

# Credit Expansions and Banking Crises: The Roles of Household and Firm Credit<sup>\*</sup>

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# Credit Expansions and Banking Crises: The Roles of Household and Firm Credit

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## **Abstract**

The literature has identified credit expansions to the private sector as an important predictor of banking crises. This paper decomposes the total credit to the private sector into household credit and enterprise credit, and investigates their effects on banking crises. In a sample of 45 emerging and developed markets, decomposing credit reveals that the household component of private credit is the driving force for the positive link between banking instability and credit expansions whereas enterprise credit growth has no effect on the likelihood of banking crises.

## 1. Introduction

Rapid growth in bank credit to the private sector is a common factor associated with banking crises (Demirgüç-Kunt and Detragiache 1997, Kaminsky, Lizondo, and Reinhart 1998, and Kaminsky and Reinhart 1999). In fact, the IMF (2004) estimates that about 75 percent of credit booms in emerging markets end in banking crises. Typically, credit expansions are fueled by overly optimistic expectations of future income and asset prices, combined with financial liberalization and capital inflows. Over time, households and firms accumulate substantial debt while income does not keep pace.<sup>1</sup> A decline in income or asset prices then leads to an increase in non-performing loans and defaults. If the problem is severe, the country experiences a banking crisis.

Looking at credit from a different perspective, the finance and growth literature shows that greater credit levels are beneficial for economic development. However, that literature distinguishes between two types of credit – household credit and enterprise credit, with different implications for economic growth. There is abundant theoretical and empirical evidence that enterprise credit enhances economic growth by easing the liquidity constraints on firms; this leads to the formation of new firms and the expansion of existing ones (see Levine 2005 for an extensive survey of the literature). Conversely, the evidence on household credit suggests that it either has no effect on medium and long-term economic growth (Beck et al. 2008) or that it even reduces growth. Jappelli and Pagano (1994) argue that greater availability of household credit reduces private savings and economic growth.

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<sup>1</sup> Duenwald et al. (2005) argue that temporary economic booms spurred by credit-driven consumption and investment growth are often misperceived as a long-term shift in the economic potential of the economy.

In this paper we follow the finance and growth literature and decompose the total credit to the private sector into household credit and enterprise credit, and we investigate their effects on banking crises.<sup>2</sup> The previous literature has used credit growth that combines the two types of credit. Yet the two are not the same. The expansion of enterprise credit raises debt levels but it also adds to the productive capacity of the economy and has the potential to increase income and improve the ability of borrowers to service their debt. In contrast, the expansion of household credit raises debt levels without much effect on income. Therefore, we argue that rapid household credit expansions are more likely to result in banking crises compared to enterprise credit expansions.

We use data on household and enterprise credit from 45 countries to test this hypothesis. Consistent with the literature, we show that rapid credit growth to the private sector contributes to the onset of banking crises. However, decomposing credit reveals that the household component of private credit is the driving factor of this effect. Household credit growth is a significant predictor of banking crises whereas enterprise credit growth has no effect on the likelihood of banking crises.

The paper is organized as follows. Section 2 describes the data and sample selection while section 3 presents the results. Section 4 concludes.

## **2. Data description and sample selection**

### *2.1 Household and enterprise credit*

Standard financial sector indicators focus on the aggregate level of credit to the private sector by deposit money banks, but do not distinguish between lending to households and

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<sup>2</sup> Hilbers et. al (2005) point out that distinguishing between household and firm credit is a “key element” in evaluating the risks associated with credit expansions.

lending to firms. We compile data from national central bank reports, annual bulletins, and other statistical sources where disaggregated credit data are available. In order to avoid discrepancies between different countries we standardized our data collection methodology by focusing on the collection of data on credit to non-financial corporations and/or private enterprises/businesses by deposit money banks, where available. If private credit is reported for various economic sectors, we define business credit as the sum of loans to industry, construction, services, agriculture, and trade. We then use the credit series from the Financial Structure Database of Beck, Demirgüç-Kunt and Levine (2000) to obtain the distribution of credit into enterprise credit and household credit as the difference between overall credit and enterprise credit. The dataset includes 45 developed and emerging economies with different time periods depending on data availability. Our dataset is unbalanced but has a significant overlap during the period from 1990 to 2005. Appendix 1 documents the exact definitions of the credit series and the available periods for each country in the sample.

Table 1 shows substantial differences in the credit to GDP ratio across countries. Credit in Japan, New Zealand, and Switzerland is over 100 percent of GDP whereas Lithuania, Mexico, Turkey, and several other countries have credit to GDP ratios below 20 percent. The two components of credit also exhibit substantial variation across countries. Household credit ranges from 96.65 percent of GDP in Switzerland to 3.31 percent of GDP in Russia. Enterprise credit ranges from 85.60 percent of GDP in Malaysia to 8.58 percent of GDP in Argentina. Notice that the share of household credit in GDP is about the same (29.82 percent) as the share of enterprise credit (31.67 percent) across all countries.

The last two columns of Table 1 show the growth of household and enterprise credit. On average, household credit grew at 1.41 percent of GDP each year whereas enterprise credit grew

at only 0.39 percent of GDP. This indicates the increasing importance of household credit around the world. Furthermore, in some countries household credit grew very rapidly. For example, household credit in Iceland increased by 6.08 percent of GDP on average each year. In contrast, enterprise credit decreased in a number of countries including, for example, Indonesia and Japan. The correlations in Table 2 show that household credit growth and enterprise credit growth are positively correlated but the correlation coefficient is only 0.29. In other words, the two types of credit have relatively different dynamics.

## *2.2 The banking crisis variable*

We follow Demirgüç-Kunt and Detragiache (1997) and Caprio and Klingebiel (2003) in constructing our banking crisis variable. Demirgüç-Kunt and Detragiache (1997) identify an episode of distress as a full-fledged crisis if at least one of the following conditions apply: the ratio of non-performing assets to total assets in the banking system exceeds 10%; the cost to rescue operations is at least 2% of GDP; banking sector problems resulted in a large scale nationalization of banks, or generalized deposit guarantees were enacted by the government in response to the crisis.

We use the method of Demirgüç-Kunt and Detragiache (1997) and the banking sectors information available via Caprio and Klingebiel (2003) to expand the banking crisis dataset to all countries and time periods in our sample. The onset of a banking crisis is marked as the year when at least one of the criteria mentioned above is satisfied. We identify 8 systemic banking crises in our panel (Table 3), corresponding to 3.8 percent of the observations, a similar fraction of crisis episodes as in Demirgüç-Kunt and Detragiache (1997, 2002).

To distinguish between crises of different magnitude or of different nature, we compile another banking crisis dummy that captures the borderline and smaller (non-systemic) crises. We

use the classification in Caprio and Klingebiel (2003) to identify the non-systemic crises. We find three borderline banking crises that occurred during our sample period.

### *2.3 Control Variables*

Following the literature (Demirgüç-Kunt 1997), we use four key control variables: GDP growth, the ratio of M2 to international reserves, the ratio of bank reserves to total bank assets, and GDP per capita. The rate of growth of real GDP captures macroeconomic developments that affect the quality of bank assets. More rapid economic growth is associated with increasing incomes and a smaller likelihood of a banking crisis. The ratio of M2 to foreign exchange reserves captures the vulnerability of the economy to sudden capital outflows triggered by a run on the currency. Greater M2 to reserves ratio is expected to raise the likelihood of banking crises.

The bank reserves to total assets ratio captures the liquidity and soundness of the banking system. Greater reserves to assets ratio is expected to reduce the likelihood of a banking crisis. Finally, GDP per capita is used to control for the level of development of the country, which can proxy for the quality of regulation and of the legal environment. Higher GDP per capita is expected to reduce the likelihood of a banking crisis. Demirgüç-Kunt (1997) find support for all of these hypotheses. Detailed variable definitions and sources are given in the Appendix A.

## **3. Empirical results**

### *3.1 Credit growth and systemic banking crises*

We estimate the probability of banking crisis using a panel logit model. The error structure of the estimations allows for clustering of error terms by country. Also, we incorporate robust estimation procedures using the Huber/White “sandwich” estimator. We begin with a parsimonious model where we include credit growth and two control variables that are available

for the entire sample – GDP growth and GDP per capita. Then we add the bank reserves to assets ratio and the M2 to foreign exchange reserves ratio. These two variables have more limited coverage. The first three columns in Table 4 estimate the model with total credit growth and the last three columns perform the same estimations with household and enterprise credit growth separately.

The results show that total credit growth has the expected positive sign and is statistically significant at the 1% level in each estimation. This result is in line with the literature that shows a positive effect of private credit growth on the likelihood of a banking crisis. The remaining explanatory variables also have the expected signs and are statistically significant. The one exception is the bank reserves to assets ratio, which is not statistically significant. A higher level of development and more rapid economic growth reduce the likelihood of a banking crisis whereas greater M2 to reserves ratio raises the likelihood of a crisis.

In columns 4-6 we decompose private credit into enterprise credit and household credit. We find that household credit growth enters with a positive and statistically significant sign in all of the specifications with an increasing significance and magnitude as we include additional control variables. In contrast, enterprise credit growth is not statistically significant in any of the specification. In terms of marginal effects, the results imply that an increase in total credit growth by 1 percentage point of GDP raises the conditional expectation of a systematic banking crisis by 13.15 percent.<sup>3</sup> Similarly, an increase in household credit by one percentage point of GDP increases the conditional expectation of a crisis by 14.10 percent. These are substantial

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<sup>3</sup> The conditional expectation of a banking crisis in the data set is about 1 percent, depending on the specification. This low probability is not surprising since banking crises are rare events and we study only the onset of crises as opposed to the entire duration of a crisis. Demirgüç-Kunt and Detragiache (2002) have a similarly low incidence of crises in their analysis. The economic significance of the coefficients is therefore discussed as the percentage deviation from the conditional expectation of a banking crisis. For example, the effect of an increase of total credit by 1 percent of GDP is given by  $0.00103$  (the marginal impact of total credit growth in column 3) /  $0.00783$  (the conditional expectation of a banking crisis in column 3) =  $0.1315$ . The conditional probabilities of crises along with the marginal effects from all models are available on request.

effects given the rapid credit growth in some countries. For example, household credit expanded by 2.21 percent of GDP before the financial crisis in Turkey in 2000.

### *3.2. Credit growth and systemic and non-systemic banking crises*

In Table 5, we estimate the same models but we use a different dependent variable. Here, the dependent variable equals 1 for systematic and nonsystematic banking crises and zero otherwise. We obtain quantitatively the same results as in the other estimations, including a positive and statically significant coefficient on household credit. Notable exception is the effect of enterprise credit growth, which is positive and statistically significant at the 7 percent level. It appears that if we incorporate less severe crises in the estimation, enterprise credit growth adds to the explanatory power of the models, albeit only marginally.<sup>4</sup>

### *3.3 Additional explanatory variables*

Next, we include three additional explanatory variables with potential effect on the likelihood of banking crises. These variables are also drawn from the previous literature: Demirgüç-Kunt and Detragiache (1997), but have been used primarily as control variables in robustness checks or/and have more limited coverage. First, we add the change in the external terms of trade. An improvement in the terms of trade is a positive macroeconomic development and is expected to reduce the likelihood of banking crisis. As expected, this variable enters with a negative and statistically significant sign in Table 6. The rest of the results are not affected – household credit growth remains positive and statistically significant and enterprise credit growth remains not statistically significant.

Then, we add the short-term real interest rate. The short-term real interest rate reflects banks' cost of funds and may affect bank profitability, since bank assets are often long-term at

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<sup>4</sup> We also estimated the likelihood of banking crisis using ordered probit where the dependent variable takes the value 0 for no crisis, 1 for non-systematic crisis, and 2 for systematic crisis. We find that household credit growth is positive and statistically significant whereas enterprise credit growth is insignificant.

fixed interest rates. Also, in emerging economies high short-term interest rates attracts short-term capital inflows, which may also increase the chance of a sudden stop. Although the real interest rate enters the estimation with a positive sign it is not statistically significant and does not affect our variables of interest, household and enterprise credit growth. Finally, inflation is introduced as a measure of macroeconomic mismanagement with adverse effects on the economy and the banking system. In Table 6, inflation is not statistically significant and its inclusion does not affect the remaining variables.

#### **4. Conclusion**

We decompose total bank credit to the private sector into household and enterprise credit and show that household credit growth is an important predictor of banking crises. In contrast, we do not find consistent relationship between enterprise credit growth and banking crises. Our results are consistent with the finance-growth literature, which argues that enterprise credit adds to the productive capacity of the economy and leads to higher income whereas household credit does not have a positive long-run affect on growth. We show that the two types of credit have different implications for the likelihood of banking crises as well.

Our results underscore the importance of distinguishing between household and enterprise credit. The level of private credit has been rising steadily after widespread financial liberalization in the early 1990s and a large literature has investigated the effects of total private credit on various economic outcomes. However, the two components of credit may affect the economy differently. For example, is income inequality reduced by enterprise and household credit in different ways? What is the differential impact of household and firm credit growth on the current account? Future research can address these questions.

The association between household credit growth and banking crisis also has important policy implications. Credit expansions are argued to be the cause of increased banking instability. Therefore, policy makers focus on total private credit to prevent the negative repercussions of credit growth. The practice of limiting credit growth has been adopted by several emerging countries; in particular Mexico during the 1994-1995 crisis (Gruben and McComb, 1997) and Brazil in 1999 (International Monetary Fund, 2003). While in those cases the focus is mostly on total private credit, recent developments in credit markets both in emerging and developed countries point to the distinction between household and firm credit as a key element in evaluating the risks associated with credit expansions.

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**Appendix Table A1. Enterprise credit definitions**

| Country        | Variable definitions  | Years Available |
|----------------|---|-----------------|
| Argentina      | Financing by activities: credit to production, industry, construction, services, electricity, and commerce.                                   | 1993-1999       |
| Australia      | Bank lending classified by sector: commercial lending   | 1991-2005       |
| Austria        | Financial liabilities of non-financial corporations: short-term and long-term loans.  | 1996-2005       |
| Belgium        | Loans originally granted by credit institutions to Belgian non-financial corporation  | 2000-2005       |
| Bulgaria       | Commercial banks credit: credit to private enterprises, total   | 2000-2005       |
| Canada         | Business loans from chartered banks   | 1997-2004       |
| Costa Rica     | Credit from deposit money banks: credit to production, industry, construction, services, electricity, and commerce.                           | 1998-2005       |
| Czech Republic | Banking statistics: loans: sectoral breakdown, commercial banks, non-financial corporations   | 1995-2005       |
| Denmark        | Bank lending to non-financial corporations.   | 1992-1999       |
| Egypt          | Banks lending by private sector: private businesses: local and foreign currency   | 1994-2004       |
| Estonia        | Loans granted by groups of customers: commercial undertakings   | 1999-2005       |
| Finland        | Finnish MFIs' euro-denominated loans, non-financial corporations, stock   | 2002-2005       |
| France         | Lending by credit institutions to non-financial corporations: total   | 1995-2005       |
| Germany        | Lending to domestic enterprises and self-employed persons/total/commercial banks  | 1995-1998       |
| Greece         | Domestic MFI credit to domestic enterprises   | 2001-2005       |
| Hungary        | Credits to enterprises and small entrepreneurs  | 1995-2000       |
| Iceland        | Deposit money banks credit to industries  | 1990-2005       |
| India          | Distribution of outstanding credit of scheduled commercial banks according to occupation: everything but personal and miscellaneous.          | 1990-1995       |
| Indonesia      | Outstanding credit by commercial banks by group of debtor: Rupiah and foreign currency by private enterprises                                 | 1998-2005       |
| Ireland        | Sectoral distribution of advances: All financial institutions   | 2000-2005       |
| Jamaica        | Commercial banks analysis of loans and advances: everything but government and personal credit  | 1995-2004       |
| Japan          | Loans and discounts outstanding by sector (by Type of Major Industries):domestically licensed banks   | 1990-2005       |
| Kenya          | Commercial banks: distribution of credit facilities: private sector credit to industry, trade and business services                           | 1998-2005       |
| Korea          | Financial assets and liabilities outstanding: bank Loans: business Sector   | 1990-2005       |
| Latvia         | Banking and monetary statistics: loans granted by credit institutions: loans to domestic enterprises and private persons: private enterprises | 1995-2005       |
| Lithuania      | Loans to Non-financial Corporations and Households: Non-financial Corporations  | 1997-2005       |
| Malaysia       | Loans by Sector: Commercial Banks: Industry, Construction, Business Services (Everything but Consumption Credit)                              | 1999-2004       |
| Mexico         | Credit granted by the commercial bank: Enterprises and persons with enterprise activity   | 1995-2005       |
| Netherlands    | Monetary Financial Institutions Loans to the Private Sector: non-financial Corporations   | 1991-2005       |
| New Zealand    | Sector Credit: Resident NZ Claims of registered banks: Agriculture and Business Credit  | 1999-2005       |
| Pakistan       | Classification of Scheduled Banks Advances by Borrower: Industry, Commerce, Construction (Everything but Personal and Other Credit)           | 1990-2003       |

|                 |   |           |
|-----------------|---|-----------|
| Poland          | Commercial banks credit to non-financial corporations                               | 1994-2001 |
| Portugal        | Domestic credit to non-financial Corporations                                       | 1990-2005 |
| Russia          | Bulletin of Banking Statistics: Credit extended to Enterprises                      | 1997-2005 |
| Slovak Republic | Analytical Accounts of the Banking Sector: Domestic Credit: Credit to Enterprises   | 1998-2005 |
| Slovenia        | Deposit Money Banks Claims on Domestics Non-Monetary sectors: Claims on Enterprises | 1995-2005 |
| South Africa    | Total Credit Extended by All Monetary Institutions Net of Household Credit          | 1993-2005 |
| Sweden          | Lending to non-financial enterprises: banks   | 1993-1999 |
| Switzerland     | Lending to companies by company size and type of loan:total                         | 1990-2005 |
| Thailand        | Commercial Bank Credit to Industry, construction, Trade and Services                | 1990-2004 |
| Turkey          | Deposit Money Banks Credit to Enterprises   | 1990-2005 |
| UK              | UK resident banks lending to private sector, net of lending to individuals          | 1990-2005 |
| USA             | Commercial Banks Credit: Commercial and Industrial Loans                            | 1990-2005 |
| Uruguay         | Commercial Bank Credit to Agriculture, Industry, Commerce and Services              | 1990-2002 |

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**Appendix Table A2. Variables - definitions and sources**

| <b>Variable</b>                 | <b>Definition</b>   | <b>Source</b>                         |
|---------------------------------|---|---------------------------------------|
| Bank Credit to GDP Growth       | Rate of change of total outstanding claims of deposit money banks on private sector to GDP ratio    | Beck, Demirguc-Kunt and Levine (2000) |
| Enterprise Credit to GDP Growth | Rate of change of total outstanding claims of deposit money banks on enterprise sector to GDP ratio | See Appendix Table A1                 |
| Household Credit to GDP Growth  | Rate of change of total outstanding claims of deposit money banks on households to GDP ratio        | See Appendix Table A1                 |
| GDP per capita                  | Real GDP per Capita   | World Development Indicators (WDI)    |
| Bank Reserves to Total Assets   | Total bank reserves as ratio of total assets  | WDI                                   |
| M2/Reserves                     | Ratio of the M2 to foreign reserves of the Central Bank   | WDI                                   |
| GDP Growth                      | Rate of growth of real GDP  | WDI                                   |
| Inflation                       | Rate of change of the GDP deflator  | WDI                                   |
| Real Interest Rate              | Nominal interest rate minus the rate of inflation   | WDI                                   |
| Terms of Trade Change           | Change in the terms of trade  | WDI                                   |

**Table 1: Banking sector development and credit growth across countries, 1990-2005**

Bank Credit to GDP is total claims of deposit money banks on private domestic non-financial sector as ratio to GDP. Enterprise Credit to GDP is total claims of deposit money banks on enterprises as ratio to GDP. Household Credit to GDP is total claims of deposit money banks on households as ratio to GDP. Enterprise and Household Credit growth is the rate of change of the credit to GDP ratio.

|                 | Bank Credit to GDP | Household Credit to GDP | Enterprise Credit to GDP | Household Credit Growth | Enterprise Credit Growth |
|-----------------|--------------------|-------------------------|--------------------------|-------------------------|--------------------------|
| Argentina       | 20.12              | 11.55                   | 8.58                     | 1.15                    | 0.19                     |
| Australia       | 78.84              | 51.30                   | 27.54                    | 2.19                    | 0.68                     |
| Austria         | 100.59             | 35.19                   | 65.40                    | 2.00                    | 0.94                     |
| Belgium         | 75.61              | 43.71                   | 31.90                    | 0.30                    | -1.49                    |
| Bulgaria        | 22.22              | 7.56                    | 14.66                    | 2.14                    | 3.29                     |
| Canada          | 66.50              | 53.23                   | 13.27                    | 1.14                    | -0.45                    |
| Costa Rica      | 24.60              | 13.27                   | 11.33                    | 1.89                    | 0.49                     |
| Czech Republic  | 49.12              | 17.31                   | 31.81                    | -0.72                   | -2.61                    |
| Denmark         | 78.76              | 66.09                   | 12.67                    | -0.60                   | 0.73                     |
| Egypt           | 42.50              | 7.17                    | 35.34                    | 0.09                    | 2.33                     |
| Estonia         | 29.33              | 11.35                   | 17.97                    | 2.67                    | 1.06                     |
| Finland         | 63.93              | 40.85                   | 23.07                    | 3.17                    | 0.99                     |
| France          | 85.15              | 51.18                   | 33.97                    | 1.30                    | -0.42                    |
| Germany         | 97.80              | 37.15                   | 60.65                    | 0.32                    | 2.69                     |
| Greece          | 67.04              | 28.67                   | 38.38                    | 3.79                    | 1.87                     |
| Hungary         | 23.18              | 4.18                    | 18.99                    | 0.24                    | 0.79                     |
| Iceland         | 81.67              | 36.15                   | 45.52                    | 6.08                    | 4.65                     |
| India           | 22.74              | 6.86                    | 15.88                    | -0.38                   | -0.06                    |
| Indonesia       | 25.02              | 8.09                    | 16.93                    | -0.37                   | -4.03                    |
| Ireland         | 114.55             | 43.05                   | 71.50                    | 6.42                    | 2.45                     |
| Jamaica         | 19.95              | 9.80                    | 10.16                    | 0.43                    | -0.57                    |
| Japan           | 111.30             | 35.41                   | 75.89                    | 0.18                    | -1.27                    |
| Kenya           | 25.35              | 5.34                    | 20.02                    | -0.44                   | -0.18                    |
| Korea, Rep.     | 63.69              | 33.77                   | 29.92                    | 2.26                    | 0.69                     |
| Latvia          | 20.14              | 3.94                    | 16.20                    | 1.34                    | 2.42                     |
| Lithuania       | 16.33              | 5.03                    | 11.30                    | 0.94                    | 1.35                     |
| Macedonia       | 18.56              | 4.62                    | 13.94                    | 0.34                    | 0.32                     |
| Malaysia        | 95.75              | 10.15                   | 85.60                    | 1.96                    | -3.04                    |
| Mexico          | 18.66              | 9.95                    | 8.71                     | 0.08                    | -1.84                    |
| Netherlands     | 115.59             | 69.61                   | 45.98                    | 4.86                    | 0.18                     |
| New Zealand     | 112.97             | 69.17                   | 43.81                    | 1.42                    | 1.41                     |
| Pakistan        | 22.38              | 4.84                    | 17.54                    | 0.06                    | -0.15                    |
| Poland          | 20.59              | 4.00                    | 16.59                    | 1.00                    | 0.50                     |
| Portugal        | 99.04              | 50.96                   | 48.09                    | 4.12                    | 2.16                     |
| Russia          | 14.80              | 3.31                    | 11.49                    | 0.24                    | 1.48                     |
| Slovak Republic | 41.93              | 15.18                   | 26.75                    | 0.72                    | -3.76                    |
| Slovenia        | 33.34              | 9.76                    | 23.58                    | 0.77                    | 1.89                     |
| South Africa    | 65.19              | 33.49                   | 31.70                    | 1.25                    | 0.78                     |
| Sweden          | 60.66              | 36.71                   | 23.95                    | -0.09                   | -0.34                    |
| Switzerland     | 160.11             | 96.65                   | 63.47                    | 1.84                    | -1.47                    |
| Thailand        | 87.03              | 18.35                   | 68.69                    | -0.14                   | 0.92                     |

|                |              |              |              |             |             |
|----------------|--------------|--------------|--------------|-------------|-------------|
| Turkey         | 15.51        | 5.25         | 10.25        | 0.38        | 0.23        |
| United Kingdom | 123.09       | 67.72        | 55.37        | 1.90        | 1.01        |
| United States  | 38.98        | 29.45        | 9.53         | 0.79        | -0.23       |
| Uruguay        | 32.93        | 15.49        | 17.44        | 1.61        | 1.14        |
| <b>Average</b> | <b>59.60</b> | <b>29.82</b> | <b>31.67</b> | <b>1.41</b> | <b>0.39</b> |

**Table 2: Descriptive Statistics**

| <i>Variable</i>                | <i>Total Credit Growth</i> | <i>Household Credit Growth</i> | <i>Business Credit Growth</i> | <i>GDP Growth</i> | <i>GDP per Capita</i> | <i>M2/Reserves</i> | <i>Bank Reserves/Assets</i> |
|--------------------------------|----------------------------|--------------------------------|-------------------------------|-------------------|-----------------------|--------------------|-----------------------------|
| <i>Mean</i>                    | 1.794                      | 1.407                          | 0.386                         | 3.434             | 17750                 | 9.360              | 6.601                       |
| <i>Standard Deviation</i>      | 5.281                      | 3.259                          | 3.272                         | 2.995             | 11159                 | 13.192             | 6.556                       |
| <i>Minimum</i>                 | -18.740                    | -17.870                        | -14.100                       | -11.032           | 1191                  | 1.111              | 0.000                       |
| <i>Maximum</i>                 | 50.620                     | 26.770                         | 23.840                        | 10.596            | 41813                 | 90.944             | 34.019                      |
| <i>Correlations</i>            |                            |                                |                               |                   |                       |                    |                             |
| <i>Bank Credit Growth</i>      | 1.0000                     |                                |                               |                   |                       |                    |                             |
| <i>Household Credit Growth</i> | 0.7926                     | 1.0000                         |                               |                   |                       |                    |                             |
| <i>Firm Credit Growth</i>      | 0.8141                     | 0.2910                         | 1.0000                        |                   |                       |                    |                             |
| <i>GDP Growth</i>              | 0.1371                     | 0.1668                         | 0.0561                        | 1.0000            |                       |                    |                             |
| <i>GDP per Capita</i>          | 0.1448                     | 0.2087                         | 0.0284                        | -0.1509           | 1.0000                |                    |                             |
| <i>M2 to Reserves</i>          | -0.0206                    | -0.0418                        | 0.0074                        | -0.1643           | 0.5184                | 1.0000             |                             |
| <i>Bank Reserves to Assets</i> | -0.1195                    | -0.1830                        | -0.0132                       | 0.0465            | -0.4801               | -0.3721            | 1.0000                      |

**Table 3a: Dates of Systemic Banking Crises**

| <i>Country</i>     | <i>Banking Crises</i> |
|--------------------|-----------------------|
| Argentina          | 1995                  |
| Jamaica            | 1996                  |
| Japan              | 1992                  |
| Korea, Rep.        | 1997                  |
| Russian Federation | 1998                  |
| Thailand           | 1997                  |
| Turkey             | 2000                  |
| Uruguay            | 2002                  |
| Total              | 8                     |

**Table 3b: Dates of Non-Systemic Banking Crises**

| <i>Country</i> | <i>Banking Crises</i> |
|----------------|-----------------------|
| Iceland        | 1993                  |
| India          | 1993                  |
| Turkey         | 1994                  |
| Total          | 3                     |

**Table 4: Household and enterprise credit growth and systemic banking crises**

|                         | (1)                  | (2)                  | (3)                 | (4)                  | (5)                  | (6)                  |
|-------------------------|----------------------|----------------------|---------------------|----------------------|----------------------|----------------------|
| Total credit growth     | 0.095<br>(0.049)**   | 0.089<br>(0.049)**   | 0.134<br>(0.048)*** |                      |                      |                      |
| Household credit growth |                      |                      |                     | 0.081<br>(0.041)**   | 0.085<br>(0.044)**   | 0.143<br>(0.052)***  |
| Business credit growth  |                      |                      |                     | 0.114<br>(0.071)     | 0.094<br>(0.076)     | 0.122<br>(0.078)     |
| GDP growth              | -0.304<br>(0.088)*** | -0.294<br>(0.090)*** | -0.31<br>(0.106)*** | -0.298<br>(0.088)*** | -0.293<br>(0.088)*** | -0.314<br>(0.105)*** |
| GDP per capita          | 0.001<br>(0.000)*    | 0.001<br>(0.000)**   | 0.001<br>(0.000)*** | 0.001<br>(0.000)*    | 0.001<br>(0.000)**   | 0.001<br>(0.000)***  |
| Bank reserves to assets |                      | -0.042<br>(0.077)    | -0.023<br>(0.081)   |                      | -0.041<br>(0.083)    | -0.026<br>(0.09)     |
| M2 to reserves          |                      |                      | 0.058<br>(0.020)*** |                      |                      | 0.058<br>(0.020)***  |
| Constant                | -2.365<br>(0.445)*** | -1.905<br>(0.826)**  | -2.123<br>(0.929)** | -2.398<br>(0.462)*** | -1.926<br>(0.945)**  | -2.076<br>(1.053)**  |
| Observations            | 400                  | 379                  | 315                 | 400                  | 379                  | 315                  |
| Countries               | 45                   | 43                   | 33                  | 45                   | 43                   | 33                   |

The dependent variable is a crisis dummy, which takes the value one if there is a systemic banking crisis and the value zero otherwise. We estimate a population averaged panel logit probability model. Standard errors are given in parentheses. \*, \*\*, and \*\*\* indicate significance levels of 10, 5 and 1 percent, respectively.

**Table 5: Household and enterprise credit growth and systemic and non-systemic banking crises**

|                         | (1)                  | (2)                  | (3)                  | (4)                  | (5)                 | (6)                  |
|-------------------------|----------------------|----------------------|----------------------|----------------------|---------------------|----------------------|
| Total credit growth     | 0.088<br>(0.040)**   | 0.091<br>(0.038)**   | 0.117<br>(0.043)***  |                      |                     |                      |
| Household credit growth |                      |                      |                      | 0.079<br>(0.041)*    | 0.088<br>(0.045)**  | 0.125<br>(0.054)**   |
| Business credit growth  |                      |                      |                      | 0.099<br>(0.056)*    | 0.095<br>(0.058)    | 0.108<br>(0.058)*    |
| GDP growth              | -0.295<br>(0.064)*** | -0.321<br>(0.075)*** | -0.324<br>(0.081)*** | -0.291<br>(0.065)*** | -0.32<br>(0.074)*** | -0.327<br>(0.081)*** |
| GDP per capita          | 0.001<br>(0.000)**   | 0.001<br>(0.000)*    | 0.001<br>(0.000)*    | 0.001<br>(0.000)**   | 0.001<br>(0.000)*   | 0.001<br>(0.000)*    |
| Bank reserves to assets |                      | -0.03<br>(0.057)     | -0.017<br>(0.058)    |                      | -0.029<br>(0.062)   | -0.019<br>(0.062)    |
| M2 to reserves          |                      |                      | 0.038<br>(0.017)**   |                      |                     | 0.039<br>(0.018)**   |
| Constant                | -2.504<br>(0.943)*** | -2.289<br>(0.868)*** | -3.092<br>(2.287)    | -2.508<br>(1.085)**  | -1.912<br>(1.067)*  | -2.722<br>(2.712)    |
| Observations            | 400                  | 379                  | 315                  | 400                  | 379                 | 315                  |
| Countries               | 45                   | 43                   | 33                   | 45                   | 43                  | 33                   |

The dependent variable is a crisis dummy, which takes the value one if there is a systemic or non-systemic banking crisis and the value zero otherwise. We estimate a population averaged panel logit probability model. Standard errors are given in parentheses. \*, \*\*, and \*\*\* indicate significance levels of 10, 5 and 1 percent, respectively.

**Table 6**  
**Credit growth and systemic banking crises: controlling for additional variables**

|                         | (1)                  | (2)                | (3)                | (4)                  | (5)                | (6)                |
|-------------------------|----------------------|--------------------|--------------------|----------------------|--------------------|--------------------|
| Total credit growth     | 0.165<br>(0.056)***  | 0.192<br>(0.091)** | 0.187<br>(0.099)*  |                      |                    |                    |
| Household credit growth |                      |                    |                    | 0.216<br>(0.073)***  | 0.246<br>(0.145)*  | 0.236<br>(0.137)*  |
| Business credit growth  |                      |                    |                    | 0.112<br>(0.071)     | 0.156<br>(0.096)   | 0.151<br>(0.114)   |
| GDP growth              | -0.316<br>(0.108)*** | -0.335<br>(0.180)* | -0.293<br>(0.168)* | -0.352<br>(0.122)*** | -0.39<br>-0.257    | -0.34<br>-0.24     |
| GDP per capita          | 0.001<br>(0.000)***  | 0.001<br>(0.000)** | 0.001<br>(0.000)*  | 0.001<br>(0.000)**   | 0.001<br>(0.000)** | 0.001<br>(0.000)** |
| Bank reserves to assets | -0.209<br>(0.051)*** | -0.44<br>-0.399    | -0.637<br>-0.612   | -0.25<br>(0.058)***  | -0.471<br>-0.392   | -0.661<br>-0.588   |
| M2 to reserves          | 0.072<br>(0.024)***  | 0.099<br>(0.040)** | 0.106<br>(0.053)** | 0.073<br>(0.025)***  | 0.104<br>(0.042)** | 0.109<br>(0.050)** |
| Terms of trade change   | -0.229<br>(0.087)*** | -0.371<br>-0.276   | -0.423<br>-0.393   | -0.229<br>(0.085)*** | -0.394<br>-0.278   | -0.435<br>-0.384   |
| Real interest rate      |                      | 0.072<br>(0.086)   | 0.12<br>(0.143)    |                      | 0.062<br>(0.103)   | 0.109<br>(0.159)   |
| Inflation               |                      |                    | 0.132<br>(0.155)   |                      |                    | 0.132<br>(0.152)   |
| Constant                | -1.797<br>(0.787)**  | -2.182<br>(1.207)* | -3.092<br>(2.287)  | -1.395<br>(0.891)    | -1.834<br>(1.544)  | -2.722<br>(2.712)  |
| Observations            | 301                  | 273                | 273                | 301                  | 273                | 273                |
| Countries               | 32                   | 30                 | 30                 | 32                   | 30                 | 30                 |

The dependent variable is a crisis dummy, which takes the value one if there is a systemic banking crisis and the value zero otherwise. We estimate a population averaged panel logit probability model. Standard errors are given in parentheses. \*, \*\*, and \*\*\* indicate significance levels of 10, 5 and 1 percent, respectively.