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CREDIT GROWTH IN LATIN AMERICA: FINANCIAL DEVELOPMENT OR CREDIT BOOM?

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Abstract: Banking credit to the private sector in Latin America has on average increased by 7 percent of GDP from primo 2004 to ultimo 2011, with real credit in some countries growing by up to 20 percent per year. This paper documents and analyzes the patterns of credit growth in 18 countries in Latin America and uses econometric methods to determine whether it is indicative of financial deepening or poses risks of credit booms. The strongest credit growth occurred for consumption and mortgages within the household sector and for construction within the corporate sector. At the same time credit has de-dollarized in most countries and there are some signs of maturity lengthening. To assess whether the recent credit growth is excessive two different methods are applied. First, by application of HP-filters the paper finds that credit-to-GDP levels in a number of countries are above their long-term trend. Second, using a panel co-integration approach on 107 high and mid-income countries the paper estimates a model for the credit-to-GDP levels. Comparing the actual levels of credit with the ones predicted by the model we find that some countries in Latin America show significant and positive deviations. These results indicate the existence of a certain level of risk in the recent credit developments.

JEL Classification Numbers: E51, G21.

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I. INTRODUCTION

1. **Real credit in Latin America grew by an average of 9 percent from primo 2004 to ultimo 2011.**² After a period of negative growth, real banking credit to the private sector picked up during 2004-07, with the average growth in the region being 12.4 percent. This was slightly higher than the growth rates seen in Emerging Asia, but well below the growth in Emerging Europe (Figure 1). During the global financial crisis in 2008-09 real credit growth in Latin America receded to 2.7 percent. However, in contrast to Emerging Europe credit growth in Latin America recovered strongly in 2010-11, where the average real credit growth almost reached a near pre-crisis level of 10.2 percent. In 2011, real credit growth in Latin America was faster than both Emerging Europe and Asia.

2. **The fast credit growth can reflect deepening of Latin America's relatively shallow credit markets.** In primo 2004, most countries in Latin America had credit-to-GDP levels lower than countries with similar income per capita levels, although Chile and Panama were notable exceptions (Figure 1). In spite of the high credit growth since 2004, the depth of Latin American credit markets remains relatively low as per ultimo 2011 (Figure 1), and only Brazil, Chile and Panama post credit-to-GDP ratios significantly above the average of middle-income countries. Overall, the highest credit growth has happened in countries with low initial credit-to-GDP ratios (Figure 2), which points to some convergence in credit depth within Latin America.

3. **The financial deepening can help boost income per capita in the region.** Better access to credit has the potential to foster supply-side driven economic growth by bolstering capital accumulation and total factor productivity. Capital accumulation can be promoted as deeper credit markets mobilizes savings and promotes risk-sharing, which in turn can nurture the willingness to undertake risky investment projects with a high mean return (Acemoglu and Zilibotti, 1997). Deeper credit markets can also bolster technological innovation by identifying, selecting and funding entrepreneurs (Schumpeter, 1912; Levine, 1997). The existence of these mechanisms finds some support in an empirical literature, which tends to find a positive association between credit market depth and economic growth (King and Levine, 1993).³

4. **However, rapid credit growth also entails risks to macro and financial stability.** Rapid credit growth can undermine macroeconomic stability by pushing domestic demand above potential output, causing overheating, manifested through inflationary pressure,

² Countries in Latin America included in the analysis are Argentina, Brazil, Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, El Salvador, Ecuador, Guatemala, Honduras, Nicaragua, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

³ Some studies have, however, qualified this statement by finding that the positive relationship tends to disappear when (i) financial depth becomes too high, (ii) when institutions quality is poor or (iii) when inflation is excessive (Favara, 2003; Arcand *et al.*, 2012; Demetriades and Law, 2006; Rosseau and Wachtel, 2002).

ramped up asset prices, eroded competitiveness and widening external imbalances. In addition, rapid credit growth can have direct adverse effects on financial stability as it can give rise to vulnerabilities on the asset and/or the liability side of the banking sector's balance sheet. First, vulnerabilities on the asset side might occur if banks overestimate the credit-worthiness of borrowers during a boom as the assessments risk attaching too much weight on current benign economic conditions and strong collateral values. Second, rapid credit growth might also impede the credit quality, as banks' ability to duly process loan application could be stretched during a boom in loan applications. Third, banks may fail to diversify their loan portfolio properly in an environment, where they easily can service existing customers. Fourth, vulnerabilities on the liability side might emerge if banks, in order to sustain rapid credit growth, become excessively reliant on unstable funding sources.

5. **The goal of this paper to document the recent expansion of banking credit to the private sector in Latin America and identify potential risks.** First, we build a new and relatively rich dataset documenting the composition of the recent credit development in Latin America. This allows us to analyze the composition of credit in Latin America by breaking down credit by market segments, sectors, currencies, maturities, and bank origin. Second, we assess whether current credit-to-GDP levels in Latin America are excessive by means of two different methods. The first method is inspired by the observation that the build-up of financial imbalances on the asset side often manifest themselves through rapid credit growth and buoyant asset prices (Borio and Lowe, 2002). To capture this we analyze the deviations of credit-to-GDP ratios and equity prices from their estimated long-run trend. In the second method we estimate a long-run relationship between credit and deposits using panel cointegration methods. Large deviations from this relationship could indicate existence of imbalances on the liability side since large reliance on non-depositary funding often precedes a banking crisis (Hahm *et al.*, 2011). In addition we use a short-run error correction model to assess what drives deviations from the estimated long-run equilibrium.

6. **The main findings of this paper are as follows:**

- Growth in banking credit during 2004-11 has been strongest for households credit for most Latin American countries. Indeed, in most countries consumption and mortgage credit has grown faster than credit to the corporate sector. Within the latter sector credit has expanded the most within construction.
- Banking credit to the private sector has become increasingly de-dollarized and for some countries we find signs of maturity lengthening.
- Foreign owned banks posted the fastest lending growth, although domestic banks accounted for most of the growth in credit owing to larger market shares.

- In a number of countries the period of strong credit growth since 2004 has opened a “gap” between the actual credit-to-GDP ratio and its long-run trend. The gaps in general receded somewhat after 2007, but have in some countries picked up again after 2010. For some countries large credit-to-GDP gaps have been accompanied by positive gaps in real equity prices – especially in the time before 2008.
- The estimated econometric model suggests that credit-to-GDP in some countries deviates significantly from their estimated long-run level given the deposit-to-GDP levels in the economies. There is however a large amount of uncertainty involved in determining these long-run levels.

7. **This paper adds to an existing literature on the recent credit development in Latin America.** A number of papers have recently studied whether the period of rapid credit growth in Latin America could build up financial vulnerabilities in the region (*e.g.* Cubeddu *et al.*, 2012; IMF, 2011b; IMF, 2012a). This paper adds to this literature by providing a detailed breakdown of the credit development on market segments, sectors, currencies, maturities, and bank origin. Moreover, it contributes by estimating and applying an econometric model for the long-run level of credit in the economy.

8. **The remainder of this paper is organized as follows.** Section 2 offers some salient facts on the recent credit expansion in Latin America by breaking down the credit growth. Section 3 estimates a model for the level of credit-to-GDP using cointegration methods. The model is then applied to Latin America to assess whether the credit levels lie within the estimated equilibria. In addition a model for the dynamics of credit growth in the short-run is estimated in order to assess what is driving the deviations from the long-run equilibrium. Section 4 concludes.

II. STYLIZED FACTS ON THE CREDIT EXPANSION IN LATIN AMERICA IN 2004-11

9. **The growth since 2004 can be divided into three sub-periods.** From primo 2004 and up to 2007, real credit in the region expanded at a rapid pace. The average growth rate of real credit was 12.4 percent per year, while the median growth was 13.7 percent per year (Figure 2).⁴ During the global financial crisis in 2008-09 real credit growth receded to an average of 2.7 percent per year, but it is noteworthy that no slow-down occurred in Brazil and real credit even accelerated in Paraguay and Peru. In the post-crisis period, 2010-11, real credit growth has picked up to near pre-crisis levels as the average growth rate in real credit for this period stood at 10.2 percent per year.

10. **The period of high credit growth has caused the region’s credit-to-GDP ratios to increase.** The credit-to-GDP ratio in Latin America has increased from 31.0 percent of GDP

⁴ Notable exceptions are Guatemala, El Salvador, Bolivia, the Dominican Republic and Uruguay, where growth was muted or even negative.

in primo 2004 to 38.5 percent of GDP in ultimo 2011 (Figure 2). The rise was particularly pronounced in Paraguay and Brazil, where the credit-to-GDP ratio over the period increased by 25 and 31 percentage points, respectively.

11. **The period of buoyant credit has been accompanied by strong deposit accumulation.** During 2004-11 the ratio of deposits to GDP has on average risen from 32.3 to 38.1 percent of GDP. The increase was particular marked in the countries that also saw the largest increases the credit-to-GDP ratio (Figure 3). This positive association reflects that banks' capacity to lend is bolstered by a higher level of deposits, which constitutes an important funding variable for the Latin American banking sector. Indeed, on average deposits accounts for 77% of total banking funding in Latin America.⁵

12. **The credit expansion has not been homogenous across Latin America, which has brought about some convergence in credit levels.** Real credit growth has been particular rapid (average of 15-20 percent per year) in Venezuela, Paraguay and Brazil, while it has been more muted (less than 6 percent per year) in Honduras, Bolivia, Guatemala, the Dominican Republic and Uruguay. Overall, the highest growth has happened in countries with low initial credit-to-GDP ratios (Figure 2), which points to some convergence in credit depth within Latin America.

13. **A detailed breakdown of credit can help shed light on whether the fast credit growth reflects sound financial deepening or an unsustainable credit boom.** Specifically, it is important to assess whether the concentration of credit across markets, sectors, currencies, maturities and lenders are pointing to vulnerabilities. Below we provide such a break-down for the recent credit growth in most countries of Latin America, although data limitations preclude us from providing a complete break-down for all the assessed countries.

14. **Credit to households has been more vibrant than corporate credit.** Across the countries where data is available, mortgages, and consumption credit have grown faster than corporate credit throughout the period 2005-2011 (Figure 4).⁶ This reflects the picture in most countries, although Guatemala, Panama, Costa Rica and Mexico stands out with relatively high growth rates for corporate credit. Mortgage credit has been especially dynamic in Brazil, where the average real growth rate for this segment was 31 percent over the period. Similarly, consumption credit has been most buoyant in Argentina, where the average real growth rate was 22 percent over the period. However, in spite of the recent development, the stock of loans in Latin America remains dominated by corporate credit. Indeed, in 2011 corporate loan shares stand above 50 percent in most countries (Figure 3).

⁵ We define total bank funding as deposits, bank equity, bank securities, banks' net foreign liabilities. See Annex 1B for a detailed description of the variables.

⁶ The development during 2005-2011 is described as data is lacking for 2004-11.

15. **Within the corporate sector credit to construction has grown the fastest.** Looking closer at credit in the corporate sector shows that real credit to the corporate sector has been strongest within construction followed by the service and commerce sector, while it has expanded the least within the productive sectors (Figure 5).⁷ The average growth in real credit to construction was above 10 percent in most countries with available data during 2005-11. Real credit to construction was particularly buoyant in Mexico and Uruguay, where it on average grew by more than 20 percent per year. In most countries credit to the construction sector accounted for approximately 10 percent of the stock of corporate loan during the period. However, in Mexico, Bolivia and Panama the construction sector accounts for around 30 percent of corporate loans.

16. **Domestic banks have been the main drivers of the credit expansion.** Foreign owned banks increased their lending faster than domestically owned banks from 2004 to 2008 (Figure 6). Nevertheless, the largest *contribution* to credit growth in this period in most countries came from domestic banks owing to large initial market shares. Lending from domestic banks also continued to grow after the global financial crisis intensified in 2008, while foreign banks curtailed their lending in 2009.

17. **National currency lending has been on the rise.** The stock of credit in domestic currency has increased substantially since 2004 in Peru, Bolivia and Uruguay. The same has happened to a lesser degree in Paraguay, Guatemala and Costa Rica (Figure 7). At the same time foreign currency lending has been less than 10 percent and roughly constant in Chile, Brazil, Mexico, Argentina, Colombia and Honduras. On the other hand credit remains fully dollarized in Ecuador, Panama and El Salvador while credit in Nicaragua continues to be highly dollarized.⁸ The declining importance of foreign currency loans in the stock of loans is likely to partly reflect that new lending increasingly is done in national currency. At the same time, the appreciation of the Latin American currencies *vis-à-vis* the dollar since 2004 is also likely to have played a role.

18. **There are some signs of maturity lengthening.** During 2004-11, there has been a substantial shift towards longer maturities in Brazil, Chile and to a lesser extent in Bolivia (Figure 8). At the same time maturities have remained roughly constant and relatively long in Guatemala and El Salvador, as less than 30 percent of all loans in these countries have maturities shorter than one year. On the other hand maturities are relatively short in Mexico, as the share of loans with maturities of less than one year stood at 70 percent in 2011.

⁷ “Productive sectors” are defined as Agriculture, Other Rural Industries, Manufacturing, Mining and Energy Supply.

⁸ As per ultimo 2011 71.6 percent of all assets in the banking system in Nicaragua were in foreign currency (IMF, 2012b).

III. IS CREDIT EXCESSIVE IN LATIN AMERICA?

19. **It is a first order problem for policymakers to assess whether the recent credit growth in Latin America is building up vulnerabilities in the financial sector.** Indeed, there is a long history of periods with rapid credit growth “gone wrong” leading to subsequent strains in the financial sector and severe economic contractions (*e.g.* Reinhart and Rogoff, 2009). This can happen as rapid credit growth can give rise to vulnerabilities on the asset and/or liability side of the banking sector’s balance sheet. The first can happen if the rapid expansion of credit leads to a drop in the credit quality and lack of diversification. The second can happen if banks, in order to sustain the rapid growth in credit, become excessively reliant on unstable funding sources. However, the *ex ante* identification of periods with excessive credit is complicated by the fact that an episode of credit growth can be benign if it reflects a sound financial deepening or a positive productivity shock.⁹

20. **To assess whether the recent credit developments in Latin America are “excessive” we apply two approaches previously utilized in the literature.** The first approach is inspired by the work by Borio and Lowe (2002) and Borio and Drehmann (2009). The basic idea is that financial imbalances often manifest themselves via the coexistence of rapid growth in private credit and buoyant asset prices. Thus, the authors construct indicators intended to capture this based on deviations on private credit and asset prices from their trend (“gaps”). The second approach is based on the observation that large reliance on non-depository often precedes a banking crisis (Hahm *et al.*, 2011). On the back of this observation we estimate a long-run relationship between credit and deposits using panel co-integration methods. This allows us to assess whether the credit-to-GDP ratio in a country deviates from the estimated long-run level implied by the observed level of deposits. In this section we apply both methods to the Latin American countries. We also provide a discussion of the virtues and shortfalls of each method.

A. Credit and Equity Price Gaps

21. The buildup of financial imbalances is often manifested in large and positive “gaps” in credit-to-GDP and real asset prices *vis-à-vis* their long-run trend. This is the motivation for the approach proposed by Borio and Lowe (2002), who construct a vulnerability indicator *e.g.* using the gaps from trend of credit-to-GDP and real asset prices. The gaps are constructed using a one-sided Hodrick-Prescott filter.¹⁰ If both gaps exceeds given thresholds the indicator issues a warning. Borio and Drehmann (2009) show that by an appropriate

⁹ The latter point is made in a DSGE model in chapter 3 of IMF (2011a).

¹⁰ In the analysis below we are using a smoothing parameter (λ) in the HP-filtering of 400.000. This is what Drehmann *et al.* (2011) suggest for quarterly data. The relatively high value is motivated by the observation that financial cycles approximately are four times longer than usual business cycles. Moreover, Drehmann *et al.* (2011) show that this λ value outperforms alternative λ values as a banking crisis predictor.

choice of thresholds the indicator has historically done relatively well in issuing warning signals prior to banking crises, while avoiding to issue signals when no crisis occurred.¹¹ Specifically, they suggest thresholds for the real equity price gaps and the credit-to-GDP in the interval 40-60 percent and 4-6 percentage points, respectively. For the latter threshold we will however use 2-10 percentage points based on later analysis by Drehmann *et al.* (2011). However, an important limitation of the original indicator proposed by Borio and Lowe (2002) is that only equity prices are included in spite of the important role of property prices in previous banking crisis. This point is addressed by Borio and Drehmann (2009), who augment the analysis with property prices. However, data limitations preclude us from including property prices in our analysis of Latin America below.

22. Large and positive credit-to-GDP gaps are found in some Latin American countries (Figure 9-11). The recent period of strong credit growth since 2004 has made the credit-to-GDP gap positive in most countries in the region. The gaps in general receded somewhat after 2007, but have picked up again after 2010. In the end of 2011 the gap was especially pronounced in Brazil, Paraguay, Venezuela and Colombia.¹² Chile, Honduras, Costa Rica and Nicaragua also saw large positive gaps prior to 2008, but up to 2011 the gaps receded in these countries on the back of the global financial turmoil starting in 2007.

23. Positive real equity price gaps are also found in some Latin American countries (Figure 12). In 2010-2011 the gaps were largest in Argentina, Chile and Peru, although generally below the crisis indicator thresholds suggested by Borio and Drehmann (2009). However, in previous years some countries have simultaneously seen real equity price gaps and credit-to-GDP gaps in the thresholds areas. This was the case for Chile in primo 2010, where the real asset price gap was substantial, but a marked correction in 2011 left the gap considerably below the threshold. Brazil and Costa Rica also saw real equity price gaps and credit-to-GDP in the threshold area up to 2007-08. Argentina have up to 2010 seen substantial equity price gaps without presence of large credit gaps, although the latter picked up somewhat in 2011. The coverage of our analysis is however hampered by the fact that our dataset only contains equity indices for 7 out of 18 countries in our sample.¹³

24. The absence of data on property prices is an important limitation of the analysis. Indeed, as mentioned above the property prices have historically played an important role in banking crises. However, data on housing prices is only available in a minor sub-sample of

¹¹ However, in contrast to Borio and Drehmann (2009) and Drehman *et al.* (2011) the study by IMF (2011a) finds that the change in the credit-to-GDP ratio outperforms the credit-to-GDP gap as a crisis indicator.

¹² Note that in contrast to our findings the Financial System Stability Assessment for Brazil (IMF, 2012b) finds that the credit-to-GDP in Brazil has receded notably since 2009. This cautions against a strong interpretation of the result.

¹³ Our dataset does not contain equity prices for Venezuela, Uruguay, Bolivia, the Dominican Republic, Guatemala, Ecuador, Nicaragua, El Salvador, Paraguay, Honduras and Panama.

Latin American countries (Cubeddu, Tovar and Tsounta, 2012), why we are precluded from including them in our analysis here. Nevertheless, Cubeddu, Tovar and Tsounta (2012) analyze the housing markets in Peru, Mexico, Chile and Colombia using a VECM model and find no imminent misalignment in prices, although the authors note that misalignments could emerge if current trends persists.

25. **The HP-filter methodology has some limitations.** First, a general is that such calculations fail to take the initial level of credit into account (Coudert and Pouvell, 2010). Indeed, a period of sound financial deepening might entail a period of temporary high credit growth. Second, a related point is that the technique does correct for structural breaks that might arise due to policy reforms or other structural changes that could affect the degree of financial sophistication (Cubeddu *et al.*, 2012). Third, on the technical level revisions to the credit-to-GDP gap can be substantial (Edge and Meisenzahl, 2011) and the HP-filter is known to have end point problems (Mise *et al.*, 2005). Finally, the credit-to-GDP gaps can be rather sensitive to choice of starting point and choice of smoothing parameter. In sum, the analysis above can give useful warning signs, but there exist a compelling case for complimenting the analysis with other methods.

B. A Model for the Long-Run Level of Credit

26. **To compliment the gap analysis above we construct an econometric model as a benchmark.** We first estimate a relationship between the level of credit-to-GDP and a set of financial and economic variables. Rather than trying to identify causality the model attempts to estimate a long-run relationship between credit-to-GDP and a set of financial and economic variables. Comparing the actual level of credit with the level implied by the model will in turn allow us to gauge whether the level of credit in Latin America shows sign of being “excessive”.

27. **Our model specification is presented in equation (1).** Here y_{it} denotes credit-to-GDP, $x_{1,it}, \dots, x_{h,it}$ denote the explanatory variables and ε_{it} is the error term. We will estimate the model parameters via panel data estimation methods. This allows us to exploit information from several time series and thus achieve more precise parameter estimates. Nevertheless, the drawback is that we have to impose the assumption that the parameters are common for all countries in the dataset. The model below does however allow for an idiosyncratic intercept.

$$y_{it} = \beta_{i,0} + \beta_1 x_{1,it} + \dots + \beta_n x_{h,it} + \varepsilon_{it} \quad (1)$$

28. **The approach is inspired by studies of the credit development in Emerging Europe.** During the period of rapid credit growth in Eastern Europe prior to 2008 a number of papers studied whether credit in the region was “excessive”. Cottarelli *et al.* (2005), Kiss *et al.* (2006), Egert *et al.* (2006) and Coudert and Pouvelle (2010) use various econometric methods to estimate a relationship between private credit and a set of structural and

macroeconomic variables. Coudert and Pouvelle (2010) and Kiss *et al.* (2006) also estimate error-correction models for the growth of credit. These relationships were then applied to Eastern Europe in order to investigate whether the observed levels of private sector go beyond what the fundamentals predicts. Our approach adds to this literature by estimating the long-run relation using a dataset with a wider selection of countries and by including additional funding variables into the analysis.

C. Data and Estimation Results

29. **We estimate the model using an unbalanced dataset of credit and explanatory variables for 107 high and middle income countries.** The dataset includes banking to the private credit in percent of GDP as well as explanatory variables suggested by the literature:¹⁴

- **PPP-adjusted income per capita (logpppc).** A higher level of income has been found to be associated with a higher level of credit (*e.g.* Cottarelli *et al.*, 2005; Coudert and Pouvelle, 2010). Causality can run both ways. On the one hand financial deepening has been argued to spur economic development as explained in the introduction. On the other hand it has been argued that economic development provides the prerequisites to maintain a costly financial system (Greenwood and Jovanovic, 1990).
- **Deposits as percent of GDP (deposgdp).** A higher level of deposits is likely to increase the level of credit by boosting the lending capacity of banks.
- **Bank equity as percent of GDP (equitygdp).** More equity in the banking system will also allow banks to increase lending through higher lending capacity.
- **Bank securities as percent of GDP (securitygdp).** Similarly, a higher level of issued bank securities will enable banks to increase their lending.
- **Banks' net foreign assets as percent of GDP (nfagdp).** Lower net foreign assets, *i.e.* more net funding from abroad, will allow banks to supply more credit domestically.
- **Government debt as percent of GDP (govdebtgdp).** More credit to the public sector is likely to limit private credit by crowding out the banks' supply of credit.¹⁵
- **Stock market capitalization as percent of GDP (mktcapgdp).** A deeper equity market is *ceteris paribus* expected to diminish the demand for credit, as better access to equity funding provides companies with an alternative financing channel.

¹⁴ See Annex 1B for a detailed description of the dataset.

¹⁵ As noted by Cottarelli *et al.* (2005) and Egert *et al.* (2006) domestic bank credit to the public sector would be a superior measure of this crowding out effect.

- **Net capital inflows as percent of GDP (cfgdp).** Net capital inflows are included as they have been argued to be an important driver behind credit growth (*e.g.* Duenwald *et al.*, 2005). Specifically, if channeled through the banking system capital inflows can bolster the supply of credit by banks and thus increase credit in the economy. However, this effect might be accounted for via the inclusion of deposits and the additional funding variables mentioned above.
- **Banking sector concentration (bcon).** Competition in the banking sector, here inversely proxied by banking sector concentration, can be expected to lower interest margins and thus increase credit in the economy.
- **Credit market regulation (cmr_fraser and cmr_wb).** Financial market liberalization can ease banks supply credit, and empirically the regulation and credit depth have been found to be positively associated (Cottarelli *et al.*, 2005). To account for this we include two alternative measures of credit market regulation.
- **Real interest rate (rlr and rdr).** Some studies include a real interest rate as it simultaneously determines the supply and demand of credit. However, the interest rate is the price variable that clears the market for credit. Thus, insofar that the variables above affecting supply and demand will affect the equilibrium level of credit through a change in the interest rate. The real interest rate is therefore an *outcome* variable, which we will abstain from including in our model.¹⁶

30. **Unit root tests are applied to investigate whether variables are non-stationary.** To determine whether the variables in our dataset possess unit roots we rely on panel unit root tests. Testing for unit roots in panels, rather than in individual time series, has the advantage of giving higher power through the simultaneous exploration of cross country and time information. However, at the same time the panel-based tests restrict the time-series to have the same integration order across countries. Below we apply a battery of panel unit root tests to determine the existence of unit roots in our dataset. Specifically, we apply the tests of Levin *et al.* (2002), Im *et al.* (2003), Maddala and Wu (1999) and Choi (2001).¹⁷

31. **Credit-to-GDP, deposits-to-GDP, PPP-adjusted income and stock market capitalization as percent of GDP are found to have unit roots.** Table 1 summarizes the results from the tests. The tests point to non-stationarity of credit, deposits, and stock market capitalization (all as percent of GDP). The tests for PPP-adjusted income per capita and deposits as percent of GDP are more ambiguous, but since the tests do not ambiguously point to stationary we shall assume that the series are have unit roots. These test results confirms

¹⁶ For a discussion of the problems of inclusion of outcome variables see section 3.2.3 in Angrist and Pischke (2009).

¹⁷ Harris and Sollis (2003) provides an accessible discussion of these tests.

previous findings in the literature (Coudert and Pouvelle, 2010; Egert *et al.*, 2006). The test results point to stationarity of the additional explanatory variables.

32. **Cointegration methods are applied to take the non-stationarity of the data into account.** Against the backdrop of unit roots existence in our dataset, it becomes important to take the non-stationary properties into account to avoid spurious regression problems (Entorf, 1997; Kao, 1999). We do so by applying a panel cointegration framework. The economic appeal of this approach is that it allows us to estimate models for both (i) the long-run equilibrium relationship between the level of credit and a set of cointegrating variables, and (ii) the short-run dynamics of credit growth. These models will in turn be used as benchmarks for the level and growth of credit currently observed in Latin America.

33. **Non-stationary variables are allowed to affect the level of credit in the long run, while stationary variables can affect credit growth in the short run.** It is important to grasp the economic implications of the econometric findings above. In the applied cointegration framework a necessary, albeit not sufficient, condition for a change in an explanatory variable to affect the long run level of credit-to-GDP is that the variable is non-stationary. Indeed, a variable that is non-stationary will be allowed to affect the long run level of credit insofar that it cointegrates with credit-to-GDP. Conversely, if the explanatory variable is stationary it will oscillate around a constant mean. This will allow the variable to affect the growth of credit in the short run relationship, but not the level of credit in the long run relationship.

34. **Credit-to-GDP, deposits-to-GDP, PPP-adjusted income and stockmarket capitalization-to-GDP are found to cointegrate.** To analyze which variables that can affect the credit level in the long run, we rely on the panel cointegration tests proposed by Pedroni (1999, 2004). The tests are reported in Table 2 and point to cointegration between credit-to-GDP, deposits-to-GDP, PPP-adjusted income per capita and stock market capitalization. These findings are broadly in line with the findings done by the literature on other samples of countries (Coudert and Pouvelle, 2010; Egert, Backe and Zumer, 2006; Corradi *et al.*, 1990; Backe, Egert and Walko, 2007; Gersl and Seidler, 2010; Cottarelli *et al.*, 2005).

35. **The long-run relationships are estimated using estimators that allow for cointegration in a panel.** Having established cointegration between credit and the explanatory variables the next step is to estimate the cointegration vector (*e.g.* the long-run relationship) between the variables. We apply the Mean Group Estimator (MGE) by Persaran and Smith (1995) to identify this relationship and consider the Fully Modified OLS (FMOLS) proposed by Pedroni (2001) and the Dynamic OLS (DOLS) for robustness.

36. **We estimate the long-run relationship using a sample spanning 1970Q1-2003Q4 in Latin American, middle- and high-income countries, respectively.** The sample period is chosen so as to exclude the recent period of strong credit growth, which could bias our estimates insofar we are unable to fully include the latest “credit cycle”. To allow for parameter heterogeneity across income levels we estimate separate relationships for middle-

and high-income countries. Moreover, we estimate a separate relationship for Latin America. In our specifications we allow for country fixed effects to account for country idiosyncrasies. Such effects are likely to be important in order to capture institutional features as well as different means of the stationary variables.

37. **Our preferred long-run specification includes credit and deposits.** The parameter estimates in the long-run relationship (equation 1) are reported in Table 3.¹⁸ Deposits-to-GDP enters significantly and with the expected sign across all estimators and specifications. The estimates for deposits-to-GDP tend to be lower in Latin America and other middle-income countries *vis-à-vis* high-income countries. This could reflect that the banking sector in middle-income countries on average relies more on deposits and less on alternative funding instruments. On the other hand the parameters for PPP-adjusted income and stock market capitalization-to-GDP do not enter significantly, and are unstable across time. These observations lead us to prefer the specification including credit and deposits.

38. **A positive deviation from the estimated long-run relationship can potentially reflect an unsustainable reliance on non-deposit funding.** A positive deviation from the estimated relationship implies that the credit level is high given the level of deposits and the historic relationship between credit and deposits. Such a deviation might be a sign of excessive credit levels. That is, when credit is growing faster than deposits, which is the usual pool of funds, the banks need to turn to other, and potentially less stable, funding sources in order to sustain the credit growth. In this context Figure 13 is interesting, as it shows that some of the previous banking crisis did happened on the back of positive and rising deviations from the estimated long-run relationship. This squares well with the findings of Hahm *et al.* (2011) who found that the ratio of non-core to core liabilities to be an indicator of banking crisis. Moreover, IMF (2011a) established an association between credit-to-deposit and the probability of experiencing a banking crisis.

39. **However, deviations from the estimated long-run level of credit should be interpreted with caution.** First, all non-depository funding types are not equally unstable and a deviation from a deposit funded banking system is thus not necessarily worrisome. While securities with long maturities are close substitutes to deposits this is less the case for securities with short maturities. Second, more formal testing is needed to assess whether deviations from the estimated relationship have good predictive power for future banking crisis.

¹⁸ The FMOLS and DOLS estimators confirms the estimates delivered by the MGE estimator. Recursive estimation points to parameter stability for deposits to GDP for the sample of middle-income countries except a period from 1988 to 1993, where the estimate temporary increased.

D. Is Credit in Latin America Deviating from the Estimated Long-run Level?

40. **We compare actual credit-to-GDP in Latin America with its fitted long-run level.** To gauge how the current credit-to-GDP levels in Latin America compare to the estimated long-run levels, we fit the model using the deposits-to-GDP ratios in Latin America. Specifically, we use the estimates from the preferred estimated model of equation (1) for middle-income countries (model (3) in Table 3) along with the country specific fixed effects. Using the model along with the actual values of deposits-to-GDP yields an estimated credit-to-GDP level for each country. These fitted values are in turn benchmarked with the actual credit levels, which gives us the estimated “credit gaps” for Latin America.

41. **No significant deviations from the estimated long-run level are present for most Latin American countries.** Figures 14-15 depict the estimated “credit gaps” for Latin America. Prediction intervals are included in addition to the mean prediction. The model has historically yielded a fair prediction of the long run credit levels, as witnessed by some mean reversion in the long run. The figure also shows that the brisk credit growth since 2004 in some countries (Brazil, Mexico, Honduras, Bolivia and Argentina) happened amid historically low credit levels given the amount of deposits in the banking sector. Consequently, most Latin American countries are per ultimo 2011 operating credit-to-GDP levels below, or not significantly above, the estimated long-run level.

42. **However, significant deviations were present in Chile, Colombia, Costa Rica and Paraguay ultimo 2011.** According to Figure 14-15 the credit levels in these countries were significantly above the estimated long-run level. In Paraguay and Colombia this reflects a fast growth in the deviation since 2004, while it in Chile and Costa Rica reflects a steady growth in the deviation since the nineties, which however accelerated in 2004. These deviations do not necessarily imply that credit is excessive. Indeed, one methodological concern is that the deviations could reflect a structural change in the long run relationship between credit and deposits, insofar that evolution of the banking system has allowed more credit for a given level of deposits in the long run. Indeed, that such a development happens as income grows is consistent with the fact that the parameter on deposits is higher in high-income *vis-à-vis* middle-income countries (Table 3). One way to assess this is to fit the long-run credit level using the estimated parameters of the model estimated for high-income (model 1 in Table 3). According to this model credit levels in the countries were still above their estimated long-run level in 2011 – albeit not significantly for all¹⁹.

43. **Deviations reflect an increasing reliance on non-depository funding in the banking sectors.** The observed deviations from the estimated long-run credit level can in principle reflect (*i*) reshuffling of assets towards private sector credit on the asset side of the

¹⁹ Specifically, the credit level is compared with the credit level implied by model 1 in Table 3 and recalculated country specific constraints.

banking sector's balance sheet or (ii) increasing reliance on non-depository funding on the liability side. However, the latter is at least part of the explanation as Chile, Colombia and Paraguay have indeed seen a shift towards non-depository funding since 2004.²⁰ Costa Rica has not seen a shift but the share of non-depository funding was relatively high during the period.²¹ Whether or not this development is cause for concern depends importantly on the maturity of the non-depository funding used by the banks.

44. **Deviations warrant caution and more analysis.** As explained above positive, and increasing, deviations from the estimated long-run level of credit can reflect unsustainable credit growth. Thus, more analysis is warranted to assess the risk profile of the non-depository funding that is driving the model deviations in Latin America.

E. What is Driving the Credit Growth in Latin America?

45. **To assess what has been driving the recent credit growth in Latin America we estimate an augmented error correction model.** In the long-run model for the level of credit-to-GDP estimated above we only allowed credit to be affected by deposits. We will now turn to the estimation of (2), which is an empirical model for how credit growth behaves in the short run. This is an augmented error correction model, which includes deviations from the estimated long-run level of credit. In addition, it includes the set of above-mentioned variables that we found not to belong in the long-run equation. That is, the model allows the non-cointegrating variables, denoted $z_{1,it}, \dots, z_{n,it}$, to affect the credit growth in the short run. This model will enable us to assess what is driving the deviations from the long-run equilibrium.

$$\Delta y_{it} = \alpha_0 + \alpha_1 ecm_{i,t-1} + \alpha_2 \Delta z_{1,it} + \dots + \alpha_{n+1} \Delta z_{n,it} + \sum_{j=1}^k \alpha_{n+1+j} \Delta y_{it} + \sum_{j=0}^k \alpha_{n+g+1+j} \Delta x_{it} + \varepsilon_{it} \quad (2)$$

46. **Our estimations suggest that credit growth beyond the estimated long-run level of credit partly can be explained by growth in additional bank funding and incomes.** The model is estimated on the sample of middle-income countries during the period 1970Q1-2003Q4. Table 4 presents the parameter estimates for the short-run model of credit growth. A significant and negative estimate is found for the error-correction term, which implies that a positive (negative) deviation from the estimated long-run level of credit is associated with an

²⁰ According to *IMF's International Financial Statistics* the share of issued securities and net foreign liabilities as share of total funding (deposits, equity, issued securities and net foreign liabilities) has increased from 2004 to 2011 by 3 and 23 percentage points in Chile and Paraguay, respectively. In Colombia the increase started earlier as the share increased by 24 percentage points from 2000 to 2011.

²¹ The share of issued securities and net foreign liabilities as share of total funding (deposits, equity, issued securities and net foreign liabilities) in Costa Rica stood at 45 percentage in 2011.

decrease (increase) in the growth of credit. This finding is trivial since cointegration is known to imply error-correction (Engle and Granger, 1987). In addition, we find significant estimates with the expected sign (*cf.* the discussion of variables above) for PPP-adjusted income per capita, securities issued by the banking sector, and banks' net foreign asset position²².

47. **Recent credit growth in some Latin American countries goes beyond what can be explained by our model - although not significantly.** In Figure 16-17 we compare the actual credit growth in Latin America with the prediction of our short-run model. Here it is seen that the credit growth in none of the countries deviates significantly from the model prediction. However, prior to 2009 e.g. Colombia, Costa Rica and Paraguay displayed positive deviations from the model predictions. In 2009 the deviation in general receded, but since 2010 positive deviations have emerged again in e.g. Colombia, Bolivia, Panama, Brazil and Paraguay.

IV. CONCLUDING REMARKS

48. **This paper began by documenting in detail the credit growth in Latin America from during the period 2004-11.** During this period banking credit to the private sector grew by an average of 7 per cent of GDP. Overall, the growth was fastest in countries with low initial credit-to-GDP ratios. Although important idiosyncrasies exist, the credit development also have some general characteristics. Indeed, in most countries credit to households have been most buoyant as witnessed by a stronger growth in consumption and mortgage credit *vis-à-vis* credit to the corporate sector. Within the latter sector credit has expanded the most in the construction sector. Foreign banks have posted the fastest credit growth, while domestic banks accounts for most of the credit growth owing to their larger market shares. Finally, credit in the region has become increasingly de-dollarized and for some countries we find signs of maturity lengthening.

49. **An important question is whether the credit expansion reflects a sound financial deepening or an unsustainable credit boom?** On the one hand Latin American credit markets remain relatively shallow as witnessed by low credit-to-GDP ratios *vis-à-vis* other countries with comparable income levels. On the other hand rapid credit growth can also pose risks to macro and financial stability.

50. **To contribute to the understanding of this question we have applied two different methods from the literature.** First, we constructed credit-to-GDP and real asset price gaps through the application of a one-sided HP-filter. This method is motivated by the observation that financial imbalances on the asset side often manifest themselves through rapid credit growth and buoyant asset prices (Borio and Lowe, 2002). Second, we estimated a

²² Securities issued by banking sector are borderline significant in Table 4. Stock market capitalization is not included due to a large implied loss of observations.

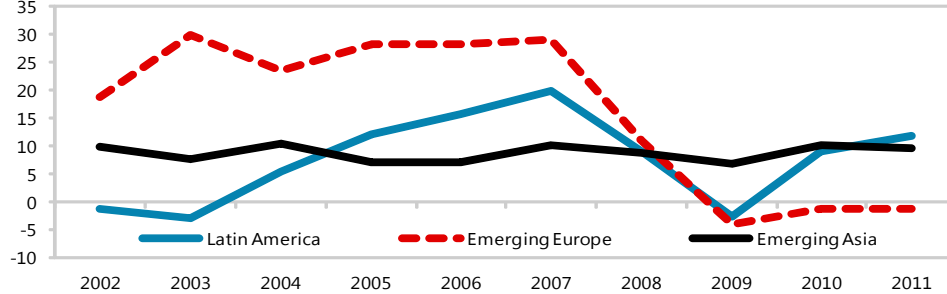
long-run relationship between credit and deposits using panel cointegration methods. A positive deviation from this relationship can be indicative of vulnerabilities on the financial sector's liability side, since it can reflect that the financial sector is tapping into less stable funding sources in order to sustain high credit growth. Indeed, this method is motivated by the observation that large reliance on non-depository funding often precedes a banking crisis (Hahm *et al.*, 2011).

51. **We find large and positive credit-to-GDP gaps in a number of Latin American countries.** The period of strong growth since 2004 has made the credit-to-GDP gap positive in most countries in the region. The gaps in general receded somewhat after 2007, but have picked up again since 2010. Recently, these gaps have been largest in Brazil, Paraguay, Venezuela and Colombia. In previous years (2008-10) large credit-to-GDP gaps have also been accompanied by substantial real equity price gaps in Brazil, Chile and Costa Rica. Historically, such deviations have been indicative of potential risks on the asset side in the financial sector, why continued close monitoring and vigilance at the supervisory level is warranted.

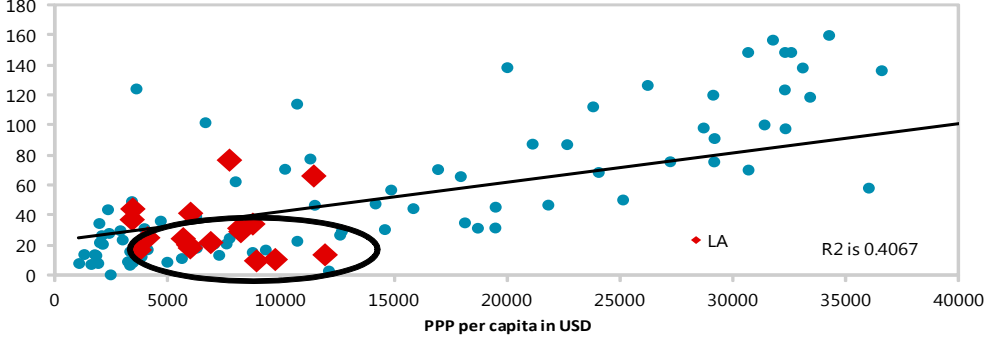
52. **In some countries the credit-to-GDP level displays a positive deviation from the estimated long-run level.** These deviations are large and significant in Chile, Peru, Paraguay, Costa Rica and Colombia. This reflects that the level of credit is high given the estimated long-run model and the level of deposits in these economies. This could be indicative of vulnerabilities on the liability side in the financial sector. Thus, our results warrant monitoring and further analysis of the risk profile of the non-depository funding in Latin America.

Figure 1: Credit to Private Sector, International Comparison

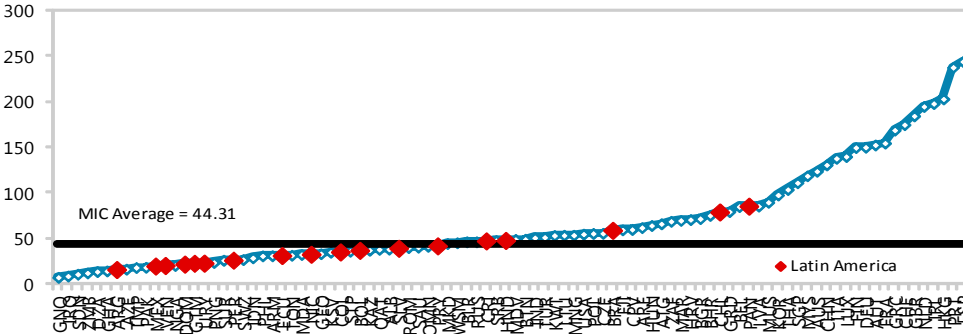
Real Banking Credit: Growth by Regions
(Per cent)



Banking credit to private sector to GDP and PPP-adjusted income per capita, 2004
(Per cent of GDP)



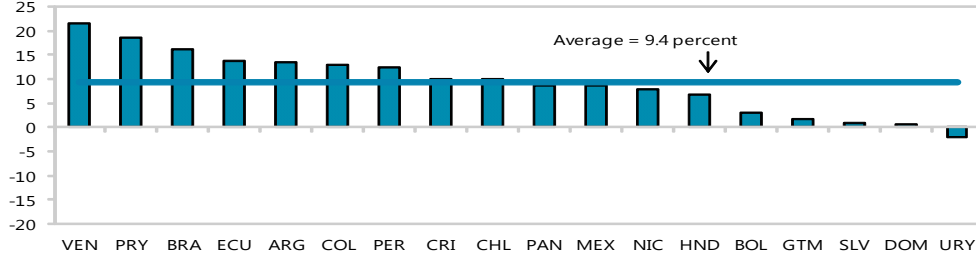
Banking Credit to Private Sector, Ultimo 2011
(Middle and High Income Countries, Percent of GDP)



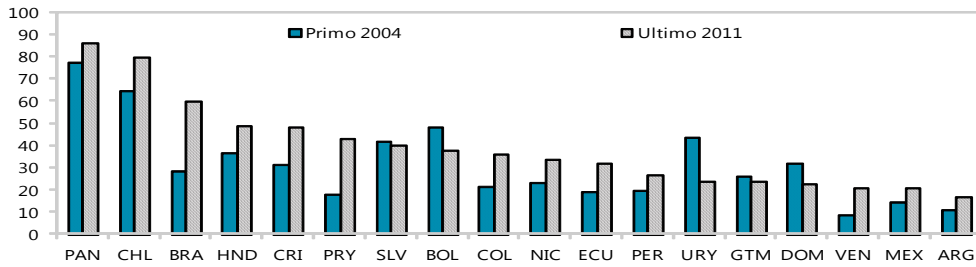
Notes: Banking claims of other depository cooperations on the private sector. Latin America is unweighted average of Argentina, Brazil, Chile, Colombia, Mexico, Peru, Venezuela, Uruguay, Bolivia, Dominican Republic, Guatemala, Ecuador
Nicaragua, El Salvador, Paraguay, Costa Rica, Honduras and Panama. Emerging Europe is Bulgaria, Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Romania and Czech Republic. Emerging Asia is China (mainland), India, Indonesia, Malaysia, Phillipines, Korea, and Thailand. Deflation is done using CPI from WEO. For Argentina deflation is done using IMF staff estimates of average provincial

Figure 2: Credit to Private Sector, Development Over Time

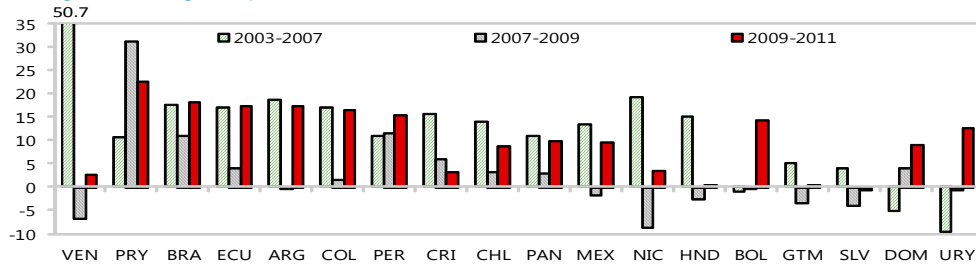
Real Banking Credit: Growth, primo 2004 - ultimo 2011
(Average annualized growth, percent)



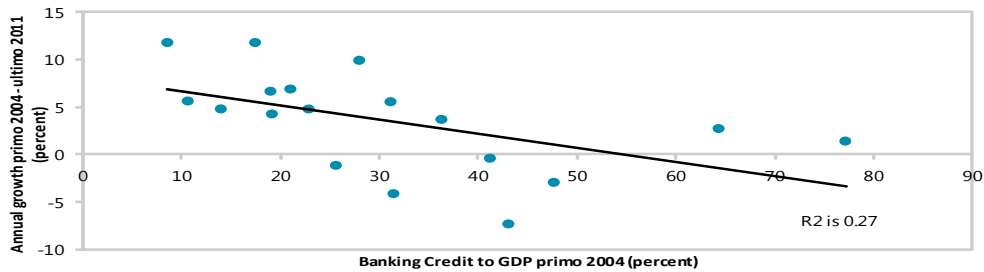
Banking Sector Credit to GDP ratios
(Percent of GDP)



Real Banking Credit: Growth, 2003-2011
(Average annualized growth, percent)



Banking Credit Level and Banking Credit Growth, primo 2004 - ultimo 2011

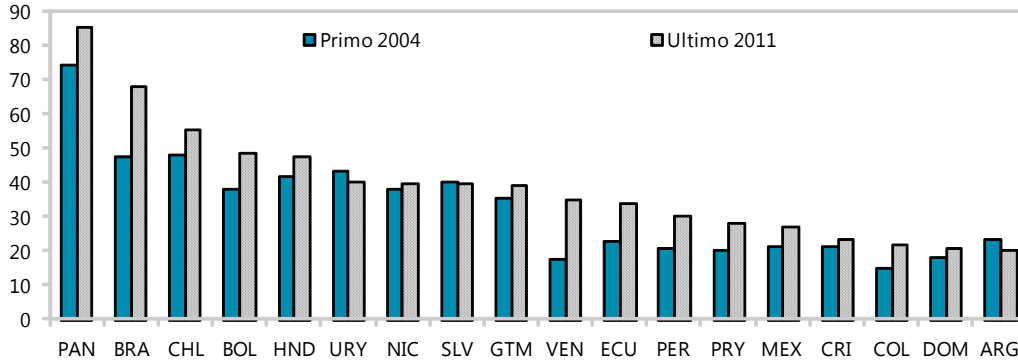


Source: IFTS, MBRF2, WEO.

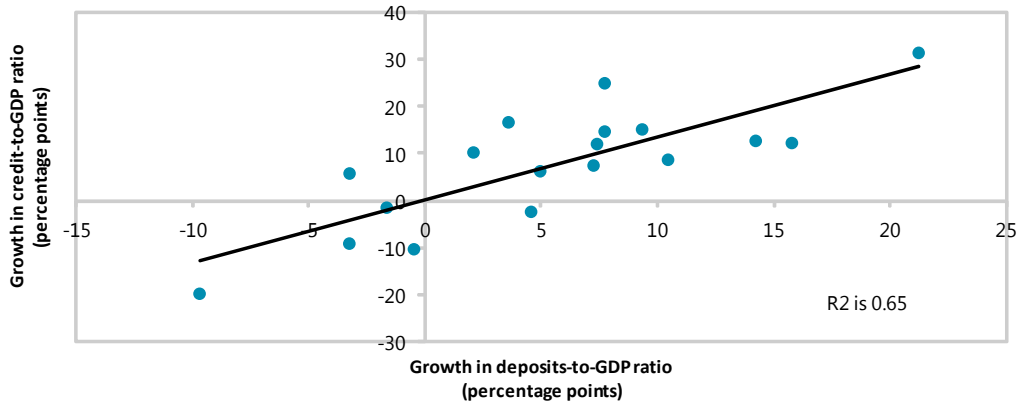
Notes: Banking credit is claims of other depository cooperations on the private sector. Deflating is done using CPI from WEO. For Argentina deflating is done using IMF staff estimates of average provincial inflation.

Figure 3: Credit to Private Sector and Deposits Accumulation

Banking Sector Deposits to GDP ratios
(Percent of GDP)



Growth in Credit and Deposits in the Banking Sector, primo 2004 - ultimo 2011



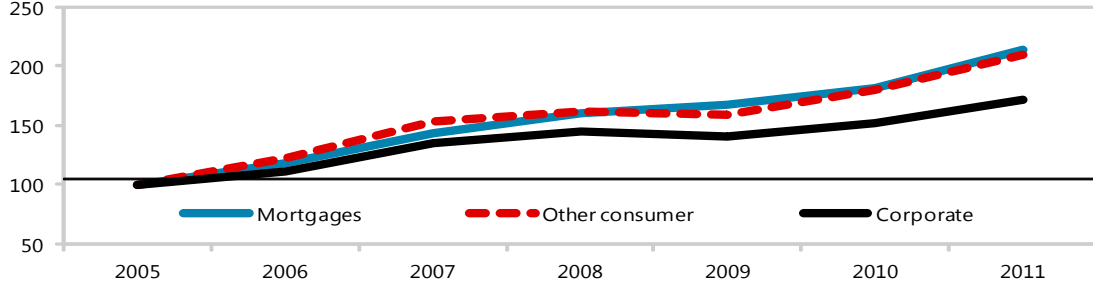
Source: IFTS, MBRF2, WEO.

Notes: Banking credit is claims of other depository cooperations on the private sector. Deposits in the banking sector is the sum of transferable and other deposits.

Figure 4: Credit to Private Sector, Households and Corporate

Real Banking Credit by Market Segment

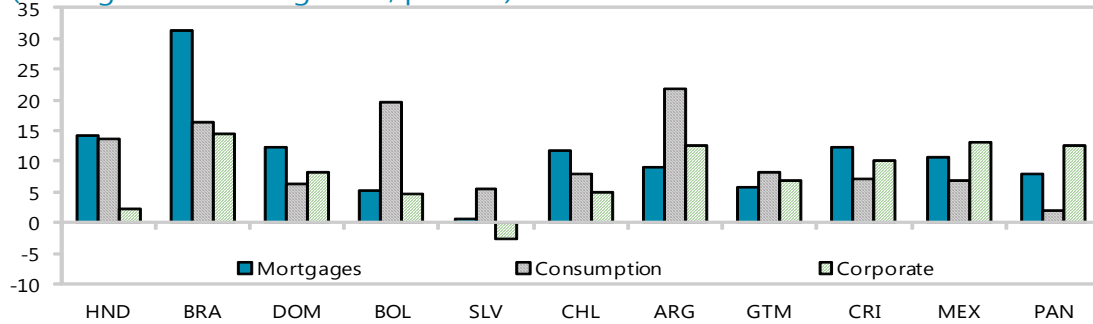
(2005=100)



Notes: Simple average of Argentina, Brazil, Chile (Ex. 2011), Mexico, Bolivia, Guatemala (Ex. 2011), El Salvador, Costa Rica, Honduras and Panama. Deflation is done using the CPI index.

Real Banking Credit by Market Segment: Growth, 2005-11

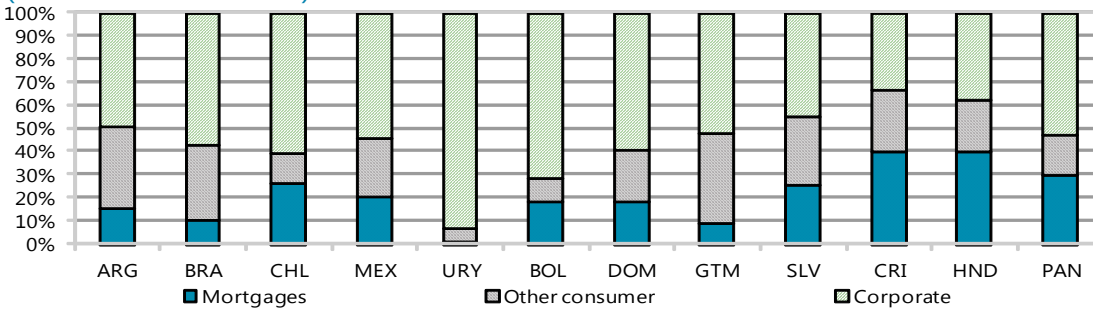
(Average annualized growth, percent)



Notes: Dominican Republic is computed using 2006-2011. Credit is deflated using CPI.

Loans by Banking Sector by Segments, 2011

(Percent of total loans)



Notes: Chile and Guatemala are from 2010, while Dominican Republic is from 2009.

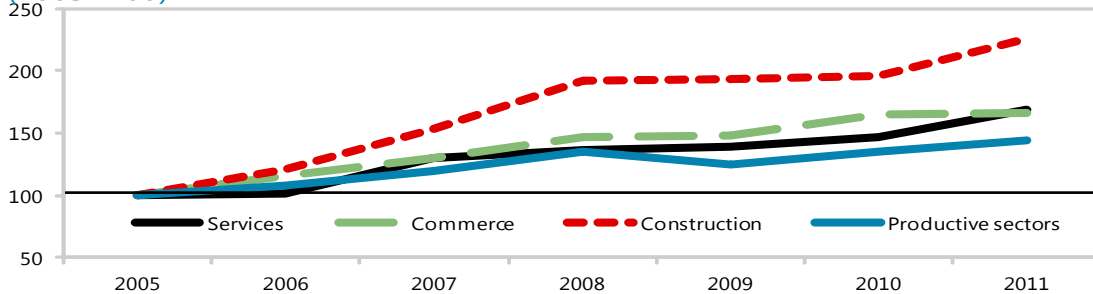
Notes: For Mexico only lending by commercial banks are included.

Sources: WEO, national sources.

Figure 5: Credit to Private Sector, Composition of the Corporate Credit

Real Commercial Credit by Sector

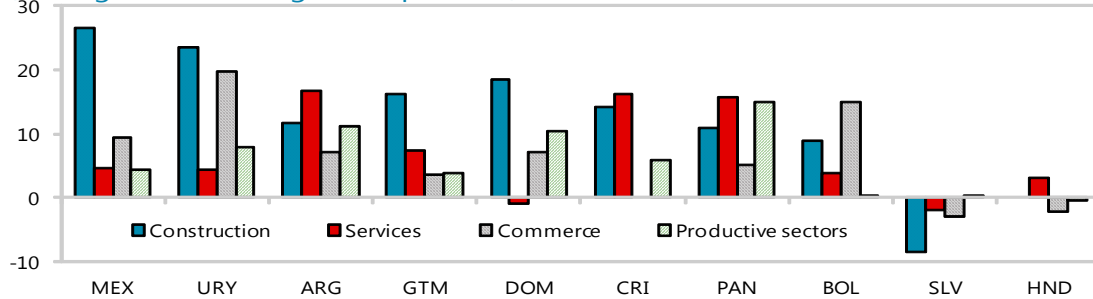
(2005=100)



Notes: Simple average of Argentina, Mexico, Uruguay, Bolivia, Guatemala (Ex. 2011), El Salvador, Costa Rica, Honduras and Panama.

Real Credit by Sector: Growth, 2005-2011

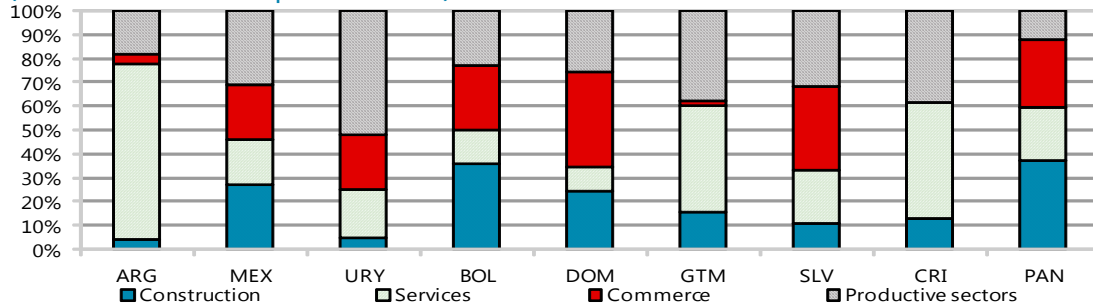
(Average annualized growth, per cent)



Notes: Dominican Republic and Guatemala are computed using 2006-11 and 2005-10, respectively.

Corporate Credit from Banks by Sector, 2011

(Percent of total corporate loans)



Notes: DR and Guatemala are from 2009 and 2010, respectively.

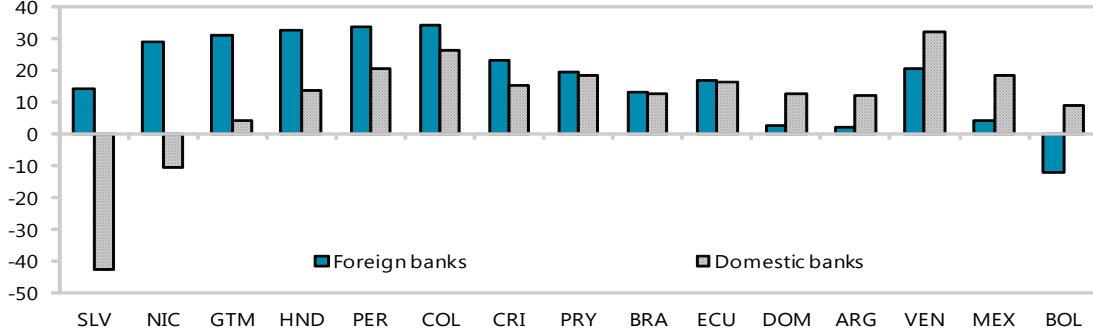
Notes: "Productive sectors" is defined as agriculture and other rural industries, manufacturing, mining and energy supply. For Argentina, Mexico and Bolivia "Real Estate Services" is included in "Construction". Credit is deflated using CPI. For Mexico only lending by commercial banks are included.

Sources: WEO and national sources.

Figure 6: Credit to Private Sector, Domestic and Foreign Banks

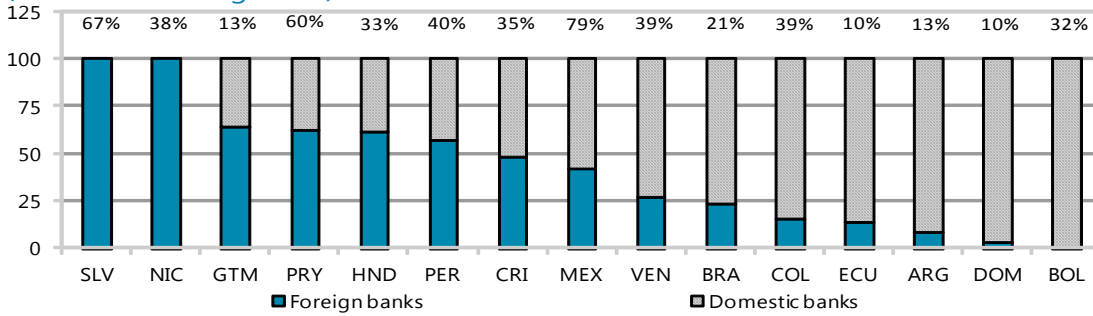
Total loans by bank origin, 2004-2008

(Real growth, annualised, percent)



Contributions to Growth in Real Credit, 2004-08

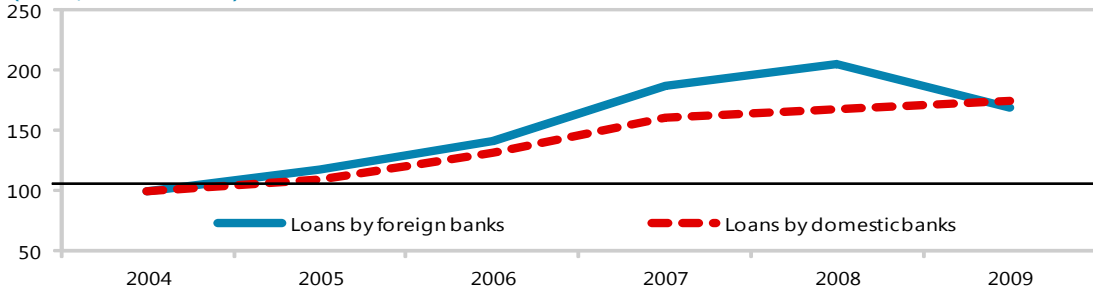
(Percent of total growth)



Notes: Contributions have been truncated at 0 and 100 percent. Numbers denote the market share of foreign banks.

Total Loans by Bank Origin, 2004-09

(Real, 2004=100)

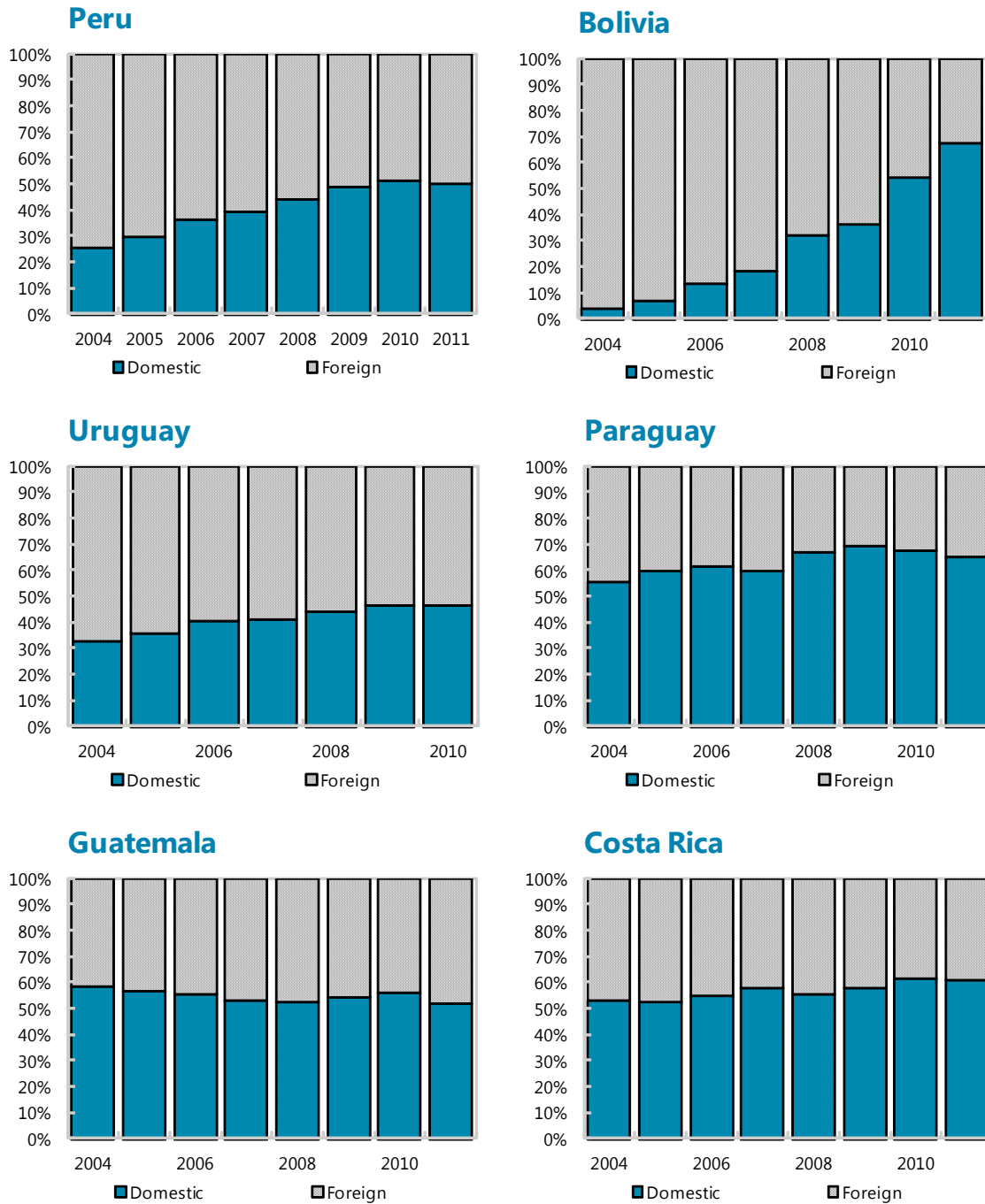


Notes: Simple average of Argentina, Brazil (Ex. 2009), Colombia, Mexico, Peru, Venezuela (Ex. 2009), Bolivia, DR, Guatemala, Ecuador, Nicaragua, El Salvador, CR, Honduras.

Notes: A bank is defined as foreign if more than 50 percent of its shares are owned by foreigners. Deflation is done using the CPI index.

Source: Classens and van Horen (2012); WEO.

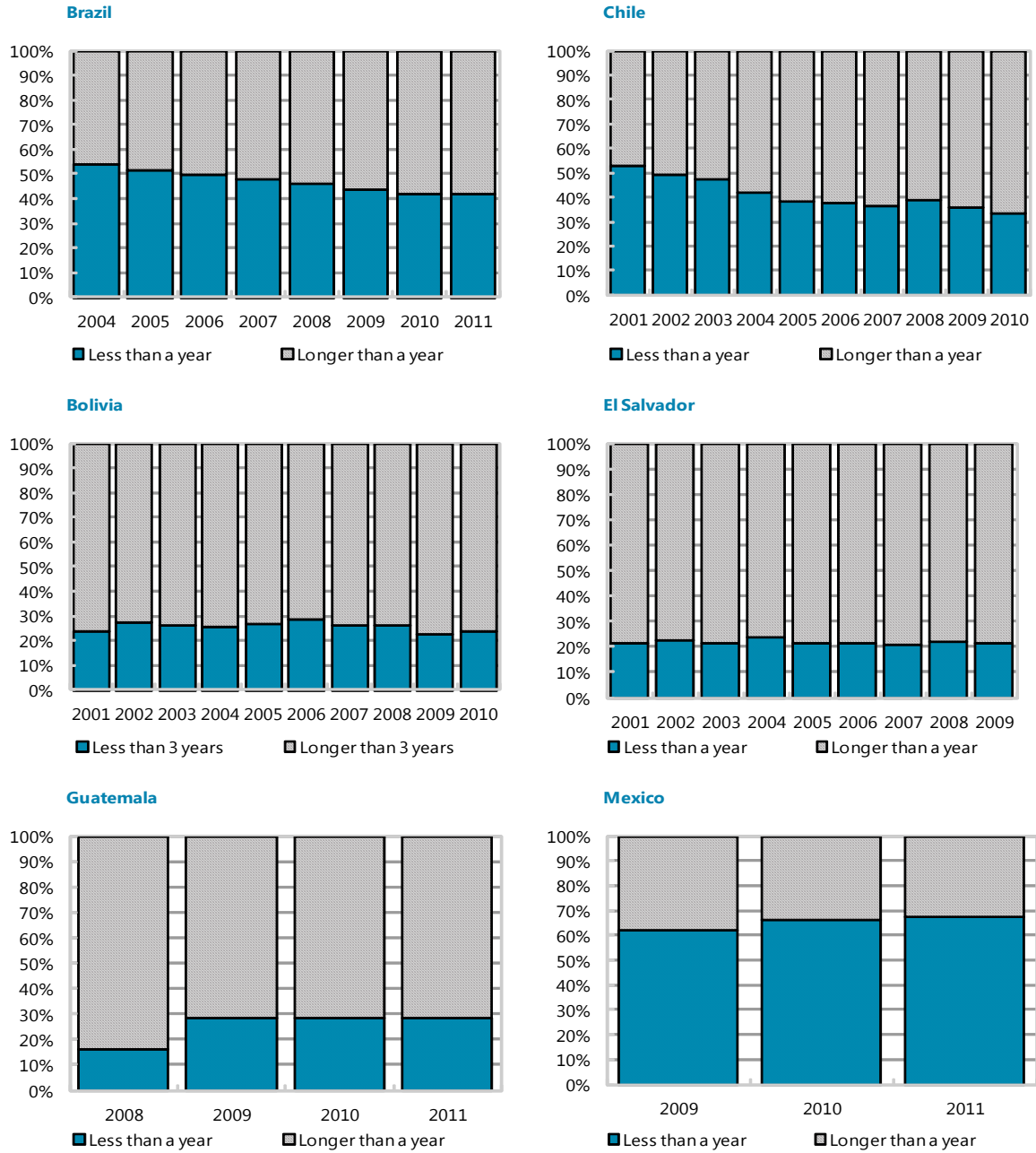
Figure 7: Loans by Banking Sector to Private Sector by Currency
(Percent of total loans, ultimo stock)



Notes: Loans of Other Depository Corporations to the Non-Financial Sector, Other Resident Sectors and Non-Residents divided on foreign and domestic currency.

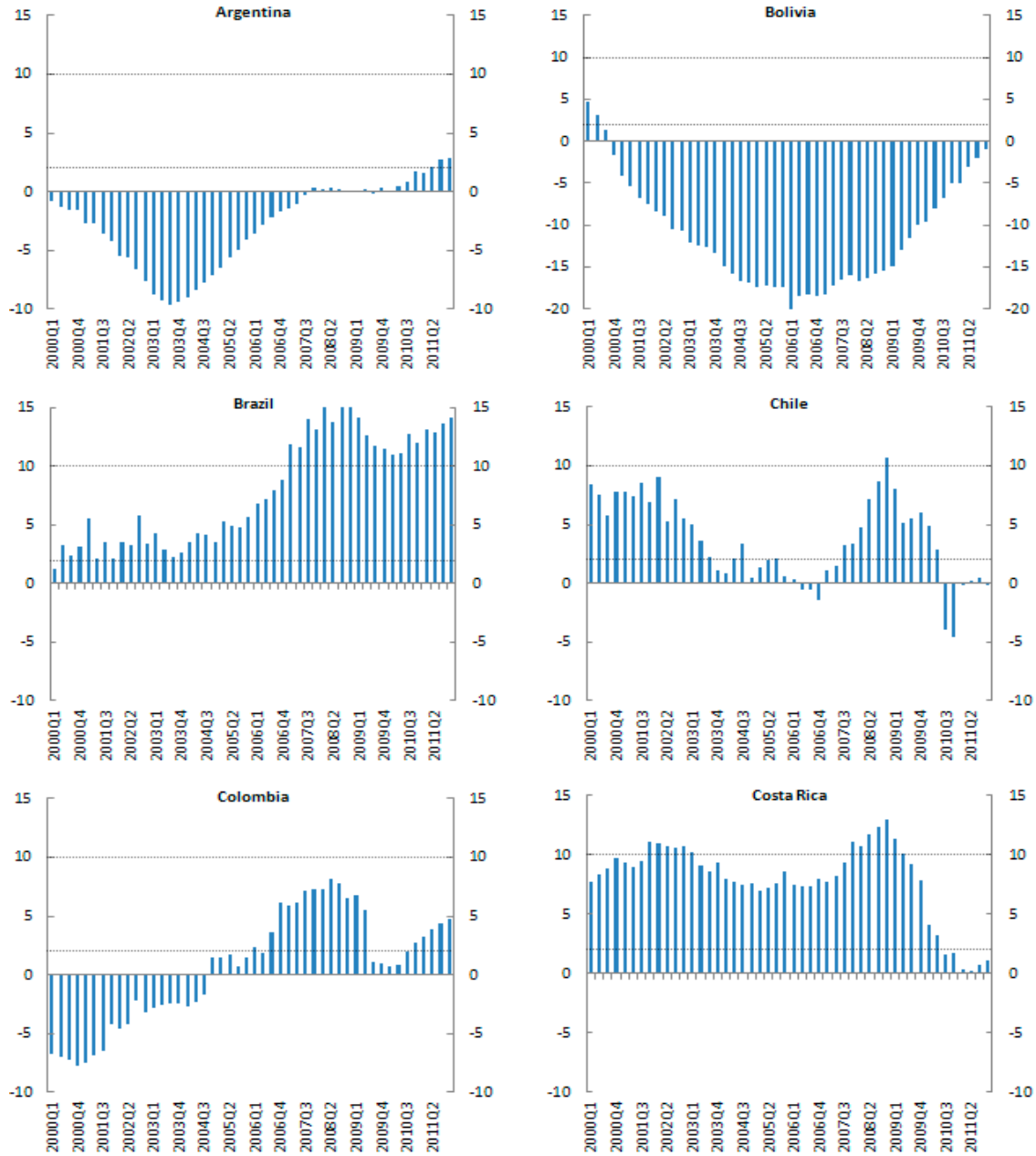
Source: MBRF2

Figure 8: Loans by Banking Sector by Maturity
(Percent of total loans, ultimo stock)



Source: Banco Central de Chile; Autoridad de Supervision del Sistema Financiero (Bolivia); Banco Central de Reserva de El Salvador; Superintendencia de Bancos (Guatemala); Banco Central Do Brasil (Brazil); Comision Nacional Bancaria y de Valores (Mexico).

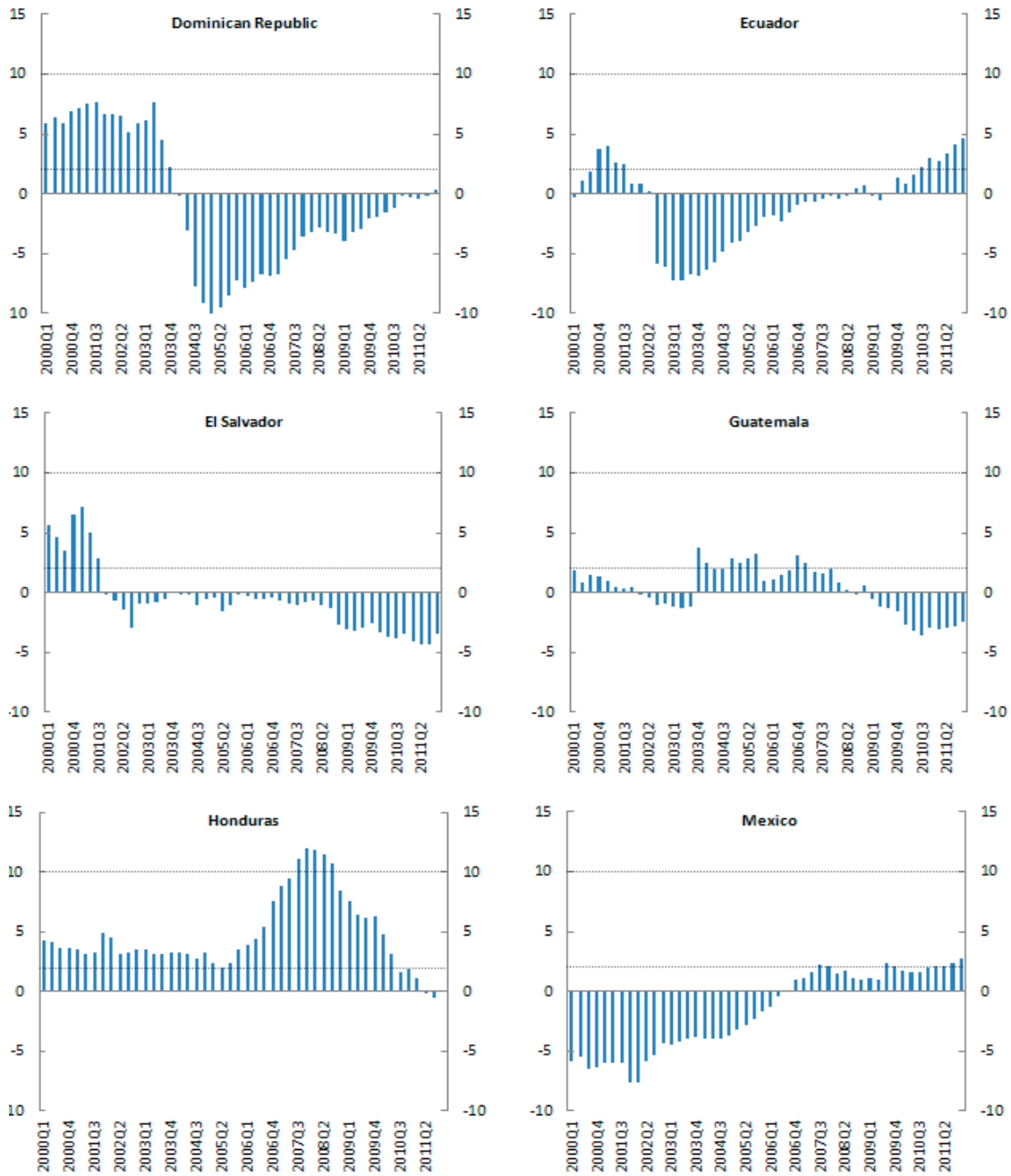
Figure 9: Credit-to-GDP gaps, 2000-2011
(Percentage points)



Notes: Figures show deviations of credit-to-gdp ratio (quarterly data) in percentage points from its long-term trend, calculated by a one-sided HP-filter using a $\lambda=400,000$. Drehmann *et al.* (2011) motivates this λ by the observation that financial cycles are approximately four times longer than standard business cycles. The existence of gaps in the interval from 2 to 10 percentage points has historically performed relatively well as a predictor future banking crisis (Drehmann *et al.*, 2011).

Source: International Financial Statistics, World Economic Outlook.

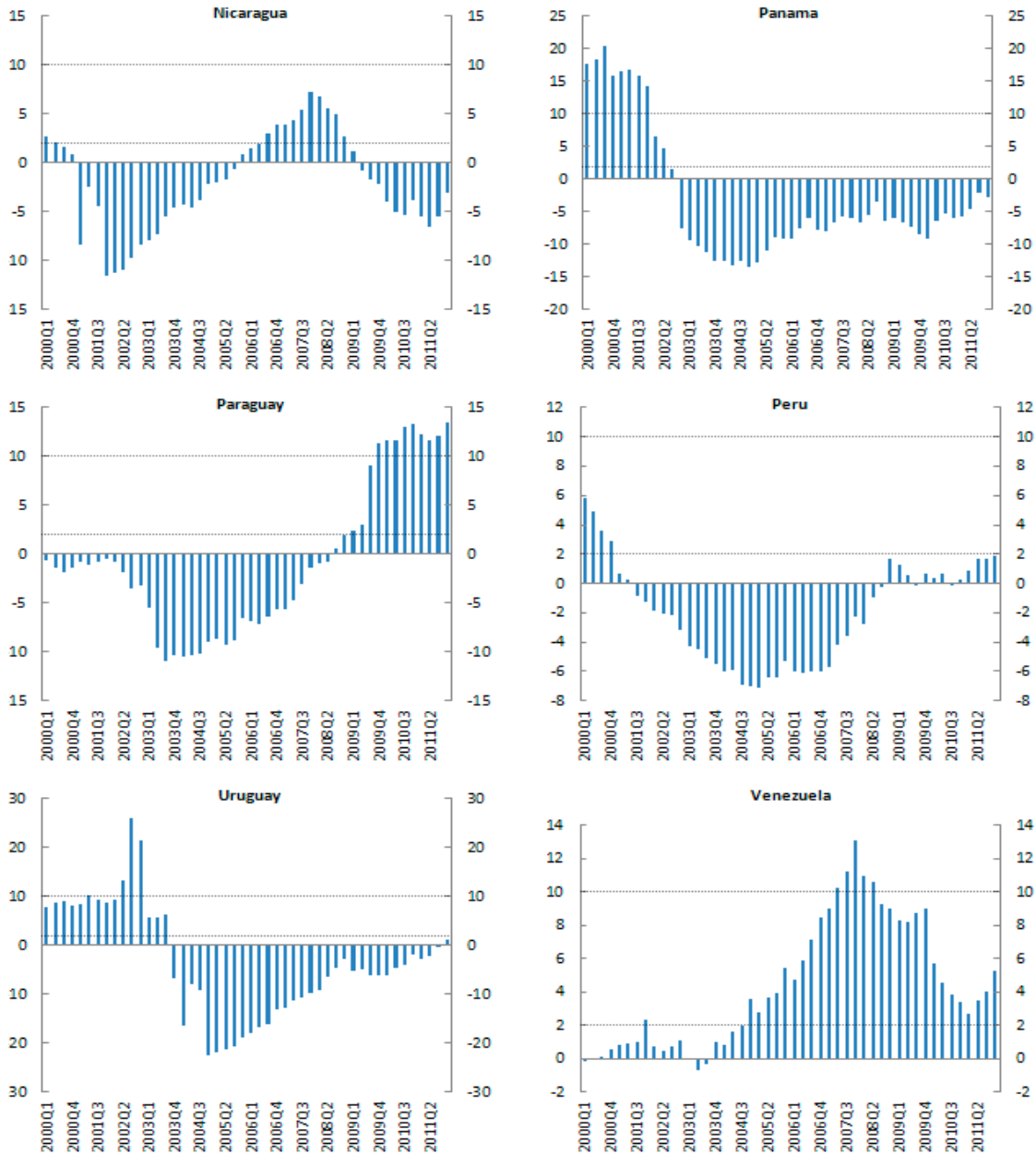
Figure 10: Credit-to-GDP gaps, 2000-2011
(Percentage points)



Notes: Figures show deviations of credit-to-gdp ratio (quarterly data) in percentage points from its long-term trend, calculated by a one-sided HP-filter using a $\lambda=400,000$. Drehmann *et al.* (2011) motivates this λ by the observation that financial cycles are approximately four times longer than standard business cycles. The existence of gaps in the interval from 2 to 10 percentage points has historically performed relatively well as a predictor future banking crisis (Drehmann *et al.*, 2011).

Source: International Financial Statistics, World Economic Outlook.

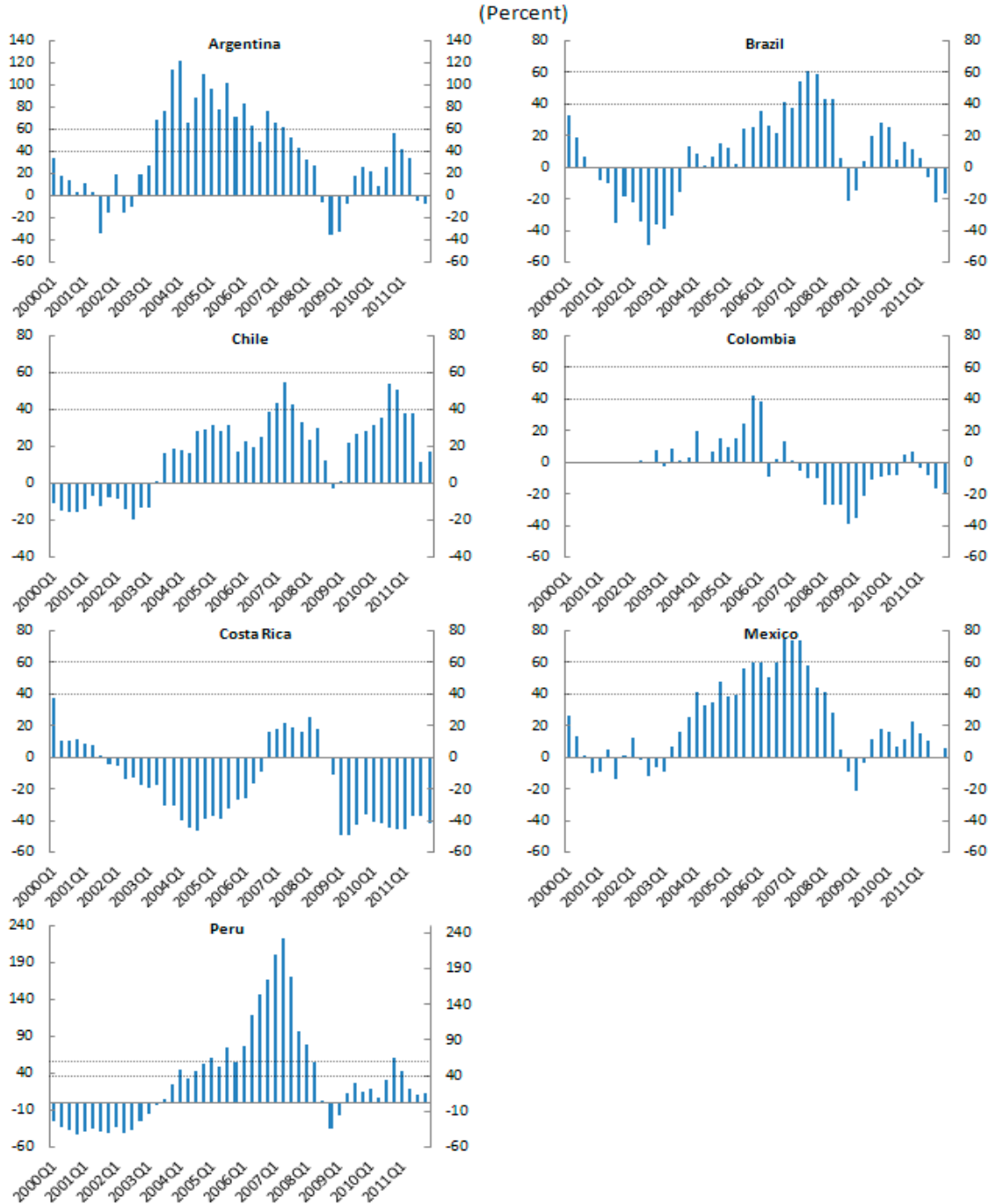
Figure 11: Credit-to-GDP gaps, 2000-2011
(Percentage points)



Notes: Figures show deviations of credit-to-gdp ratio (quarterly data) in percentage points from its long-term trend, calculated by a one-sided HP-filter using a $\lambda=400,000$. Drehmann *et al.* (2011) motivates this λ by the observation that financial cycles are approximately four times longer than standard business cycles. The existence of gaps in the interval from 2 to 10 percentage points has historically performed relatively well as a predictor future banking crisis (Drehmann *et al.*, 2011).

Source: International Financial Statistics, World Economic Outlook.

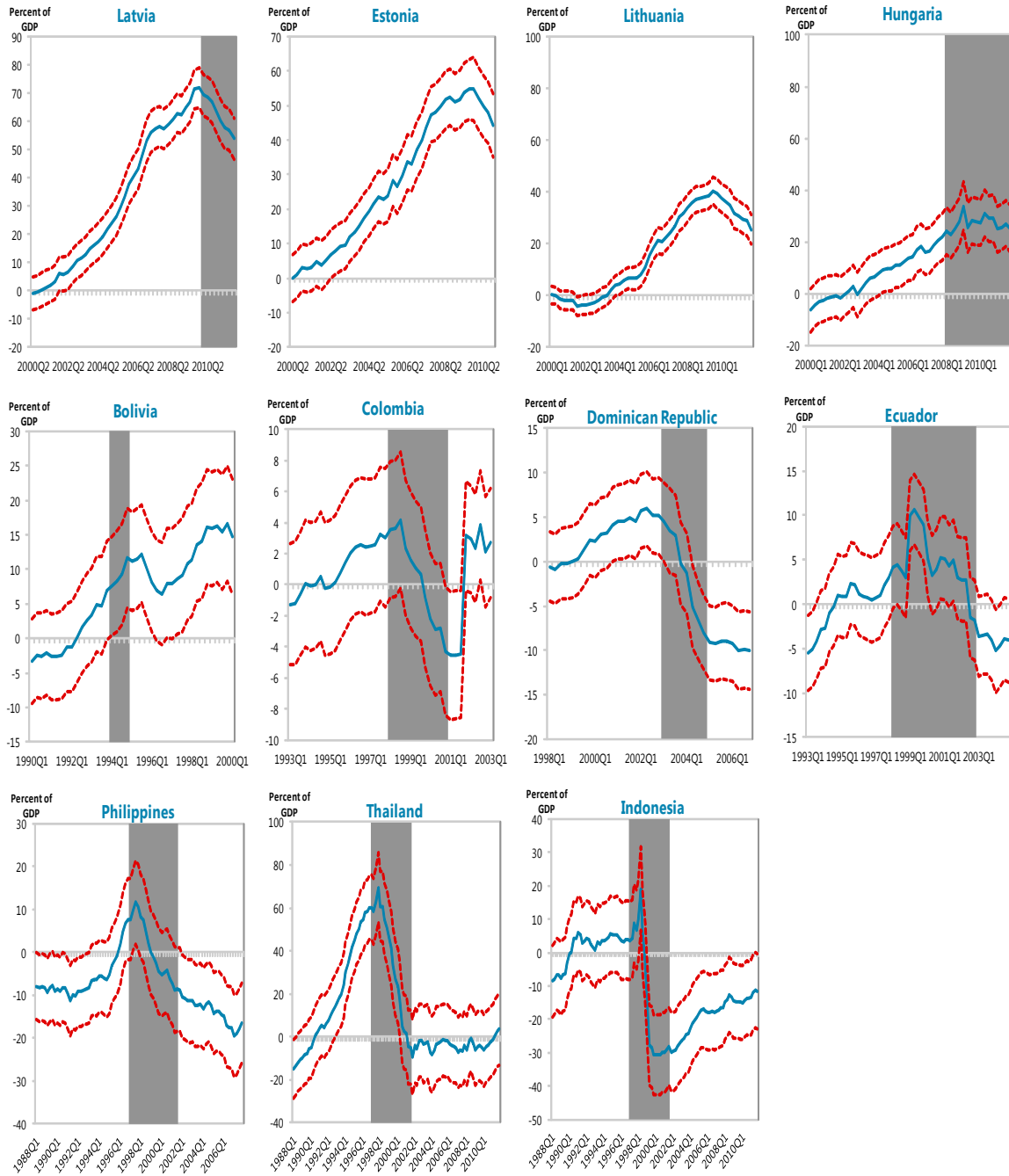
Figure 12. Real equity price gaps, 2000-2011



Notes: Figures show deviations of quarterly real equity prices (deflated by CPI) in percent from its long-term trend, calculated by a one-sided HP-filter using a $\lambda=400,000$. Drehmann *et al.* (2011) motivates this λ by the observation that financial cycles are approximately four times longer than standard business cycles. The coexistence of a real equity price gaps and a credit-to-gdp gap has historically performed relatively well as a predictor of banking crisis (Borio and Drehmann, 2009). The threshold interval of 40-60 percent is from Borio and Drehmann (2009).

Source: Bloomberg (see Annex 1B), World Economic Outlook.

Figure 13: Estimated "credit gaps" and banking crises
Emerging Europe, Asia and Asia



Notes: Estimated excessive credit denotes the difference between actual credit and the prediction of the model (model 2 for Middle Income Countries). Dotted lines depicts the 95% prediction interval. Shaded periods indicate periods of banking crisis. Dating of crisis is taken from Laeven and Valencia (2010).
Source: IFTS, WEO, Laeven and Valencia (2010) and own calculations.

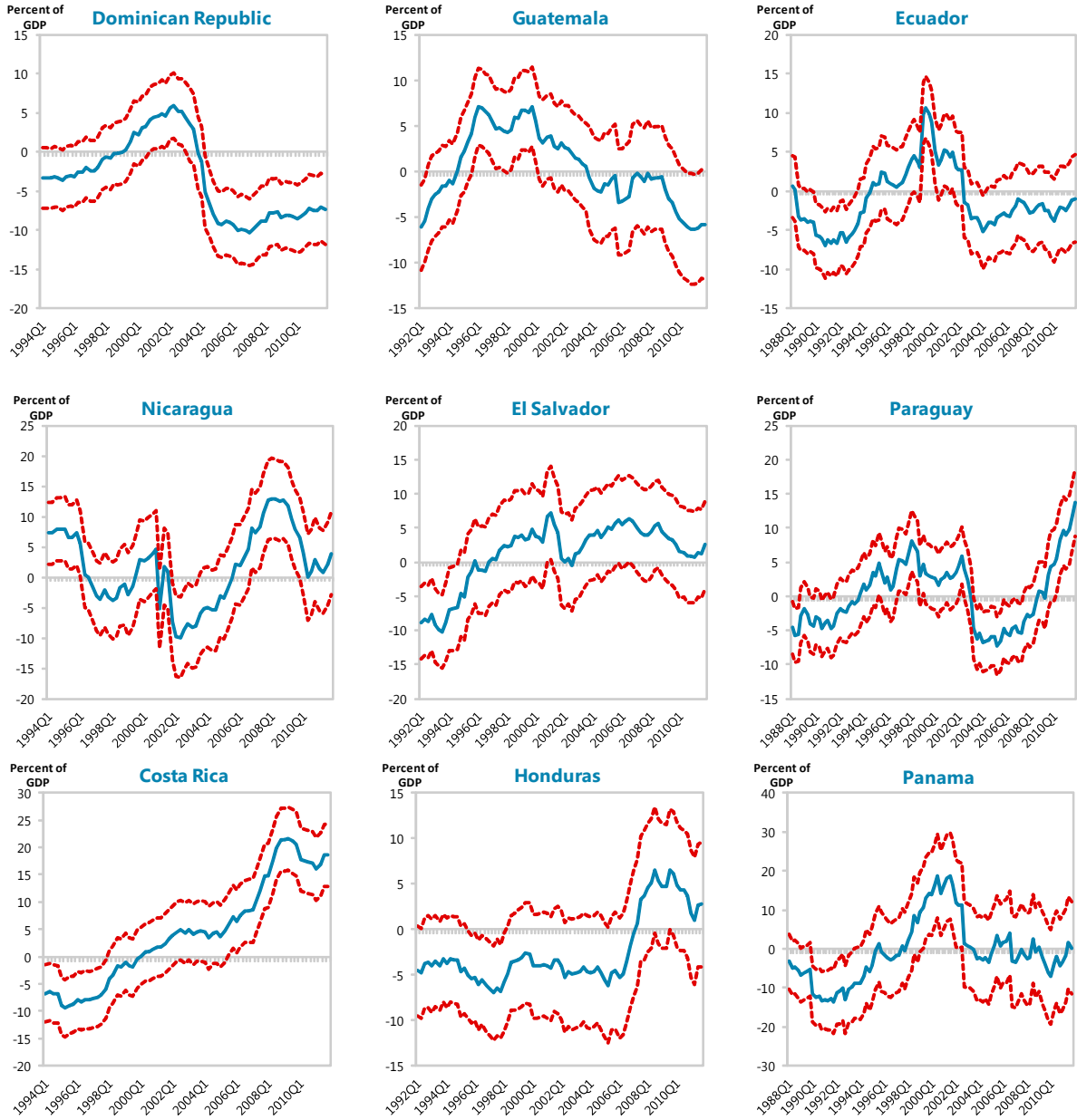
Figure 14: Estimated "credit gaps"



Notes: Estimated excessive credit denotes the difference between actual credit and the prediction of the model (model 2 for middle income countries). Dotted lines depicts 95% prediction interval.

Source: IFTS, WEO and own calculations.

Figure 15: Estimated "credit gaps"



Notes: excessive credit denotes the difference between actual credit and the prediction of the model (model 2 for middle income countries). Dotted lines depicts 95% prediction interval.
 Source: IFTS, WEO and own calculations.

Figure 16: Actual less predicted credit growth

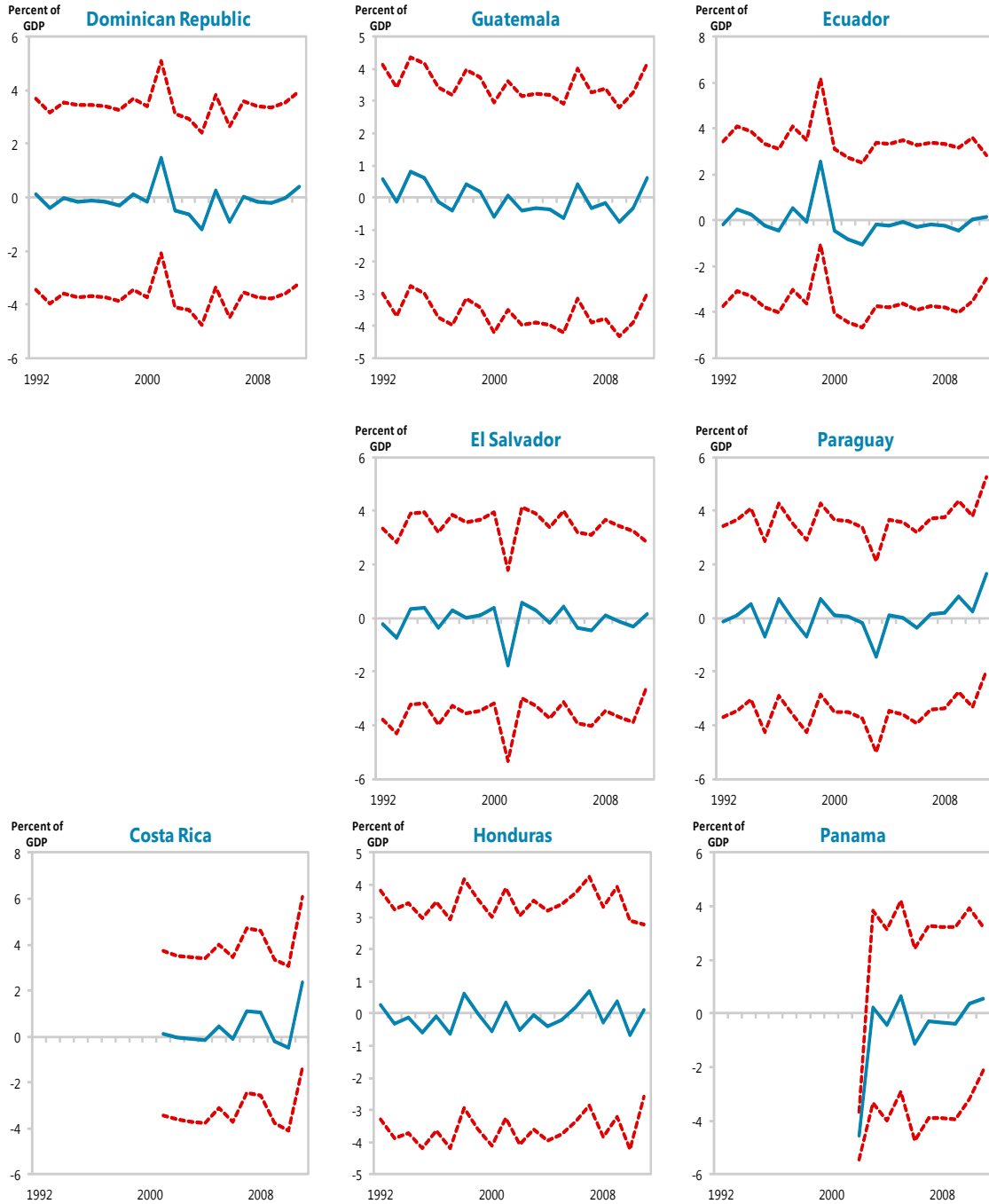


Notes: Figures show the difference between actual credit and the prediction of the model for credit growth (Column 2, Table 6).

Dotted lines depicts 95% prediction interval.

Source: IFTS, WEO and own calculations.

Figure 17: Actual less predicted credit growth



Notes: Figures show the difference between actual credit and the prediction of the model for credit growth (Column 2, Table 6). Dotted lines depicts 95% prediction interval. Source: IFTS, WEO and own calculations.

Table 1: Determination of Integration Order

	Constant				Constant and trend				Integrat
	LLC ^a	IPS ^b	ADF ^c	PP ^d	LLC ^a	IPS ^b	ADF ^c	PP ^d	
Credit-to-GDP (credgdp)	4.35 [1.00]	7.98 [1.00]	152.90 [1.00]	146.60 [0.94]	-0.51 [0.31]	2.90 [1.00]	218.77 [0.19]	273.75*** [0.00]	I(0)
Deposits-to-GDP (deposgdp)	3.24 [1.00]	5.36 [1.00]	210.18 [0.30]	181.74 [0.81]	-3.79*** [0.00]	1.86 [0.97]	-4.46*** [0.00]	333.89*** [0.00]	I(1)
Stockmarket capitalization as percent of GDP (mktcapgdp)	18.17 [1.00]	12.41 [1.00]	109.18 [1.00]	67.36 [1.00]	16.52 [1.00]	51.43 [1.00]	28.92 [1.00]	48.13 [1.00]	I(1)
PPP-adjusted income per capita (logpppc)	-16.30*** [0.00]	-1.62* [0.05]	247.57* [0.06]	1025.34*** [0.00]	-26.27*** [0.00]	5.70 [1.00]	302.11*** [0.00]	149.69 [0.99]	I(1)
Bank equity as percent of GDP (equitygdp)	5.19 [1.00]	-2.76*** [0.00]	438.20*** [0.00]	441.68*** [0.00]					I(0)
Bank securities-as percent of GDP (securitygdp)	31.85*** [0.00]	-1.16 [0.12]	409.40*** [0.00]	415.97*** [0.00]					I(0)
Net foreign assets as percent of GDP (nfagdp)	1.76 [0.96]	-3.16*** [0.00]	440.89*** [0.00]	459.59*** [0.00]					I(0)
Current account-as percent of GDP (cagdp)	-2.55*** [0.0054]	-11.95*** [0.00]	522.44*** [0.00]	446.38*** [0.00]					I(0)
Government debt-as percent of GDP (govdebtgdp)	-2.39258* [0.0084]	-0.78404 [0.2165]	203.552 [0.1795]	395.559*** [0.00]	-4.15*** [0.00]	-1.97*** [0.02]	253.80*** [0.00]	312.20*** [0.00]	I(0)
Real lending rate (rlr)	-6.74*** [0.00]	-15.13*** [0.00]	735.44*** [0.00]	798.07*** [0.00]					I(0)
Real deposit rate (rdr)	13.85*** [0.00]	-24.11*** [0.00]	1106.50*** [0.00]	865.75*** [0.00]					I(0)
Inflation (infl)	-26.81*** [0.00]	-31.81*** [0.00]	1165.62*** [0.00]	715.31*** [0.00]					I(0)
Capital as percent of GDP (cfgdp)	-14.40*** [0.00]	24.14*** [0.00]	1110.95*** [0.00]	435.44*** [0.00]					I(0)
Banking sector concentration (bcon)	-7.11*** [0.00]	-9.29*** [0.00]	463.55*** [0.00]	456.48*** [0.00]					I(0)
Capital market regulation 1 (cmr_fraser)	-6.34*** [0.00]	-1.96** [0.02]	221.69*** [0.01]	206.79* [0.05]					I(0)
Capital market regulation 2 (cmr_wb)	-8.00*** [0.00]	-6.12*** [0.00]	342.56*** [0.00]	162.24*** [1.00]					I(0)

Notes: *, ** and *** denote significance on 10, 5 and 1 percent level, respectively. P-values are reported in parenthesis. Tests are performed using the full sample of countries. Lags are selected based on the Schwarz information criterion.

a. Test with unit root as null hypothesis by Levin, Lin and Chu (2002).

b. Test with unit root as null hypothesis by Im, Pesaran and Smith (2003).

c. Test with unit root as null hypothesis by Maddala and Wu (1999).

d. Test with unit root as null hypothesis by Choi (2001).

Table 2: Panel Cointegration Tests

	Group rho-stat ^a	Group PP-stat ^a	Group ADF-stat ^a
Credgdp and deposgdp	-4.02*** [0.00]	-4.46*** [0.00]	-5.54*** [0.00]
Credgdp, deposgdp and logpppc	-6.15*** [0.00]	-6.60*** [0.00]	-7.56*** [0.00]
Credgdp, deposgdp, logpppc and mktcapgdp	-0.63 [0.73]	-3.75*** [0.00]	-5.28*** [0.00]
Credgdp and logpppc	1.73 [0.96]	1.57 [0.94]	0.81 [0.79]
Credgdp and mktcapgdp	4.83 [1.00]	6.16 [1.00]	3.11 [1.00]
Credgdp, deposgdp and mktcapgdp	3.55 [1.00]	2.01 [0.98]	-1.55* [0.06]

Notes:

*, ** and *** denote significance on 10, 5 and 1 percent level, respectively. P-values are reported in parenthesis. Tests are performed using the full sample of countries, and the number of lags in the test specifications is determined using the Schwartz Information Criteria. The specifications included an individual intercept.
a. Test with no cointegration as null hypothesis by Pedroni (1999, 2004).

Table 3: Results from Mean Group Estimation						
Dependent variable: Credgdp						
	High income		Middle income		Latin America	
	(1)	(2)	(3)	(4)	(5)	(6)
Deposits-to-GDP (deposgdp)	1.05*** [0.20]	0.55* [0.21]	0.66*** [0.07]	0.54*** [0.09]	0.61*** [0.12]	0.70*** [0.16]
Stockmarket capitalization as percent of GDP (mktcapgdp)		0.08 [0.06]		-0.00 [0.25]		-0.31 [0.67]
PPP-adjusted income per capita (logpppc)		5.96 [13.05]		-6.42 [5.76]		-11.42 [7.56]
N*T	3386	1490	5730	2099	2024	732
Notes: * , ** and *** denote significance on 10, 5 and 1 percent level, respectively. Standard errors are reported in parenthesis. Country fixed effects are included but not reported. Estimation is done in STATA using the XTMG package.						

Table 4: Results from Pooled OLS Estimation		
Dependent variable: d.Credgdp		
Sample: Middle income countries		
	(1)	(2)
Constant		-0.09** [0.08]
ECM(t-1)	-0.03*** [0.00]	-0.04*** [0.01]
d(Bank deposits / GDP)		0.49*** [0.03]
d(Bank equity / GDP)		-0.078** [0.030]
d(Bank securities / GDP)		0.07 [0.05]
d(Bank net foreign assets / GDP)		-0.07*** [0.01]
d.log(PPP adjusted GDP per capita)		10.82*** [3.96]
N	61	46
T	127	105
Number of observations	5331	2158
Adjusted R ²	0.25	0.23
Durbin-Watson stat	2.00	1.97
<i>Notes:</i> *, ** and *** denote significance on 10, 5 and 1 percent level, respectively. Standard errors are reported in parenthesis. Lags of d.log(credit-to-GDP) and d.log(deposits-to-GDP) are included but not reported.		

APPENDIX 1: DATA SET

A. Sample of countries

54. Our sample includes the following middle and high income countries. Categorization follows the World Bank.²³

Middle income countries	High income countries	Latin America
Thailand, Zambia, Turkey, Timor-Leste, Tonga, Syrian Arab Republic, Sudan, Suriname, Swaziland, South Africa, Russian Federation, Samoa, São Tomé & Príncipe, Republic of Serbia, Papua New Guinea, Nigeria, Pakistan, Moldova, Mongolia, Morocco, Maldives, Mauritius, FYR Macedonia, Kazakhstan, Republic of Kosovo, Iraq, Fiji, Georgia, Ghana, Grenada, Cape Verde, Bhutan, Albania, Algeria, Antigua and Barbuda, Armenia, Rep. of Azerbaijan, P.R. China: Mainland, India, Indonesia, Malaysia, Philippines, Romania, Latvia, Lithuania, Argentina, Brazil, Chile, Colombia, Mexico, Peru, Rep. Bol. Venezuela, Uruguay, Bolivia, the Dominican Republic, Guatemala, Ecuador, Nicaragua, El Salvador, Paraguay, Costa Rica, Honduras, Panama, Bulgaria.	Republic of Korea, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, United Kingdom, United States, Kingdom of Bahrain, Barbados, Equatorial Guinea, P.R. China: Hong Kong, Kuwait, Malta, Oman, Qatar, Saudi Arabia, Singapore, United Arab Emirates	Argentina, Brazil, Chile, Colombia, Mexico, Peru, Rep. Bol. Venezuela, Uruguay, Bolivia, the Dominican Republic, Guatemala, Ecuador, Nicaragua, El Salvador, Paraguay, Costa Rica, Honduras, Panama.

²³ <http://data.worldbank.org/about/country-classifications/country-and-lending-groups>

B. Data Definitions and Sources

55. **Nominal GDP** is from IMF *World Economic Outlook* (WEO). Data is linearly interpolated from annual to quarterly frequency.

56. **Consumer price index** is taken from line 64 in IMF *International Financial Statistics* (IFTS). Frequency is quarterly. **Inflation (infl)** is created by taking year-to-year growth in this variable.

57. **Private banking credit-to-GDP (credgdp)** is defined as claims of other depository corporations on the non-financial private sector divided by nominal GDP. The data is taken from line 22d in the IFTS. Frequency is quarterly. Due to a large methodological change at euro adoption we have extrapolated the series for the euro area countries by means of the growth rate in the claims of other depository corporations on the non-financial private sector from IMF Monetary and Financial Statistics.²⁴ The variable is corrected for the following breaks: Chile (1978Q3), Colombia (1990Q4), Mexico (1977Q4), Uruguay (1998Q4, 1975Q4 and 2001Q4), Bolivia (2001Q4), the Dominican Republic (2001Q4), Guatemala (2002Q3), Nicaragua (1988Q1), Honduras (1997Q4), Croatia (1994Q2), Hungaria (1987Q4), Poland (1985Q4), Romania (1996Q4), Malaysia (1992Q1), Phillipines (1986Q4), Samoa (1971Q4), Serbia (2001Q4), Nigeria (1992Q4), Moldova (1998q1), Mongolia (1992Q2), Morocco (1990q1), Mauritius (2003Q2), Ghana (1973Q4), Cape Verde (1993Q3), Algeria (1992Q3), Armenia (1992Q4), Austria (1998Q4), Belgium (1992Q2, 1998Q4), Canada (2001Q4), Denmark (1987Q4, 2000Q3), Finland (1999Q1), France (1978Q1, 1998Q3), Germany (1999Q1), Greece (1978Q4, 2001Q1), Ireland (1999Q1), Italy (1999Q1), Japan (2001Q4), Luxembourg (1999Q1, 1977Q1), Netherlands (1998Q1), New Zealand (1988Q3), Portugal (1999Q1), Slovak Republic (1997Q1), Spain (1999Q1), Sweden (2001Q1), Switzerland (1974Q4, 1982Q3), United Kingdom (1986Q3), Bahrain (1995Q1), Barbados (2001Q4) and China, P.R.: Hong Kong (1993Q4).

58. **Real interest rates (rlr and rdr)**. The lending rate is taken from line 60p in IFTS, and is the bank rate that usually meets the short- and medium-term financing needs of the private sector. The deposit rate is taken from line 60l in IFTS, and refers to the rate usually offered to residents customers for demand, time or saving accounts. The frequency of both rates is quarterly. The real interest rates are constructed using the *ex post* inflation.²⁵

²⁴ Constructed by: loans to non-financial corporations (line 22DG in IMF Monetary and Financial Statistics) + loans to households and non-financial corporations (line 22DH) + securities other than shares on non-financial corporations (line 22DL) + securities other than shares on households and non-profit institutions (line 22DM) + shares and other equity on other residents (line 22DF).

²⁵ Specifically, the following formula is applied: $r_{ir} = 100 * (1 + (1+i)/(1+\pi) - 1)$. Here r_{ir} , i and π are the real interest rate, the nominal interest rate and actual inflation, respectively.

59. **PPP-adjusted income per capita (logpppc)** is taken from WEO. Data is linearly interpolated from annual to quarterly frequency.
60. **Deposits-to-GDP (deposgdp)** is the sum of “transferable deposits included in broad money” and “other deposits included in broad money” for other depository corporations (line 24 and 25 in IFTS). Frequency is quarterly. This is expressed as percentage of nominal GDP. The variable is corrected for the following breaks: Mexico (1977Q4), Guatemala (2001Q4), Nicaragua (1988Q1), Costa Rica (1997Q4), the Dominican Republic (2001Q4), Honduras (1997Q4), Hungaria (1987Q4), Poland (1985Q4), Romania (1989Q4), Malaysia (1992Q1), Phillipines (1986Q4), Turkey (1978Q1), Suriname(2002Q2), Serbia (2001Q4), Nigeria (2007Q4), Mongolia (1992Q2), Macedonia (2001Q4), Bhutan (1985Q4), Armenia (1994Q1), Austria (1998Q4), Belgium (1992Q4, 1998Q4), Canada (2001Q4), Denmark (1987Q4), France (1978Q1, 1998Q3), Germany (1999Q1), Greece (2001Q1), Ireland (1995Q1), Israel (1981Q1), Italy (1999Q1), Japan (2001Q4), Luxembourg (1998Q3), Netherlands (1998Q1), New Zealand (1988Q3), Portugal (1979Q4), Spain (1999Q1) and Barbados (2001Q4).
61. **Bank equity as percent of GDP (equitygdp)** is “shares and other equity” for other depository corporations (line 27 in IFTS) at a quarterly frequency. This is divided by GDP.
62. **Bank securities as percent of GDP (securitygdp)** is the sum of “securities other than shares included in broad money” (line 26a) and “securities other than shares excluded from broad money” (line 26s) at quarterly frequency. The measure is expressed in percentage of GDP
63. **Banks’ net foreign assets as percent of GDP (nfagdp)** is “net foreign assets” (line 21N in IFTS) merged with “foreign assets” (line 21) minus “foreign liabilities” (line 26C) for other depository corporations. Frequency is quarterly and the variable is expressed as share of GDP.
64. **Government debt as percent of GDP (govdebtgdp)** is gross government debt from WEO. The variable is linearly interpolated from annual to quarterly frequency, and expressed in percentage of GDP.
65. **Stock market capitalization as percent of GDP (mktcapgdp)** is the value of listed shares as percent of GDP from the database by Beck and Demirguc-Kunt (2009). The variable is linearly interpolated from annual to quarterly frequency.
66. **Banking sector concentration (bcon)** is the assets of the country’s three largest banks as the share of all commercial banks (Beck and Demirguc-Kunt, 2009). The variable is linearly interpolated from annual to quarterly frequency.
67. **Credit market regulation (cmr_fraser)**. **cmr_fraser** is an index for credit market regulation compiled by the Fraser institute, where a higher value implies less regulation. The variable is linearly interpolated from annual to quarterly frequency.

68. **Equity prices.** The following indices from Bloomberg are used: Merval (Argentina), IBOV (Brazil), IGPA (Chile), IGBC (Colombia), CRSMBCT (Costa Rica), MEXBOL (Mexico), IGBVL (Peru) and IBVC (Venezuela).

References

- Acemoglu, Daron and Fabrizio Zilibotti, 1997, “Was Prometheus Unbound by Chance? Risk, Diversification, and Growth”, *Journal of Political Economics*, No. 105 (4), pp. 709-751.
- Angrist, J. and J.-S. Pischke, 2009, *Mostly Harmless Econometrics – An Empiricist’s Companion*, (Princeton: Princeton University Press).
- Arcand, Jean-Louis, Enrico Berkes and Ugo Panizza, 2012, “Too Much Finance?”, *IMF Working Paper 12/161* (Washington: International Monetary Fund).
- Backe, P., B. Egert and Z. Walko, 2007, “Credit Growth in Central and Eastern Europe Revisited”, *Focus on European Economic Integration*, No. 2 (Vienna: Oesterreichische Nationalbank).
- Beck, T. and A. Demirgüç-Kunt, 2009, "Financial Institutions and Markets Across Countries and over Time: Data and Analysis", *World Bank Policy Research Working Paper No. 4943*.
- Borio, C. and M. Drehmann, 2002, “Assessing the risk of banking crisis”, *BIS Quarterly Review*, December, pp. 43-54.
- Borio, C. and M. Drehmann, 2009, “Assessing the risk of banking crisis – revisited”, *BIS Quarterly Review*, March, pp. 29-46.
- Choi, I., 2001, “Unit Root Tests for Panel Data”, *Journal of International Money and Finance*, No. 20, pp. 249-272.
- Classens, S. and N. van Horen, “Foreign Banks: Trends, Impact and Financial Stability”, *IMF Working Paper 12/10* (Washington: International Monetary Fund).
- Corradi, V., M. Gaiotti and R. Rovelli, 1990, “A Cointegration Analysis of the Relationship Between Bank Reserves, Deposits and Loans: The Case of Italy, 1965–1987”, *Journal of Banking and Finance*, No. 14, pp. 199-214.
- Cottarelli, C., G. D. Ariccia and I. Vladkova-Hollar, 2005, “Early birds, late risers, and sleeping beauties: Bank credit growth to the private sector in Central and Eastern Europe and in the Balkans”, *Journal of Banking & Finance*, No. 29, pp. 83-104.
- Coudert, V. and C. Povel, 2010, “Assessing the Sustainability of Credit Growth: The Case of Central and Eastern European Countries”, *The European Journal of Comparative Economics*, No. 7(1), pp. 87-120.
- Cubeddu, L., C. Tovar and E. Tsounta, 2012, “Latin America: Vulnerabilities under Construction?”, *IMF Working Paper 12/193* (Washington: International Monetary Fund).

Demetriades, P. and S. H. Law, 2006, "Finance, Institutions and Economic Development", *International Journal of Finance and Economics*, No. 11, pp. 245-260.

Duenwald, C., N. Gueorguiev and A. Schaechter, 2005, "Too Much of a Good Thing? Credit Booms in Transition Economics: The Cases of Bulgaria, Romania, and Ukraine", *IMF Working Paper 05/128* (Washington: International Monetary Fund).

Drehmann, M., C. Borio and K. Tsatsaronis (2011), "Anchoring countercyclical capital buffers: the role of credit aggregates", *Bank of International Settlements Working Paper No. 355*.

Edge, R. and R. Meisenzahl (2011), "The unreliability of credit-to-GDP ratio gaps in real-time: Implications for countercyclical capital buffers", *International Journal of Central Banking*, December.

Engle, R. and C. Granger, 1987, "Co-Integration and Error Correction: Representation, Estimation and Testing", *Econometrica*, 55, 251-276.

Egert, B., P. Backe and T. Zumer, 2006, "Credit Growth in Central and Eastern Europe. New (Over)Shooting Stars?", *ECB Working Paper Series*, No. 687.

Entorf, H., 1997, "Random Walks and Drifts: Nonsense Regression and Spurious Fixed-Effect Estimation", *Journal of Econometrics*, No. 80, pp. 287-96.

Favara, G., 2003, "An Empirical Reassessment of the Relationship Between Finance and Growth", *IMF Working Paper 03/123* (Washington: International Monetary Fund).

Gersl, A. and J. Seidler, 2010, "Excessive Credit Growth as an Indicator of Financial (In)Stability and its Use in Macroprudential Policy", *Financial Stability Report 2010/2011* (Czech National Bank).

Greenwood, J. and B. Jovanovic, 1990, "Financial Development, Growth, and the Distribution of Income", *Journal of Political Economy*, vol. 98, pp. 1076-1107.

Hahm, J.-H., H. Shin, K. Shin, 2012, "Non-Core Bank Liabilities and Financial Vulnerability", *NBER Working Paper No. 18428*.

Hamilton, J., 1994, *Time Series Analysis*, (Princeton, N.J.: Princeton University Press).

Harris, R. and R. Sollis, 2003, *Applied Time Series Modeling and Forecasting*, (Chichester, West Essex: John Wiley and Sons Ltd).

Im, K., M. H. Pesaran and Y. Shin, 2003, "Testing for Unit Roots in Heterogenous Panels", *Journal of Econometrics*, No. 115, pp. 53-74.

IMF (International Monetary Fund), 2011b, *Global Stability Report*, World Economic and Financial Surveys (Washington, September).

IMF (International Monetary Fund), 2011a, *Regional Economic Outlook: Western Hemisphere* (Washington, April).

IMF (International Monetary Fund), 2012b, “Nicaragua: Article IV Consultation – Staff Report”, *IMF Country Report 12/256* (Washington).

IMF (International Monetary Fund), 2012a, *Regional Economic Outlook: Western Hemisphere* (Washington, April).

IMF (International Monetary Fund), 2012b, “Brazil: Financial System Stability Assessment”, *IMF Country Report no. 12/206*, (Washington, July).

King, and Levine, 1993, “Finance and Growth: Schumpeter Might Be Right”, *The Quarterly Journal of Economics*, No. 108 (3), pp. 717-737.

Kiss, G., M. Nagy and B. Vonnack, 2006, “Credit Growth in Central and Eastern Europe: Convergence or Boom?”, *Magyar Nemzeti Bank Working Paper 2006/10* (Budapest: Central Bank of Hungary).

Kao, C. 1999, “Spurious Regression and Residual-Based Tests for Cointegration in Panel Data”, *Journal of Econometrics*, No. 90, 1–44.

Levine, R., 1997, “Financial Development and Economic Growth: Views and Agenda”, *Journal of Economic Literature*, No. 35 (2), pp. 688-726.

Levin, A. C. Lin and C. Chu, 2002, “Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties”, *Journal of Econometrics*, No. 108, pp. 1-24.

Laeven, L. and F. Valentina, 2010, “Resolution of Banking Crises: The Good, the Bad, and the Ugly”, *IMF Working Paper 10/146* (Washington: International Monetary Fund).

Maddala, G. S. and S. Wu, 1999, “A Comparative Study of Unit Root Tests with Panel Data and a New Simple Test”, *Oxford Bulletin of Economics and Statistics*, No. 61, pp. 631-652.

Mise, E., T.H. Kim, P. Newbold, 2005, “On the suboptimality of Hodrick-Prescott filter at time series endpoints”, *Journal of Macroeconomics*, No. 27.

Pedroni, P. (1999), “Critical Values for Cointegration Test in Heterogenous Panels with Multiple Regressors”, *Oxford Bulletin of Economics and Statistics*, No. 61, pp. 653-670.

Pedroni, P. (2004), “Panel Cointegration: Asymptotic and Finite Sample Properties of Pooled Time Series Tests With An Application to the PPP hypothesis”, *Econometric Theory*, No. 20, pp.597-625.

Petersen, M. A. and R.G. Rajan, 1995, "The Effect of Credit Market Competition on Lending Relationships", *Quarterly Journal of Economics*, No. 110, pp. 407-443.

Pesaran, H. and R. Smith, 1995, "Estimation of Long-Run Relationships From Dynamic Heterogenous Panels", *Journal of Econometrics*, Vol. 68(1), pp. 79-113.

Reinhart, C. and K. Rogoff, 2009, *This Time Is Different: Eight Centuries of Financial Folly* (New Jersey: Princeton University Press).

Rosseau, Peter L. and Paul Wachtel, 2002, "Inflation Threshold and the Finance-Growth Nexus", *Journal of International Money and Finance*, Vol. 21(6), pp. 777-793.

Schumpeter, Joseph A., 1912, *Theorie der Wirtschaftlichen Entwicklung* (Leipzig: Dunker & Humblot).