borrowing decisions (it has the wrong sign and it is not statistically significant).

- *Macroeconomic and institutional factors.* There is no evidence that either the macroeconomic factors or institutional quality play a significant role as determinants of the capital structure of the nontradables sector firms of the emerging market economies that experienced a credit boom during the 1990s.

²⁶This result is robust to the inclusion of the real exchange rate (deviations from trend).

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