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Financial Development and Economic Growth: A Non-Linear Affair

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Abstract. This thesis analyzes the relationship between financial development and economic growth. We look at the individual growth contributions of the banking sector and the stock markets in terms of size and efficiency, dividing our panel-data into two subsamples according to the development stage. Using the system-GMM approach we find a non-linear relationship between the size of the banking sector and GDP growth in both, emerging markets and developed countries, implying a threshold in the economy after which the growth contribution turns negative. The growth contribution of stock markets in terms of efficiency behaves differently in emerging markets compared to developed countries. We find no significant impact of improving stock market efficiency in emerging markets, while we find a concave pattern in developed countries – again, implying an optimal amount of liquidity in developed stock markets.

Keywords: Financial Development, System-GMM, Economic Growth, Financial Intermediation

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1 Introduction

The last decades have been characterized by the outstanding rise of the emerging economies in terms of economic growth. Such a rise has been accompanied by a constant improvement of the financial system; for instance, the share of total world capitalization of the emerging markets has increased from 4% to 13% over the last 10 years and its growth pace is far from ceasing. On the other side, although the developed economies performed better in terms of stock market capitalization to GDP, their growth has been modest compared to emerging countries(Beck et al., 2010). This broad overview provides insight into the significant relationship between financial development and economic growth. The size and efficiency of both equity markets and banking sector are not necessarily associated with an enhancement of economic growth. However, mainstream economics has often taken for granted a positive relationship between the development of the financial system and economic growth. The famous quote from Miller (1988) " *the idea that financial markets contribute to economic growth is a proposition too obvious for serious discussion*", expresses the lack of interest toward this topic in a nutshell, before it reached its renaissance after the second half of the 1990s with Ross Levine. The issue has grown in importance in light of subsequent studies that used more sophisticated and accurate econometric methodologies.

This paper follows the last wave of research on financial development and economic growth. The question is not *if* the former causes the latter, but rather *how* these two economic elements are linked to each other (Michalopoulos et al. (2009), Beck et al. (2014), Arcand et al. (2012) among others). Is the relationship linear or non-linear? Does it change in accordance with the stage of development of the financial system? What is the contribution of the banking sector and stock market? The current literature is very inconclusive regarding this topic and there is no general agreement about the empirical findings. The reasons range from econometric pitfalls (reverse causality and omitted variable bias above all) and low quality data (for instance, the use of strongly unbalanced dataset), to different approaches to the problem. Much emphasis has been placed on large panel data sets that have pooled together developed, emerging and developing countries, but relatively low attention has been paid to the specific features that characterize each group of countries. As a result, general conclusions have been drawn without taking into account the specificities of the emerging economies with respect to the high income countries.

This thesis makes a number of contributions to the ongoing research field. First of all, instead of using a general proxy to measure financial development, as done in previous study, we select specific variables with the aim to better capture the level of contribution in terms of size and efficiency of specific components of the financial system. Moreover, the countries have been selected and divided in two groups in order to see if the relationship changes according to the level of financial development. Indeed, the characteristics of developed and emerging financial systems are too different to be pooled together in a single dataset. Finally, we use a different econometric specification that will be described in section 5.

The results of the whole sample show a parabolic shape of the relationship between GDP growth and the size of the banking sector (credit-to-GDP ratio). In other words, the banking system promotes economic growth up to a critical threshold. Moreover, equity markets have a low or negative effect on growth. However, the results change once countries are divided into developed and emerging markets. While the banking pattern is persistent in both subsamples, stock markets behave differently. The size of equity markets is either negative or insignificantly related to economic growth in both emerging and developed countries. On the other hand, the relationship between equity market efficiency (turnover ratio) and GDP growth is concave in developed countries, suggesting that too much liquidity is a threat for growth, while it is insignificant in emerging economies.

Overall, two main conclusions can be drawn from this thesis. Firstly, there is an optimal level of financial development. This optimal level is valid for both banks and stock markets. Secondly, at different stages of development, the drivers of economic growth change. The banking system loses its importance in contributing to growth once the financial system develops.

The paper is structured as follows: section 2 provides a theoretical background of the financial system, namely its functions and how its development promotes economic growth. The section highlights and discusses the two contrasting theories of financial development and economic growth. Moreover, we briefly describe the financial systems in developed and emerging countries. Section 3 proposes a literature review with the presentation of the latest results. The summary covers the market view versus the bank view in promoting economic growth, the non-linear relationship between financial system and economic growth and the different econometric models. Section 4 introduces the analytical part with the formulation of the hypotheses to be verified. Section 5 presents the econometric method, while section 6 discusses the data. Section 7 presents the results. Finally, section 8 sums up the conclusions and possible extensions for further work.

2 Theoretical Background

This section provides preliminary tools to better understand the core themes of the thesis that will be presented in the literature review (section 3). The first subsection presents the financial system and its main functions in promoting economic growth. The second and third part analyze the two main theories concerning the link between financial development and economic growth as well as the differences between emerging and developed financial systems.

2.1 The Financial System and its Functions in Promoting Growth

The system is comprised by financial intermediaries, financial markets, the financial net among household, firms and the government. Due to space constraints, this thesis cannot provide a comprehensive review of the financial system as a whole. Following the majority of the papers in the financial development literature, this thesis focuses on the banking sector and the stock market as major segments of the financial system, leaving secondary, yet important, intermediaries (for instance, bond markets and insurance) in the background of the discussion.

Levine (2005) lists five broad categories of functions that, if provided efficiently, promote economic growth:

a) Produce information ex ante about possible investments and allocate capital

b) Monitor investments and exert corporate governance after providing finance

c) Facilitate trading, diversification, and management of risk

d) Mobilize and pool savings

e) Ease the exchange of goods and services

For the sake of the reader, we only describe the first two functions, as we consider them the most crucial for the thesis discussion. It is important to note that both stock markets and banking sector provide the aforementioned functions, although through different channels.

a) Financial intermediaries reduce the costs of acquiring information and stimulate investments in innovative firms. In a well developed system, firms are funded more easily and capital allocation is more efficient. Stock markets make the process of acquiring information very efficient, especially when the markets are liquid, because the free-rider problem is prevented. The free-rider problem is particularly present when there are many, and small, stockholders who rely on other investors to disclose information and monitor the management. Banks, however, have in general superior information and a closer relationship with firms, making the investments less risky. Levine et al. (2014) argue that financial innovation is a powerful tool to promote the process of investing in innovative firms. Financial innovation allows a better screening of technological entrepreneurs who have higher potential in terms of innovation and profit, but also higher risk. Financial innovation also allows to tailor products more specifically to the need of financial agents. Consequently, those countries that support financial innovation are more likely to have a technological advantage in the long run.

b) Monitor investments. Financial markets can better monitor firms activity and induce managers to maximize their values. The main problems between managers and firms owners are principal-agent and free riding. This generates a gap of information among stockholders, undermining the corporate control mechanisms. Financial markets, by linking the firms stock performance to manager compensation, are a powerful tool to reform the owner- manager friction. All this, in turn, promotes economic growth (Diamond, 1984). Yet, banks offer very valid tools to monitor investments due to the privileged informational assets and they are more efficient in preventing the free-rider problem in those cases where there are atomistic markets (numerous and small stockholders).

The difference between a well- developed financial system and a poorly functional one is the degree of efficiency in providing these five classes of functions. *Financial development stands for the improvement of any of the mentioned functions and, consequently, it refers to the enhancement of both banks and equity markets, whose roles are mainly to ease information and lower transaction costs*.

2.2 Financial Development Theories

The previous subsection would suggest that financial development undoubtedly promotes economic growth. However, the most controversial issue is the bidirectional causality between financial development and economic growth. Is it true that a better financial system promotes economic growth? Or, perhaps, is it the case that financial development is a consequence of economic growth? The reader might find many similarities between this problem and the institution-economic growth controversy. Especially when it comes to formulating the econometric model, it is very important to justify the method in accordance with the theory that has been following. The recent literature has mostly shifted towards explaining how financial development leads to economic growth. However, the relationship is not unidirectional. Financial development promotes economic growth that in turns provide a better institutional framework and a better contract system that spurs on the financial system even more.

2.2.1 Financial Development and Economic Growth. Two Contrasting Theories

Schumpeter (1934) was one of the first economists to rigorously demonstrate that financial system spurs economic growth. Less transaction costs and a more organized pooled savings system promotes economic development through capital accumulation. Davis et al. (1971) introduced the concepts of economies of scale and overcoming capital indivisibilities in financial institutions, among the causes that would promote economic growth.

Goldsmith (1969) is one of the first empirical attempts to verify the positive nature of the relationship. Data availability and endogeneity problems were the major restriction of his study. The work of King and Levine (1993) is the cornerstone of the financial development empirical studies. New and more accurate variables were used as proxies for financial development and the general level of data was more reliable than the one in Goldsmith (1969). Yet, the econometric approach shows many pitfalls in terms of controlling for omitted variables and reverse causality bias. Levine and Zervos (1998), Beck et al. (2000) and Beck and Levine (2001) constitute the major examples in the field of financial development.

All the aforementioned studies support a positive and strong relationship between financial development and economic growth. Robinson (1951) is the pioneer of an alternative financial development theory, where financial services develop as the economy grows simply because the economic agents request more financial tools due to more savings. Stiglitz (1989) and Mayer (1989), pointed out similar aspects. They argue that the role of capital markets in development is very marginal, especially when it comes to least developed countries. The main problem of financial markets are free-riding and the incentive gap between managers and owners. The threat of takeovers and the growing influence of stockholders on management decision are weak instruments to reform the distortion and to have an efficient corporate governance. Keynes (1936) and Krugman (1995) are even more critical with respect to the role of the financial system. They state that financial intermediaries might even be harmful for the achievement of a sustainable growth in the long-run, because they are sources of potential financial crises due to irregular credit issue. Keynes stated in his General Theory: *"The measure of success attained by Wall Street,..., cannot be claimed as one of the outstanding triumphs of laissez- faire capitalism...*". In particular, the Keynesian financial repressionistic theory, that imposed controlled interest rates and bank reserve requirements, ruled out a spontaneous and positive effect of the financial sector over growth. The empirical evidence fails to support these theories. Recent papers such as Adusei (2012), Rousseau and Wachtel (2009) among others, find a non-significant relationship between economic growth and financial development only in the recent time series. In this thesis we are focusing on the first viewpoint: financial development leads to economic growth. However, we want to study the nature of the relationship and if it changes with the level of financial depth.

2.3 Emerging and Developed Financial Systems

The justification that leads us to split the countries into emerging and developed economies lies in the different nature of them. Smith and Boyd (1998) and other authors as Capasso (2006) and Deidda and Fattouh (2008) argue that the concentration of banks and markets depend on the level of economic activity. At the first stages of development, a bank-based sector is preferred. As the economy grows, monitoring investments through banks becomes too expensive, so a market-based system will eventually prevail.

It is important to keep in mind that both developed and emerging financial systems have experienced extensive growth over the last few years. The overall level of financial depth has dramatically increased. However, to what extent is an emerging financial system different from a developed one? This is a crucial issue when it comes to understanding the dynamics that leads to economic growth. In this theoretical review, as well as throughout the subsequent paper, we exclude low and low-medium income countries (i.e. developing countries). The reason is due to lack of reliable data and a financial structure that is too primitive to be compared with modern financial tools.

2.3.1 Emerging Countries and Developed Economies - Characteristics

To start with, the emerging markets include a more diversified and heterogeneous variety of countries than developed economies in terms of macroeconomic factors. Following our computation (Appendix A, tables 7 and 8), the emerging countries have a relatively more volatile GDP growth (standard deviation of 0.08% compared to 0.05% in developed economies) and inflation rate (standard deviation of 173.3% compared to 2.1% in developed countries). Inflation hampers the role of financial development as engine of economic growth. High inflation makes the future more unpredictable, so investors prefer to invest more in the short run rather than the long run. Moreover, it causes the intervention of policy makers in the markets, with the effect of distorting them. Among many studies on the effect of inflation, Rousseau and Yilmazkuday (2009) argue that even moderate inflation (ranging from 4% to 19%) can have a very negative impact on macroeconomic indicators.

The emerging financial systems are relatively small: the stock market capitalization (size of equity markets) is on average 33.5% compared to 82.7% in developed countries. Moreover, the stock market turnover ratio, measuring the public firms' stocks traded relative to the size of the economy, is on average 46.3% compared to 70.4% in developed countries. Also when it comes to comparing the banking sector between developed and emerging economies, the formers perform better than the latters in terms of size and efficiency (Appendix A, tables 7 and 8).

The emerging financial systems have grown at a very fast pace in the last ten years. The indicators of financial depth (such as liabilities-to-GDP) show an increase by a factor of 3, compared to 2 in developed economies. Similarly, indicators of market liquidity, such as turnover ratio, and access to financial tools, show an overall improvement among emerging economies (Beck et al., 2010).

Another difference is the share of FDIs. The emerging markets have a relatively bigger share of FDIs, but their efficiency is very low due to the lack of ability to make use of them. The biggest difference, however, is the institutional framework. The contract enforcement and the ability of the central government to enforce the law, is still very challenging. Many studies consider the legal framework as the backbone on which a functional financial system is built (compare with the next section).

Finally, it is worth mentioning another channel that is very relevant when it comes to differentiate developed from emerging economies, namely capital account liberalization. Capital liberalization promotes efficiency in the domestic financial system; subsidiaries and branches of foreign banks may enlarge the absolute size of the national banking system and increase savings (Klein and Olivei, 1999).

3 Literature Review

This section narrows down the core literature of the thesis. The first subsection explores the non-linear relationship between financial development and economic growth. In the second part we analyze the relevant literature concerning the market versus the bank view. Finally, we investigate the different econometric approaches that have been used in financial development.

3.1 Non-linear Relationship

The studies presented thus far assumed a linear relationship between financial development and economic growth. In other words, the magnitude of the estimated regression coefficients measuring the impact of financial development on GDP were constant in time and space. This is not surprising, since most of the studies were cross-country panel data, without differentiating the sample based on the time period or the level of financial development.

(Rioja and Valev, 2004a,b) are the pioneers in empirically studying the non-linear relationship between financial and economic growth. Following the theoretical framework of Acemoglu et al. (2002), where the least developed countries achieve growth by accumulating capital and the developed economies tend to innovate, the authors divide the sample into three groups: low, medium and high income economies. The results are striking: emerging equity markets sustain growth by contributing to capital accumulation, while developed ones promote innovative firms. Moreover, the level of efficiency is much higher for the developed cohort, suggesting that an exponential function would be more suitable than a line to represent the relationship.

A further step is made by Loayza and Ranciere (2006) that analyze the short and long-run effect of credit to GDP on economic growth. It might be the case that excessive over-lending reduces the efficiency of banks to screen the customers and control the repayment of loans. If this is the case, function (b) of the financial system (section 2.1) loses its efficiency and ultimately has damaging effects on the economy. Indeed, in the short-run the credit to GDP coefficient is negative due to an overall destabilization effect, while in the long-run its effect is positive as suggested by the financial development theory. Loayza and Ranciere (2006) follow the financial crises literature that warn of the presence of a negative effect due to uncontrolled lending and poor regulation (more on this in the next subsection). The short and long-run effects are reproposed by Beck et al. (2014). The question is as simple as it is challenging: "Is more finance better?". The study is justified in light of the 2008 financial crisis and of the studies that have preceded in time. For instance, Turner (2010), Smaghi (2010) and Trichet (2010) have claimed that an excessive financial sector might lead to resource misallocation. The results of Beck show generally more significant and positive effect of financial development on economic growth in the long run, with the additional effect of lowering the GDP volatility. However, highly developed countries are harmed by a deeper financial sector in the short run because of the enhanced GDP volatility caused by the incapacity of financial intermediaries in developed countries to deal with too much financial depth, such as financial innovation and over-lending. Samargandi et al. (2014) repeated Loayza and Rancire's study by reducing the sample to middle-income countries only. Although the short-run results resemble theirs, actually the long-run findings are insignificant. This would suggest a lack of efficiency in the emerging economies in promoting growth.

Rousseau and Wachtel (2009) proposed a different approach. It might be the case that the non-linear relationship is due to different time periods, mainly because the pace at which the economy and the markets have grown has changed dramatically. The authors study the relationship over different periods of time, specifically 1960-1989 and 1990-2004, finding that in the period 1960-1989, the hypothesis that financial development brings about economic growth is consistent with the classical findings, such as Levine and Zervos (1998); Levine (2002). However, once the analysis is conducted over the series 1990-2004, the effect of financial development on economic growth is much smaller and tends to be insignificant. The justification is due to the fact that in the latter period of time, the economies have reached an excessive financial deepening. In particular, if the financial deepening is too fast and it is caused by a boom in credits, it is very likely that a crisis will occur. On the other hand, if financial deepening is led by an improvement of institutions, it will contribute to economic growth. These results were challenged by Arcand et al. (2012) who reinterpreted the study. By adding a squared term (in this case, the squared credit-to-GDP), they found a concave relationship between financial development and economic growth. The term credit -to-GDP is positive up to a maximum (estimated around 110%), after which its contribution to economic growth becomes negative. Again, the main result is that too much financial depth is harmful. However, the authors don't test if this relationship changes based on emerging or developed countries. Their results suggest that emerging markets, whose level of financial development is relatively lower, should not experience such a harmful effect. These results were confirmed by Cecchetti and Kharroubi (2012) that found a critical threshold of 90%.

A smaller body of the literature has focused on the non-linear contribution of the stock markets. Bhide (1993) argued as follows: *"active stockholders reduce agency costs by providing more internal monitoring"*. However, this leads to less liquid stocks due to information asymmetry issues. Conversely, more liquid stocks reduce incentives to monitor a company because exit costs of unhappy stockholders are reduced. He identifies a trade-off of liquidity against corporate governance. Keynes (1936) blamed the stock markets for its speculative nature and its inability to create real value. However, the most recent studies find no evidence of a negative contribution of liquidity over economic growth. Chordia et al. (2008) find that stock liquidity increases arbitrage trading and, therefore, enhances market efficiency; short-run predictability of stock returns is hindered by liquid markets. Moreover, Edmans et al. (2013) find empirically that liquidity has a positive effect on corporate governance. Stockholders can either actively monitor the firm they invested in or be passive owners. Liquidity of stocks decreases the exit costs of owners, giving them less incentive to actively monitor the firm. The authors argue that this exit threat is already an efficient monitoring incentive. If managers don't work to the benefit of their stockholders, they may sell their shares, driving the stock price down, which (in general) leads to a lesser compensation of board members. Exiting is therefore just another monitoring channel. This suggests that there may also be an optimal point of stock market liquidity.

As far as we know, the non-linear relationship has only been studied through generic variables, such as private credit-to-GDP or liabilities-to-GDP. In previous studies private credit-to-GDP refers to credit from all intermediaries to the private sector; the measure used in this thesis refers only to private credit given out by banks. The biggest drawback of the method used in previous studies is that the non-linearity does not isolate the specific banking sector (as theory suggests), but take into account the financial system as a whole. All this makes the justification of the results quite unreliable, since the banking sector has been blamed many times for financial crises, without any reference to the market system. This thesis clearly divides the contributions of the market system and the banking system, so that the coefficients can have a better interpretation. The next subsection clarifies and justifies this division.

3.2 Market vs. Bank View

The financial development literature that agrees on a positive relationship between finance and growth is divided into three groups: those who believe that a financial system based on stock markets is more efficient than a system based on banks, those who believe that the reverse is true and scholars who believe a complementary system to be more efficient.

The scholars in favour of a banking-based system consider it as superior in three different aspects: free-rider problem, corporate governance and economies of scale. Stiglitz (1985) argues that atomistic markets face a serious free-riding problem. When an investor acquires information about an investment project and takes a decision, he/she reveals this information to all the investors. The free-rider problem disincentives the other investors to look for other potential projects, not enhancing technological innovation. On the other hand, banks keep the information they acquire for themselves, stimulating long-run relationship with firms and researching in new projects. Moreover, banks have a better control on loan repayment by increasing the pressure on particular firms. The bank-based proponents argue that the principal-agents problem can be better managed through banks that act as outside monitors of the firms (Allen and Gale, 2001). Again, the close relationship between banks and firms are the main reason for considering the bank-based system as more efficient.

The supporters in favour of a market-based system state that the free-rider problem can be solved when there is concentrated ownership. In this case, however, small investors in the stock markets might be harmed due to the large influence that the ownership has over the public opinion and government policies. Similarly, powerful banks can influence the companies decision process, so as to generate distortions. Moreover, stock markets can ameliorate the principal-agent problem. The market for corporate control is an effective way to control the management in three ways: proxy contests, friendly mergers and takeovers and hostile takeovers (Levine, 2005).

The financial crisis literature is very critical when it comes to the banking sector because of the lack of regulation in issuing credit. Well before the first empirical studies on non-linearity were released, Easterly et al. (2001), showed a non monotonic (convex) relationship between the ratio private credit by deposit money banks and other financial institutions to GDP and growth volatility. Based on their results, as credit-to-GDP increases, growth volatility tends to decrease to an optimal point after which it upturns. This study, however, did not receive much echo. Especially in light of the recent financial crisis, many economists stress how the banking sector can be inefficient in some of the channels through which financial development promotes growth. Over-lending limits the monitoring process and hinders the capacity to discriminate good projects from bad ones. Schneider and Tornell (2004) argue that before crises, there is a tendency to over-lend, whereas during crises the loans are provided less easily. This prediction has been empirically tested by Ivashina and Scharfstein (2010), reporting that the 2008 financial crisis has been characterized by an outstanding issue of loans in the years before the crisis, whereas the years after it have been characterized by a very low amount of loans issued. Moreover, Rajan (2005) studies how the system of incentives has changed in highly developed (and complicated) banking systems. He argues that in a highly competitive environment, investment managers incentives have raised the tendency to make riskier investments. In this way, channels b) and c) (section 1.2) become less effective since managers expose investors to higher risks. Acharya and Naqvi (2012) argue that when banks have access to liquidity, managers tend to misprice the downside risk. This is likely to generate financial bubbles, inducing the investors to make deposits, rather than make direct investments.

3.2.1 Complementary View

Although the market-based view is very appealing, actually most of the literature supports the complementary theory (Kaufmann and Valderrama, 2008; Beck and Levine, 2003;

Demirguc-Kunt and Maksimovic, 2002). In substance, it is not important if a system has a relatively bigger banking sector than stock markets, as long as the legal system is well functioning. Stock markets and banks are complementary, because they provide different financial tools that have their own drawbacks and advantages. Yet, all the financial intermediaries reduce the participation costs. For instance, banks allow the investors to have access to the financial markets (Allen and Santomero, 1997). The crucial point is whether investors have access to an efficient financial system as a whole (Levine, 1997; Beck and Levine, 2003).

The complementary view can also explain the differences between developed and emerging markets as well as the non-linear relationship between financial development and economic growth. Deidda and Fattouh (2008) built a theoretical model where banks and stock markets interact in gathering and screening information. In the beginning state of the world, only banks exist. Once stock markets are introduced and information is disclosed, banks' incentives to screen and monitor become lower as stock markets get larger. The idea is that if stock markets and banks have similar roles in the financial world, banks will contribute less to economic growth in the long run. Larger stock markets will disclose private (and costly) information, damaging the banking sector and they are able to better deal with principal agent problem. Therefore, the way financial development brings about economic growth is not linear and depends on both the levels of banking and stock markets development. A similar study was conducted by Lee (2012), whose findings are in line with the complementary view: the Granger causality test reveals that the banking sector has a superior efficiency in terms of inducing growth in the early stages of economic development, although its effect slows down as the economy grows.

3.3 Econometrics in Financial Development Literature

Before the analytical section, it is worth briefly describing how the econometric methodologies have evolved over time. The main problems in identifying an unbiased relationship between financial development and economic growth are reverse causality and omitted variables. These problems were often neglected in the first studies, where simple cross-country analyses were conducted. However, the time-series studies and the dynamic panel data regressions are an attempt to strengthen the results. This section briefly presents three econometric methods: cross-country, time series and dynamic panel data.

3.3.1 Cross-Country Analysis

As already stated above, the cross-country analysis is a relatively weak method to study this controversial relationship. The first studies dealt with a dataset constituted by a large variety of countries due to restricted access to reliable data. Many drawbacks pull down the validity of the method: besides the lack of controls for omitted variables and reverse causality (with the assumption that the direction of causality is as simple as from financial development to economic growth), the cross-country analysis does not take into account the timing component of the data (Ang, 2008).

One way to overcome these biased results is to use the instrumental variable approach. Finding a good instrument can be quite challenging and it does not guarantee an unbiased result. For instance, Levine and Zervos (1998) uses the legal origin as an instrument for financial development. As known, a good instrument is such that it is uncorrelated with the error term and as correlated as possible with the variable to be instrumented. The pure cross-country approach has been almost totally wiped out by two more recent econometric methodologies. It is also important to note that the first studies relied on datasets that were often strongly unbalanced and with variables that were measured differently from country to country, making the cross-country analysis very weak.

3.3.2 Time-Series Analysis

The time series analysis requires a relatively long dataset. In most of the cases, more observations are obtained by using high frequency data (for instance, quarterly data). The majority of the studies with time-series approach (Luintel et al., 2008; Arestis et al., 2001) uses the VAR-model, where the omitted variable bias is ruled out by assuming a strong and reverse correlation among the variables that must be stationary. This approach involves many shortcomings. Since we are dealing with data that has long-memory, the number of lags to be used is very high, reducing the degrees of freedom of the estimates. The VAR approach is also based on the Granger causality concept, that involves the forecasts rather than the past values and that is somewhat different to the causality we refer to when we talk about the reverse causality: *A variable does not Granger cause another one if its past values do not affect the current realization of it*. It is also important to stress the restriction due to data availability, that can be overcome with a pooled country dataset (Enders, 2008).

The last wave of studies considers also the use of VECM (Ang, 2008; Rousseau and Vuthipadadorn, 2005), by using the variables in level, instead of first difference. Again, long series and the need of cointegrated variables, make the use of this method not very appealing.

3.3.3 Dynamic-Panel-Data Analysis

This method has been the most used one in recent years, especially among studies that involve a non-linear relationship between financial development and economic growth. A dynamic panel data differs from a static one due to the presence of the lagged values of the dependent variables. The advantage is that it is possible to have a big dataset (as in the cross-country) by taking into account the timing effect. Moreover, the dynamic panel data allows to have dynamic instrumental variables that increase over time.

One of the first studies of dynamic panel data in financial development has been conducted by Beck et al. (2000). The method is from Arellano and Bond (1991) and Arellano and Bover (1995). The majority of the works described in the literature review (Rioja and Valev, 2004a; Rousseau and Wachtel, 2009; Arcand et al., 2012) have used dynamic panel data to assess the magnitude of financial development on economic growth.

This paper adopts the dynamic panel data approach. Its characteristics and properties will be described in section 5.

4 Preliminary Discussion and Hypotheses

Previous studies have analyzed the non-linear relationship between financial development and economic growth through generic variables, such as credit-to-GDP ratio and liabilities-to-GDP ratio; for instance, private credit-to-GDP refers to credit from all intermediaries to the private sector while the measure used in this thesis refers only to private credit given out by banks. Even though the non-linearity has been proven in many papers (Rioja and Valev, 2004a,b; Loayza and Ranciere, 2006; Cecchetti and Kharroubi, 2012; Masten et al., 2008; Arcand et al., 2012; Samargandi et al., 2014), it is hard to establish which are the main causes of the relationship. We want to have an insight into this issue by using more specific proxies for financial development. For instance, is the concave relationship that has been found by previous studies between financial development and GDP growth due to bank over-lending (as suggested by the financial crisis literature)?

In order to address these issues, we divide the financial system into equity markets and banking sector. This division is justified in light of the dichotomy between bank-based and market-based views (section 3.2) as well as the different role that banks and equity markets play in differently developed financial systems (section 2.3). Moreover, the sample is divided into emerging and developed countries in order to account for the characteristics of the two financial systems (section 2.3). Finally, stock markets and the banking sector are analyzed by a set of variables that capture size and efficiency of these sectors. This leads us to the following two hypotheses for emerging markets.

H1: In emerging countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency. However, the magnitude of the contribution is smaller than in developed countries.

H2: The contribution to growth of the banking sector in emerging markets is positive and linear in size and efficiency.

As we have seen in the theoretical background, emerging economies are characterized by a relatively higher concentration of the banking system, while stock markets are thin and less efficient compared to developed countries. The mainstream literature also suggests that equity markets are positive and linear in contributing growth. Moreover, some studies (Smith and Boyd, 1998; Capasso, 2006; Deidda and Fattouh, 2008) suggest that banks are more important at the lowest stages of development and that they lose their role once stock markets become bigger and more efficient. Moving on to the hypotheses about developing countries:

H3: In developed countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency.

H4: The relationship between GDP growth and the size of the banking sector in developed countries is concave and has an optimal point, whereas the relationship between GDP growth and the banking sector in terms of efficiency is positive and linear. However, the magnitude of the contribution of the banking sector to GDP is lower than in emerging countries.

At the latest stages of financial development, stock markets gain additional importance and become relatively more efficient in contributing growth compared to the banking sector. Therefore, a positive and linear relationship is expected. On the other hand, the banking system decreases its impact on growth. In general, we expect a non- linear effect in terms of size, or credit issued by banks; once credits given out by banks pass a critical threshold, the contribution becomes negative. The reason for such a pattern is explained by the financial crisis literature that concludes that over- lending is the cause of many financial crises (Schneider and Tornell, 2004; Rajan, 2005). When banks lend too much, a financial crisis is likely to be triggered. As shown in section 2.3, developed countries have a remarkably higher credit-to-GDP ratio (measure for size), therefore we believe that only in developed countries such threshold has been passed, while emerging economies still enjoy a linear contribution.

The idea behind the relationship between banking sector and GDP growth can be better explained graphically:

Figure 1: Illustration Hypothesis: Size of the Banking Sector

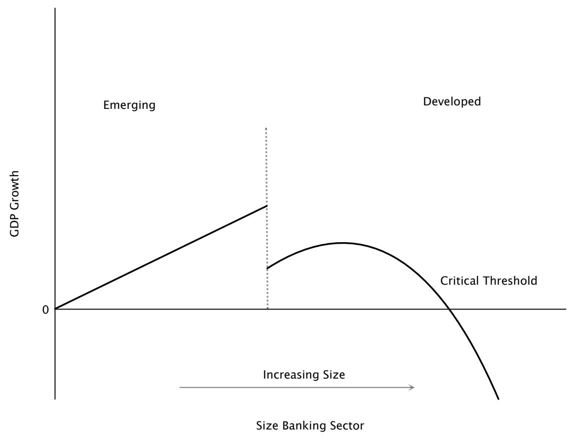
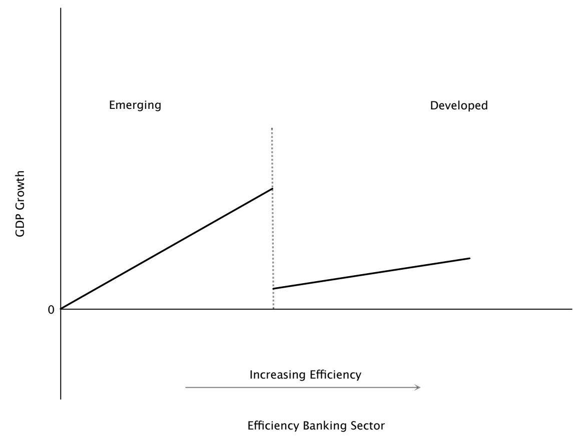


Figure 2: Illustration Hypothesis: Efficiency of the Banking Sector



In both graphs, the dotted vertical line divides the samples in emerging and developed countries. Developed countries are on the right side of the cartesian area because they have higher size and efficiency in banking sector compared to emerging economies (section 2.3). The graphs show the hypotheses 2 and 4. The graph on the left depicts the relationship between GDP growth and banking sector size (credit issued by banks). While emerging economies enjoy a positive and constant contribution, developed countries, after reaching a maximum, tend to decrease in growth until a critical threshold after which the increasing size of the banking sector starts to harm GDP growth. The other graph is more straightforward: both the subsamples have a positive contribution from an increased banking efficiency, but the line for emerging economies is steeper because of its higher contribution to growth.

Figure 3: Illustration Hypothesis: Size of the Stock Market

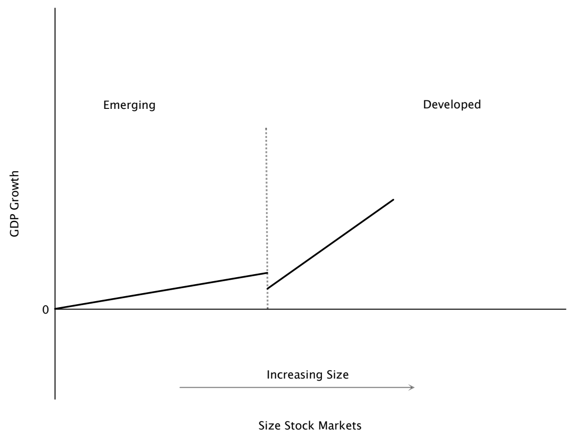
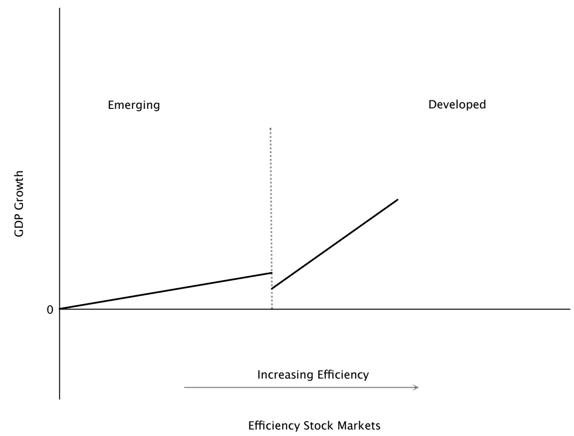


Figure 4: Illustration Hypothesis: Efficiency of the Stock Market



Finally, the last two graphs depict the hypotheses 1 and 3 for stock markets. Stock markets have positive and linear contribution to growth. Moreover, as theory suggests, developed countries benefit more from equity markets due to their superior development.

5 Empirical Method

The main econometric issue to be addressed is that of endogenous regressors. As has been presented in the literature review, there is a theoretical debate about whether financial development causes economic growth or is a consequence of growth. This problem of reverse causality has to be addressed. The model must be able to implement a non-linear relationship between financial development and economic growth. Country-specific effects have to be dealt with in order to get unbiased results. We have to take this into account in our econometric approach.

As described in section 3.3, past literature has mostly been using three different methods: simple cross-country regressions, time-series specifications and dynamic panel data methods. The dynamic panel data model has been used widely in former studies about financial development, beginning with Levine et al. (2000). They use a Generalized-Methods-of-Moments (GMM) dynamic panel data estimator developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991). It has later been extended in Arellano and Bover (1995) and Blundell and Bond (1998). These estimators have become extremely popular within the field. [1]. We will see that the Blundell and Bond (1998) estimator suits the purpose of our study very well and will therefore be used.

In the following subsection the idea behind the two estimators shall be discussed.

5.1 Difference-GMM and System-GMM

The Arellano-Bond estimator, often referred to as *difference-GMM* is an estimator used in dynamic panel data contexts.

Both estimators start from the following regression model, for settings in which N is large and T is small:

$$y_{i,t} = \alpha y_{i,t-1} + \mathbf{X}'_{\mathbf{i,t}}\boldsymbol{\beta} + \epsilon_{i,t}, i = 1, \ldots, N; t = 1, \ldots, T \tag{1}$$

[1] According to ideas.repec Arellano and Bond (1991) is the second most cited article in economics and Blundell and Bond (1998) is the fifth most cited

$$\epsilon_{i,t} = \mu_i + v_{i,t} \tag{2}$$

With the following assumptions about the error structure:

$$E(v_{i,t}) = E(\mu_i) = E(v_{i,s}v_{i,t}) = 0, \text{for } i = 1, \ldots, N \text{ and } \forall t \neq s \tag{3}$$

It can be seen easily that the errors are composed by a fixed error term and an idiosyncratic error. They are zero on average. Idiosyncratic errors have no serial correlation. It is important to notice that there is no strict exogeneity assumption imposed upon the regressors $\mathbf{X_{i,t}}$.

Arellano and Bond (1991) now continue by first differencing the equation, eliminating the fixed-effects:

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \Delta \mathbf{X'_{i,t}} \boldsymbol{\beta} + \Delta v_{i,t} \tag{4}$$

However, the endogeneity problem still persists through the correlation of the differenced error term $\Delta v_{i,t} = v_{i,t} - v_{i,t-1}$ with the lagged dependent variable $\Delta y_{i,t-1} = y_{i,t-1} - y_{i,t-2}$ and possibly with the regressors $\Delta \mathbf{X_{i,t}}$.

To deal with this, Anderson and Hsiao (1982) proposed to use the lagged variable as instrument in such a dynamic panel data setting. Holtz-Eakin et al. (1988) incorporated this idea into the GMM-framework, constructing an instrumental variable matrix consisting of a set of instruments. Arellano and Bond (1991) now added *all* available lagged variables as instruments in the new *GMM-style* instrumental matrix developed by Holtz-Eakin et al. (1988) in order to increase the efficiency of the estimator.

This means past values of the variables can be used as instruments. For example, if $t = 3$, the equation to be estimated is the following:

$$\Delta y_{i,3} = \alpha \Delta y_{i,2} + \Delta \mathbf{X'_{i,3}} \boldsymbol{\beta} + \Delta v_{i,3} \tag{5}$$

Therefore $y_{i,1}$ and $\mathbf{X'_{i,1}}$ are available as instruments for $\Delta y_{i,3}$ and $\Delta \mathbf{X'_{i,3}}$, as they are not correlated with the error term $\Delta v_{i,3}$.

Similarly, if $t = 4$, this leads to:

$$\Delta y_{i,4} = \alpha \Delta y_{i,3} + \Delta \mathbf{X}'_{\mathbf{i},\mathbf{4}} \boldsymbol{\beta} + \Delta v_{i,4} \tag{6}$$

With $y_{i,1}$ and $y_{i,2}$ as well as $\mathbf{X}'_{\mathbf{i},\mathbf{1}}$ and $\mathbf{X}'_{\mathbf{i},\mathbf{2}}$ as available instruments. One can see easily that the amount of available instruments increases with the amount of time periods in consideration. The coefficients of interest, α and β are then estimated via GMM. It is important to notice that in the Arellano and Bond (1991), *levels* are used to instrument *differenced* variables. In later studies (Arellano and Bover, 1995; Blundell and Bond, 1998) it has been revealed that the lagged levels are often not very good instruments for the differenced variables, leading to the development of the so called *system-GMM* estimator by Blundell and Bond (1998).

The *system-GMM* estimator exploits additional moment conditions as proposed by Arellano and Bover (1995) making the GMM estimator more efficient. The original level equation (equation (1)) is instrumented using the differenced regressors. It therefore enhances the instrumental variable matrix by adding the differenced variables as instruments for the leveled variables in the original equation on top of the instrumental matrix derived by Arellano and Bond (1991) (see Appendix for a more detailed description). It is therefore combining information from the system with differenced variables (as in Arellano and Bond (1991)) with the original system of level variables for which instruments are observed, i.e. stacking both systems together, that efficiency is increased considerably and finite sample bias reduced.

There are in essence two statistical tests to check the validity of the model. As this is in essence an instrumental variable approach, we have to check whether the instruments are in fact valid. This can be done with a Hansen -test for overidentifying restrictions. The null hypothesis tested is that the set of instruments used is uncorrelated to the residuals. This means that the instruments are valid if the hypothesis is not rejected (i.e. we get a high p-value).

The second test is to verify whether the residuals are in fact not serially correlated. This is done via the Arellano-Bond test for serial correlations in the first-differenced errors. Since we created first order autocorrelation in the errors by first-differencing (via the shared term $v_{i,t-1}$ in $\Delta v_{i,t}$ and $\Delta v_{i,t-1}$), the validity of the model is only questioned if the null of no serial correlation is rejected at higher orders of autocorrelation than one.

5.1.1 Drawbacks of the System GMM

The system GMM as well as the difference GMM have many drawbacks that shall be taken into account. Besides the common problems of an instrumental variable approach, i.e. correlation with the variables and independence with the error term, the GMM might suffer by instrument proliferation. Roodman (2009) draws some guidelines in order to prevent the overfitting that bias the GMM results towards those of a simple OLS that presents the typical problems of omitted variable bias and reverse causality. Unfortunately, there is no formal rule to determine the number of instruments. As rule of thumb, many econometricians tend not to have more instruments than groups (in our case, the number of groups is the number of countries). The Hansen test, whose null hypothesis is that over-identifying restrictions are valid, gets upward biased when too many instruments are used, so a p-value close to 1 is a clear sign that the model is being overfitted. Therefore, one way to overcome this bias is to reduce the number of instruments in accordance with the sample size. Many econometrics software packages have the function to restrict the number of variables to be used as instruments. However, such restrictions come to some costs. If the number of instruments is reduced, less information can be obtained from lagged variables, with the subsequence that efficiency is reduced.

Another source of potential trouble is the autocorrelation of the error terms that is determined both by the quality of the method as well as the correct specification of itself (number of lagged values that have been used). In most of the cases, the number of lags is determined by the economic theory, therefore it is very important to check for serial autocorrelation once the regression is ran. Specifically, it is crucial not to reject the null hypothesis of no serial correlation for the AR(2) that inspects the autocorrelation in levels. Our goal is to obtain an insignificant p-value at the 5%-10% critical levels.

Roodman (2009) suggests to report as much information as possible about these tests. Besides the Hansen test, also the test for instruments in difference shall be reported. Moreover, the number of observations, instruments and the p-values of AR(1) and AR(2) shall be added. As normal GMM standard errors are downwards biased using this method, we use corrected robust standard errors.

5.2 The Econometric Model

The purpose of this study is to check the hypotheses derived in section 4. The Blundell and Bond (1998) estimator presented in the previous subsection serves this purpose well. It is able to deal with the main econometric issue, endogeneity of the regressors, by implementing an internal instrumental variable approach. The model is also flexible enough to add squared terms of the regressors and therefore model non-linearities in the relationship between the different indicators of financial development and economic growth. We can observe a concave relationship between the indicators if the coefficient of the squared term is negative, then the relationship is described by a concave parabola, which has a local maximum.

The baseline equation of our empirical model is the following:

$$\begin{aligned} g_{i,t} =& \alpha g_{i,t-1} + \beta_1 credit_{i,t-1} + \beta_2 credit^2_{i,t-1} + \beta_3 margin_{i,t-1} + \beta_4 turnover_{i,t-1} \\ & + \beta_5 turnover^2_{i,t-1} + \beta_6 capitalization_{i,t-1} + \boldsymbol{\gamma}' \mathbf{C_{i,t}} + \epsilon_{i,t} \end{aligned} \tag{7}$$

$$\epsilon_{i,t} = \mu_i + v_{i,t} \tag{8}$$

$g_{i,t}$ the real per capita GDP growth of country i at time t. *Credit* is the ratio of bank credit to private entities to GDP, a measure of the size of the banking sector. *Margin* is the ratio of bank‘s net interest revenue and its interest bearing assets. *Turnover* is the stock market turnover ratio, i.e. the value of total shares traded divided by the average real market capitalization. *Capitalization* is the ratio of total share value divided by GDP. **C** is a set of control variables, which are exogenous. $\epsilon_{i,t}$ is the error term of country i at time t. It contains a fixed effect term, μ_i and an idiosyncratic term, $v_{i,t}$.

These 4 variables, credit-to-GDP ratio, net-interest margin, turnover ratio and market capitalization are the indicators used to measure financial development. The first two, credit-to-GDP ratio and net-interest margin, refer to the financial development of the banking sector. Specifically, they measure the relative size and efficiency of the banking industry in a country. The other two, stock market turnover ratio and market capitalization, measure the efficiency and relative size of the stock market in a country.

As motivated by the literature, we are going to test whether too much bank-credit (measured by the credit-to-GDP ratio) or too much liquidity on the stock market (as measured by the stock market turnover ratio) have a negative effect on growth. This is why a squared term of both variables are included in the regression equation. If the coefficient of the squared term is negative, a concave function is observed and therefore there exists a non-linear relationship between GDP growth and this variable.

The control variables consist of other variables suspected to have an influence on economic growth, such as inflation, human capital or schooling, openness to trade and quality of institutions.

As we are not interested in business cycle effects, but in explaining the longer-term effect financial development has on economic growth, all of our data is averaged over three-year periods. By doing this we follow Levine et al. (2000) who averaged their data over five-year periods to get rid of these short term effects. We are taking 3 years instead 5 years in order to have a big enough dataset to work with. As we are only looking at data from a range of 21 years instead of about 40 as Levine et al. (2000) do (because of missing data in emerging markets), we need this to keep a necessary amount of observations. Most business-cycle effects should be gone when averaging over 3 years. Three years should be enough time for changes in the financial development indicators to have an influence on growth. In the studied time range (1991-2011), international capital flows and the economy in general have become quick to adapt and to react to changes. This is also the reason why lagged regressors are used to explain economic growth. Increases in an indicator of financial development is assumed to have an effect in the subsequent period (3 years) and not instantaneously, as opposed to some control variables, like inflation, which are assumed to have an instantaneous effect on growth.

The regression model is then estimated using the Blundell and Bond (1998) system-GMM estimator previously introduced. The results will be shown and discussed in the section 7.

6 Data

We mainly use the Financial Development and Structure dataset originally published by Beck et al. (2010) in the World Bank Economic Review. It has lastly been updated in November 2013. This is the same dataset some of the financial development literature we are citing in the literature review have been using. This allows comparability of our results with these studies. It consists of data from 203 countries from 1960 to 2011. However, there is a lot of data missing for developed and emerging countries before 1990. As we want to test our hypotheses comparing developed countries and emerging markets our analysis is restricted to 69 countries, 30 developed countries and 39 emerging markets in the time period after the fall of the Soviet Union, i.e. 1991 until 2011. This is to avoid problems with the creation of new countries in Eastern Europe. Our division of countries into the two groups, developed and emerging, is based on the World Bank definition. It is mostly a division upon income levels. Some minor adjustments to this definition are made, as for example South Korea is a developed county by today‘s standard, but was an emerging market during the 90s. The dataset is completed with GDP growth and control variables from the IMF‘s World Economic Outlook Database and the World Bank database.

In table 1 a short overview of our main explanatory variables is shown, what they are measuring and how to interpret them. In our analysis the natural logarithm of the explanatory variables are used. As opposed to other studies of financial development that use a generic credit-to-GDP ratio as measure for financial development (including other financial intermediaries than banks), the amount of private *bank* credit is used in this study, allowing us to clearly identify the role of banks in facilitating growth. The second bank variable of concern is the net interest margin which is used as a proxy for competitiveness and efficiency in the banking sector as is common practice in the financial development literature (Espinosa et al. (2011)). However, as the role of the stock market will be tested as well, we have two variables measuring the relative size and efficiency of the stock market. The size is measured by the stock market capitalization. If stock markets spur growth via more effective governance as suggested by the stock market view of financial development mentioned earlier, then a bigger importance of stock markets in the economy should yield higher GDP growth rates. The stock market turnover ratio measures the liquidity of a stock market. In general, liquid markets are assumed to be more efficient than illiquid ones, e.g. see Chordia et al. (2008).

Table 1: Overview of the main explanatory variables

Variable	**Measures**
Credit to GDP Ratio	*Relative size of the banking sector*. The amount of private credit given out by banks in relation to the size of the economy as measured by the GDP. A higher ratio means a bigger banking sector relative to the size of the economy.
Net Interest Margin	*Efficiency of the banking sector*. The accounting value of the interest revenues divided by the banks‘ value of interest bearing assets. When the margin is low, this means that the banks‘ profit is low, indicating a higher degree of competition
Stock Market Capitalization	*Relative size of the stock market*. The total value of public firms‘ stocks divided by the size of the economy as measured by the GDP. A higher capitalization means a higher importance of stock markets in an economy.
Stock Market Turnover Ratio	*Efficiency of the stock market*. The total value of shares traded in the stock market divided by the GDP. It is a measure of liquidity. A higher ratio means more liquidity.

In table 2 a short overview of the control variables we are using can be seen, including a short explanation of what they measure. We have chosen a number of variables controlling for an array of influence factors: macroeconomic ones like the inflation rate and the governmental budget deficit, related to international economics as openness to trade or following a more institutional setting with quality of education and institutions.

The inflation rate, the governmental deficit and openness to trade are fairly standard control variables in studies dealing with macroeconomic issues. There is a vast amount

Table 2: Overview of control variables

Control Variable	Definition
Inflation rate	Changes of the price level within a country in percent.
Budget deficit	Yearly budget deficit of the government in % of GDP.
Openness to trade	Imports plus exports divided by GDP.
Schooling	Secondary enrollment rate (pupils enrolled in secondary education divided by the official secondary education age) plus tertiary enrollment rate (students enrolled in tertiary education divided by the amount of persons in the age group 5 years following the official secondary age) is used as proxy variable for the quantity of schooling.
Quality of institutions	Indicator measuring the quality of contract enforcement and confidence in the law.

of empirical studies suggesting an influence from either of these variables on economic growth, hence this should be controlled for. We combined two World Bank measures of school enrollment to create our schooling variable. The individual measures are the secondary and tertiary enrollment rate, compared to an according population group, which were simply added together. Higher education leads to more innovation and hence to growth as has been shown in a large number of studies. Our last control variable is the quality of institutions. We take the data from the Worldwide Governance Indicator dataset, a project from the World Bank (lastly updated in 2013). In the economic growth literature, the role of institutions has been growing in importance. Popular proponents of this view are (among others) Daron Acemoglu, Simon Johnson and James Robinson who published a very influential paper on the subject in 2002. However, the data for these last two variables, schooling and quality of institutions, are of limited quality. Secondary and tertiary school enrollment does not assure the quality of the obtained education. The governance indicator used to proxy the quality of institutions also delivers no objective quantification of institutional quality as it relies heavily on surveys and perception data.

In table 7 in the appendix, summary statistics of the used 3-year averages of GDP growth and the financial development variables can be seen. Table 8 shows summary statistics of the 3 year averages of chosen control variables.

There are no big surprises in the data. Financial development indicators in developed countries feature average values of higher financial development than in emerging markets. A little bit surprising is that emerging markets do not have a higher dispersion for all variables as could have been expected. There is a wider spread across developed countries in credit-to-GDP and stock market capitalization values. This is due to some smaller outliers like Hong-Kong, Cyprus or Singapore, as they are weighted equally with other countries. Negative interest margins have been observed in 3 cases, in 1997-1999 in Ecuador, Indonesia and Russia. One can say in general that there are some outliers in every variable and among both groups, in emerging markets as well as in developed countries.

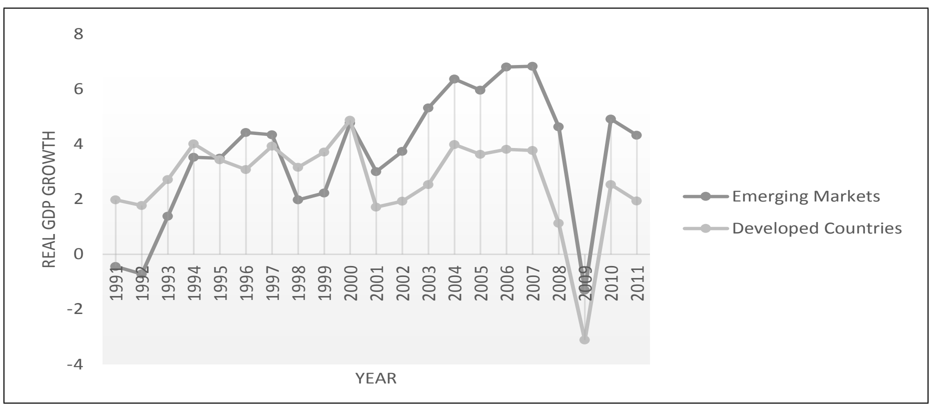


Figure 5: Average Yearly Real GDP per capita Growth

Source: Authors' Calculations

In figure 5 the average yearly real GDP growth for emerging markets and developed countries are shown. It can clearly be seen that on average emerging markets have had a higher growth rate than developed countries. This indicates that, at least for emerging markets, the convergence theory might be right. It is important to notice that the 2007/2008 financial crisis hit both groups, developed countries and emerging markets equally hard, whereas the so called "dot.com" crisis of 2000/2001 hit developed countries harder than emerging markets. This is why we will later include a crisis dummy as a robustness check only for the 2007/2008 crisis.

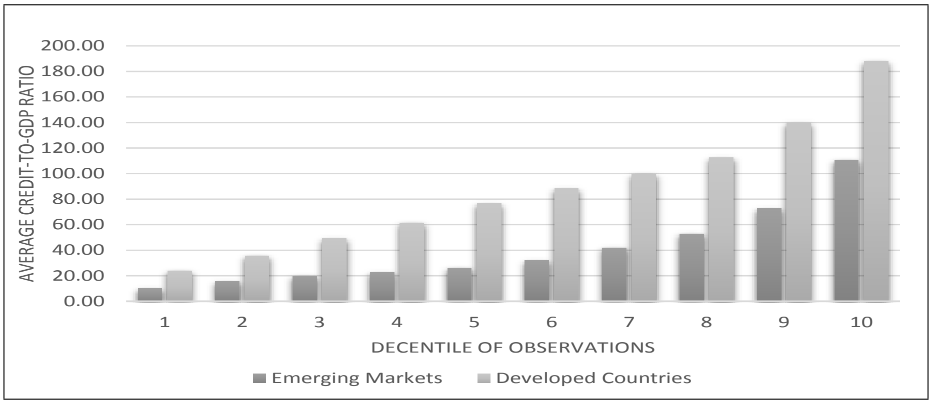


Figure 6: Average Credit-To-GDP Ratio by Country Decentile

Source: Authors' Calculations

The average credit-to-GDP ratios by observation decentiles for emerging markets and developed countries are shown in figure 6. One can see that although the average credit-to-GDP ratio of emerging markets is relatively low compared with developed countries, a fair amount, about 10%, of the observations are on average over the 100% mark.

Figure 7 shows the average yearly stock market capitalization ratio for emerging markets and developed countries. It is noticeable that emerging markets had a lower average capitalization ratio than developed countries throughout the whole studied time horizon. It looks like the capitalization ratio for both groups shares a same trend, although the ratio is less volatile in emerging markets than in developed countries. One can see that the capitalization ratio drops sharply in times of crises, remarkably after 2007.

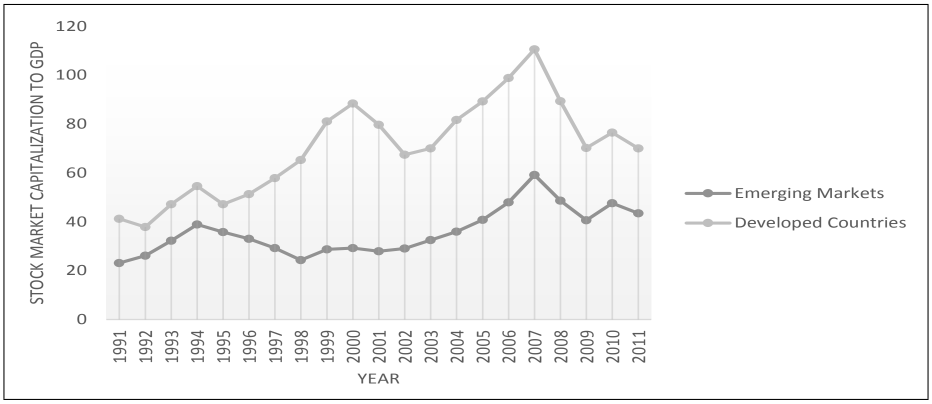


Figure 7: Average Yearly Stock Market Capitalization Ratio

Source: Authors' Calculations

7 Results and Discussion

This section describes the main results and the relative robustness checks. The first subsection explores the results of the sample as a whole. The following two parts directly verify the hypotheses modeled in section 4. Finally, robustness checks are performed.

7.1 Results using the Pooled Sample

Table 3 reports the results of the whole sample without distinction between developed and emerging countries, in order to see if the method can be compared to previous studies as Arcand et al. (2012). The upper part of the table shows the magnitude of the coefficients, while the lower part includes useful information to verify the overall quality of the system GMM. The table is constructed so that the control variables (inflation, deficit and openness) are divided from the main regressors. Moreover, we divide the last two variables (education and institutions) from the rest since they are of a more qualitative nature than the former three. As already stated, the main tests that shall be continuously monitored are the AR(2)-test, checking for remaining autocorrelation of the error terms and the Hansen-test for validity of the instrumental variables. It is important to note that the number of instruments has been restricted. In order to avoid overfitting, we use only the first two lagged values as instrument variables instead of all lagged values. Restricting the amount of used instruments has the trade-off of reducing the problem of overfitting and losing information that could be used in the estimation. This issue will be further elaborated in section 7.4.

Throughout the discussion of results, it is important to keep in mind that the magnitude of coefficients refers to 3 -year averages. Column (1) of table 3 shows the results of the regression without quadratic terms. The results suggest that the model is misspecified: The p-value of AR(2) test is significant at the 5% level, while Roodman (2009) suggests a value above the 10% level. This indicates that there is still relatively strong autocorrelation in the residuals. The low p-value of the Hansen test also suggests that the used instruments are not valid in this specification. The signs of the estimated regression coefficients also tend to be in the opposite direction of what we expected or not be significant at all. Only turnover has the expected sign, being significant at 10% level. It is also worth mentioning the low p-value of Hansen test, suggesting potential problems with the instrumental variables.

As the quadratic terms are added, the specification improves dramatically as can be seen in column (2), with the R^2 increasing from 15% to 66%. The low p-value of the AR(2)-test reveals remaining autocorrelation in the error terms. The Hansen-test cannot be rejected at a reasonable significance level. The coefficients of our credit variable show the expected signs. We can observe a concave relationship between GDP growth and the credit-to-GDP ratio as the coefficient of the quadratic term is negative. This relationship is significant at the 1 % level. Section 7.4 provides a graphical representation of the results found in order to make the concave interpretation more intuitive. The coefficient on the net interest margin now also shows the expected sign and is significant at the 5% level; a 100% increase in interest margin leads to a 4.7% decrease in GDP growth over 3 years. However, the coefficient of the stock market turnover ratio terms are both insignificant and the coefficient of stock market capitalization has an, at first, unintuitive sign. However, if one looks at figure 7 one can see that the capitalization ratio drops sharply in times of crisis, after years of booming stock markets. This is more evident when one looks at the years 2000-2002 and 2007-2009. The crises have been preceded by a boom in the stock market. Based on these estimates, we calculated the average threshold after which an increase in credit-to-GDP would have a negative growth effect. This threshold can be seen in the second last row of the table. In the second specification it is around 400%.While the results improved dramatically from the first specification, we suspect there may still be some omitted variable bias present.

Table 3: System GMM Whole Sample: Emerging Markets and Developed Countries

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDPGrowth$_{t-1}$	0.291**	0.00692	0.00506	-0.0904	-0.0864	-0.176	-0.173
	(0.128)	(0.946)	(0.0938)	(0.116)	(0.116)	(0.128)	(0.129)
(B) Credit$_{t-1}$	0.0101	0.212***	0.241***	0.243***	0.233***	0.0964	0.129*
	(0.0141)	(0.0336)	(0.0361)	(0.0361)	(0.0390)	(0.0688)	(0.0665)
(B) Credit$^2_{t-1}$		-0.0353***	-0.0399***	-0.0390***	-0.0382***	-0.0235***	-0.0292***
		(0.0056)	(0.0057)	(0.0059)	(0.0058)	(0.0088)	(0.0089)
(B) Int.Margin$_{t-1}$	0.0190**	-0.0473**	-0.0415**	-0.0391*	-0.0376*	-0.0272	-0.0247
	(0.0083)	(0.0188)	(0.0204)	(0.0230)	(0.0228)	(0.0191)	(0.0176)
(M) Turnover$_{t-1}$	0.0175*	0.0115	0.0022	-0.0009	-0.0001	0.0058	-0.0019
	(0.0092)	(0.0193)	(0.0212)	(0.0209)	(0.0201)	(0.0204)	(0.0205)
(M) Turnover$^2_{t-1}$		-0.0024	-0.0005	-0.0001	0.0001	-0.0005	0.0001
		(0.0030)	(0.0033)	(0.0033)	(0.0032)	(0.0033)	(0.0032)
(M) Capitalization$_{t-1}$	-0.0191	-0.0408***	-0.0444***	-0.0468***	-0.0458***	-0.0461***	-0.0449***
	(0.0170)	(0.0112)	(0.0126)	(0.0121)	(0.0118)	(0.0124)	(0.0125)
Inflation$_{t-1}$			-0.0219*	-0.0226	-0.0222	-0.0221	-0.0200
			(0.0126)	(0.0155)	(0.0153)	(0.0149)	(0.0151)
Deficit$_{t-1}$				-0.0019*	-0.0019*	-0.0016	-0.0017
				(0.0011)	(0.0011)	(0.0011)	(0.0011)
Openness$_{t-1}$					0.0001	0.0004	0.0003
					(0.0003)	(0.0003)	(0.0003)
Education$_{t-1}$						0.0654*	0.0550
						(0.0340)	(0.0336)
Institutions$_{t-1}$							0.0258
							(0.0197)
N. Observations	323	323	317	280	280	268	268
N. Instruments	45	67	68	69	70	71	72
adj. R^2	0.153	0.661	0.661	0.535	0.515	0.653	0.700
p-value Hansen	0.011	0.291	0.363	0.336	0.328	0.545	0.505
p-value Dif.-Hansen	0.502	0.998	0.986	0.907	0.814	0.933	0.921
p-value AR(1)	0.003	0.027	0.065	0.119	0.111	0.128	0.128
p-value AR(2)	0.055	0.016	0.017	0.204	0.200	0.210	0.255
Credit Threshold	-	405%	419%	508%	445%	60%	82%
Turnover Threshold	-	-	-	-	-	-	-

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
This table shows the regression outputs using the whole dataset. Column (1) shows the specification without squared terms. Column (2) adds Credit^2 and Turnover^2. Columns (3) to (7) add control variables. The regressions are run restricting the use of internal instruments to the two first lags.

Therefore we add control variables one by one in the columns (3) to (7). We will firstly look at the columns (3) to (5). Credit, its squared term, interest margin and capitalization don't change much in magnitude and turnover stays insignificant. It is important to note that the AR(2) error autocorrelation test as well as the Hansen test improve dramatically. One can see that the amount of observation drops sharply when adding the government deficit control variable. This is due to more unbalanced data with many missing values, especially for emerging markets. Finally, we add two more variables, namely education and institutions in columns (6) and (7). We can see that the coefficient for credit becomes smaller or even insignificant. However, one has to be careful when considering these last two specifications. Especially the variable measuring the quality of institutions is based on an index calculated through surveys and perceptions. Therefore it cannot really be seen as a quantitative objective measure.

These results are consistent with previous studies mentioned in the literature review. Although the variables that have been used are different, the pattern of the variable credit-to-GDP ratio resembles the result of Arcand et al. (2012). However, it is important to stress that Arcand et al. (2012) used a generic credit-to-GDP ratio, while in our specification we use private bank credit to GDP ratio. Based on our hypotheses, these results are strongly biased due to the pooling of developed and emerging countries in one sample. The next two subsections challenge the hypotheses presented in section 4.

7.2 Results using the Subsample of Emerging Markets

Table 4 reports the results of the first half of the sample constituted by emerging countries. It is evident that the number of observations is dramatically reduced since only 39 countries out of 69 are considered in this subsample. For this reason, instead of using two lagged values, we restrict the number of instruments to the first lagged variable. This restriction is needed in order to avoid overfitting of the instrumental variables and to not bias the GMM system towards a standard OLS regression. We are going to lift this restriction in the robustness checks section (7.5), where we are going to look at the results with two lagged values used as instrumental variables.

Before starting with the discussion, it is worth recalling the first two hypotheses:

H1: In emerging countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency. However, the magnitude of the contribution is smaller than in developed countries.

H2: The contribution to growth of the banking sector in emerging markets is positive and linear in size and efficiency.

The first column of table 4 shows the system GMM regression without quadratic terms. Apart from the negative coefficient of capitalization, the signs of the variables are those we expected. However, the magnitude of credit is very small, since a 100% increase in credit would only generate a 3,8% increase in growth over 3 years. Turnover is positive at the 5% level and the coefficient is relatively low as predicted by the first hypothesis. However, the low p-value of AR(2) test suggests that the model is misspecified as the error terms are autocorrelated. This is likely due to omitted variable bias, although the instruments look strong enough based on Hansen test.

The quadratic terms added in column (2) dramatically improve the model. Looking at the lower part of the table, the Hansen test, with a p-value of 0.701, does not reject the null hypotheses of valid instruments. The autocorrelation test for AR(2) is also insignificant at the 5% level, although the p-value suggests that the probability of remaining autocorrelation is relatively high. The Hansen test for instruments in levels, however, warns us about the presence of too many instruments. Although this test is secondary, it is important to keep it in mind in the robustness checks. Turning to the variables we are interested in, the value of the quadratic term of credit is surprising and it is contrasting our hypothesis related to the banking sector. Indeed, besides a positive credit term, we expected an insignificant coefficient for the squared term of credit indicating a monotonic and positive relationship between GDP growth and credit-to-GDP. The coefficient is significant at the 1% level and suggests a concave relationship between credit and GDP growth. The credit threshold after which an increase in credit-to-GDP results in a negative growth impact lies at around 400%. Interest margin is negative and significant at 1% level as expected. It is important to recall that a lower interest margin is translated into a higher efficiency in the banking sector. A 100% increase in interest margin leads to a 9.7% decrease in GDP growth over 3 years. Yet, capitalization is negative, arguably due to its predictive nature of financial crises. Turnover turns out to be insignificant. We expected an either positive or insignificant effect of the stock market variables on GDP growth. Thus, the results are partially in contrast with our hypotheses, as the turnover ratio behaves according to our hypothesis, but the capitalization ratio does not.

The following columns, add the control variables. There are no substantial changes in magnitude and signs of coefficients. It is important to stress the improvement of the autocorrelation test for AR(2) as well as of the Hansen test. The Hansen validity test shows that the instruments are exogenous. However, the power of the test is limited, because the number of instruments used is rather high compared to the number of countries in our sample. We will see in the robustness checks that using a collapsed instrument matrix (resulting in a lower amount of instruments) gives approximately the same results. Therefore we believe that the number of instruments used is not heavily biasing our results.

Table 4: System GMM Restricted Sample: Emerging Countries

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDPGrowth_{t-1}	0.413**	0.0023	0.0012	-0.0993	-0.0813	-0.169	-0.138
	(0.141)	(0.156)	(0.152)	(0.169)	(0.152)	(0.129)	(0.121)
(B) Credit_{t-1}	0.0388**	0.294***	0.306***	0.291***	0.276***	0.210***	0.200**
	(0.0177)	(0.0501)	(0.0530)	(0.0557)	(0.0617)	(0.0781)	(0.0792)
(B) Credit^2_{t-1}		-0.0490***	-0.0514***	-0.0478***	-0.0466***	-0.0401***	-0.0378***
		(0.0097)	(0.0103)	(0.0108)	(0.0102)	(0.0139)	(0.0139)
(B) Int.Margin_{t-1}	-0.0276	-0.0979***	-0.0934***	-0.0982***	-0.0968***	-0.0907***	-0.0929***
	(0.0235)	(0.0184)	(0.0210)	(0.0199)	(0.0195)	(0.0205)	(0.0203)
(M) Turnover_{t-1}	0.0317**	0.0091	0.0065	0.0061	0.0050	-0.0037	-0.0004
	(0.0128)	(0.0263)	(0.0263)	(0.0262)	(0.0239)	(0.0229)	(0.0241)
(M) Turnover^2_{t-1}		-0.0018	-0.0010	-0.0008	-0.0001	0.0022	0.0017
		(0.0041)	(0.0039)	(0.0039)	(0.0035)	(0.0036)	(0.0037)
(M) $\text{Capitalization}_{t-1}$	-0.0485***	-0.0608***	-0.0607***	-0.0550***	-0.0549***	-0.0477***	-0.0515***
	(0.0172)	(0.0147)	(0.0145)	(0.0173)	(0.0163)	(0.0165)	(0.0155)
Inflation_{t-1}			-0.0115	-0.0080	-0.0078	-0.0040	-0.0033
			(0.0167)	(0.0214)	(0.0210)	(0.0182)	(0.0183)
Deficit_{t-1}				-0.0014	-0.0012	-0.0012	-0.0009
				(0.0011)	(0.0012)	(0.0011)	(0.0010)
Openness_{t-1}					0.0002	0.0011**	0.0011**
					(0.0006)	(0.0004)	(0.0004)
Education_{t-1}						0.0137	0.0163
						(0.0295)	(0.0300)
$\text{Institutions}_{t-1}$							-0.0185
							(0.0337)
N. Observations	174	174	174	144	144	137	137
N. Instruments	33	49	50	51	52	53	54
adj. R^2	0.562	0.852	0.846	0.562	0.556	0.630	0.568
p-value Hansen	0.190	0.701	0.748	0.717	0.857	0.936	0.951
p-value Dif.-Hansen	0.742	0.999	0.987	0.999	1.000	1.000	1.000
p-value AR(1)	0.184	0.169	0.157	0.164	0.138	0.099	0.099
p-value AR(2)	0.007	0.062	0.065	0.988	0.883	0.777	0.572
Credit Threshold	-	403%	385%	440%	373%	188%	198%
Turnover Threshold	-	-	-	-	-	-	-

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
This table shows the regression outputs only using the subsample of emerging markets. Column (1) shows results without squared terms. Column(2) adds Credit^2 and Turnover^2. Columns (3) to (7) add control variables. The regressions are run restricting the use of internal instruments to only the first lag.

The last two columns confirm the overall validity of the model, although the low number of observations as well as the high value of the Hansen test would suggest prudence in interpreting the magnitude of the coefficients.

All in all, the results partially verify the first hypothesis. The contribution of equity markets turned out to be zero in terms of efficiency (turnover) and negative in terms of size (capitalization). Moreover, the banking sector positively affects growth in terms of efficiency (interest margin) and size (credit-to-GDP), although the contribution is weaker than expected due to the concavity in the relationship.

7.3 Results using the Subsample of Developed Countries

Table 5 reports the results for developed countries. In this case we have even less observations than in emerging countries. As before, we use only the first lagged variable as instrument.

It is important to recall the third and fourth hypothesis:

H3: In developed countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency.

H4:The relationship between GDP growth and the size of the banking sector in developed countries is concave and has an optimal point, whereas the relationship between GDP growth and the banking sector in terms of efficiency is positive and linear. However, the magnitude of the contribution of the banking sector to GDP is lower than in emerging countries.

As usual, the first column presents the regression without quadratic terms. The only significant coefficient at the 5% level is interest margin, although its sign is not the one expected. The Hansen test and the AR(2)-test for error autocorrelation do not show any sign of misspecification. However, we believe that there is the case of omitted variable bias.

Column (2) adds the quadratic terms. Again, the results improve dramatically both in terms of significance and overall quality captured by the two usual tests. Surprisingly, credit is insignificant, while the quadratic term is negative and significant at 10% level, suggesting a negative impact of credit on growth. It is important to highlight the positive contribution of the stock markets through the variable turnover. Yet, the squared turnover is negative and significant at 1% level. Although we expected a positive and linear contribution of stock markets, actually we can justify the concave pattern through the bank-based view that considers excessive liquidity as a threat for the function of the financial system: too much liquidity in markets is inefficient in allocating long-term investments.

Specifications (3), (4) and (5) increase the quality of the model. In this case adding inflation as control consistently improves the results. Credit is positive and significant at 1% level, while the squared term of credit is negative and significant at the same level. As expected, the relationship between credit to GDP and GDP growth is concave. It is important to note that the magnitude of the variable credit is much smaller in developed than in emerging countries.Also the efficiency of equity market has a concave shape and this relationship is stable by adding control variables. Interest margin is insignificant; this is not surprising, since we don't expect a strong contribution of the banking sector in terms of efficiency. Moreover, capitalization is either negative or insignificant, indicating an unclear contribution of the size of equity markets. Regarding the Hansen test, it is close to 1, suggesting that too many instruments have been used. This test will be challenged in the robustness checks via a collapsed instrument matrix. The AR(2) test behaves well.

Finally, the last two columns add institutions and education as control variables. Credit turns out to be insignificant, while the concavity of turnover is confirmed. Hansen test has a value of 1 in the last column.

All in all, the results partially verify the second hypothesis. The banking sector has a relatively lower contribution in bringing about growth and its shape is concave. The equity markets sector is positive but surprisingly has a concave relationship with GDP growth.

Table 5: System GMM Restricted Sample: Developed Countries

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDPGrowth_{t-1}	0.167	0.0475	0.0865	0.108	0.106	0.0961	0.136
	(0.172)	(0.0962)	(0.102)	(0.101)	(0.0990)	(0.0903)	(0.124)
(B) Credit_{t-1}	0.0085	0.0755	0.137***	0.136***	0.143***	-0.0063	-0.0156
	(0.0129)	(0.0521)	(0.0442)	(0.0429)	(0.0426)	(0.103)	(0.0994)
(B) Credit^2_{t-1}		-0.0139*	-0.0201***	-0.0207***	-0.0212***	-0.0060	-0.0045
		(0.0080)	(0.0067)	(0.0061)	(0.0062)	(0.0125)	(0.0122)
(B) Int.Margin_{t-1}	0.0286**	-0.0138*	-0.0081	-0.0109	-0.0111	-0.0103	-0.0107
	(0.0129)	(0.0076)	(0.0089)	(0.0074)	(0.0077)	(0.0085)	(0.0086)
(M) Turnover_{t-1}	-0.0082	0.0773***	0.0440*	0.0460**	0.0424*	0.0505***	0.0538***
	(0.0135)	(0.0264)	(0.0229)	(0.0217)	(0.0233)	(0.0193)	(0.0201)
(M) Turnover^2_{t-1}		-0.0160***	-0.0106***	-0.0110***	-0.0111***	-0.0132***	-0.0140***
		(0.0046)	(0.0041)	(0.0040)	(0.0041)	(0.0038)	(0.0036)
(M) $\text{Capitalization}_{t-1}$	0.0049	-0.0074	-0.0283**	-0.0244*	-0.0218	-0.0242*	-0.0246**
	(0.0158)	(0.0120)	(0.0121)	(0.0140)	(0.0159)	(0.0129)	(0.0121)
Inflation_{t-1}			-0.0411**	-0.0413**	-0.0421***	-0.0413***	-0.0440***
			(0.0083)	(0.0104)	(0.0109)	(0.0116)	(0.0128)
Deficit_{t-1}				0.0017	0.0018	0.0015	0.0019
				(0.0036)	(0.0036)	(0.0031)	(0.0035)
Openness_{t-1}					-0.0001	0.0001	0.0001
					(0.0002)	(0.0002)	(0.0002)
Education_{t-1}						0.0814*	0.0916**
						(0.0458)	(0.0460)
$\text{Institutions}_{t-1}$							-0.0249
							(0.0291)
N. Observations	149	149	143	136	136	131	131
N. Instruments	33	49	50	51	52	53	54
adj. R^2	0.098	0.459	0.557	0.524	0.540	0.721	0.750
p-value Hansen	0.388	0.958	0.971	0.972	0.990	0.998	1.000
p-value Dif.-Hansen	0.998	1.000	1.000	1.000	1.000	1.000	1.000
p-value AR(1)	0.011	0.046	0.102	0.059	0.054	0.096	0.092
p-value AR(2)	0.223	0.450	0.188	0.227	0.256	0.205	0.201
Credit Threshold	-	228%	912%	713%	850%	-	-
Turnover Threshold	-	125%	63%	65%	45%	45%	46%

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
This table shows the regression outputs only using the subsample of developed countries. Column (1) shows results without squared terms. Column(2) adds Credit^2 and Turnover^2. Columns (3) to (7) add control variables. The regressions are run restricting the use of internal instruments to only the first lag.

7.4 Discussion

As already stated above, the hypotheses are only partially verified and partially rejected. We will now discuss the hypotheses one by one.

Recall hypothesis 1:

H1: In emerging countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency. However, the magnitude of the contribution is smaller than in developed countries.

According to our results we can reject the first part of this hypothesis. The coefficients of our stock market variables are not positive. The stock market turnover ratio has no significant impact on GDP growth in emerging markets. We expected only the squared turnover term to be insignificant, not both of them. This is in line with the complementary view of the financial development literature. Stock markets are able to contribute to economic growth once a certain development stage is reached (see Deidda and Fattouh (2008)). Our results however, suggest that stock markets in emerging countries on average are not yet developed enough to contribute to growth. The coefficient on stock market capitalization is negative and significant, contrary to our hypothesis stating that a rise in importance of stock markets leads to economic growth. As already mentioned in the results section, we believe that the stock market capitalization ratio variable can also be seen as a crisis-predictor. Studying figure 7 indicates that a substantial rise in stock market capitalization in the last two decades has been followed by an economic crisis later, especially for the dot.com crisis and the financial crisis of 2007-2009. The second part of this hypothesis has not been rejected. As we have seen that stock market turnover has a positive contribution to growth in developed countries and stock market capitalization in developed countries has a smaller negative contribution to growth than in emerging countries, the overall contribution of stock markets to economic growth is smaller in emerging markets than in developed countries.

Moving on to hypothesis 2:

H2: The contribution to growth of the banking sector in emerging markets is positive and linear in size and efficiency.

Our results indicate to reject the first part of this hypothesis as well. While we found a positive contribution of the credit-to-GDP ratio as our banking sector size variable, this is only true up to a certain point. The results suggest that the relationship is concave and the contribution to growth of the credit-to-GDP ratio is not monotonic positive. Indeed, the contribution to growth becomes negative after a certain threshold is reached. Our analysis suggests that the threshold lies around 400% for our main results (columns (3) to (5)), whereas the threshold lies at around 200% after adding education and institutions as control variables. This can be justified by over-lending arguments. Intriguing is that these also hold for the assumingly less developed financial systems of emerging markets. However, when looking at the data, this becomes less surprising. The subsample of emerging markets is very heterogenous, with credit-to-GDP ratios ranging from about 5% to about 150%. This is due to the fact that our division of countries is based on income levels in 1991, but several countries have witnessed a tremendous growth of their economy and their financial system during the two decades of our sample and therefore do have developed financial systems comparable to those of developed countries. Therefore it is not surprising that over-lending is also an issue for this countrygroup. The second part of the hypothesis can be confirmed by our results. The banking-efficiency variable behaves as predicted. The coefficient on the net interest margin is significant and negative in all specifications. Recall that a decrease in interest margins is an indicator for efficiency in the banking sector. The magnitude of the coefficient is relatively constant across specifications. If margins increase by 100%, average 3-year GDP growth decreases by about 9 percentage points.

We will now continue with our hypotheses concerning developed countries:

H3: In developed countries, the contribution of stock markets to GDP growth is positive and linear in size and efficiency.

Based on our results, we can reject this hypothesis. While the contribution of the stock market turnover ratio to GDP growth is positive at first, it becomes negative after a certain threshold as we observe a concave parabola shaped relationship. From our estimates we calculated this threshold to be between 45% and 63% for our main results after adding some control variables (columns (3) to (5)). This result can be justified by following the argument of Bhide (1993). Too much liquidity reduces the ability of the stock market to exert effective corporate governance as it decreases the incentive of investors to play a more active role in monitoring the firm (which is costly). Instead, they can just sell their shares for a discount, which is smaller the more liquid the market gets. When it comes to the stock market capitalization ratio, we can witness a similar behavior as for the subsample of emerging markets. The sign of the coefficient is negative, on average, an increase of the stock market capitalization reduces the GDP growth in the next period. However, for some specifications the estimate is insignificant. We can apply the same justification as before. Stock market capitalization can be regarded as predictive variable for economic crises.

H4: The relationship between GDP growth and the size of the banking sector in developed countries is concave and has an optimal point, whereas the relationship between GDP growth and the banking sector in terms of efficiency is positive and linear. However, the magnitude of the contribution of the banking sector to GDP is lower than in emerging countries.

According to the results of our regression analysis, we can partly confirm this hypothesis. As was expected, the private banking credit-to-GDP ratio is in a concave relationship with GDP growth. The squared term is negative and both terms are significant in our main specifications (columns (3) to (5)). As has already been mentioned, this can be explained by an over-lending argument, reducing the efficiency of banks' ability to adequately monitor firms. However, the coefficient on interest margin has the right sign but is insignificant in our main specifications. We conclude that this is the case because the financial systems in developed countries is already highly developed and the small changes observable in the net interest margins do not necessarily mean that the efficiency of the system changed. Comparing the magnitude of the coefficients, we can say that the contribution to GDP growth of the banking sector is bigger in emerging markets than in developed economies. This can also be seen in figure 8. Up to the intersection of both graphs, emerging markets have a higher contribution than developed countries. After this intersection point, more credit in emerging markets contributes less to growth than in developed countries. This can be explained with the lower efficiency and experience of emerging markets to manage such a high amount of credit in the economy.

Using the estimates of column (5), we can draw the relationship between credit to GDP and GDP growth in developed and emerging economies:

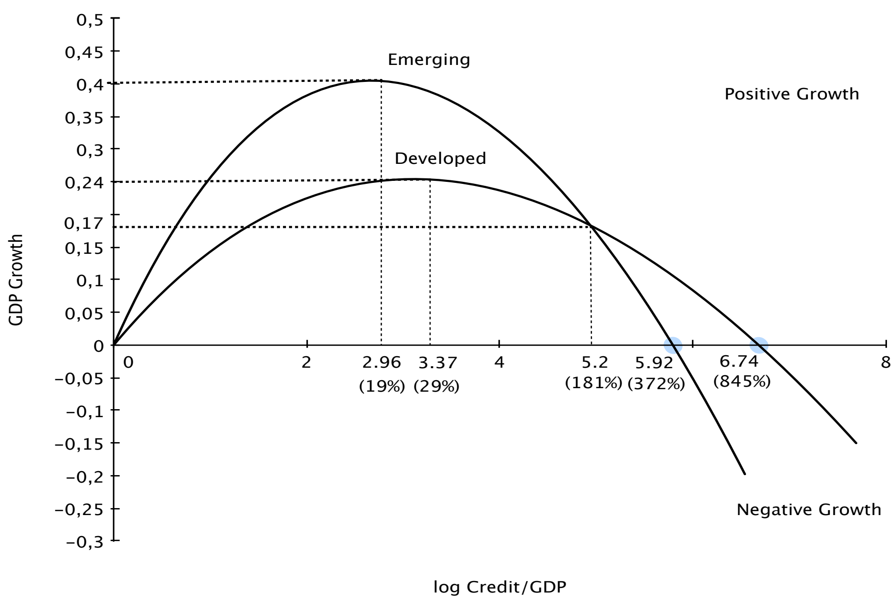


Figure 8: Optimal Points and Critical Thresholds

It is striking that emerging countries reach a higher GDP growth through issuing credits due to the bigger importance of banks in these economies. We calculated the optimal points of financial development in terms of credit-to-GDP ratio and critical thresholds for when the GDP growth contribution of credit-to-GDP turns negative. These can be seen in the figure. No country has yet reached the amount of credit necessary to negate the growth contribution of the credit-to-GDP ratio (the critical threshold values lie at 372% for emerging markets and 845% for developed countries). However, the figure implies that the optimal amount of credit in emerging and developed countries lies way below the average values of credit in most countries. E.g. for developed countries, the optimal amount of credit-to-GDP in the economy lies at 29%, which would lead to a growth contribution of credit-to-GDP of 24% over 3 years. For emerging markets, this contribution lies even higher at the optimal credit level of 19%, yielding a growth contribution of 40% over 3 years. While we believe that the relationship between credit-to-GDP and GDP growth is as it is depicted in this figure, we are cautious about trusting the magnitude of the coefficients estimated. The quality of data and the number of observations in general could be higher.

These results are in line with previous studies that found a concave relationship between financial development and economic growth, although the individual contribution of banks and equity markets was not incorporated in previous models. It is important to note that these patterns are revealed once countries are divided in two sub-samples. Without such division, the results of the whole sample only show a non-linear relationship in banking private credit.

All in all, the results of the thesis suggest that the majority of the countries is beyond the optimal point in terms of credit-to-GDP, although both developed and emerging countries are far from having a negative impact caused by an excess of credit. However, in order to prevent the negative effects of over-lending, it would be beneficial a firm regulation on the banking sector : on one side the competition among banks shall be encouraged, since it has been shown that a lower interest margin, and consequently a higher competition in the banking sector, leads to economic growth. On the other hand, it is important that the issuing of credit by banks is well regulated. Indeed, too few or too much credit is dangerous for growth, especially for emerging countries that have a weaker institutional framework. Many papers (Levine and Beck, 2001 among others) stress the importance of the institutional setting in which the financial system grows and expands itself as the keystone of financial development.

Regarding the stock markets, the results individuate a low critical threshold after which turnover ratio become harmful to economic growth due to too much liquidity. Moreover, the size of equity markets would be the cause of a lower economic growth. All this would suggests to pay attention towards those issues that make the equity markets so harmful growth-wise. Note that this thesis does not provide an insight into the causes of the controversial behavior of equity markets, as leaving them to further studies.

In order to challenge the results obtained, we will now go through some robustness checks.

7.5 Robustness Checks

As highlighted in section 5.1.1, there are some issues related to the system GMM. The AR(2)-test didn't show any problems in terms of rejecting the null hypothesis of no autocorrelation of the error terms. The main issue is the trade off between good quality instruments and overfitting. Many instruments bring more information, but bias the results towards a standard OLS. For this reason, we have restricted the number of instruments to 1 lagged value in the subsample.

As robustness check, we first run the same system GMM for emerging and developed countries by using 2 lagged values. The results are in tables 9 and 10 (Appendix). Due to the high number of instruments, the power of the Hansen test is low, leaving it upward biased, with p-values very close to 1. Regarding the emerging countries, we don't find any substantial changes; the magnitude of the variables is slightly different, but overall there are not many differences. The results for developed countries are slightly different. Interest margin is generally significant at 5%-10% level, while turnover is smaller in some specifications. Overall, there are no changes that gravely undermine the quality of our results.

Another robustness check is to restrict the number of instruments even more in order to definitely rule out the overfitting issue. This is possible through collapsing the instruments, allowing to average all the possible instruments in order to reduce the number significantly. The striking drawback is the loss of efficiency of the instrument, since we expect the average to be less correlated with the main variables than before performing this transformation. Table 11 (Appendix) shows the results for both developed and emerging countries. The variables of emerging countries don't present major changes. On the other side, turnover in developed countries become insignificant, while its quadratic term is negative and significant. This is in contrast with what we got in the previous subsection.

We might be interested in looking at the results without outliers. The sample consists of small states like Hong-Kong and Luxembourg that might bias the results. Therefore, we run a system GMM without considering those countries with a population lower than 2 million[2] and the top-bottom 10% countries according to openness to trade[3]. The idea is to delete those countries with capital control and with abnormal openness towards international trade. Due to the dramatic reduction of the sample size, we are forced to collapse the instrument matrix. The results are in table 12 (Appendix). Although we can't directly compare the values of the coefficients due to few observations, we limit our analysis to the signs of the coefficients. The main result has been confirmed.The concavity of credit is still present in developed countries and in emerging countries. However, the magnitude of variables are very different. Developed countries have values for credit that are way too high to be considered realistic.

A further and last robustness check is to add a crisis dummy. It might be the case that the 2008 crisis has had some distorting effect. The values are reported in table 13 (Appendix). It looks like the dummy has very little effect on our sample.

[2] Cyprus, Estonia, Iceland, Luxembourg, Malta

[3] Argentina, Brazil, Colombia, Hong Kong, India, Ireland, Japan, Luxembourg, Malaysia, Malta, Pakistan, Panama, Singapore, United States

8 Conclusions

Following the last wave of research on financial development and economic growth, this thesis aims to shed light on how financial development promotes economic growth. In order to address the problem, we take into account the specificities of emerging and developed financial systems, as well as the contrasting views of bank-based and market-based systems. Both banks and markets are studied through two sets of two variables each that aim to capture size and efficiency. Moreover, the endogeneity problems are overcome by using the system GMM. The sample is split in developed and emerging countries in order to isolate the specificities of these economies.

The results are in line with those studies that find a concave relationship between financial development and economic growth. However, such a relationship is misleading if the sample is not divided in developed and emerging economies. Stock markets have no or a negative effect on the emerging economies, due to the inefficiency of emerging markets as well as the high correlation with financial crises, while developed countries gain advantage from liquid markets. However, too much liquidity is a threat for economic growth. The banking system has a similar pattern on growth, both in emerging and developed countries: giving out too much credit might trigger bubbles, harming the economic stability. As expected, emerging countries enjoy higher growth through the banking system, both in terms of size (credit-to-GDP) and efficiency (interest margin).

This thesis makes a number of contributions to the ongoing research field. First of all, instead of using a general proxy to measure financial development, we select specific variables with the aim to better capture the level of contribution in terms of size and efficiency. Moreover, the countries have been selected and divided in two groups in order to see if the relationship changes according to the level of financial development. Indeed, the characteristics of developed and emerging financial systems are too different to be pooled together in a single dataset. As far as we know, the non-linear relationship between equity markets and economic growth has never been empirically tested, although there is theoretical argument that suggests it (Keynes, 1936; Bhide, 1993).

Overall, two main messages can be drawn from this thesis. Firstly, there is an optimal level of financial development. This optimal level is valid for both banks (in developed and emerging economies) and stock markets (in developed countries only). Secondly, at different stages of development, the drivers of the economic growth change. The bank system loses its importance in the economy once stock markets increase in efficiency (but not in size).

The thesis has a number of restrictions. To start with, the sample size is relatively small, especially when it comes to analyze emerging and developed economies as independent sub-samples. Many emerging countries have not been included due to missing data and a bigger time span would have undermined the specification; the year 1991 is a crucial date for many emerging countries, and it would have been hard to control for all the political, institutional and economic changes that occurred during the transitional phase. The fact that only some emerging countries have been included might be a source of bias. For instance, it could be the case that only data from the emerging countries that performed better are available. The small sample size also restricts us to use few control variables. The econometric approach has also some drawbacks as extensively discussed along the thesis. Although some tests (Hansen and autocorrelation) have been reported, the trade-off of overfitting and information losses can't be fully overcome. Moreover, the internal instruments approach is weaker than the typical external instruments approach due to the lower correlation with the variable that has been instrumented.

This study has also many potential extensions. A bigger sample would allow to use all the lagged values available as instruments without biasing the results, thus obtaining more reliable values for the coefficients. The study can be extended to developing countries, although the restrictions due to missing data are severe. Moreover, one could also view this from a different angle and emphasize the role played by the "rule of law" or institutions since it is a crucial factor in distinguishing emerging from developed economies. Another important extension is to use a different set of main variables to measure size and efficiency in banking sector and equity markets in order to compare the magnitude of coefficients. Finally, this thesis does not provide final insight into the causes of the controversial behavior of equity markets, as leaving it to further studies.

A Data

Table 6: Overview of the countrygroups

Emerging Markets		**Developed Countries**	
Argentina	Malaysia	Australia	New Zealand
Bolivia	Mauritius	Austria	Norway
Botswana	Mexico	Belgium	Portugal
Brazil	Morocco	Canada	Saudi Arabia
Bulgaria	Pakistan	Cyprus	Singapore
China	Panama	Denmark	Spain
Colombia	Peru	Finland	Sweden
Croatia	Philippines	France	Switzerland
Czech Republic	Poland	Germany	United Kingdom
Ecuador	Romania	Greece	United States
Estonia	Russian Federation	Hong Kong	
Hungary	Slovak Republic	Iceland	
India	Slovenia	Ireland	
Indonesia	South Africa	Israel	
Jamaica	Thailand	Italy	
Kazakhstan	Trinidad and Tobago	Japan	
Korea	Tunisia	Kuwait	
Latvia	Turkey	Luxembourg	
Lithuania	Uruguay	Malta	
Macedonia		Netherlands	

Table 7: 3-year average summary statistics of the dependent and the main explanatory variables

	Emerging Markets	Developed Countries	Total
Real GDP Growth			
#OBS	228	180	408
Min	-0.2919	-0.2833	-0.2919
Average	0.0897	0.0495	0.0720
Max	0.3266	0.2529	0.3266
Standard Deviation	0.0882	0.0588	0.0791
Credit-To-GDP			
#OBS	257	206	463
Min	5.7075	15.8289	5.7075
Average	40.6957	98.8734	66.5804
Max	154.4121	272.7350	272.7350
Standard Deviation	28.0565	46.0172	47.0479
Net Interest Margin			
#OBS	251	207	458
Min	-2.5311	0.0275	-2.5311
Average	4.0293	1.9957	3.1102
Max	21.6552	6.2054	21.6552
Standard Deviation	2.5411	0.9990	2.2380
Stock Market Capitalization			
#OBS	257	206	463
Min	0.0124	5.6668	0.0124
Average	33.5107	82.7374	55.4129
Max	261.4787	486.1752	486.1752
Standard Deviation	38.8277	69.6041	59.8737
Stock Market Turnover			
#OBS	255	206	461
Min	0.1234	0.2101	0.1234
Average	46.3270	70.4251	57.0954
Max	399.3254	263.0580	399.3254
Standard Deviation	63.7988	48.4573	58.6328

Table 8: 3-year average summary statistics of the control variables

	Emerging Markets	Developed Countries	Total
Inflation			
#OBS	267	210	477
Min	0.0957	-2.8043	-2.8043
Average	40.5131	2.6228	23.8319
Max	1662.2750	16.5730	1662.2750
Standard Deviation	173.3217	2.1650	130.9347
Openness to Trade			
#OBS	272	210	482
Min	14.9024	17.1710	14.9024
Average	82.4451	101.1396	90.5900
Max	268.4819	428.1443	428.1443
Standard Deviation	42.8943	82.1261	63.6662
Government Deficit			
#OBS	195	193	388
Min	-25.9573	-18.8010	-25.9573
Average	-0.3978	1.1272	0.3607
Max	54.6890	37.3030	54.6890
Standard Deviation	6.7474	5.7029	6.2881
Schooling			
#OBS	273	210	483
Min	1	1	1
Average	36.8609	61.0967	47.3982
Max	96.6424	152.4185	152.4185
Standard Deviation	27.0836	37.5029	34.1824
Rule of Law			
#OBS	234	180	414
Min	-1.2243	0.0366	-1.2243
Average	-0.0078	1.4295	0.6171
Max	1.2172	1.9781	1.9781
Standard Deviation	0.5966	0.4611	0.8955

B Technical Appendix

In this technical appendix we will briefly describe the instrumental approach used in the Arellano-Bond and Blundell-Bond estimators, also known as *difference-GMM* and *system-GMM*. This discussion will be based on Roodman (2009).

B.1 Arellano-Bond or difference-GMM

To keep it simple, we start off by a simple dynamic panel equation of the following form, without external regressors:

$$y_{i,t} = \alpha y_{i,t-1} + \epsilon_{i,t}, i = 1, \ldots, N; t = 1, \ldots, T \tag{9}$$

where

$$\epsilon_{i,t} = \mu_i + v_{i,t} \tag{10}$$

With the following assumptions about the error structure:

$$E(v_{i,t}) = E(\mu_i) = E(v_{i,s} v_{i,t}) = 0, \text{for } i = 1, \ldots, N \text{ and } \forall t \neq s \tag{11}$$

Arellano and Bond (1991) now continue by first differencing the equation, eliminating the fixed-effects:

$$\Delta y_{i,t} = \alpha \Delta y_{i,t-1} + \Delta v_{i,t} \tag{12}$$

In order to deal with endogeneity problems, all lagged values of the observed regressors are used as internal instruments. Due to the lagged dependent variable, only values from the second lag on can be used. In a standard 2SLS the instruments would be entered in a single column, stacked of elements in the following form for each country i:

$$\begin{pmatrix} . \\ y_{i,1} \\ y_{i,2} \\ \vdots \\ y_{i,T-2} \end{pmatrix}$$

The "." in the first row of the vector is a missing value, because we lose the first observation in the transformed variables due to first differencing. Holtz-Eakin et al. (1988) now introduces to use *GMM-style* instruments, meaning to use a set of instruments rather than a single vector:

$$\begin{pmatrix} 0 & 0 & \dots & 0 \\ y_{i,1} & 0 & \dots & 0 \\ 0 & y_{i,2} & \dots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \dots & y_{i,T-2} \end{pmatrix}$$

The innovation of Arellano and Bond (1991) was to use *all* available lags as instruments, resulting in an instrumental matrix with stacked blocks of the following form for each country i:

$$\begin{pmatrix} 0 & 0 & 0 & 0 & 0 & 0 & \dots \\ y_{i,1} & 0 & 0 & 0 & 0 & 0 & \dots \\ 0 & y_{i,2} & y_{i,1} & 0 & 0 & 0 & \dots \\ 0 & 0 & 0 & y_{i,3} & y_{i,2} & y_{i,1} & \dots \\ \vdots & \vdots & \vdots & \vdots & \vdots & \vdots & \ddots \end{pmatrix}$$

B.2 Blundell-Bond or System-GMM

Blundell and Bond (1998) now implemented the idea of Arellano and Bover (1995), to transform the instruments instead of the regressors, in order to make them exogenous to the fixed effects and increase the efficiency of the estimator. I.e. where *difference-GMM* instruments differenced regressors by lagged levels, *system-GMM* instruments untransformed, leveled regressors by differenced instruments.

This means that for every country i, twice the observations are used, the differenced values are stacked on top of the original values, resulting in the following data structure:

$$Y_i = \begin{pmatrix} y_{i,3} - y_{i,2} \\ y_{i,4} - y_{i,3} \\ \vdots \\ y_{i,T} - y_{i,T-1} \\ y_{i,3} \\ \vdots \\ y_{i,T} \end{pmatrix}, X_i = \begin{pmatrix} y_{i,2} - y_{i,1} \\ y_{i,3} - y_{i,2} \\ \vdots \\ y_{i,T-1} - y_{i,T-2} \\ y_{i,2} \\ \vdots \\ y_{i,T-1} \end{pmatrix}$$

The used instrumental matrix consists of two parts, Z^D for the differenced equations (as above) and Z^L for the level equations:

$$Z_i^D = \begin{pmatrix} y_{i,1} & 0 & 0 & \dots \\ 0 & y_{i,2} & y_{i,1} & \dots \\ 0 & 0 & 0 & \ddots \end{pmatrix}, Z_i^L = \begin{pmatrix} y_{i,2} - y_{i,1} & 0 & \dots \\ 0 & y_{i,3} - y_{i,2} & \dots \\ 0 & 0 & \ddots \end{pmatrix}$$

These two parts are then stacked for each country i in the following way and used for estimation:

$$Z_i = \begin{pmatrix} Z_i^D & 0 \\ 0 & Z_i^L \end{pmatrix}$$

Adding additional regressors is relatively straightforward. For a detailed documentation of the method see Roodman (2009). However, since there are several drawbacks of using too many instruments, we have restricted the amount of instrument-lags to one (or two as a robustness check) in this thesis.

C Robustness Checks

Table 9: Instrument lags restricted to two, Subsample: Emerging Countries

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDPGrowth$_{t-1}$	0.355***	-0.0612	-0.0574	-0.168	-0.142	-0.233*	-0.214*
	(0.132)	(0.141)	(0.139)	(0.158)	(0.143)	(0.128)	(0.125)
(B) Credit$_{t-1}$	0.0354**	0.295***	0.305***	0.291***	0.277***	0.196***	0.195***
	(0.0167)	(0.0490)	(0.0514)	(0.0543)	(0.0611)	(0.0740)	(0.0738)
(B) Credit$^2_{t-1}$		-0.0507***	-0.0527***	-0.0487***	-0.0476***	-0.0393***	-0.0389***
		(0.0095)	(0.0099)	(0.0105)	(0.0101)	(0.0132)	(0.0130)
(B) Int.Margin$_{t-1}$	-0.0201	-0.0941***	-0.0900***	-0.0970***	-0.0961***	-0.0885***	-0.0894***
	(0.0231)	(0.0176)	(0.0199)	(0.0195)	(0.0193)	(0.0207)	(0.0199)
(M) Turnover$_{t-1}$	0.0279**	0.0071	0.0045	0.0085	0.0071	-0.0029	-0.0021
	(0.0119)	(0.0255)	(0.0258)	(0.0256)	(0.0238)	(0.0229)	(0.0234)
(M) Turnover$^2_{t-1}$		-0.0019	-0.0012	-0.0013	-0.0005	0.0020	0.0020
		(0.0039)	(0.0038)	(0.0038)	(0.0035)	(0.0035)	(0.0035)
(M) Capitalization$_{t-1}$	-0.0418**	-0.0515***	-0.0512***	-0.0500***	-0.0495***	-0.0425***	-0.0433***
	(0.0167)	(0.0132)	(0.0132)	(0.0162)	(0.0153)	(0.0156)	(0.0142)
Inflation$_{t-1}$			-0.0105	-0.0078	-0.0075	-0.0036	-0.0036
			(0.0159)	(0.0211)	(0.0208)	(0.0176)	(0.0175)
Deficit$_{t-1}$				-0.0015	-0.0013	-0.0013	-0.0011
				(0.0010)	(0.0011)	(0.0011)	(0.0009)
Openness$_{t-1}$					0.0002	0.0011**	0.0011**
					(0.0006)	(0.0004)	(0.0004)
Education$_{t-1}$						0.0203	0.0199
						(0.0311)	(0.0309)
Institutions$_{t-1}$							-0.0066
							(0.0329)
N. Observations	174	174	174	144	144	137	137
N. Instruments	45	67	68	69	70	71	72
adj. R^2	0.079	0.414	0.318	0.272	0.267	0.955	0.956
p-value Hansen	0.652	0.996	0.998	0.991	0.997	1.000	1.000
p-value Dif.-Hansen	0.975	1.000	1.000	1.000	1.000	1.000	1.000
p-value AR(1)	0.153	0.140	0.136	0.181	153	0.109	0.109
p-value AR(2)	0.006	0.040	0.045	0.901	0.992	0.797	0.694
Credit Threshold	-	336%	326%	393%	336%	146%	150%

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
This table shows the regression outputs only using the subsample of emerging markets. Column (1) shows results without squared terms. Column(2) adds Credit^2 and Turnover^2. Columns (3) to (7) add control variables. The regressions are run restricting the use of internal instruments to the two first lags, instead of only the first lag as done in the main specification.

Table 10: Instrument lags restricted to two, Subsample: Developed Countries

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
GDPGrowth_{t-1}	0.165	0.0665	0.0871	0.0728	0.0591	0.0578	0.0730
	(0.213)	(0.131)	(0.119)	(0.102)	(0.0944)	(0.0913)	(0.114)
(B) Credit_{t-1}	0.0032	0.104**	0.161***	0.168***	0.173***	0.0433	0.0418
	(0.0109)	(0.0476)	(0.0448)	(0.0401)	(0.0385)	(0.0953)	(0.0922)
(B) Credit^2_{t-1}		-0.0181**	-0.0241***	-0.0256***	-0.0261***	-0.0125	-0.0122
		(0.0076)	(0.0069)	(0.0057)	(0.0055)	(0.0115)	(0.0112)
(B) Int.Margin_{t-1}	0.0294**	-0.0150**	-0.0120	-0.0164***	-0.0160***	-0.0131*	-0.0132*
	(0.0136)	(0.0067)	(0.0076)	(0.0059)	(0.0061)	(0.0071)	(0.0073)
(M) Turnover_{t-1}	-0.0053	0.0577***	0.0320*	0.0341*	0.0313	0.0400*	0.0411**
	(0.0128)	(0.0201)	(0.0189)	(0.0192)	(0.0205)	(0.0211)	(0.0205)
(M) Turnover^2_{t-1}		-0.0122***	-0.0082***	-0.0086***	-0.0082***	-0.0099***	-0.0102***
		(0.0033)	(0.0031***)	(0.0031)	(0.0032)	(0.0032)	(0.0029)
(M) $\text{Capitalization}_{t-1}$	0.0078	-0.0141	-0.0328***	-0.0325**	-0.0338**	-0.0354***	-0.0360***
	(0.0158)	(0.0104)	(0.0120)	(0.0141)	(0.0146)	(0.0107)	(0.0109)
Inflation_{t-1}			-0.0384***	-0.0371***	-0.0369***	-0.0374***	-0.0385***
			(0.0072)	(0.0096)	(0.0105)	(0.0114)	(0.0122)
Deficit_{t-1}				0.0011	0.0009	0.0006	0.0007
				(0.0041)	(0.0040)	(0.0035)	(0.0037)
Openness_{t-1}					-0.0001	0.0001	0.0001
					(0.0001)	(0.0001)	(0.0001)
Education_{t-1}						0.0663	0.0694
						(0.0470)	(0.0468)
$\text{Institutions}_{t-1}$							-0.0104
							(0.0246)
N. Observations	149	149	143	136	136	131	131
N. Instruments	45	67	68	69	70	71	72
adj. R^2	0.081	0.442	0.557	0.540	0.546	0.655	0.672
p-value Hansen	0.887	1.000	1.000	1.000	1.000	1.000	1.000
p-value Dif.-Hansen	1.000	1.000	1.000	1.000	1.000	1.000	1.000
p-value AR(1)	0.033	0.104	0.166	0.288	0.360	0.428	0.370
p-value AR(2)	0.233	0.421	0.145	0.217	0.230	0.188	0.179
Credit Threshold	-	312%	796%	708%	756%	31%	30%
Turnover Threshold	-	6%	49%	52%	45%	85%	56%

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
This table shows the regression outputs only using the subsample of developed countries. Column (1) shows results without squared terms. Column(2) adds Credit^2 and Turnover^2. Columns (3) to (7) add control variables. The regressions are run restricting the use of internal instruments to only the first lag.

Table 11: Collapsed Instruments, both subsamples

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)
	(D)	(D)	(D)	(E)	(E)	(E)
GDPGrowth$_{t-1}$	0.124	0.125	0.0848	0.126	0.113	-0.151
	(0.179)	(0.120)	(0.143)	(0.143)	(0.186)	(0.297)
(B) Credit$_{t-1}$	0.129**	0.146***	-0.0825	0.273***	0.310***	0.235**
	(0.0599)	(0.0382)	(0.129)	(0.0437)	(0.0746)	(0.102)
(B) Credit$^2_{t-1}$	-0.0228**	-0.0258***	-0.00251	-0.0507***	-0.0527***	-0.0594***
	(0.00915)	(0.0060)	(0.0145)	(0.0081)	(0.0110)	(0.0181)
(B) Int.Margin$_{t-1}$	-0.0117	-0.0040	-0.0006***	-0.0567**	-0.0643**	-0.0643***
	(0.0076)	(0.0068)	(0.0074)	(0.0149)	(0.0274)	(0.0212)
(M)Turnover$_{t-1}$	0.0335	0.0353	0.0394	-0.0210	-0.0402	-0.0497
	(0.0227)	(0.0266)	(0.0332)	(0.0328)	(0.0375)	(0.0331)
(M)Turnover$^2_{t-1}$	-0.0089**	-0.0066*	-0.0086**	0.0025	0.0061	0.0104*
	(0.0040)	(0.0039)	(0.0039)	(0.0045)	(0.0053)	(0.0056)
(M)Capitalization$_{t-1}$	-0.0095	-0.0229	-0.0308**	-0.0408***	-0.0583**	-0.0078
	(0.0215)	(0.0160)	(0.0155)	(0.0149)	(0.0261)	(0.0350)
Inflation$_{t-1}$		-0.0364**	-0.0364**		-0.0086	-0.0018
		(0.0152)	(0.0168)		(0.0189)	(0.0128)
Deficit$_{t-1}$		0.0027	0.0017		-0.0008	-0.0006
		(0.0038)	(0.0031)		(0.0015)	(0.0019)
Openness$_{t-1}$		0.0002	0.0002		-0.0001	0.0025**
		(0.0004)	(0.0004)		(0.0009)	(0.0010)
Education$_{t-1}$			0.136*			-0.0135
			(0.0729)			(0.0351)
Institutions$_{t-1}$			0.0069			0.143***
			(0.0567)			(0.0548)
N. Observations	149	136	131	174	144	137
N. Instruments	31	34	36	31	34	36
adj. R^2	0.524	0.590	0.950	0.772	0.704	0.852
p-value Hansen	0.297	0.448	0.602	0.160	0.545	0.298
p-value Dif.-Hansen	0.997	1.000	0.595	0.207	0.918	0.471
p-value AR(1)	0.101	0.023	0.548	0.063	0.132	0.078
p-value AR(2)	0.356	0.200	0.151	0.026	0.304	0.853
Credit Threshold	286%	286%	-	218%	358%	52%
Turnover Threshold	-	-	-	-	-	-

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
(D) Developed Countries
(E) Emerging Countries
This table shows the regression outputs using both subsamples individually. Columns (1) to (3) show results for the subsample of developed countries while columns (4) to (6) show results for the subsample of emerging markets. The regressions are run using collapsed instruments.

Table 12: Removed Outliers, both subsamples

$GDPGrowth_t$	(1)	(2)	(3)	(4)	(5)	(6)
	(D)	(D)	(D)	(E)	(E)	(E)
GDPGrowth$_{t-1}$	-0.0589	0.0116	-0.106	0.0856	0.0526	0.0403
	(0.111)	(0.0969)	(0.109)	(0.174)	(0.214)	(0.278)
(B) Credit$_{t-1}$	0.713**	1.023***	0.615**	0.283***	0.246***	0.300**
	(0.302)	(0.364)	(0.263)	(0.0400)	(0.0756)	(0.142)
(B) Credit$^2_{t-1}$	-0.0893***	-0.127***	-0.0839***	-0.0549***	-0.0405***	-0.0574**
	(0.0347)	(0.0415)	(0.0298)	(0.0082)	(0.0155)	(0.0259)
(B) Int.Margin$_{t-1}$	-0.0044	-0.0195**	-0.0105	-0.0706***	-0.0311	-0.0451**
	(0.0112)	(0.00809)	(0.0091)	(0.0160)	(0.0211)	(0.0187)
(M) Turnover$_{t-1}$	-0.592*	-0.834**	-0.752***	-0.0387	-0.0535	-0.0447
	(0.309)	(0.346)	(0.261)	(0.0340)	(0.0467)	(0.0383)
(M) Turnover$^2_{t-1}$	0.0643*	0.0896**	0.0809***	0.00794	0.0105	0.0066
	(0.0342)	(0.0397)	(0.0294)	(0.0060)	(0.0077)	(0.0067)
(M) Capitalization$_{t-1}$	0.0035	0.0001	-0.0046	-0.0311*	-0.0773**	-0.0551*
	(0.0204)	(0.0208)	(0.0204)	(0.0164)	(0.0336)	(0.0325)
Inflation$_{t-1}$		-0.0441***	-0.0358***		-0.0299**	-0.0241**
		(0.0141)	(0.0114)		(0.0136)	(0.0121)
Deficit$_{t-1}$		0.0066*	0.0027		-0.0050	-0.0034
		(0.0037)	(0.0021)		(0.0043)	(0.0039)
Openness$_{t-1}$		0.0001	0.0004		0.0012	0.0014*
		(0.0010)	(0.0009)		(0.0008)	(0.0008)
Education$_{t-1}$			0.150*			-0.0105
			(0.0776)			(0.0598)
Institutions$_{t-1}$			0.0562			0.119
			(0.0411)			(0.0742)
N. Observations	100	95	95	123	99	99
N. Instruments	31	34	36	31	34	36
adj. R^2	0.205	0.334	0.896	0.842	0.526	0.894
p-value Hansen	0.767	0.873	0.941	0.302	0.951	0.978
p-value Dif.-Hansen (inst. levels)	0.991	0.179	0.211	0.206	1.000	1.000
p-value AR(1)	0.153	0.586	0.634	0.015	0.302	0.292
p-value AR(2)	0.654	0.319	0.145	0.327	0.113	0.127

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
(D) Developed Countries
(E) Emerging Countries
This table shows the regression outputs using both subsamples individually. Columns (1) to (3) show results for the subsample of developed countries while columns (4) to (6) show results for the subsample of emerging markets. The regressions are run with a slightly smaller subsample where outliers have been removed. Countries with a population lower than 2 million inhabitants and the top/bottom 10% observations according to openness to trade have been removed from the sample.

Table 13: Regression with Crisis Dummy

$GDPGrowth_t$	(1)	(2)	(3)	(4)
	(D)	(D)	(E)	(E)
GDPGrowth$_{t-1}$	0.106	0.111	-0.0813	-0.194
	(0.0990)	(0.0969)	(0.152)	(0.136)
(B) Credit$_{t-1}$	0.143***	0.146***	0.276***	0.275***
	(0.0426)	(0.0439)	(0.0617)	(0.0639)
(B) Credit$^2_{t-1}$	-0.0212***	-0.0216***	-0.0466***	-0.0460***
	(0.0062)	(0.0066)	(0.0102)	(0.0105)
(B) Int.Margin$_{t-1}$	-0.0111	-0.0107	-0.0968***	-0.0948***
	(0.0077)	(0.0083)	(0.0195)	(0.0192)
(M) Turnover$_{t-1}$	0.0424*	0.0430*	0.0050	0.0166
	(0.0233)	(0.0232)	(0.0239)	(0.0191)
(M) Turnover$^2_{t-1}$	-0.0111***	-0.0115***	-0.0001	-0.0014
	(0.0041)	(0.0042)	(0.0035)	(0.0030)
(M) Capitalization$_{t-1}$	-0.0218	-0.0220	-0.0549***	-0.0622***
	(0.0159)	(0.0160)	(0.0163)	(0.0210)
Crisis Dummy		0.00254		0.0181
		(0.0094)		(0.0166)
Inflation$_{t-1}$	-0.0421***	-0.0424***	-0.0078	-0.0075
	(0.0109)	(0.0108)	(0.0210)	(0.0207)
Deficit$_{t-1}$	0.0018	0.0018	-0.0012	-0.0011
	(0.0036)	(0.0035)	(0.0012)	(0.0012)
Openness$_{t-1}$	-0.0001	-0.0001	0.0002	0.0003
	(0.0002)	(0.0002)	(0.0006)	(0.0006)
N. Observations	136	136	144	144
N. Instruments	52	53	52	53
adj. R^2	0.540	0.737	0.556	0.636
p-value Hansen	0.990	0.995	0.857	0.877
p-value Dif.-Hansen (inst. levels)	1.000	1.000	1.000	0.997
p-value AR(1)	0.054	0.104	0.138	0.220
p-value AR(2)	0.256	0.239	0.883	0.924

Note: Credit, Int.Margin, Turnover, Capitalization and Inflation are logged values
Standard errors are in parentheses
p-value: ***<0.01 **<0.05 *<0.1
(B) Bank Variable
(M) Market Variable
(D) Developed Countries
(E) Emerging Countries
This table shows the regression outputs using both subsamples individually. Columns (1) and (2) show results for the subsample of developed countries while columns (3) and (4) show results for the subsample of emerging markets. Regressions are run with an included crisis dummy for the financial crisis of 2007-2009.

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