2009

The Finance–Growth Link in Latin America

Luisa Blanco
Pepperdine University, luisa.blancoraynal@pepperdine.edu

The Finance–Growth Link in Latin America

Luisa Blanco*
The Finance–Growth Link in Latin America
Pepperdine University
School of Public Policy
24255 Pacific Coast Highway
Malibu, CA 90263-7691
USA
Phone: 310.506.7466
lblanco@pepperdine.edu

JEL Categories: G20, O16, O54,

Abstract

This paper analyzes the relationship between financial development and economic growth in Latin America with a Granger causality test and impulse response functions in a panel vector autoregression model. Using annual observations from a sample of 18 countries from 1962 to 2005, it is shown that while economic growth causes financial development, financial development does not cause economic growth. This finding is robust to different model specifications and different financial indicators. Interestingly, when the sample is divided according to different income levels and institutional quality, there is two way causality between financial development and economic growth only for the middle income group and for countries with stronger rule of law and creditor rights. The impulse response functions show that a shock to financial development has a positive impact on economic growth only for these subsamples, but the net effect of financial development on growth is relatively small.

* Acknowledgements: This paper benefited greatly from comments by Robin and Kevin Grier; all their help is greatly appreciated. I am thankful to Inessa Love for making her code for panel VAR available to me and Haichun Ye for her help in the empirical part. I also thank James Prieger for helpful comments, Michelle Isenhouer for research assistance, and Luis Rodriguez for graphics editing. Two anonymous referees have made valuable comments, which helped to improve the paper significantly. Any remaining errors are my own.

1. Introduction

During the 1980s, most Latin American countries suffered from distorted financial systems. In this decade the government kept interest rate controls, allocated credit arbitrarily, and deterred the expansion of security markets and the creation of new financial institutions (Edwards 1999). Nonetheless, there has been a significant improvement on the levels of financial development in the region. While credit to the private sector as a share of Gross domestic product (GDP) in the Latin American region was on average 12 percent in the 1960s, it grew to an average of 29 percent in the early 2000s.[1] Even though Latin American countries experienced significant financial reforms in the 1990s that promoted financial deregulation and the growth of the stock market, financial development indicators show that the region is financially underdeveloped when compared to other emerging regions.[2] Therefore, lack of financial depth may be a barrier to better economic performance in Latin America.

The link between financial development and economic growth is complex since the direction of causation between the two variables may run both ways. Theoretical and empirical analyses support causality running from financial development to economic growth (supply-leading hypothesis), but there is also evidence that economic growth causes financial development (demand-following hypothesis). It has also been posited that the relationship between financial development and growth varies across countries depending on different economic and institutional conditions. Therefore, the goal of this paper is to determine whether financial development causes economic growth in the Latin American region, and whether there are specific conditions that allow this to happen.

There is a vast literature on the analysis of the relationship between financial development and economic growth, but there are few empirical analyses that pool only Latin

American countries. Using a sample of 18 Latin American countries, with observations from 1962 to 2005, this paper focuses on determining the way of causation between financial development and economic growth. This paper also explores whether the relationship between financial development and economic growth is different across countries with different economic and institutional conditions. The indicators of financial development used are private credit, liquid liabilities, and bank deposits as a share of GDP.

Using a vector autoregression (VAR) model, the Granger causality test supports the demand following hypothesis for the whole region. The impulse response functions (IRFs) show that a shock to GDP growth causes greater financial development, but a shock to financial development has no impact on GDP growth. These findings are robust to different measures of financial development and model specifications.

When the sample is divided according to different income levels, there is two way causality only for the middle income group. When the sample is divided according to institutional setups, the same result is found for countries with stronger rule of law and creditor rights. While the flow from financial development to growth is weaker for the stronger rule of law and creditor rights sample than for the middle income sample, a shock to financial development causes greater economic growth for both subsamples. Although these findings support the argument that the finance-growth link is dependent on income levels and institutional settings, the impact of financial development on economic growth is relatively small for the middle income and higher institutional quality samples.

To summarize, the main objectives of this analysis are to determine whether financial development causes economic growth in Latin America or vice versa, and whether the finance-growth link is different across countries with different economic and institutional conditions in

this region. The rest of the paper is organized as follows. Section 2 presents a review of the literature on the relationship between financial development and economic growth and an overview on financial development in Latin America; Section 3 describes the data; Section 4 outlines the model specification; Section 5 presents the empirical results; and Section 6 concludes.

2. The Finance–Growth Link and the Latin American Case

Financial Development and Economic Growth

The level of financial development in a country is determined by the access that individuals have to credit and financial services. The primary function of the financial sector is to "facilitate the allocation of resources across space and time in an uncertain environment" (Levine 1997, p. 691). Financial development also decreases market frictions that result from imperfect information by connecting savers with investors and by allocating resources to profitable projects (Demirguc-Kunt 2006). Therefore, the financial sector plays a crucial role in the economy because it provides relevant information, monitors investment projects, promotes risk diversification, increases the amount of transactions, and affects any entrepreneurial and trading activity (Levine 2005).

A country is considered financially developed if it has a large financial sector that successfully connects savers with investors (Beck et al. 2001). In the empirical literature, financial development has been frequently measured using private credit issued by deposit money banks as a share of GDP. Private credit not only reveals the ability of the financial sector to reach businesses and to allocate resources to profitable projects, but also accounts for credit allocated only through private institutions to the private sector (Beck, Demirguc-Kunt, and

Levine 2000). Liquid liabilities and bank deposits as a share of GDP are commonly used as alternative measures of financial depth because they account for the use of financial institutions for everyday transactions and savings purposes. Liquid liabilities is the addition of currency and interest bearing liabilities of financial intermediaries and non-bank financial intermediaries, and bank deposits is the value of demand, time, and saving deposits in deposit money banks.

Although these indicators are commonly used in the literature, they are not perfect measures of financial development. To measure financial development, it is required to use indicators that account for the quality and quantity of the financial services available to society. While private credit, liquid liabilities, and bank deposits as a share of GDP account for true financial development, they are also related to financial cycles, which are linked to the demand of financial services. In fact, it is argued that the fast expansion of private credit does not necessarily represent an improvement in the financial sector if this expansion leads to an increase in risk at the micro and macro level (Honohan 2004). Researchers acknowledge the limitations of the financial development indicators by using a group of indicators and econometric techniques that address for these issues.

There is a debate about the causality between financial development and economic growth, with some arguing that financial development causes economic growth, while others assert that economic growth causes financial development. Supporters of the causation running from financial development to economic growth state that the characteristics of the financial sector are relevant for economic activity and base their argument on Schumpeter's view of financial development as creative destruction (Rajan and Zingales 2003). On the other hand, others argue that financial development may be the consequence of economic growth because developed economies create the demand for developed financial sectors (Shan 2005). Empirical

analyses on the relationship between financial development and economic growth use cross country, panel, and firm-industry data to support both sides of the debate.

In a literature review on the relationship between financial development and economic growth, Levine (2005) concludes that financial development causes economic growth. The channels through which financial development causes economic growth are productivity and capital accumulation (Beck, Levine, and Loayza 2000). Financial development promotes the increase of technology because access to financial resources allows for labor specialization, which creates a virtuous cycle in the economy (Saint-Paul 1992). More efficient financial sectors are also associated with better resource allocation that leads to higher capital accumulation.[3]

Cross country and panel empirical analyses support the supply-leading hypothesis by showing that the exogenous component of financial development has a positive effect on economic growth (Beck, Levine, and Loayza 2000; Benhabib and Spiegel 2000; Khan and Senhadji 2003; Levine, Loayza, and Beck 2000), productivity, and capital accumulation (King and Levine1993; Beck, Levine, and Loayza 2000; Nourzad 2002; Rioja and Valev 2004a). Analyses at the firm-industry level also support the argument that financial development is conducive to growth (Beck 2002; Kroszner, Laeven, and Klingebiel 2007; Love 2003; Manning 2003; Rajan and Zingales 1998).

Although there is an extensive amount of work showing that financial development causes economic growth, others posit that financial development is just the consequence of economic growth. As stated by Shan, Morris, and Sun (2001), the relationship between financial development and economic growth may be a ‘chicken and the egg’ problem since financial institutions are usually developed in developed countries (DCs) and underdeveloped in less developed countries (LDCs). The theoretical explanation behind this hypothesis is that there is a

virtuous cycle in developed economies, where an expansion in the real sector increases the demand for loanable funds (Berthélemy and Varoudakis 1996; Greenwood and Jovanovic 1990). The empirical record is mixed.

While some empirical analyses show the bi-directional causality between financial development and economic growth (Berthélemy and Varoudakis 1996; Calderon and Liu 2003; Demetriades and Hussein 1996; Luintel and Khan 1999), others find no evidence that financial development causes economic growth (Ram 1999; Shan, Morris, and Sun 2001; Shan 2005). There is also empirical evidence showing that the effect of financial development on economic growth is different across regions (Al-Awad and Harb 2005; Habibullah and Eng 2006; Iyare Lorde, and Francis 2005; Naceur and Ghazouani 2007; Odhiambo 2007), income levels (Aghion, Howitt, and Mayer-Foulkes 2005; Berthélemy and Varoudakis 1998; Andersen and Tarp 2003; Jung 1986; Ram 1999; Rioja and Valev 2004a; Xu 2000), levels of financial development (Rioja and Valev 2004b), and institutions (De Gregorio and Guidotti 1994; Shen and Lee 2006).

There are three possible explanations for the heterogeneous effect of financial development. First, it is argued that the effect of financial development on economic growth is dependent on the country's level of economic development. According to Aghion, Howitt, and Mayer-Foulkes (2005), because firms in advanced countries are financially unconstrained, the steady state growth rate of these countries does not respond to improvements in the financial sector. On the other hand, for LDCs, the lower the level of financial development, the greater the "disadvantage of backwardness" the country faces due to credit constraints. Financial development allows LDCs to converge to the frontier growth rate, but a country can converge to the frontier growth rate only if financial development exceeds a certain threshold. Therefore, financial development benefits the most, in terms of economic growth, those countries that are

not at the global technology frontier, and that have neither too low nor too high levels of financial development.

Second, financial development may have a nonlinear effect on growth. The effect of financial development on growth is dependent on the level of financial development of a country. Rioja and Valev (2004b) find that financial development has a positive effect on growth once financial development has passed certain threshold, but this effect is diminishing once countries have achieved high levels of financial development. Economies of scale, risk pooling, and learning by doing explain why financial development has a positive effect on growth once a threshold level is achieved, while the law of diminishing returns explains why financial development has no effect on growth in countries with highly developed financial systems.

Third, the effect of financial development on growth may be dependent on country conditions related to institutions, such as credit protection and law enforcement. Property rights institutions, which protect citizens against government power, are important determinants of financial development and economic growth (Acemoglu and Johnson, 2005). In fact, La Porta, Lopez-de-Silanes, and Shleifer (2008) posit that the legal origin of a country has a significant impact on institutions, and consequently, on the level of financial development. Countries under common law have greater protection to investors than countries under civil law, and this may be one of the factors explaining why capital markets are more developed in common law countries (La Porta et al. 1997, 1998). Therefore, the finance-growth link can be affected by the legal environment, where better institutions may allow financial development to spur economic growth.

Under certain conditions, financial development has also been associated with lower economic growth (Berthélemy and Varoudakis 1998; De Gregorio and Guidoti 1995; Shen and

Lee 2006). A negative effect of financial development on growth is explained by the fact that financial development, specifically in the banking sector, may lead to lower saving rates or depress stock markets (Shen and Lee 2006). It is also argued that there is a negative effect of financial development on growth when there is financial repression (Berthélemy and Varoudakis 1998), and when there is fast financial liberalization with poor regulation that leads to overlending (De Gregorio and Guidotti 1995).[4] Based on these explanations, the general consensus that financial development causes greater growth cannot be applied to all countries.

Current research has also recognized the important role that macroeconomic volatility plays when analyzing the relationship between financial development and economic growth. Disentangling the effect of financial development on economic growth is difficult since several countries have experienced financial crises in periods in which they had a significant improvement in their financial sector. Some argue that the empirical evidence showing that financial development has no impact or a negative effect on economic growth may be due to the fact that the impact of financial development may be different across different time frames. Since emerging regions are likely to experience financial crises after financial liberalization, financial development in the short run may be negatively associated with economic growth. However, it is expected that the improvements on the financial sector, due to financial liberalization, have a positive impact in the long run once the country has stabilized (Loayza and Rancière 2006). Loayza and Rancière (2006) reconcile the banking crises with the financial intermediation literature by showing that the effect of financial development on economic growth is negative in the short run but positive in the long run.[5]

The Latin American Case

In most Latin American countries, the financial sector is bank based and the stock market is small. In the 1990s, the average level of credit to the private sector in Latin America was only 28 percent of GDP, which is considerably smaller than that found in other developing regions (e.g. 72 percent for Asia and 43 percent for countries in the Middle East and North Africa; Inter-American Development Bank 2005).[6] Although Latin American countries experienced financial liberalization, the financial sector in the region has not been able to catch up with other emerging regions.

Evidence shows that the lack of financial depth has characterized the Latin American region since independence. In the early 1900s capital markets and the banking system were extremely weak, which made the sources of credit limited and led to a high concentration in the financial sector.[7] The underdevelopment of the financial system in the region has been attributed to short term lending strategies, the governments' inability to pay back their debt, and the legal framework that lacks contract enforcement (Levine 2000). The underdevelopment of the financial sector in Latin America today is also a consequence of the financial repression experienced in the region throughout the 1970s and 1980s. During these decades, Latin American governments used the banking sector to finance their budget deficits with borrowing and implicit taxation. Governments also used the banking sector to subsidize sectoral development projects and this produced a "bias to refinance non-performing loans," that "benefited bad banks and especially bad borrowers" (Mas 1995, p. 695).

It is argued that the structural reforms implemented in Latin America during the 1990s have promoted the participation of the private sector in financial institutions (Loayza and Palacios 1997). However, Burki and Perri (1997) posit that these reforms did not make financial markets in the region more efficient, and that future reforms should focus on increasing

competition, reducing government participation, developing efficient bond and equity markets, and promoting foreign participation.[8] In a comprehensive analysis of financial reforms in Latin America in the last two decades, Galindo, Micco, and Panizza (2007) conclude that reforms related to the legal framework, such as contract protection and creditor's rights, are required in order to further expand the financial sector and to allow this sector to have a real effect in the economy.

There are few empirical studies on the relationship between financial development and economic growth for the Latin American region. De Gregorio and Guidotti (1995), in a panel of 12 Latin American countries between 1950 and 1985, find that financial development has a significant negative effect on economic growth. They argue that this finding was due to the fast financial liberalization experienced at the time and that without proper regulation, led to macroeconomic volatility. On the other hand, Nazmi (2005) finds, using a panel data of 5 Latin American countries from 1960 to 1995, that financial development has a significant positive effect on investment. Because there has been a significant change in the financial sector in the late 1990s and early 2000s in Latin America (see Figure 1), it is important to analyze the relationship between financial development and economic growth using current data. By pooling only Latin American countries, which controls for cross-country heterogeneity, and using a sample period that includes current changes on the financial sector, this paper contributes significantly to the literature on the finance-growth link.[9]

3. Data

The relationship between financial development and economic growth is analyzed in a panel of 18 Latin American countries from 1962 to 2005. The countries included are: Argentina,

Bolivia, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Mexico, Panama, Paraguay, Peru, Trinidad and Tobago, Uruguay, and Venezuela.[10]

Economic growth is measured as the difference of the natural log of real GDP per capita (constant U.S. dollars).[11] The natural log of private credit issued by deposit money banks as a share of GDP is the main measure of financial development used in this analysis.[12] Liquid liabilities and bank deposits as a share of GDP (in logs) are used as alternative measures of financial development for robustness purposes.[13] Financial development indicators for Argentina, Bolivia, Chile, Peru, and Uruguay were constructed following Beck, Demirguc-Kunt, and Levine (2000) formula, since they were not consistently available for the period of analysis in Beck, Demirguc-Kunt, and Levine (2000; October 2007 version) financial structure database. Financial development indicators for all the other countries were obtained from Beck, Demirguc-Kunt, and Levine (2000) database.[14] For robustness purposes, a set of control variables, similar to the one used in Loayza's and Rancière (2006) analysis, is included in the estimation (ratio of government consumption to GDP, ratio of exports plus imports to GDP, and inflation; all in natural logs).

The impact of financial development on growth is explored across countries with different economic and institutional conditions. To account for different economic conditions, following Rioja and Valev (2004a), the sample is divided in three groups according to their relative ranking in their GDP per capita (constant 2000 U.S. dollars) in the middle of the sample period.[15] The sample is also divided according to institutional conditions. To account for institutional conditions, the average of the rule of law and creditor rights indices are estimated for each country during the period of analysis with the available observations.[16] Tables 1 and 2

provide a detailed description, sources, and summary statistics of all variables. Table 3 shows the average institutional indices for each country and the country classification according to its relative income level.

4. Model Specification

To determine the direction of causality between financial development and economic growth, the Granger causality test in a VAR framework is used. The panel VAR model in this analysis has the following form:

$$Y_{i,t} = c_0 + A_1 Y_{i,t-1} + A_2 Y_{i,t-2} + \ldots\ldots\ldots\ldots + A_p Y_{i,t-p} + D\alpha + T\lambda + \varepsilon_{i,t} \qquad (1)$$

where c is a vector of constants and for each j = 0, 1,…p, $Y_{i,\,t-j}$ is a vector of variables evaluated at time t – j, A_j is a matrix that gives the relationship among the variables at time t – j, while $\varepsilon_{i,\,t}$ is a vector of error terms for the country i in period t. D is a vector of country dummy variables and T is a vector of time effects.

This VAR estimation includes fixed effects to control for cross country differences and time variation. The fixed effect approach to the Granger causality test in a panel VAR provides the advantage of accounting for individual heterogeneity by removing the average variation across countries and across time.[17]

For the Granger causality test in a bivariate VAR, $Y_{i,\,t-j}$ is a vector of two variables: GDP growth (GDP) and financial development (FD) evaluated at time t – j. j is equal to 2 since this is the appropriate lag length according to the Schwarz information criterion (SIC).[18] Based on this framework, the hypotheses that financial development does not Granger cause GDP growth, and that GDP growth does not Granger cause financial development are tested. Therefore, the null hypotheses of this test are

$H_0 : \beta_1^{FD} = \beta_2^{FD} = ... = \beta_p^{FD} = 0$, where β^{FD} are the coefficients of financial development (FD) in periods t – p in the GDP growth equation.

$H_0 : \beta_1^{GDP} = \beta_2^{GDP} = ... = \beta_p^{GDP} = 0$, where β^{GDP} are the coefficients of GDP growth in periods t – p in the financial development equation.

For the purpose of robustness, the Granger causality test is performed in a multivariate VAR, where $Y_{i, t-j}$ is a vector of six variables: GDP growth, financial development, government consumption, trade, and inflation (all in logs) evaluated at time t – j.

This analysis also explores the dynamic behavior of economic growth and financial development in a panel framework following the methodology used by Love and Zicchino (2006). The panel VAR specified in equation (1) is estimated using a system General Method of Moments (GMM) estimator, where lagged regressors are used as instruments.[19] In this estimation, time fixed effects are eliminated by subtracting the means of each variable calculated for each country-year and forward mean differencing (Helmert procedure) is used to account for country fixed effects. Coefficients and IRFs are estimated using the system GMM.[20] Because the IRFs capture the time path of shocks on financial development and economic growth, they help to determine the interaction between these two variables. The IRFs visually represent how GDP growth responds to a shock in financial development and vice versa.[21] Therefore, the impulse response of GDP growth to a shock in financial development allows evaluating the effect of financial development booms on economic growth. This approach also allows evaluating how an economic boom impacts financial development. [22]

Although it is argued that time series techniques are biased in analyses that include few observations (small T), the results obtained from the panel VAR in this analysis are reliable. According to Beggs (1986) cross sectional data improves the reliability of time series techniques.

He shows that time series processes can be identified for samples that include at least 25 observations and 5 countries.[23] In this analysis, estimations include at least 6 countries and 33 observations per country.[24]

5. Empirical Results

The Finance–Growth Link in Latin America

In Table 4, column 1 shows the results from the Granger causality test of the bivariate VAR model in a balanced panel framework with fixed effects for the full sample using 2 lags and 3 different measures of financial development, one at the time.[25] There is evidence of one way causality, where GDP growth causes financial development, and this finding is robust to different measures of financial development. The hypothesis that financial development does not Granger cause GDP growth cannot be rejected at the 10 percent level, and the hypothesis that GDP growth does not Granger cause financial development is rejected at the 1 percent level. This result is robust to expanding the number of lags to 4 (Table 4, column 2).

Because there could be an omitted variable bias in the bivariate VAR that country and time dummies cannot fully account for, the Granger causality test is performed in a multivariate VAR to check for robustness. The variables included in the estimation, besides GDP growth and financial development, are government consumption as a share of GDP, trade as a share of GDP, and inflation (all in logs). This estimation excludes Panama and uses a shorter sample period (1970 to 2005) due to data unavailability. In Table 4, columns 3 and 4 also show one way causation from GDP growth to financial development. When using 2 and 4 lags, the hypothesis that economic growth does not Granger cause financial development is rejected at the 1 and 5

percent level, respectively. We fail to reject at the 10 percent level that financial development does not Granger cause GDP growth in the multivariate VAR using 2 and 4 lags.[26]

In order to determine whether previous results are driven by a specific country, the Jack-knife approach is used. The Granger causality test is performed 18 times, each time excluding observations from one country. Table 5 presents the summary statistics of the Granger causality tests, excluding one country at the time, using private credit as a measure of financial development and 2 lags. In all cases, for the bivariate VAR, the hypothesis that GDP growth does not Granger cause financial development is rejected at the 1 percent level, but the hypothesis that financial development does not Granger cause GDP growth cannot be rejected at the 10 percent level.[27] These results are consistent to the country-by-country Jack-knife Granger causality test in the multivariate VAR (Table 5).[28]

Since Garcia-Herrero et al. (2002) argue that Chile and Panama are more financially developed than other Latin American countries, it is important to explore whether results in the Granger causality test hold when we exclude these countries from the estimation. The Granger causality test in a bivariate VAR with 2 lags, using private credit, liquid liabilities, and bank deposits as a share of GDP (one at the time, all in logs), shows that the hypothesis that economic growth does not Granger cause financial development is rejected at the 1, 2, and 6 percent level. In all cases, the hypothesis that financial development does not Granger cause GDP growth cannot be rejected at the 10 percent level.[29]

To further understand how financial development and economic growth influence each other in Latin America, the system GMM and IRFs are estimated. Tables 6 and 7 show the coefficients and standard errors for the bivariate and multivariate VAR estimations using the system GMM and 3 different financial indicators (one at the time). In the bivariate VAR

estimation (Table 6, column 1), when using private credit as a share of GDP, financial development has no significant effect on economic growth, but economic growth has an effect on financial development. Estimates show that the first lag of GDP growth has a significant positive effect on financial development at the 1 percent level, and the second lag of GDP growth has a significant negative effect on financial development at the 5 percent level. An increase on GDP growth by one standard deviation (0.0425) causes private credit as a share of GDP to increase by 0.03 the next period and to decrease by 0.01 in the second period after the initial increase on GDP growth. Therefore, the net effect of an increase on economic growth by one standard deviation on private credit is 0.02 after 2 years. The net effect of growth on financial development is very small when compared with the standard deviation of private credit (0.6455). These results are similar using other financial development indicators. When using liquid liabilities and bank deposits as a share of GDP (columns 2 and 3), a one standard deviation increase on GDP growth has a positive effect on financial development of 0.02 the next period. Coefficients size and significance are similar in the multivariate VAR estimates shown in Table 7.

IRFs and 5 percent error bands are generated by Monte Carlo simulation with 1000 repetitions. Figure 2 shows the IRFs when using 2 lags and private credit as a share of GDP in the bivariate VAR model. A shock in financial development has no impact on GDP growth, but a shock in economic growth leads to greater financial development. The effect of GDP growth on financial development effect fades away by year 5. For the multivariate VAR, IRFs are presented in Figure 3 and they are similar to those shown in Figure 2. The only difference in Figure 3 is that the effect of GDP growth on financial development fades away by year 3 (approximately).[30] Evidence from the impulse response of GDP growth to a shock on financial development helps

to disentangle the impact of a financial boom in the real sector. This impulse response shows that a private credit boom does not lead to greater economic growth for the full sample. Therefore, what is evaluated here is the response of economic growth to financial development in the short run. The impulse response of financial development to a GDP growth shock shows how financial development responds to an economic boom. Evidence from this impulse response supports the argument that financial development follows economic booms.

To summarize, empirical evidence from the granger causality test, system GMM, and IRFs supports the argument that financial development follows GDP growth, and that financial development does not cause GDP growth in the Latin American region. This result is robust to using different financial development indicators (private credit, liquid liabilities, and bank deposits as a share of GDP), model specifications (bivariate and multivariate VAR), lags (2 and 4), and samples (Jack-knife approach).

In this section, it is important to note that there may be specific reasons why causality does not run from financial development to growth, and it cannot be concluded that financial development has no impact on growth per se. As argued by Demetriades and Andrianova (2004), this finding may be due to the fact that financial resources are not being allocated to productive activities as a result of political interference. Furthermore, Demetriades and Andrianova (2004) also posit that financial development has no real effect in the economy if there is macroeconomic and political instability. For this reasons, it is necessary to explore the impact of financial development on growth across countries with different economic and institutional conditions.

The Finance–Growth Link across Countries with Different Conditions

In the analysis of the relationship between financial development and economic growth, many have argued that the effect of financial development on growth may vary across countries with different conditions. To evaluate this, economic and institutional conditions are taken into consideration. To determine whether there is a heterogeneous effect of financial development on growth that is dependent on economic conditions, Granger causality test and system GMM are estimated for high, middle, and low income countries separately. Furthermore, the finance-growth link across countries with different institutions is analyzed by taking away from the sample those countries with low indices of rule of law and creditor rights. There are 3 subsamples based on institutional set ups for which the granger causality test and the system GMM are estimated. The first estimation excludes those countries with a rule of law index below the sample mean minus one half standard deviation. The second estimation excludes those countries with a creditor rights index below the sample mean minus one half standard deviation. The third sample includes only those countries with both indices above the sample mean minus one half standard deviation (see Table 3 for country classification).[31]

Table 8 shows the Granger causality test estimated for the three different subsamples based on relative income levels, using private credit as a share of GDP and 2 lags. For the high and low income group, results are similar to those found for the full sample, where there is evidence of one way causality running from GDP growth to financial development. Interestingly, a two way causality is present only for middle income countries. For the middle income sample, the hypotheses that financial development does not granger cause GDP growth and that GDP growth does not cause financial development are rejected at the 1 percent level. The system GMM estimates for each subsample are shown in Table 9. Only for the middle income group (Table 9, column 3), financial development has a significant effect on GDP growth. Based on

estimates on column 3, for the middle income group it is found that an increase on financial development by one standard deviation (0.6455) leads to an increase on GDP growth of 0.04 in the next period and a decrease of 0.03 in the second period after the initial increase on financial development. Therefore, the net effect of an increase on financial development by one standard deviation on GDP growth is 0.01 after 2 years. The economic significance of the impact of financial development on GDP growth is relatively small since this effect represents one fourth of the standard deviation of GDP growth. Furthermore, the impulse response of GDP growth to a shock on financial development shows that GDP growth responds positively to a shock on financial development only for the middle income group, where the positive impact of financial development on economic growth vanishes by year 4 (Figure 4).

Table 10 shows the Granger causality test when splitting the sample based on institutional set ups (using private credit as a share of GDP and 2 lags). There is evidence that GDP growth causes financial development in all cases. The hypothesis that financial development does not granger cause GDP growth is rejected at the 10 percent level for the subsample that includes those countries with higher rule of law index and for the subsample that considers only those countries with higher rule of law and creditor rights indices. The system GMM estimates for these three subsamples are shown in Table 11. Only for those countries with higher rule of law and creditor rights indices (column 3), financial development has a marginal significant effect on GDP growth. The impact of financial development on growth is also small for this subsample since an increase on financial development by one standard deviation leads to an increase on GDP growth by 0.03 in the next period and a decrease of 0.02 in the second period after the increase on financial development. Therefore, the net effect of an increase on financial development by one standard deviation is equal to 0.01 after 2 years, which is the same

as the one found for the middle income group. Looking at the IRFs, Figure 5 shows that a shock to financial development has a positive impact on GDP growth only for those countries with stronger rule of law and creditor rights.[32]

6. Conclusion

There are two main empirical findings. First, for the full sample there is one way causality between financial development and GDP growth, where GDP growth causes financial development. Second, this result changes once the sample is separated according to economic and institutional conditions. While GDP growth causes financial development in all cases, financial development causes GDP growth only for the middle income and the stronger rule of law and creditor rights samples. While the causal flow from financial development to growth is weaker for the group with stronger rule of law and creditor rights indices than for the middle income group, the net effect of financial development on growth is relatively small for both subsamples.

This analysis provides support for the argument that financial development follows economic growth and that the impact of financial development on growth may be different across countries with different conditions. These results support Aghion, Howitt, and Mayer-Foulkes (2005), Rioja's and Valev (2004a) and Shen's and Lee (2006) findings on the heterogeneous effect of financial development on growth. Furthermore, evidence shows that greater financial development may not necessarily lead to greater economic growth for all countries in the Latin American region.

Research must focus on further understanding the complementary conditions that allow financial development to have a positive effect on economic growth. In the case of Latin

American countries, while growth seems to follow financial development for the middle income and higher institutional quality samples, the impact of financial development on growth is relatively small. Perhaps there is a threshold of income level and governance that will allow financial development to affect growth by a significant magnitude. Further research must be done in order to determine the threshold levels of income and governance indicators required for financial development to have a positive and quantitatively significant impact on the real sector.

To further understand the finance-growth link in Latin America, it is also important to use an empirical approach that takes into consideration the short and long run relationship between financial development and economic growth. Since Latin American countries have experienced fast financial liberalization and great macroeconomic volatility, it is expected that the effect of financial development on economic growth may be different across different time frames. Therefore, it is important to distinguish how GDP growth responds to financial development booms (short run) and continuous improvements in the financial sector over a long period of time (long run).

When looking at the finance-growth link across different time frames, it will be important to determine whether a positive shock to financial development increases the likelihood of a banking crisis. Additionally, exploring the finance-growth link at different periods, especially during the period where Latin American countries experienced fast financial liberalization and large capital inflows, will be an interesting task to look at once more data is available.

References

Acemoglu, Daron, and Simon Johnson. 2005. Unbundling institutions. *Journal of Political Economy* 113(5):949-95.

Aghion, Philippe, Peter Howitt, and David Mayer-Foulkes. 2005. The effect of financial development on convergence: theory and evidence. *Quarterly Journal of Economics* 120(1):173-222.

Al-Awad, Mouawiya, and Nasri Harb. 2005. Financial development and economic growth in the Middle East. *Applied Financial Economics* 15(15):1041-51.

Allen, Franklin, and Douglas Gale. 2000. *Comparing financial systems.* Cambridge, MA: MIT Press.

Andersen, Thomas, and Finn Tarp. 2003. Financial liberalization, financial development and economic growth in LDCs. *Journal of International Development* 15(2):189-209.

Beck, Thorsten, Asli Demirguc-Kunt and Ross Levine. 2000. A new database on financial development and structure. *World Bank Economic Review* 14:597-605. Revised version of October 2007. Available at http://go.worldbank.org/X23UD9QUX0.

Beck, Thorsten, Ross Levine, and Norman Loayza. 2000. Finance and the sources of growth. *Journal of Financial Economics* 58(1-2):261-300.

Beck, Thorsten, Asli Demirguc-Kunt, Ross Levine, and Vojislav Maksimovic. 2001. Financial structure and economic development: firm, industry, and country evidence. In *Financial Structure and Economic Growth: a Cross Country Comparison of Banks, Markets, and Development*, edited by Asli Demirguc-Kunt and Ross Levine. Cambridge, MA: MIT Press, pp.189-242.

Beck, Thorsten. 2002. Financial development and international trade is there a link? *Journal of International Economics* 57(1):107-31.

Beggs, John. 1986. Time series analysis in pooled cross-sections. *Econometric Theory* 2(3):331-49.

Benhabib, Jess, and Mark Spiegel. 2000. The role of financial development in growth and investment. *Journal of Economic Growth* 5(4):341-60.

Berthélemy, Jean-Claude, and Aristomene Varoudakis. 1996. Economic growth, convergence clubs, and the role of financial development. *Oxford Economic Papers* 48(2):300-28.

Berthélemy, Jean-Claude, and Aristomene Varoudakis. 1998. Développement financier, reformes financières et croissance: une approche en données de panel. *Revue économique* 49(1):195–207.

Bulmer-Thomas, Victor. 2003. *The Economic History of Latin America Since Independence*. 2nd edition. New York, NY: Cambridge University Press.

Burki, Shahid, and Guillermo Perry. 1997. *The Long March: A Reform Agenda for Latin America and the Caribbean in the Next Decade*. Washington, D.C.: World Bank.

Calderón, César, and Lin Liu. 2003. The direction of causality between financial development and economic growth. *Journal of Development Economics* 72(1):321-34.

De Gregorio, Jose, and Pablo Guidotti. 1995. Financial development and economic growth. *World Development* 23(3):433-48.

De la Torre, Augusto, Juan Gozzi, and Sergio Schmukler. 2006. Financial development in Latin America: big emerging issues, limited policy answers. World Bank Policy Research Working Paper No.3963.

Demetriades, Panicos, and Khaled Hussein. 1996. Does financial development cause economic growth? Time series evidence from 16 countries. *Journal of Development Economics* 51(2):387-411.

Demetriades, Panicos, and Svetlana Andrianova. 2004. Finance and growth: what we know and what we need to know. In *Financial Development and Economic Growth*, edited by Charles Goodhart. New York, NY: Palgrave Macmillan, pp. 38-65.

Demirguc-Kunt, Asli. 2006. Finance and economic development: policy choices for developing countries. World Bank Policy Research Working Paper No. 3955.

Djankov, Simeon, Caralee McLiesh, and Andrei Shleifer. 2007. Private credit in 129 countries. *Journal of Financial Economics* 84(2):299-329.

Edwards, Sebastian. 1999. *Crisis and Reform in Latin America: From Despair to Hope*. New York, NY: Oxford University Press.

Enders, Walter. 2004. *Applied Econometric Time Series*. 2nd Edition. New York, NY: John Wiley and Sons.

Galindo, Arturo, and Alejandro Micco. 2007. Creditor protection and credit response to shocks. *World Bank Economic Review* 21(3):413-38.

Galindo, Arturo, Alejandro Micco, and Ugo Panizza. 2007. Two decades of financial reforms. In *The State of State Reform in Latin America*, edited by Eduardo Lora. Palo Alto, CA: Stanford University Press, pp.291-316.

Garcia Herrero, Alicia, Javier Santillan Fraile, Sonsoles Gallego Herrero, Lucía Cuadro Sáez, and Carlos Egea Martínez. 2002. Latin American financial development perspective. Bank of Spain Working Paper No. 0216.

Greenwood, Jeremy, and Boyan Jovanovic. 1990. Financial development, growth, and the distribution of income. *Journal of Political Economy* 98(5):1076-1107.

Grier, Kevin, and Gordon Tullock. 1989. An empirical analysis of cross-national economic growth, 1951-1980. *Journal of Monetary Economics* 24(2):259-276.

Habibullah, Muzafar, and Yoke-Kee Eng. 2006. Does financial development cause economic growth? A panel data dynamic analysis for the Asian developing countries. *Journal of the Asia Pacific Economy* 11(4):377–93.

Hahn, Jinyong and Whitney Newey. 2004. Jackknife and analytical bias reduction for nonlinear panel models. *Econometrica* 72(4):1295-1319.

Holtz-Eakin, Douglas, Whitney Newey, and Harvey Rosen. 1988. Estimating vector autoregressions with panel data. *Econometrica* 56(6):1371-95.

Honohan, Patrick. 2004. Financial development, growth and poverty: how close are the links? In *Financial Development and Economic Growth*, edited by Charles Goodhart. New York, NY: Palgrave Macmillan, pp.1-37.

Inter-American Development Bank. 2005. Unlocking credit: the quest for deep and stable bank lending. Available at http://www.iadb.org/res/ipes/2005/chapters.cfm?language=EN&parid=3.

International Monetary Fund. 2008. International Financial Statistics. Available at http://www.imfstatistics.org/imf/.

Iyare, Sunday, Troy Lorde and Brian Francis. 2005. Financial Development and Economic Growth in Developing Economies: Empirical Evidence from the Caribbean. *Ekonomia* 8(2):168-84.

Ju, Jiandong, and Shang-Jin Wei. 2005. Endowment versus finance: a wooden barrel theory of international trade. International Monetary Fund Working Paper No.123.

Jung, Woo. 1986. Financial development and economic growth: international evidence. *Economic Development and Cultural Change* 34(2):333-46.

Kaufmann, Daniel, Aart Kraay, and Massimo Mastruzzi. 2007. Governance Matters VI: Governance Indicators for 1996-2006. World Bank Policy Research. Available at http://info.worldbank.org/governance/wgi/index.asp

Khan, Mohsin, and Abdelhak Senhadji. 2003. Financial development and economic growth: a review and new evidence. *Journal of African Economies* 12(2):89-110.

King, Robert, and Ross Levine. 1993. Finance and growth: Schumpeter might be right. *Quarterly Journal of Economics* 108(3):717-37.

Kroszner, Randall, Luc Laeven, and Daniela Klingebiel. 2007. Banking crisis, financial dependence and growth. *Journal of Financial Economics* 84(1):187-228.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny. 1997. Legal determinants of external finance. *Journal of Finance* 52(3):1131–50.

La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert Vishny. 1998. Law and finance. *Journal of Political Economy* 106(6):1113–55.

La Porta, Rafael, Florencio Lopez-de-Silanes, and Andrei Shleifer. 2008. The economic consequences of legal origins. *Journal of Economic Literature* 46(2):285–332.

Levin, Andrew, Chien-Fu Lin, and Chia-Shang Chu. 2002. Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics* 108(1):1–24

Levine, Ross. 1997. Financial development and economic growth: views and agenda. *Journal of Economic Literature* 35(2):688-726.

Levine, Ross. 2000. Napoleon, burses, and growth in Latin America. In *Market Augmenting Government,* edited by Omar Azfar and Charles Cadwell. Ann Arbor, MI: University of Michigan Press, pp.49.85.

Levine, Ross, Norman Loayza, and Thorsten Beck. 2000. Financial intermediation and growth: causality and causes. *Journal of Monetary Economics* 46(1):31-77.

Levine, Ross. 2005. Finance and growth: theory and evidence. In *Handbook of Economic Growth*, edited by Philippe Aghion and Steven Durlauf, 1A, pp. 866-934.

Loayza, Norman, and Luisa Palacios. 1997. Economic reform and progress in Latin America and the Caribbean. World Bank Policy Research Working Paper No. 1829.

Loayza, Norman, and Romain Rancière. 2006. Financial development, financial fragility, and growth. *Journal of Money, Credit, and Banking* 38(4):1051-76.

Love, Inessa. 2003. Financial development and financing constraints: international evidence from the structural investment model. *Review of Financial Studies* 16(3):765-91.

Love, Inessa, and Lea Zicchino. 2006. Financial development and dynamic investment behavior: evidence from panel VAR. *Quarterly Review of Economic and Finance* 46(2):190-210.

Luintel, Kul, and Mosahid Khan. 1999. A quantitative reassessment of the finance-growth nexus: evidence from a multivariate VAR. *Journal of Development Economics* 60(2):381-405.

Manning, Mark. 2003. Finance causes growth: can we be so sure? *Contributions to Macroeconomics*, 3(1): article 12.

Mas, Ignacio. 1995. Policy-induced disincentives to financial sector development: selected samples from Latin America in the 1980s. *Journal of Latin American Studies* 27(3):683-706.

Naceur, Samy, and Samir Ghazouani. 2007. Stock Markets, Banks, and Economic Growth: Empirical Evidence from the MENA Region. *Research in International Business and Finance* 21(2):297–315

Nazmi, Nader. 2005. Deregulation, financial deepening and economic growth: the case of Latin America. *Quarterly Review of Economics and Finance* 45(2-3):447-59.

Nourzad, Farrokh. 2002. Financial development and productive efficiency: a panel study of developed and developing countries. *Journal of Economics and Finance* 26(2):138-49.

Odhiambo, Nicholas. 2007. Supply-leading versus demand-following hypothesis: empirical evidence from three SSA countries. *African Development Review* 19(2):257-80.

Pesaran, Hashem, and Ron Smith. 1995. Estimating long run relationships from dynamic heterogeneous panels. *Journal of Econometrics* 68(1):79-113.

Rajan, Raghuram, and Luigi Zingales. 1998. Financial dependence and growth. *American Economic Review* 88(3):559-86.

Rajan, Raghuram, and Luigi Zingales. 2003. The great reversals: the politics of financial development in the twentieth century. *Journal of Financial Economics* 69(1):5-50.

Ram, Rati. 1999. Financial Development and Economic Growth: Additional Evidence. *Journal of Development Studies* 35(4):164-174.

Rioja, Felix, and Neven Valev. 2004a. Finance and the sources of growth at various stages of economic development. *Economic Inquiry* 42(1):127-40.

Rioja, Felix, and Neven Valev. 2004b. Does one size fit all?: a reexamination of the finance and growth relationship. *Journal of Development Economics* 74(2):429-47.

Saint-Paul, Gilles. 1992. Technological Choice, financial markets and economic development. *European Economic Review* 36(4):763-81.

Shan, Jordan, Alan Morris, and Fiona Sun. 2001. Financial development and economic growth: an egg-and-chicken problem? *Review of International Economics* 9(3):443-54.

Shan, Jordan. 2005. Does financial development 'lead' economic growth? A vector auto-regression appraisal. *Applied Economics* 37(12):1353-67.

Shen, Chung-Hua, and Chien-Chiang Lee. 2006. Same financial development yet different economic growth—why? *Journal of Money, Credit and Banking* 38(7):1907-44.

Wooldridge, Jeffrey. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.

World Bank. 2008. World Development Indicators. Available at http://publications.worldbank.org/WDI/.

Xu, Zhenhui. 2000. Financial development, investment, and economic growth. *Economic Inquiry* 38(2):331-44.

Endnotes

[1] Author's calculation using data from this analysis.

[2] Garcia Herrero et al. (2002) and Galindo, Micco, and Panizza (2007) present evidence of this.

[3] Ju and Wei (2005) developed the wooden barrel theory of international trade, where economic growth depends on the financial sector if the finance constraint is binding.

[4] Financial repression refers to the strong government intervention in the financial sector. See next section for further explanation on financial repression for the Latin American case.

[5] Loayza and Rancière (2006) do an excellent job reviewing the banking crises and financial development literature; see their work for further reference on this.

[6] Garcia Herrero et al. (2002, p.23) note that in 2000 "the stock market in Latin America is only one fourth of Asia's in terms of capitalization, even after the Asian crisis."

[7] In 1914, while Argentina had a bank deposits per head in U.S. dollars of 75.5 and Guatemala had 0.9, Australia and Canada had 150.3 and 142.9 respectively (Bulmer-Thomas 2003, p. 98).

[8] De la Torre, Gozzi, and Schmukler (2006) argue that reforms in the financial sector should also focus on helping the small and medium enterprise.

[9] Grier and Tullock (1989) show the importance of pooling only countries from the same region in empirical analyses. To my knowledge, there is no analysis on the finance-growth link in Latin America that includes data from late 1990s and early 2000s and a comprehensive sample of countries.

[10] Other Latin American countries were excluded due to the lack of data to construct financial development indicators. Brazil was left out due to lack of data, but since its financial system is comparable to the one in the United States (Allen and Gale 2000) it is reasonable to exclude this country.

[11] When using real GDP in a panel framework it is important to have a measure that is comparable across countries. Loayza and Rancière (2006) use a measure of GDP in purchasing power parity adjusted 1985 dollars. Since this measure of GDP is not available for Latin American countries for the period of analysis (this measure is only available after 1980), I use the closest indicator that is available for the sample period, which is the GDP per capita in 2000 U.S. dollars. GDP in 2000 U.S. dollars is constructed using the Atlas method, which allows smoothing exchange rate fluctuations by using a three year moving average price adjusted conversion factor.

[12] Private credit as a share of GDP is the most commonly used measure of financial development (Levine, Loayza, and Beck 2000).

[13] For GDP growth, and the natural log of private credit, liquid liabilities, and bank deposits as a share of GDP, the hypothesis that the series are non-stationary is rejected at the 5 percent level using the Levin, Lin, and Chu common unit root test. See Levin, Lin, and Chu (2002) for an explanation of this panel-based unit root test and its power. Financial development indicators are highly correlated (coefficient correlation between 0.80 and 0.94).

[14] Missing observations for Colombia were filled in with linear interpolation. The indicators constructed for Argentina, Bolivia, Chile, Uruguay, and Peru are highly correlated to Beck's, Demirguc-Kunt, and Levine (2000) available observations (coefficient correlation is 0.99).

[15] 1984 is considered the middle of the sample period.

[16] This approach of measuring institutional quality is similar to Galindo's and Micco (2007) approach.

[17] In this fixed effect estimation, the individual effect is estimated for each country i in period t. This method removes the unobserved effects that are correlated with the explanatory variables to address the omitted variable bias (Wooldridge 2002). Holtz, Newey, and Rosen (1988) mention the advantages of using fixed effects in panel VAR estimations.

[18] Since the SIC can be biased when finding too few lags, j equal to 4 is also explored in this analysis (4 lags is the adequate number of lags according to the Akaike information criterion). Results are the same regardless of the lag length used.

[19] The number of regressors equals the number of instruments in the system GMM.

[20] System GMM and IRFs are estimated in STATA using Love's and Zichinno (2006) code.

[21] For the system GMM estimation and IRFs one observation is lost with the Helmert transformation, where the available observations for estimation are between 1963 and 2005 in the bivariate VAR and between 1971 and 2005 in the multivariate VAR.

[22] Loayza and Rancière (2006) also include as control variable the initial value of the ratio of total GDP to total population. To control for initial income in this analysis it will be required to use a time variant variable. I construct a time variant version of initial income, where for every 5 year period the initial GDP per capita is the ratio of real GDP to population in the initial year of the 5 year period. Results from Granger causality tests are the same if this variable is included in the analysis and are available upon request. Note that variables are transformed using country-year and forward mean differencing for the GMM estimation, and this transformation will not be adequate for a variable that varies every 5 years like the initial income variable discussed previously. For this reason, this analysis excludes initial income. The exclusion of initial income from the estimations is not problematic since cross country differences are controlled for with the inclusion of fixed effects.

[23] Beggs (1986) argues that the bias associated with a short time series sample is reduced when we pool cross-sectional units and the estimator is efficient. He shows that, with the panel approach, the sampling variance of the estimator is reduced. More recent papers also present evidence on the importance of using long time series for consistency and power (Hahn and Newey 2004; Levin, Lin, and Chu 2002; Peasaran and Smith 1995).

[24] According to Enders (2004, p.335) "cointegration necessitates that two variables be integrated of the same order." Since financial development indicators (in logs) are stationary, there is no need to test for cointegration between financial development indicators (in logs) and GDP growth in this analysis.

[25] All estimations use a balanced panel and the natural log of the financial development indicators.

[26] The sign of the causal effect in the Granger causality test is shown in Table 4, where the sum of the coefficients of the causally prior lagged regressors are included in brackets.

[27] The same results are obtained in the bivariate VAR country-by-country Jack-knife when using 4 lags and private credit (in logs) as a share of GDP. Results not included for purpose of space. Table 5 includes the summary statistics of the coefficients of the causally prior lagged regressors.

[28] The Jack-knife Granger causality test shows that the patterns of causation are similar across different sets of countries, but it does not strongly prove that causation patterns are the same in all countries. In fact, other empirical evidence has shown that the finance-growth link is country-specific (Iyare, Lorde, and Francis 2005; Odhiambo 2007).

[29] Results not include for brevity.

[30] IRFs obtained when using 3 different measures of financial development for the bivariate and multivariate VAR show the same behavior as those shown in figures 2 and 3, where a shock to financial development has no effect on GDP growth, but a shock on GDP growth has a positive effect on financial development. Results are also robust to using 4 lags

[31] All countries with a creditor rights index above zero are included in the estimation. The threshold to include countries in the estimation (index above mean minus one half standard deviation) was chosen with the purpose to keep a large amount of countries in the estimation and maintain consistent estimates. Trinidad and Tobago is not included in the estimations for the subsamples that take into consideration institutions due to the lack of data on creditor rights.

[32] Granger causality tests were also estimated for those countries with low rule of law and low creditor rights indices. For both samples, there is evidence of one way causality running from

GDP growth to financial development. Results not included for brevity, but are available upon request. Impulse response of financial development to a GDP growth shock not included for brevity. For all subsamples, there is evidence that a shock to GDP growth has a positive effect on financial development.

Table 1. Variables description

Variable	Description
GDP growth	Log difference of real GDP per capita (constant 2000 US dollars). Source: Author's construction using World Development Indicators (World Bank 2008).
Private credit[a]	Ratio of private credit by deposit money banks to GDP (natural log). Source: Author's construction and Beck's, Demirguc-Kunt, and Levine (2000) database.
Liquid liabilities[a]	Ratio of liquid liabilities to GDP (natural log). Source: Author's construction and Beck's, Demirguc-Kunt, and Levine (2000) database.
Bank deposits[a]	Demand, time and saving deposits in deposit money banks as a share of GDP (natural log). Source: Author's construction and Beck's, Demirguc-Kunt, and Levine (2000) database.
Government	Ratio of government consumption to GDP (natural log). Missing observations for Argentina, from 1980 to 1986, were filled in with linear interpolation. Source: World Development Indicators (World Bank 2008).
Trade	Ratio of exports plus imports to GDP (natural log). Source: World Development Indicators (World Bank 2008).
Inflation	Annual percentage change in CPI plus 100 (natural log). Source: Author's construction using World Development Indicators (World Bank 2008).
Rule of law index	Average rule of law index (1996-2005). The index ranges from -2.5 (weak rule of law) to 2.5 (strong rule of law). Source: Author's construction using Kaufmann's, Kraay, and Mastruzzi (2007) governance data.
Creditor rights index	Average of creditor rights index (1978-2003). The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights). Source: Author's construction using Djankov's, McLiesh, and Shleifer (2007) data.

[a] Author's construction of financial indicators for Argentina, Bolivia, Chile, Peru and Uruguay using the International Financial Statistics (International Monetary Fund 2008) and Beck's, Demirguc-Kunt, and Levine (2000) formula. Data for all the other countries obtained directly from Beck's, Demirguc-Kunt, and Levine (2000) database (October 2007 version). Missing observations for Colombia, in years 1986, 1987, 1989, and 1990, were filled in with linear interpolation.

Table 2. Descriptive statistics

	Mean	Std. Dev.	Max.	Min.
Bivariate estimation, 1962-2005, 18 countries, 792 obs.				
GDP growth	0.0135	0.0425	0.1505	-0.1651
Private credit (in logs)	-1.7747	0.6455	-0.0271	-4.2219
Liquid liabilities (in logs)	-1.3978	0.4385	-0.1910	-3.1097
Bank deposits (in logs)	-1.7339	0.5962	-0.2451	-4.0981
Multivariate estimation, 1970-2005, 17 countries, 612 obs.				
GDP growth	0.0117	0.0435	0.1505	-0.1613
Private credit (in logs)	-1.7323	0.5498	-0.4423	-3.9112
Liquid liabilities (in logs)	-1.3476	0.4075	-0.3695	-3.1097
Bank deposits (in logs)	-1.6512	0.5024	-0.5188	-4.0981
Government (in logs)	2.3615	0.3318	3.1355	1.0986
Trade (in logs)	3.8940	0.4726	4.8752	2.3026
Inflation (in log[100+inf.rate])	4.8355	0.4417	9.3801	4.4886

Table 3. Income group classification and average rule of law and creditor rights indices

Country	Rule of law (RL)	Creditor rights (CR)	Income group	Country	Rule of law (RL)	Creditor rights (CR)	Income group
Argentina	-0.38[a]	1.00[a]	High	Haiti	-1.60	2.00[a]	Low
Bolivia	-0.47[a]	2.00[a]	Low	Honduras	-0.83	2.00[a]	Low
Chile	1.17[a]	2.00[a]	Middle	Mexico	-0.43[a]	0.00	High
Colombia	-0.80	0.00	Middle	Panama	-0.14[a]	4.00[a]	High
Costa Rica	0.61[a]	1.00[a]	Middle	Paraguay	-0.98	1.00[a]	Low
Dom. Rep.	-0.54[a]	2.00[a]	Middle	Peru	-0.64[a]	0.00	Middle
Ecuador	-0.66[a]	0.00	Low	Trin. & Tob.	0.21[a]	--	High
El Salvador	-0.57[a]	3.00[a]	Middle	Uruguay	0.50[a]	2.08[a]	High
Guatemala	-0.94	1.00[a]	Low	Venezuela	-1.00	3.00[a]	High

[a]Country with an index higher than the sample mean minus one half standard deviation. Income group classification based on the relative ranking of a country's GDP per capita (constant 2000 U.S. dollars) in the middle of the sample period (year 1984). Creditor rights index not available for Trinidad and Tobago.

Table 4. Bivariate and Multivariate VAR – Granger causality F-values and probabilities[a]

	Bivariate		*Multivariate*	
	(1)	(2)	(3)	(4)
Null Hypothesis: Financial development does not Granger-cause GDP growth				
Private credit	0.978	0.362	0.513	0.246
	(0.377)	(0.836)	(0.599)	(0.912)
	[0.004]	[0.003]	[0.004]	[0.004]
Liquid liabilities	1.598	1.435	0.520	0.788
	(0.203)	(0.221)	(0.595)	(0.534)
	[-0.002]	[-0.001]	[-0.001]	[0.002]
Bank deposits	1.783	1.359	0.376	0.536
	(0.169)	(0.247)	(0.687)	(0.710)
	[-0.002]	[-0.002]	[-0.003]	[-0.003]
Null Hypothesis: GDP growth does not Granger-cause financial development				
Private credit	15.192	8.049	12.216	5.870
	(0.000)	(0.000)	(0.000)	(0.000)
	[0.329]	[0.237]	[0.379]	[0.260]
Liquid liabilities	8.086	5.072	5.685	2.956
	(0.000)	(0.001)	(0.004)	(0.020)
	[0.326]	[0.304]	[0.474]	[0.403]
Bank deposits	6.498	4.441	6.355	3.175
	(0.002)	(0.002)	(0.002)	(0.014)
	[0.347]	[0.341]	[0.551]	[0.479]
Number of countries	18	18	17	17
Sample period	1964-2005	1966-2005	1972-2005	1974-2005
Observations (each equation)	756	720	578	544
k (lag number)	2	4	2	4

[a]F-values with probabilities in parenthesis and the sum of the coefficients of the causally prior lagged regressors in brackets. Granger test estimated with country-time fixed effects and one financial development indicator at the time (in logs).

Table 5. Jack-knife Granger causality test (bivariate and multivariate VAR)[a]

	Mean	Med.	Std. Dev.	Min.	Max.
Bivariate VAR					
Null Hypothesis: Financial development does not Granger-cause GDP growth					
F-Statistic	1.030	1.063	0.445	0.035	2.164
Probability	0.393	0.346	0.193	0.116	0.966
Financial development $_{t-1}$	0.011	0.011	0.004	0.001	0.017
Financial development $_{t-2}$	-0.007	-0.007	0.003	-0.011	0.000
Null Hypothesis: GDP growth does not Granger-cause financial development					
F-Statistic	14.436	14.559	1.888	9.856	17.616
Probability	0.000	0.000	0.000	0.000	0.000
GDP growth $_{t-1}$	0.610	0.616	0.034	0.509	0.658
GDP growth $_{t-2}$	-0.282	-0.282	0.060	-0.395	-0.152
Multivariate VAR					
Null Hypothesis: Financial development does not Granger-cause GDP growth					
F-Statistic	0.582	0.537	0.248	0.133	1.065
Probability	0.575	0.585	0.140	0.345	0.876
Financial development $_{t-1}$	0.006	0.008	0.005	-0.007	0.010
Financial development $_{t-2}$	-0.001	-0.002	0.004	-0.006	0.007
Null Hypothesis: GDP growth does not Granger-cause financial development					
F-Statistic	11.120	11.102	2.101	6.894	14.212
Probability	0.000	0.000	0.000	0.000	0.001
GDP growth $_{t-1}$	0.703	0.714	0.076	0.509	0.804
GDP growth $_{t-2}$	-0.328	-0.327	0.082	-0.515	-0.177

[a]Jack-Knife Granger causality test using private credit share as a share of GDP (in logs), k = 2, and country-time fixed effects. For the bivariate VAR, each F statistic was estimated 18 times for N-1 of the countries in the sample; 714 observations (each equation). For the multivariate VAR, each F statistic was estimated 17 times for N-1 of the countries in the sample; 544 observations (each equation).

Table 6. Bivariate VAR (coefficients and standard errors)[a]

	(1)	(2)	(3)
Dependent variable: GDP growth			
Financial development $_{t-1}$	0.010	0.014	0.014
	(0.014)	(0.021)	(0.015)
Financial development $_{t-2}$	-0.009	-0.026	-0.022*
	(0.011)	(0.018)	(0.013)
GDP growth $_{t-1}$	0.254***	0.251***	0.252***
	(0.052)	(0.053)	(0.052)
GDP growth $_{t-2}$	-0.019	-0.019	-0.016
	(0.046)	(0.045)	(0.045)
Dependent variable: Financial development			
GDP growth $_{t-1}$	0.602***	0.382***	0.414***
	(0.125)	(0.117)	(0.115)
GDP growth $_{t-2}$	-0.299**	-0.075	-0.069
	(0.137)	(0.107)	(0.116)
Financial development $_{t-1}$	1.404***	1.304***	1.298***
	(0.051)	(0.074)	(0.098)
Financial development $_{t-2}$	-0.476***	-0.378***	-0.369***
	(0.045)	(0.058)	(0.075)

[a]VAR model estimated by GMM; country-time fixed effects are removed before estimation. Standard errors are in parenthesis. Private credit, liquid liabilities, and bank deposits as a share of GDP (in logs) used as financial development measures in columns 1, 2 and 3, respectively (one at the time). Each equation estimated with 18 countries and using observations from 1965 to 2005; 738 observations each equation (k=2). '***', '**', '*" significance at the 1, 5, and 10 percent level.

Table 7. Multivariate VAR (coefficients and standard errors)[a]

	(1)	(2)	(3)
Dependent variable: GDP growth			
Financial development $_{t-1}$	0.016	0.023	0.014
	(0.016)	(0.023)	(0.019)
Financial development $_{t-2}$	-0.011	-0.019	-0.014
	(0.013)	(0.019)	(0.016)
GDP growth $_{t-1}$	0.212***	0.212***	0.207***
	(0.067)	(0.067)	(0.068)
GDP growth $_{t-2}$	-0.077	-0.077	-0.079
	(0.063)	(0.061)	(0.063)
Dependent variable: Financial development			
GDP growth $_{t-1}$	0.613***	0.357**	0.451**
	(0.216)	(0.176)	(0.216)
GDP growth $_{t-2}$	-0.424**	0.062	0.014
	(0.202)	(0.142)	(0.168)
Financial development $_{t-1}$	1.381***	1.281***	1.297***
	(0.062)	(0.062)	(0.082)
Financial development $_{t-2}$	-0.466***	-0.322***	-0.365***
	(0.058)	(0.051)	(0.066)

[a]VAR model estimated by GMM; country-time fixed effects are removed before estimation. Standard errors are in parenthesis. Private credit, liquid liabilities, and bank deposits as a share of GDP (in logs) used as financial development measures in columns 1, 2 and 3, respectively (one at the time). Coefficients and standard errors for other variables (government, trade, and inflation) are omitted for space purposes. Each equation estimated with 17 countries and using observations from 1973 to 2005; 561 observations each equation (k=2). '***', '**', '*" significance at the 1, 5, and 10 percent level.

Table 8. Granger causality F-values and probabilities by income groups[a]

	(1)	(2)	(3)
Null Hypothesis: Financial development does not Granger-cause GDP growth			
	0.342	1.153	8.388
	(0.711)	(0.318)	(0.000)
Null Hypothesis: GDP growth does not Granger-cause financial development			
	5.614	2.665	16.049
	(0.004)	(0.072)	(0.000)
Sample (number of countries)	High (6)	Low (6)	Middle (6)

[a]F-values with probabilities in parenthesis. Granger test performed in the bivariate VAR using private credit as a share of GDP (in logs), k=2, observations from 1964 to 2005 (252 observations each equation), and country-time fixed effects.

Table 9. Bivariate VAR by income groups – coefficients and standard errors[a]

	(1)	(2)	(3)
Dependent variable: GDP growth			
Financial development $_{t-1}$	-0.028	0.021	0.065**
	(0.024)	(0.013)	(0.027)
Financial development $_{t-2}$	0.017	-0.019	-0.043*
	(0.016)	(0.012)	(0.022)
GDP growth $_{t-1}$	0.182*	0.116*	0.328***
	(0.101)	(0.065)	(0.093)
GDP growth $_{t-2}$	-0.034	0.106	-0.168**
	(0.071)	(0.076)	(0.082)
Dependent variable: Financial development			
GDP growth $_{t-1}$	0.547***	0.271	0.919***
	(0.207)	(0.221)	(0.211)
GDP growth $_{t-2}$	-0.375*	0.553**	-0.838***
	(0.193)	(0.224)	(0.249)
Financial development $_{t-1}$	1.378***	1.395***	1.482***
	(0.078)	(0.079)	(0.098)
Financial development $_{t-2}$	-0.490***	-0.474***	-0.543***
	(0.060)	(0.078)	(0.080)
Sample (number of countries)	High (6)	Low (6)	Middle (6)

[a]VAR model estimated by GMM; country-time fixed effects are removed before estimation. Standard errors are in parenthesis. Estimation used private credit as a share of GDP (in logs) and observations from 1965 to 2005; 246 observations each equation (k=2). '***', '**', '*" significance at the 1, 5, and 10 percent level.

Table 10. Granger causality F-values and probabilities by institutional quality groups[a]

	(1)	(2)	(3)
Null Hypothesis: Financial development does not Granger-cause GDP growth			
	2.780	1.374	2.467
	(0.063)	(0.254)	(0.087)
Null Hypothesis: GDP growth does not Granger-cause financial development			
	10.197	12.096	9.616
	(0.000)	(0.000)	(0.000)
Sample (number of countries)	RL (11)	CR (13)	RL and CR (8)
Observations (each equation)	462	546	336

[a]F-values with probabilities in parenthesis. Granger test performed in the bivariate VAR using private credit as a share of GDP (in logs), k=2, observations from 1964 to 2005, and country-time fixed effects.

Table 11. Bivariate VAR by institutional quality groups – Coefficients and standard errors[a]

	(1)	(2)	(3)
Dependent variable: GDP growth			
Financial development $_{t-1}$	0.028	0.018	0.040*
	(0.018)	(0.017)	(0.022)
Financial development $_{t-2}$	-0.018	-0.015	-0.029*
	(0.014)	(0.013)	(0.017)
GDP growth $_{t-1}$	0.270***	0.224***	0.263***
	(0.061)	(0.059)	(0.070)
GDP growth $_{t-2}$	-0.076	-0.034	-0.085
	(0.054)	(0.050)	(0.060)
Dependent variable: Financial development			
GDP growth $_{t-1}$	0.652***	0.641***	0.779***
	(0.150)	(0.131)	(0.157)
GDP growth $_{t-2}$	-0.328*	-0.251*	-0.239*
	(0.172)	(0.149)	(0.182)
Financial development $_{t-1}$	1.416***	1.371***	1.364***
	(0.063)	(0.063)	(0.082)
Financial development $_{t-2}$	-0.490***	-0.449***	-0.448***
	(0.049)	(0.055)	(0.061)
Sample (number of countries)	RL (11)	CR (13)	RL and CR (8)
Observations (each equation)	451	533	328

[a]VAR model estimated by GMM; country-time fixed effects are removed before estimation. Standard errors are in parenthesis. Estimation used private credit as a share of GDP (in logs) and observations from 1965 to 2005. Column 1 includes countries where the rule of law index is higher than the sample mean minus one half standard deviation. Column 2 includes countries where the creditor rights index is higher than the sample mean minus one half standard deviation. Column 3 includes countries where the rule of law and creditor rights indices are both higher than the sample mean minus one half standard deviation. '***', '**', '*" significance at the 1, 5, and 10 percent level.

Figure 1

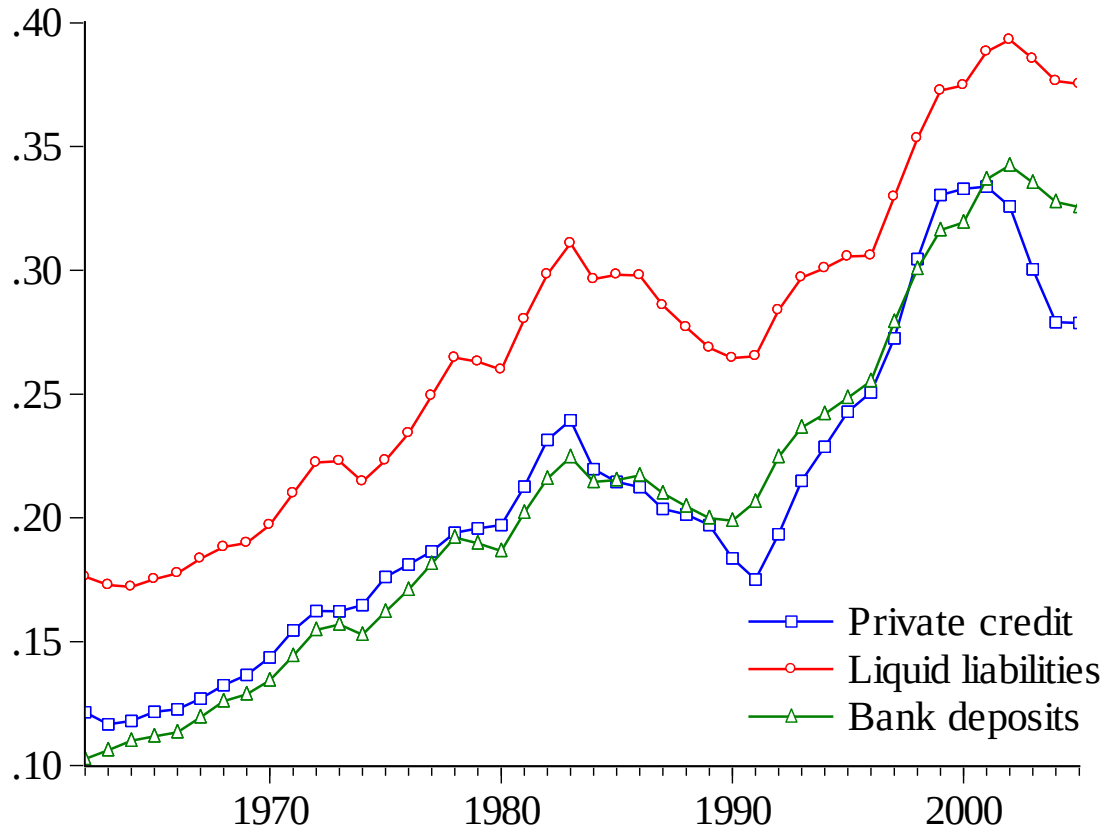
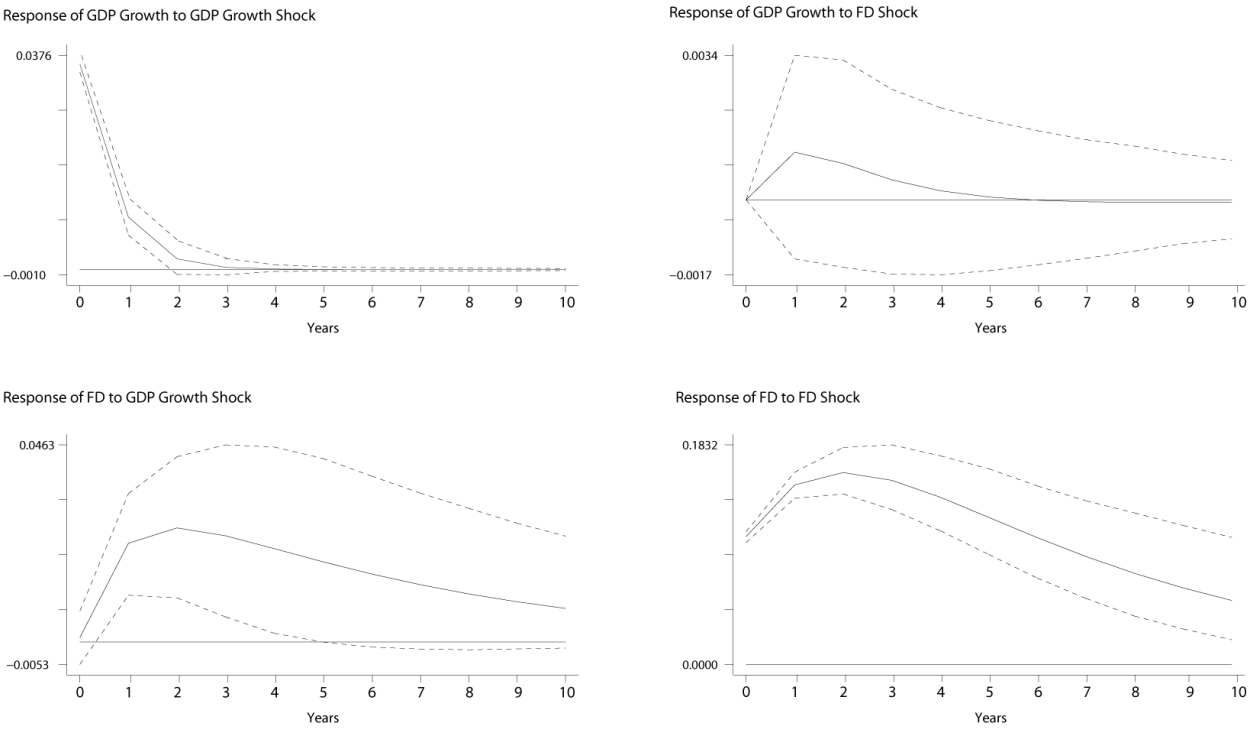
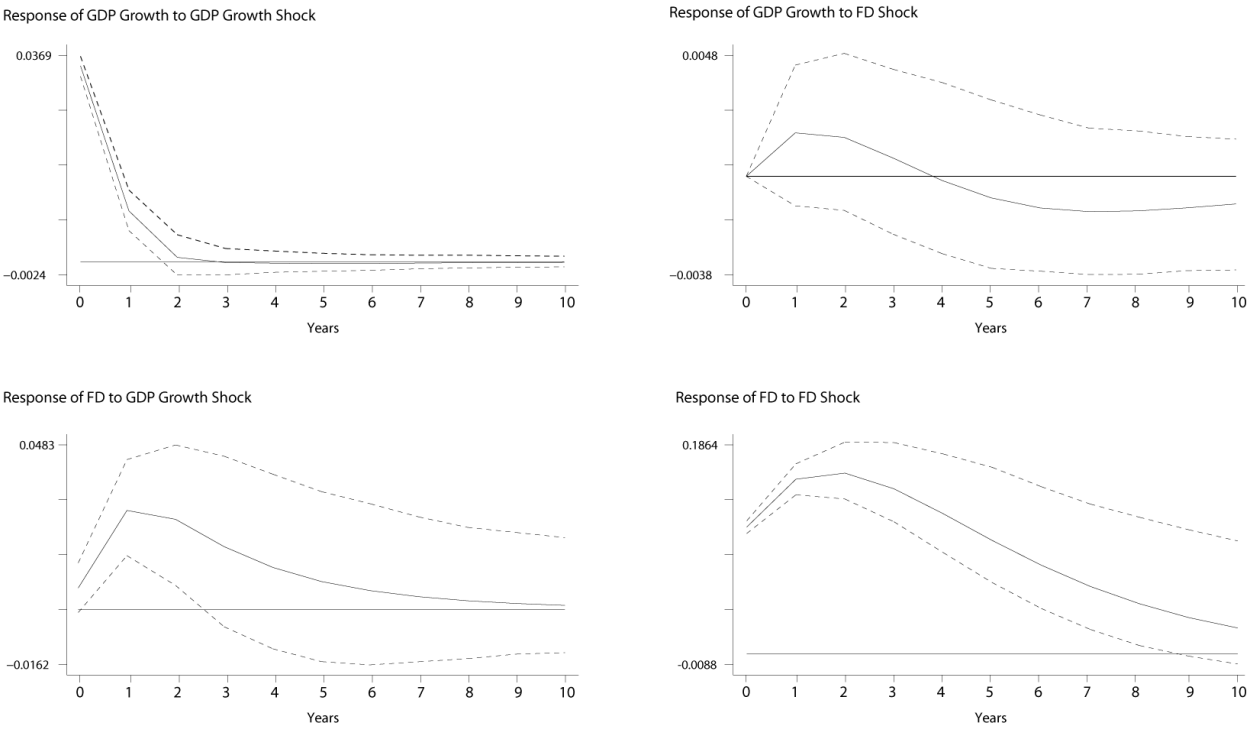

.40
.35
.30
.25
.20
.15
.10
1970
1980
1990
2000
Private credit
Liquid liabilities
Bank deposits

Figure 2



Errors are 5% on each side generated by Monte Carlo with 1000 repetitions

Figure 3



Errors are 5% on each side generated by Monte Carlo with 1000 repetitions

Figure 4

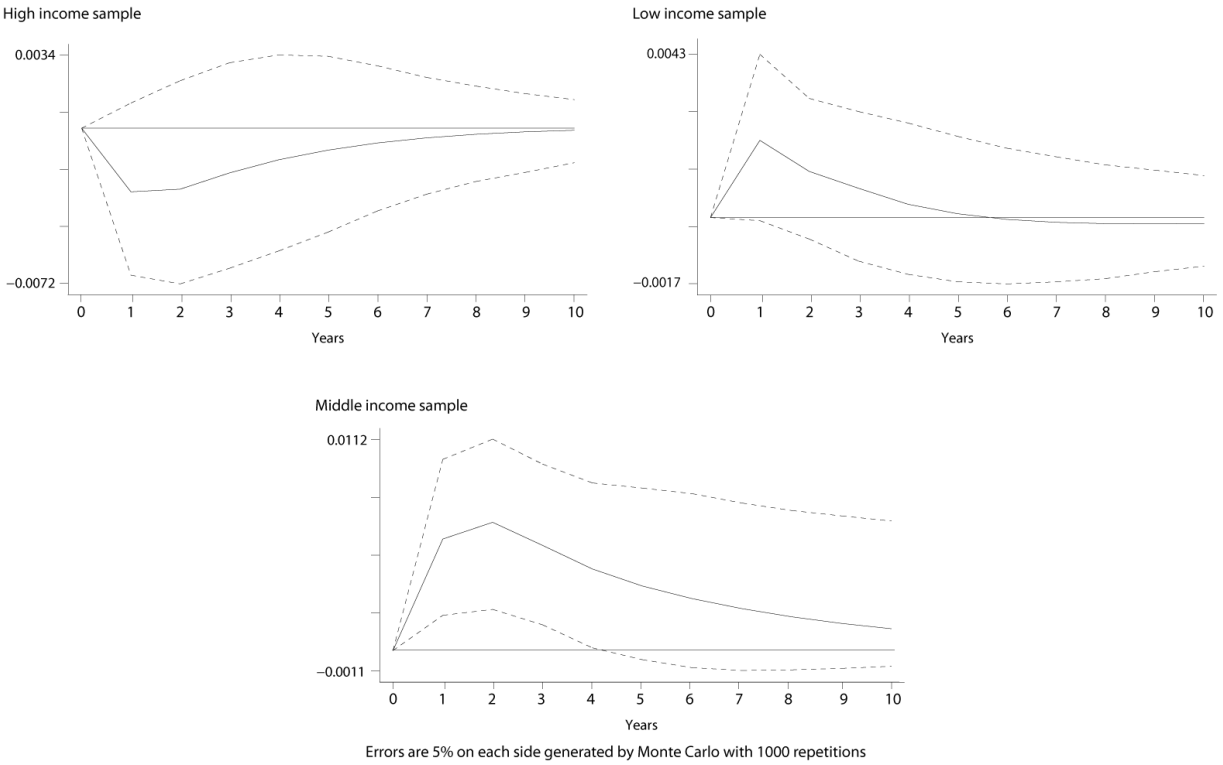
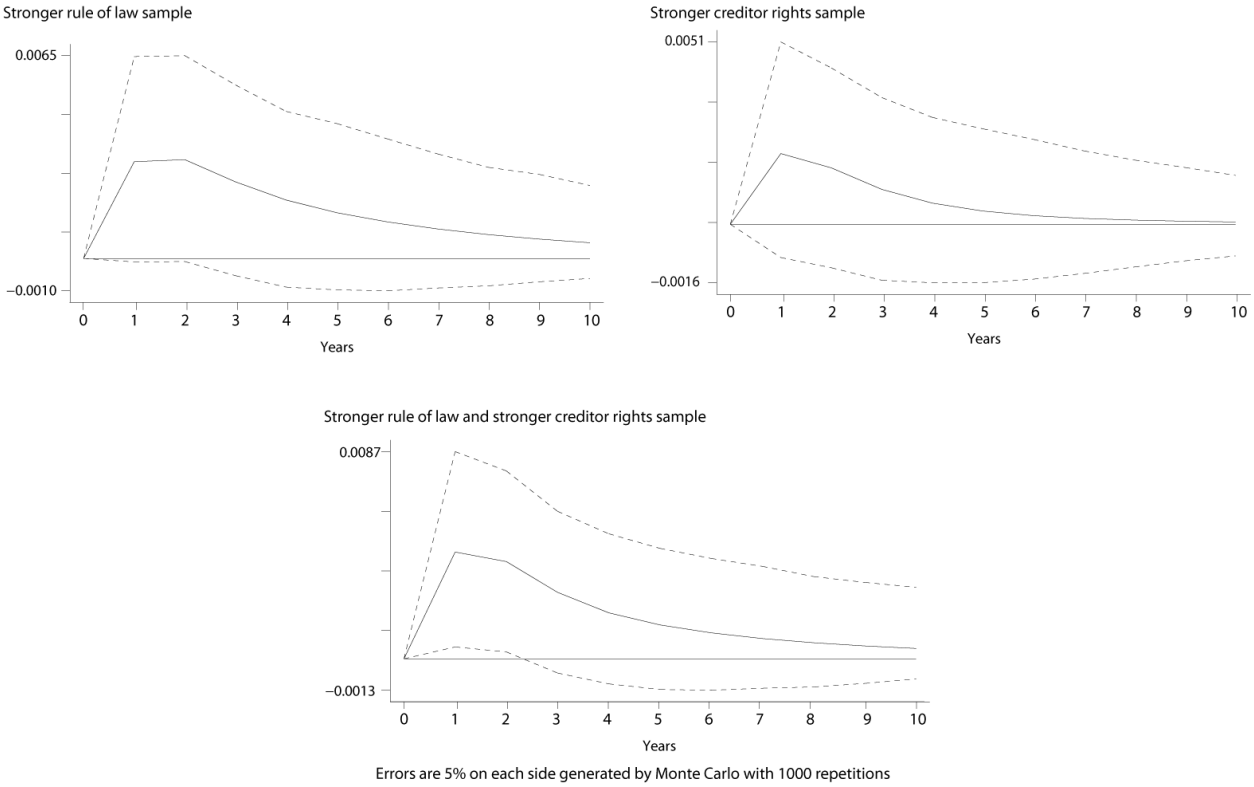

High income sample
0.0034
−0.0072
0 1 2 3 4 5 6 7 8 9 10
Years
Low income sample
0.0043
−0.0017
0 1 2 3 4 5 6 7 8 9 10
Years
Middle income sample
0.0112
−0.0011
0 1 2 3 4 5 6 7 8 9 10
Years
Errors are 5% on each side generated by Monte Carlo with 1000 repetitions

Figure 5



Errors are 5% on each side generated by Monte Carlo with 1000 repetitions