# Impact of Financial Development on Economic growth

## *Evidence from Latin America*

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# Abstract

In this thesis I analyze the relationship between financial development and economic growth in Latin America. The main objective is to find evidence of the supply-leading phenomenon in the region. The financial sector is expected to influence economic growth through its main functions that facilitate business transactions that have a positive impact on economic growth. The analysis is conducted with growth equations including two different financial development indicators estimated by the fixed effects model and its extension including instrumental variables. The issue of endogeneity is corrected for, which then allows for the proper analysis of the impact and causal relationship between economic growth and financial development in the Latin American countries. Data from the developing countries in Latin America and developed countries of the OECD are used in the estimations allowing for comparisons between the two. The findings of this study suggest that there is no considerable support for the supply-leading phenomenon in the region which indicates a case for the demand-following phenomenon in Latin America. This slightly differs from the findings for the developed countries where more support is found for the supply-leading phenomenon. Moreover, the two different financial development indicators point towards the opposite conclusion regarding the relationship between financial development and economic growth.



Keywords: Financial development, economic growth, supply-leading phenomenon

# Chapter 1 Introduction

The financial sector of a country is rarely mentioned as one of the major areas of improvement for a country's overall development. Simple transactions such as the payment of bills due occurs probably through the financial sector. Other more complex transactions where the financial sector is crucial for are business transactions and investments that occur through the financial sector. Here is where the most impact could be inflicted by the financial sector's development on the growth of the economy (Levine, 1997).

The events in 2008 after the crash of the financial markets around the world and the added threat of much more distress gave national governments motivation to act. They provided buyouts larger than ever previously seen to prevent additional disasters in the financial markets that could show spillover effects over their domestic economies and trading partners' economies (Ivashina & Scharfstein, 2008). These actions of the governments reflected that the financial sector should not be ignored as it can surely impact a country's economy. The financial sector's development can assist in impeding its limitation to have negative effects on their domestic economies. Thus, the importance of the financial sector of developed countries for their economies is clear as they experienced a recession in the periods after the global financial crisis (Reinhart & Rogoff, 2009). There are understandable differences between developing and developed economies. It would be interesting to assess if these differences also account for the relationship between financial development and economic growth. The developing countries I chose to focus on are those located in Latin America. This particular group of countries has experienced a continued increase in the growth of their economies in the last decade. This was as a result of better policies aimed at improving macroeconomic conditions and the positive external conditions which were the surrounding markets (Sosa, Tsounta & Kim, 2013). According to Torre, Ize and Schmukler (2011) the financial sector in the Latin American countries has improved considerably. It would be interesting to know if financial development has an added value related to the growth of their economies.

The theory regarding the relationship between economic growth and financial development has its foundation from the main functions of the financial sector's influence on capital accumulation

and the development of technologies. The financial sector facilitates business transactions that contribute to the growth of economies (Levine, 1997). The development of the financial sector is considered as an improvement of its main functions or additionally the reduction of barriers set by national governments that have a negative impact on the amount of transactions conducted in the economy (McKinnon, 1973). The theory suggested by Patrick (1966) is usually used to describe the expectation about the causal relationship between economic growth and financial development. The supply-leading and the demand-following phenomena are described as the causal effect of the financial development increasing the economic growth and the economic growth increasing the financial development respectively.

Quite a few studies were previously conducted about financial development and its possible relationship with economic growth. Some studies focused separately on the causal relationship and the most common evidence is from a bidirectional causal relationship between the economic growth and the financial development of a country (Luintel & Khan, 1999; Khalifa Al-Yousif, 2002). The findings regarding the potential impact of financial development on economic growth differ where Odedokun (1994) and Dawson (2008) found that financial development plays a positive role in determining the economic growth. In contrast, Demetriades and Hussein (1996) and Shan (2005) concluded that financial development has no significant effect on economic growth. Xu (2000) and Ghirmay (2005) added more confusion on the subject by suggesting that the financial sector's development impact on economic growth cannot be ignored as it is vital.

Previous research conducted focusing on the Latin American region found support for both a negative and a positive impact of financial development on economic growth. Additionally, support was also found for both the supply-leading and the demand-following phenomena in the previous studies (De Gregorio, 1995; Blanco, 2009). This ambiguity in the results also provided some motivation to reassess the relationship in this region. The objective of this study is to identify if financial development has an impact on economic growth in Latin America. Also by making use of two different financial development indicators in the analysis of this relationship allows for either confirming or discrediting the notion that the results are influenced by which particular financial development indicators are used.

The methodology employed to analyze the problem at hand differed from the bivariate and the multivariate Granger causality tests which are often used in the previous studies that analyzed the relationship between financial development and economic growth. Data from 18 Latin American countries and data from 18 developed countries for comparison purposes were used to estimate panel regressions. I used a fixed effects model which controls for country effects for the estimation of the growth equations that were used to analyze the impact relationship between financial development and economic growth. An adjustment was made to account for the matter of the suspicion of financial development's endogeneity. This alleged endogeneity is based on the evidence found of the bidirectional causal relationship between financial development and economic growth from previous studies. Whether there is a case for the support of the supply-leading phenomenon was analyzed via the fixed effects models including instrumental variables that allowed for a one way causal relationship from financial development to economic growth.

The main findings of this study point out to some support for the supply-leading phenomenon even though not an overwhelming one. More support nevertheless was found for the demand-following phenomenon in the Latin American countries. The developed countries showed slightly more evidence of the supply-leading phenomenon suggesting that there may be indeed a difference in the relationship between financial development and economic growth for countries at different levels of development. The use of different financial development indicators has an influence on the results where depending on which financial development indicator is used the conclusion regarding the supply-leading phenomenon changes. Thus, the choice of financial development indicators should not be taken lightly.

The thesis is structured as follows; the next chapter describes the theoretical basis for the empirical tests and summarizes the outcome of several previously conducted studies regarding the subject. The third chapter includes the empirical specification, the description of the data and the chosen methodology used to investigate the relationship. Subsequently, in the fourth chapter I note the results including a robustness analysis. To finish, in the fifth chapter I conclude and note recommendations regarding the financial development and economic growth relationship for the Latin American region and I also note the limitations of this study.

# Chapter 2 Literature Review

This section is regarding the relevant theory and evidence typically referred to when assessing the relationship between financial development and economic growth. It starts with a description of economic growth and its possible sources and continues with an outline of theories about financial development and the possible association with economic growth. There is some focus on Latin American countries on the subject. Next, I outline several papers by highlighting the different methods used for analyzing these variables throughout the years. Finally, I summarize the most notable and relevant aspects of the theory and methods relating to this relationship.

## Economic Growth

Major strategic decisions and activities are carried out with the sole purpose of enhancing a country's economic growth. Substantial research is conducted to get a sense to what actually can cause a country's economy to experience a maintained growth spurt. The knowledge of the determinants of economic growth can specify areas where should be invested in by all stakeholders. Economic growth is a result of several different macroeconomic policies and institutional conditions of a country. The characteristics of the economic environment where companies engage in business transactions are determinant factors for the development of an economy (OECD, 2004).

The aggregate production function also referred to as the neoclassical production function developed by Solow (1957) is used to develop a source of growth equation. Total output (Y) is a function of technology (A) usually known as total factor productivity (TFP), physical capital (K) and labor (L). The way TFP enters the production function is known as Hicks-neutral where an increase in the level of technological progress has no impact on the marginal products of labor and capital (Ansari & Ahmed, 1998). Total output is the total production in a country which is usually approximated with the gross domestic product (GDP) (Kormendi & Meguire, 1985).

$$Y_t = A_t F(K_t, L_t) \quad (1)$$

Assume a Cobb Douglass function in the form of:

$$Y = A_t {K_t}^{\alpha} {L_t}^{\beta} \quad (2)$$

Taking natural logs and differencing with respect to time we get the equation in growth rates. This allows for analysis of the changes in output and the contribution of physical capital and labor to these developments. Basically changes in the level of physical capital and labor are expected to influence changes in output. Equation (3) states that the economic growth can in some part be explained by the growth of TFP, physical capital and labor. Here $\alpha$ and $\beta$ are elasticity measures of physical capital and labor with respect to the growth rate of the economy.

$$\dot{y}_t = \dot{a}_t + \alpha \dot{k}_t + \beta \dot{l}_t \quad (3)$$

This model is used in studies attempting to analyze the determinants of economic growth. The next step is usually estimating regression equations based on this model including other variables that may play a significant role for economic growth depending on theories and assumptions. The concept of economic growth is comprehensive and it is likely a result of several factors together with what the accumulation of physical capital and labor contribute. Certain variables that are included in the growth equation and have been found to influence economic growth either positively or negatively are the level of education, the government's involvement in the economy, trade openness, legal framework and political risk (Barro, 1996, 2003).

Studies aiming to analyze financial development's importance for economic growth use this model including a financial development variable (F) which represents that the development of the financial sector in some way can account for economic growth (Ansari & Ahmed, 1998; Odedokun, 1996; Dawson, 2008). The basic model including added control variables allow for capturing what financial development adds to economic growth, this while controlling for other likely contributors to economic growth. Equation (6), where $\theta$ is the elasticity measure of the financial development with respect to the economic growth, is crucial and it serves as basis for empirical tests.

$$Y_t = A_t F(K_t, L_t, F_t) \quad (4)$$

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} F_t^{\theta} \quad (5)$$

$$\dot{y}_t = \dot{a}_t + \alpha \dot{k}_t + \beta \dot{l}_t + \theta \dot{f}_t \quad (6)$$

## Development of the Financial Sector

The financial sector is part of the economic environment and provides a framework for carrying out several transactions. The financial sector consists according to the International Monetary Fund (2012) of the central bank, national banks, stock and securities markets, pension funds and insurers. The development of these financial institutions and their services is thought to be of great importance for a country's development.

Ang (2008) stated that financial institutions arise as a response to transaction and information costs in the market. Financial resources are supplied and demanded, respectively by savers and borrowers. The act of identifying suitable savers and borrowers is costly as the matching process without a trustworthy organization or individual to intermediate is complex. Individuals who are willing to invest encounter difficulties when attempting to identify credible investment projects. They are reluctant to invest before reaching reasonable agreements regarding future payouts, this process can be time consuming and expensive. Project leaders in need of funding therefore reach an impasse to accumulate the amount necessary for the successful advancement of their projects. With the use of financial institutions there is a great possibility of reducing these costs. The institutions that comprise the financial sector possess the ability to assist with the activities and reduce costs. The specific manner in which they reduce costs is through their functions.

The financial sector main functions according to Levine (1997) are the mobilization of savings that focuses on the collection of capital from savers intended for investments**.** This function is crucial as without the efficient mobilization of savings there would be a clear constraint in the way of the development of projects that depend on the access to these funds**.** Also, the financial institutions have the ability to evaluate investment projects and point out reliable and profitable investment opportunities. The use of financial institutions reduces the costs associated with the selection of possible future investments which then improves the allocation of resources. Additionally, costs are once more reduced through the use financial institutions that serve as a middle man to lessen costs to be incurred regarding the collection of information and related to corporate control activities after getting access to the resources. In addition, the financial sector assists with risk management. The access of investors to different financial resources enables the possibility of diversifying risk and this at a lower cost compared to other methods. Furthermore,

it helps in reducing complications for organizations and individuals that could arise when exchanging goods, services and financial contracts.

The functions of the financial sector have in common that their objective is to reduce the costs in activities that foster the accumulation of capital and new technologies. The development of the financial sector entails an improvement in the quality of the functions previously mentioned. The legal framework within which these services are provided also undergoes changes for example as a result of new regulatory rules mandated by the government and these are also taken into account. According to Levine (2005) modifications in the legal framework could influence the quantity and quality of the financial services and institutions.

Ahmed and Ansari (1998) indicated that financial development can refer to financial widening and financial deepening. The first term entails the increasing amount of financial services and financial institutions available in a country. The second term is when there is an increase of financial services and institutions per capita or an increase in the ratio of financial assets to income. Financial development is also referred to as financial liberalization. McKinnon (1973) described it as the act of minimizing distortions in the financial system. For example, prices of the financial services provided by the financial institutions should be left up to the market mechanism as those set by national authorities tend to be either overpriced or underpriced. The incorrect pricing hampers the proper functioning of the financial markets. These distortions are obstacles that clearly stand in the way of the development of the financial sector. As a result of these distortions in the market, the amount of savings and capital accumulation decrease. This has direct negative effects on the allocation of resources and it is not done efficiently. These issues suggest that with financial liberalization, market transactions in the financial sector will improve.

The financial sector's fundamental role in the economy is becoming undeniable through the years. Its functions' crucial part in reducing investment costs contributes directly and indirectly to the development of the economy as a whole. Specifically, it is expected that the benefits of having a well-developed financial sector could positively influence the development of an economy.

## Financial Sector Interaction with Economic Growth

The expectation is that the financial sector is related to the economic growth through the belief that it is essential in providing funds for capital accumulation and the development of innovative technologies. The accumulation of capital and these technologies are fundamental drivers of the growth of an economy. The improved or worsened characteristics of the financial sector could have an effect on economic growth (OECD, 2004). Another major organization, the IMF (2004), state that a dysfunctional financial sector can have effects on the function of the economy. It can destabilize the expected effect of the chosen monetary policy, have an expansionary effect on economic recessions and significant costs are incurred by the government when trying to save financial institutions in financial distress. Moreover, the interdependence of countries through finance and trade indicate that the financial crisis can have spill-over effects which were evident after the latest financial crisis. For the reasons mentioned above the well-functioning of the financial sector is essential for economic and financial stability.

The notable effects of financial development are the decrease of investing and saving transaction costs as stated by Zingales (1996). This implies that the cost of capital is reduced in the domestic economy. The financial sector assists in selection procedures by minimizing moral hazard and adverse selection difficulties for companies. Transactions are conducted through the financial institutions with the goal of channeling savings into profitable investments. These investments support and lead to economic growth (Lynch, 1996). The development of the financial sector is encouraged as one of the drivers of economic efficiency by multinational agencies and national governments.

That there is a relationship between the growth of an economy and the development of the financial sector may be clear but another issue arises where if in fact financial development may lead to economic growth. This implies a causal relationship, which could either be that financial development promotes economic growth or the opposite where economic growth promotes financial development. The direction of the relationship could influence policies that are chosen by local authorities. This is specifically one of the main reasons why so much time is vested in trying to point out which one it is.

Patrick (1966) named the case where financial development promotes economic growth as the supply-leading and the reverse as the demand-following phenomena. He explained further that the demand–following phenomenon indicates that the financial sector develops in response to the demands of the population for financial services. Thus, the development of financial services available in the economy is a reaction to what is demanded by borrowers, investors and savers of the population. This reflects that the financial sector is modeled after the behavior of economic growth. This approach suggests that the financial sector is not a proactive factor in economic growth, however it is the opposite and just manifests where the demand lies.

Furthermore, Patrick (1966) acknowledged the supply-leading phenomenon by referring to it as the development of the financial sector before the actual demand from the population. The role that the financial development can play according to this view is vital at the beginning of the process. It provides a chance to stimulate growth with the aid of financial institutions. The establishment of financial institutions and their financial services will serve as stimulation for their use by the population to save and invest. This will in turn lead to economic growth. Therefore, the supply of financial services by these financial institutions will stimulate economic transactions that can lead to economic growth.

Patrick (1966) also pointed toward the possibility where the demand-following and supply-leading phenomena would interact in practice. He suggested that an interaction between the two is expected as the market is not static and these two views can change at any point in time as a reaction to developments in the market transactions. The order in which these would interact is where supply-leading would be followed by demand-following. The reason behind this order is with the supply-leading financial institutions start up the growth process, as more transactions are conducted and more consumers become involved, there will be an alteration to where financial transactions are demanded. Here the shift is observed from supply-leading to demand-following, from financial development leading economic growth to economic growth leading financial development.

## The Case of Latin America

The Latin American financial systems have been characterized by Stallings and Studart (2006) as bank-based systems. These systems are set apart by the important role played by banks and the negligible part played by capital markets for example bond markets and stock markets. Advantages of bank-based system as explained by Diamond (1984) are that it improves the allocation of resources and the ability of exercising corporate control is also enhanced. This is accomplished through the use of banks who aid in reducing costs involved in monitoring and selection procedures of firms and managers. Stulz (2000) advocated that banks assist local companies that are in need of funding by phase of production by giving them access to external resources. Banks and entrepreneurs engage in long term relationships where the banks commit to give access to financial resources for future stages of the projects.

A shortcoming of these bank-based systems mentioned by Rajan (1996) is that the role played by the banks comes with significant market power that hinders the market mechanism to function properly. Companies' expected profits from investments decrease considerably by the share that belongs to the banks. Their motivation to pursue profitable investments along with lower expected profits decreases considerably. In the absence of these projects there is a significant shortage in a notable contribution to economic growth. Another shortcoming pointed out by Rajan and Zingales (2001) is that the market economy might lack efficiency where prices do not accurately reflect the costs. Specifically, banks might continue to finance projects based on biased expectations.

A study conducted by Arestes, Demetriades and Luintel (2001) attempted to back up the preference of one system over the other when it comes to exhibiting more influence on economic growth. Developed countries typically have market-based financial systems. They provide the perfect setting to compare the expected effect of market-based and bank-based financial systems on economic growth. Their results from 10 developing countries indicate that bank-based systems compared to market-based systems have a more significant impact on economic growth. On the other hand, Ndikumana (2005) suggested that the two systems are complements rather than substitutes. The results of the sample of 99 countries while controlling for country-specific

factors showed that the structure of the financial system has no influence on the level of impact of financial development on economic growth.

The expectation of financial liberalization having a positive impact on economic growth did not come through for Latin American countries. Gregorio and Guidotti (1995) investigated the relationship between the two variables for Latin American countries around 1970's and 1980's. They used panel data and growth equations including the credit level as the measurement of financial liberalization. The results indicated that financial liberalization and economic growth had a negative relationship for Latin American countries in that period. Thus, the elimination of barriers in the financial markets does not have a positive impact on economic growth. They considered that the cause of the negative effect was that the process of financial liberalization without proper regulatory framework can impede the expected positive effects and even further lead to a financial crisis. Alternatively, a study by Bittencourt (2012**)** that covered four major countries in Latin America for the period of 1980-2007 did support the positive role of financial development for economic growth in that region. However, this was achieved after controlling for notable macroeconomic conditions such as government involvement in the economy and trade openness. He noted that the positive role could have been enhanced if the national governments took better control and avoided the hyperinflationary periods that the countries experienced by having their institutional framework at that time improved.

The Latin American region went through some severe financial crises during the eighties and the nineties. These crises, as any other significant financial crisis, had any significant negative impact on the growth of the domestic economies. After these development actions were taken with the goal to reduce the chances of these disturbances to happen again. The financial sector in the Latin American countries has become more reliable through more variety and depth. They experienced an increase in available banking systems and a development of the local currency bond markets and stock markets. The financial sector is thought to be more differentiated and complex emphasizing that institutional investors have become more significant compared with banks. The dependability and resilient feature of the financial sector for the majority of the countries is apparent from their reaction to the recent financial crises where they managed it quite well (De la Torre, Ize & Schmukler, 2011).

## Evidence on Economic Growth and Financial Development

The theory suggests that there is a relationship between financial development and economic growth. This in essence is that development of the financial sector should have an influence on economic growth. Furthermore, the theory proposes that an improvement in the financial services provided by the financial institutions could lead to even more growth of the economy or the opposite where economic growth would be the driver behind the development of the financial sector.

Several studies were conducted attempting to find empirical proof for these ideas. The studies are aimed at analyzing the causal and impact relationship and some researchers add the long run view to their study by also analyzing a possible cointegrating relationship. The most recent studies employ panel data to test these hypotheses. A clear shift is seen from using cross-sectional data to using time series data in the analyses. This shift is a consequence of advantages of panel data according to Levine, Loayza and Beck (2000) that are that it allows for analyzing the financial development effect on economic growth through time for the countries. Cross-sectional regressions tend to exhibit biased coefficient estimates, which indicate the presence of unobserved country-specific effects that are captured in the error term. Panel data estimations are considered superior because they control for unobserved country specific estimations. The coefficient estimates are found to be more accurate. The use of panel data also allows for comparisons between groups which are defined by income level or location.

### *Measurement financial development*

The choice for the financial development variable in the relevant studies varies depending on the countries and regions included in the study. The type of the financial system in a country, market-based or bank-based financial systems, can be used as guidance to which financial development indicators should be included in the analysis. For instance, when it is obvious that the countries' financial sector are market-based systems then an indicator capturing stock and bond market development are included along with the usual indicators capturing the performance of bank-based systems. The amount of financial development indicators chosen also differs across the studies. Some researchers qualify that one variable is sufficient to capture the expected effect of financial development in the economy. Others believe that one indicator may not

properly capture the level of the financial development in the country and decide to use more than one indicator and aggregate them into one comprehensive indicator. Another option is to make use of more than one indicator and used them to test whether having different financial development measurement variables can influence the results. Some measurement variables that are common to several studies are the amount of credit in the economy and the relative amount of liquid liabilities, in some cases they are chosen as sole indicator of financial development in a country. These two indicators measure the depth and size of the financial sector. (Gregorio & Guidetti, 1995; see also Khadraoui & Smida, 2012).

***Impact relationship***

Many researchers estimate equations to determine if a particular variable has an impact on the dependent variable. In the relevant studies a financial development variable is included as an independent variable. This is in order to analyze the impact of the development of the financial sector on economic growth, the dependent variable. The significance of the coefficient of the financial development variable in these equations provides clarifications on if and what financial development contributes to economic growth. The hypothesis of financial development not having an impact on economic growth is widely rejected by several studies comprising of different sample sizes, methodologies and time span.

For instance, Odedukon (1994) estimated growth equations with Ordinary Least Squares (OLS) and Generalized Least Squares method to correct for autocorrelation when necessary. He found that financial development plays a positive role in determining the economic growth using data from 71 least developing countries covering the period 1964-1989. Furthermore, the equation estimates provided support for financial development's equal importance to economic growth compared with other determinants of growth such as trade openness and investment share of the economy. This contradicts the belief by some that financial development's contribution to economic growth is considered negligible. Additionally, Khan and Senhadji (2003) noted that financial development has an impact on economic growth for 159 developing and industrial countries covering the 1960-1999 period. The growth equations were also estimated by OLS method for cross-section data and Two Stage Least Squares (TSLS) method for panel data. In

addition, they advise caution when choosing financial development indicators as each indicator can display a different size effect on economic growth.

Instead of using one growth equation, Dawson's (2008) analysis was conducted with the use of three different growth equations. Two of the growth equations were derived from the theory of Solow (1956) and included an investment share in the economy, the level of physical capital and the level of labor as control variables. Each equation included a different financial development measurement variable. The first equation includes a growth rate of the financial development which is the growth rate of credit and the second equation includes the share of the credit in the economy used as a proxy for its growth rate. These two equations are proved to be empirically superior to the third equation which was not theoretically consistent. The results show that financial development has an impact on economic growth from panel data estimations for a group of 44 developing countries covering 1974-2001.

Khadraoui and Smida (2012) using panel data for 70 developing and developed countries over the period of 1970-2009 estimated equations by the usual OLS, but also used the generalized method of moments in difference and in system estimators for dynamic panel data. Their results provided support for the notion of financial development's positive impact on economic growth with the use of five different measures of financial development that included two variables that capture the credit level in the economy, liquid liabilities, market capitalization size and financial system assets to GDP. Even with the use of a diverse choice of financial development indicators, they still managed to conclude that financial development has a positive impact on economic growth.

***Causal relationship***

Studies that attempt to analyze the causal relationship between the variables have failed to provide unanimous support for a single hypothesis. The empirical method employed in most of the studies is the Granger causality test. These tests employ a bivariate test framework. Some studies' methodology is centered on estimating the equations in vector auto-regression (VAR) framework and from there the causal relation is deduced. The objective of verifying financial development's importance to economic growth has not been fulfilled by many as the common

result of previously conducted research is a bidirectional relationship between economic growth and financial development. It only clarifies that there certainly is a causal relationship but the direction is not one way, this hampers the ability of researchers to influence national policies toward investing in the development of their financial sector with the promise of economic growth as a result.

For instance, the study conducted by Hussein and Demetriades (1996) failed to find strong support for financial development's role in leading to economic growth for 16 developing countries using a Granger causality test. They made use of two different measures of financial development, which were both attempting to capture the level of financial intermediation in the economy. Their conclusion was overwhelming support for bi-directionality and some for reverse causation from their sample. Similarly, Khalifa Al-Yousif (2002) does not find convincing support for neither supply-leading nor demand-following phenomena using Granger causality tests in an error correction model. His different methodological approach is an attempt to deal with the misspecification problem of models used in the studies analyzing the two variables. He found vast proof of a bidirectional relationship between financial development and economic growth using panel data covering 30 developing countries for the period of 1970-1999.

Then again, Christopoulos and Tsionas (2004) did find support for one of the hypotheses, the supply-leading. Their method of choice was threshold panel cointegration tests. The threshold is included as the level where financial development begins to have an effect on economic growth. As the level of financial development in a country increases and reaches the threshold, then there is a case of financial development having an impact on economic growth. Their test outcomes suggest a one way causality relationship between financial development and economic growth, a unidirectional relationship from financial development to economic growth. Moreover, their data exhibited a cointegrating relationship between the variables using panel data comprising 10 developing countries for the period 1970-2000.

Developments in the methods of analyzing relationships have led to the next step in testing the causal relationship from pairwise causality tests for testing the whole relationship in a VAR framework. This entails estimating the financial development, economic growth and its control

variables in a multivariate model. The choice for analyzing a relationship in a VAR framework is motivated by possible dynamic interrelationship between the variables (Verbeek, 2008). The preference is to analyze macroeconomic variables in a VAR setting, this as a response to the expected dynamic relationship between the respective variables. In the study of economic growth and financial development, theory suggests that they exhibit a dynamic relationship where both the supply-leading and demand-following hypotheses are possible.

Luintel and Khan's (1999) decision to assess the relationship in a multivariate VAR followed from their understanding shortcomings of cross-country regressions and bivariate causality tests. Their method corrects for miss-specification problems and single equation bias from using bivariate tests is also removed. They also found support for the bidirectional causality from the sample employed. It is relevant to note that they found support for the same direction of the relationship in all 10 developing countries in their sample, which is quite uncommon result in studies of the causal association between the two variables.

Additionally, Gries, Kraft and Meierrieks (2011) contributed to the results of rejecting the notion of financial development leading to economic growth with a sample of 13 developing countries covering the period 1960-2003 for the majority of the countries. They found support for the majority of the countries for the demand-following hypothesis. Adapted Granger causality tests in a VAR and an error correction model framework were used that allowed for different lags of the variables included in the model. They included three variables in the model specification, trade openness together with financial development and economic growth. Regarding the connection between the financial sector and trade they failed to find compelling support for this relationship in promoting economic growth.

Another study that did not succeed in providing support for the supply-leading hypothesis was conducted by Shan, Morris and Sun (2001). The hypothesis that financial development leads economic growth is rejected with their sample of 10 developed countries for a time span of at least 12 years. They test both the demand-following and supply-leading hypotheses with the use of VAR that allows for controlling for possible effects of other variables that can influence both the economic growth and financial development variables. They also found evidence of a

bidirectional relationship in five countries and three countries show evidence of reverse causation. On the other hand, Xu's (2000) study used data from 41 developing countries covering the period 1960-1993 in a multivariate VAR framework and he discredits the notion that financial is trivial to economic growth. The choice for analyzing the relationship in a VAR framework allows for detection of long run total effects of financial development on economic growth through the dynamic interactions. The level of domestic investment is included in the estimation as a control variable. He concluded further that financial development is crucial for economic growth and that through investments is where the most value is added from financial development to economic growth.

An additional study by Blanco (2009) indicated no support for the supply-leading hypothesis. The analysis was carried out using both a bivariate VAR and a multivariate VAR. The option to perform the causality tests additionally in the multivariate VAR is to account for the possibility of omitted variable bias in the bivariate VAR. Evidence is found for the demand-following hypothesis for 18 countries in Latin America for the period 1962-2005. This result is supported with the use of three financial development measurements. In order to understand this result further the sample was divided by income levels and quality of the domestic institutional framework. The results from tests conducted on these groups exhibited a bidirectional causality relationship for the middle income countries and countries with a high quality institutional framework.

Shan (2005) conducted an assessment of financial development and economic growth that similarly provided no conclusive support for the supply-leading hypothesis in the period of 1985-1998. If indeed the association between the two variables can be described from a causality point of view the strength and direction is not unanimous for a group of countries. His sample consisted of 10 OECD countries and China. The results were obtained from a VAR framework using total credit as the sole measurement of financial development. They propose that financial development is not one of the main drivers of economic growth as suggested by many but just a contributing factor. Instead, Ghirmay (2004) results highlighted the case of the supply-leading phenomenon in eight countries. He also concluded that there is a co-integrating relationship between the two variables with the use of 13 developing countries over a time span of at least 30

years. The relationship was investigated in a VAR framework together with cointegration tests and the error correction model. This supports the policy that developing countries should improve their financial sector institutions and expect this to have an increase in the growth of their economies as a response. Evidence is again found for a bi-directional causal relationship in six countries from the sample.

The importance of economic growth leads to the curiosity of finding out its determinants and whether the development of the financial sector could be one of them. The financial sector adds value to the economy in the form of decreasing transaction and information costs associated with carrying out investments. The financial sector of the Latin American countries has undergone some improvement over the years but the impact of this development on economic growth is unclear. The relationship of financial development and economic growth is analyzed mostly via causality tests and growth equations. The studies concur that financial development has a positive impact on economic growth. In regards to the causality, the most common result of previous research studies with different methodologies is that both the demand-following and supply-leading phenomena are observed from the data. It points out to a clear causal relationship between financial development and economic growth. The aim of this study is assessing the relationship for the Latin American region comprised of developing countries. I intend to identify possible causal and impact relationships between the two variables and attempt to find evidence in favor of the supply-leading phenomenon.

# Chapter 3 Methodology

This section outlines the empirical specification, the data and the estimators used to find evidence for the supply-leading phenomenon in Latin America. To begin with, I describe the empirical specification with a start off point the Solow growth model mentioned in the literature review chapter. Next, I mention and define the financial development indicators I chose for this study. The other relevant variables included in the analysis are described. After that, I explain the fixed effects model and its extension including instrumental variables correcting for endogeneity that I used in the analysis.

## Empirical Specification

In contrast to the preference shown in previous research for studying the relationship between financial development and economic growth with Granger causality tests in either a bivariate or multivariate framework, I choose to analyze the relationship with a fixed effects model with instrumental variables. By estimating the growth equations with fixed effects, I will be able to identify if there is any impact of financial development on economic growth while controlling for country effects. The reason for using the instrumental variables is that they are a method for controlling for endogeneity and making it possible to conclude in which direction the causal relationship is. Given that the purpose of this thesis is to find evidence of the supply-leading phenomenon which indicates that the causal relationship should be from financial development leading economic growth.

$$\dot{y}_t = \dot{a}_t + \alpha\dot{k}_t + \beta\dot{l}_t + \theta\dot{f}_t \qquad (6)$$

For the analysis equation (6) which states that the growth of output also referred to as economic growth can be explained by the growth of TFP, the growth of physical capital, the growth of labor and the growth of financial development. First two control variables whose motivation for being chosen are explained in the next section, (G) for the government's involvement in the economy and (TO) for a country's trade openness, are added to the equation along with labor, physical capital and the financial development variables. The growth of the government's involvement in the economy and the growth of a country's openness to trade are variables that

are expected to have an influence on economic growth. Thus, in total five explanatory variables are included in the model. These are expected to have some influence on economic growth. In regards to this study, the TFP is considered as part of the residual also known in these sources of growth equations as the Solow Residual. The Solow Residual captures all the unexplained contributions of other sources of economic growth that cannot be identified. Several other factors in a country could have an impact on economic growth. There are several sources of growth that for research purposes cannot reliably be quantified. These are then captured in the error term, which is the unexplained part in economic growth. After the inclusion of the two control variables, government's involvement in the economy (G) and a country's trade openness (TO), the error term which includes the TFP and replacing the elasticity measures with $\beta$'s we get the following:

$$\dot{y}_t = \beta_1 \dot{k}_t + \beta_2 \dot{l}_t + \beta_3 \dot{f}_t + \beta_4 \dot{g}_t + \beta_5 \dot{to}_t + \varepsilon_t \quad (7)$$

In the equation (7) there is the economic growth which is explained by the growth rate of several variables. These include the growth rate of physical capital, the growth rate of labor, the growth rate of financial development, the growth rate of the government's involvement in the economy, the growth rate of a country's openness to trade and the error term that captures the unexplained part of economic growth including in this case TFP.

## Data

Subsequently, I continue with a description of the data and relevant motivation for the chosen explanatory variables. The sample consists of 18 countries classified in the group of Latin American countries by the World Bank. The sample also includes a group of 18 OECD countries which are of course developed countries to use in the comparison process (see appendix table 9). The time frame employed in this study is 1980-2011. All the annual data were collected from the World Bank databases. The economic growth is measured by the growth rates of real GDP per capita and real GNI per capita. Gross National Income (GNI) is considered as GDP plus receipts from abroad for investment owned by the domestic population minus receipts owed to foreigners from their investment in the domestic economy. Its use can be seen as complementary where it is

a more comprehensive account of a country's income and therefore more suitable for comparing countries income level (Bowen, Hollander & Viaene, 2012). Nonetheless, the use of GNI is limited by the availability of data for the countries included in the sample.

As seen from the literature review the choice of measurements of financial development differs between the studies and the different financial development indicators can have an impact on the results (see Khan & Senhadji, 2003; McCaig & Stengos, 2005). In this study I chose to use two different financial development indicators. I believe that they can truly capture the level of development of the financial sector and also the use of two financial development indicators allows for a comparison of the two financial development indicators on the results. The countries in the sample are considered developing countries and have mostly bank-based financial systems and this provided a starting point for the choice of financial development indicators (Stallings & Studdart, 2006).

The first financial development indicator I use is the growth rate of the *ratio of broad money to GDP (G_M2).* This ratio shows the extent of monetization as any other monetary aggregate. The narrowest version of these, the M1, is considered that they fail to capture the effect of the functions of the financial sector on the growth of an economy (Calderón & Lui, 2003). Instead, the use of a broader version of monetary aggregates is advocated by many as the ratio quantifies the size of the financial sector of an economy where money is used for paying and saving purposes (Kar & Pentecost, 2000; Khalifa Al-Yousif, 2002) The ratio also refers to the financial deepening where an increase in the ratio resembles somewhat the increase in financial services in the economy (Odhiambo, 2008). It includes bank deposits that finance credit thus it represents the degree of financial intermediation in the economy (Lynch, 1996).

The second financial development indicator is the growth rate of *the ratio of domestic credit to the private sector to GDP (G_DCPS).* This ratio represents the section of financial development measuring the activity of financial intermediaries where they channel resources from savers to borrowers (Bittencourt, 2012; Beck, Demirguc-Kunt & Levine, 2000). The credit to the public sector is not included so this ratio then represents the actions carried out by the private market participants. Recalling that this function reduces the costs involved in investments for the

population, the increase in this ratio implies a direct impact on the level of investments. It then captures directly the financial sector expected impact on economic growth (De Gregorio & Guidetti, 1995; Khan & Senhadji, 2003). This ratio captures one activity of several from the financial sector which could be considered a weakness, but its impact in developing countries where it can capture the fact that domestic credit is widely used for financing local company's investments. These investments enhance productivity that lead to economic growth indicate that it still is a valuable measurement of financial development (Ghirmay, 2004; King & Levine, 1993).

The other explanatory variables were selected following the literature regarding determinants of economic growth and the availability of data (De Gregorio, 1992; De Gregorio & Guidetti, 1995; Blanco, 2009; Bittencourt 2012). Physical capital and labor are included following the Solow growth model and the government's involvement in the economy and a country's trade openness are included additionally to capture some of the unexplained part of economic growth.

One of the most significant contributors to economic growth is the capital accumulation. This is captured with the growth rate of *physical capital (G_INV)* which is measured as the growth rate of the share of gross capital formation of GDP. This is expected to have a positive relationship with economic growth. Physical capital also known as investment is considered crucial for the growth of output as it assists in several ways to increasing the level of output and therefore economic growth. Also, the increase of the productivity of workers through the more physical capital in the form of better machines for productions that leads to lower costs of production which can lead to an increase in the amount of production and total output in the economy (Morgan, 1969) . An increase in the investment level can impact the level of productive labor and this added value in facilitating and enhancing the production level leads to economic growth (Swan, 1956).

In addition, the growth rate of *labor (G_POP)* is another major factor that has shown to have an impact on countries' economic growth. It is measured with the growth rate of the population level following Ansari and Ahmed (1998). In the Cobb-Douglas production function derived from the Solow growth model, an interaction between the levels of labor and physical capital

leads to production. The workers use the physical capital that is at their disposal in their daily duties to produce goods and provide services. This way labor exercises influence on the level of output and therefore economic growth. The growth rate of labor is expected to have a negative relationship with economic growth (Mankiw, Romer & Weil, 1992). An increase in the growth rate of labor (G_POP) which is an increase in the population implies that the available physical capital in the domestic economy must now be spread between more individuals (Barro, 1996). It is therefore decreasing economic growth (G_GDP) which is measured per capita.

Additionally, national governments can impact economic growth of their countries. Decisions made by them can influence business transactions in their domestic economic environment. The growth rate of *the government's involvement in the economy (G_GOV,)* which is one of the two control variables, is used in the attempt to capture some of the impact of the government's involvement in the economy. This is measured with the growth rate of the share of general government consumption expenditure of GDP (Ergungor, 2004). It includes the costs of products and services acquired by the government. Salaries of employees in the service of the government and expenses for national security and defense excluding military related costs are also included in this expenditure. An increase in government rules and regulations are expected to have a negative relationship with economic growth. The government can through its policies, exercise significant influence on the economic environment. Measures such as an increase in corporate income tax taken following taxation policies can have a negative impact on business transactions in the economy. Moreover, government spending is seen sometimes as decreasing productivity of the domestic market instead of enhancing it for example with policies regarding international trade that can have opposite effects reducing economic growth (Barro, 1996).

Finally, the growth rate of *the degree of the country's openness to trade (G_TO)* is the other control variable chosen and it is expected to positively influence the level of economic growth (Khadraoiuh & Smida, 2012; Bittencourt, 2012). It is measured as the growth rate of the share of exports plus imports to GDP (Moral-Benito, 2009). There are gains of engaging in international trade signifying the mutual engagement in trading products and services between countries will lead to benefits for every country involved captured in the growth of their economies. However, certain groups within the engaging countries can also lose. A country's openness to trade may

influence the domestic distribution of income where there are winners and losers from trade. The relevant part here is with the redistribution of the gains of trade where the losers of trade can be compensated and therefore allowing the final result to be a positive one for the economy as a whole (Krugman & Obstfelt, 2009)

## Estimators

Next, I describe the two estimators, fixed effects and fixed effects with instrumental variables, used in the analysis.

### *Fixed effects (FE) model*

This model is used to analyze the impact of variables over time. It analyzes the relationship between the explanatory variables and the dependent variable within a cross-section, in this case a country. The sample consists of several cross-sections, 18 countries to be exact in this analysis. It is quite reasonable that individual characteristics of each cross-section could and will influence the dependent variable. This influence creates bias on the dependent variable and the coefficient estimates if not taken into account. This is corrected for by introducing fixed effects in the OLS estimation. Equation (7) which includes the economic growth as the dependent variable, and the growth rates of the five variables as the independent variables, this equation is transformed to include the fixed effects resulting in equation (8).

$$y_{it} = a_i + \dot{X}_{it}\beta + \varepsilon_{it} \qquad \varepsilon_{it} \sim (0, \sigma^2) \tag{8}$$

The intercept term $a_i$ is varies per cross-section but not per time. It captures all observable and unobservable time-invariant differences across the individual countries. $y_{it}$ is the dependent variable economic growth. $\dot{X}_{it}$ is a vector of the explanatory variables which include the growth rate of the financial development indicators, growth rate of broad money as share of GDP (G_M2) or the growth rate of the ratio of the domestic credit to the private sector as share of GDP (G_DCPS). The vector includes also the growth rates of the other explanatory variables, growth rate of physical capital (G_INV), growth rate of labor (G_POP), the growth rate of the

government's involvement in the economy (G_GOV) and the country's openness to trade (G_TO).

Equation (8) is supposed to serve for analyzing the impact of financial development on economic growth. However, finding evidence for the supply-leading phenomenon necessitates one more adjustment in order to be certain that the estimation is capturing the desired relationship from financial development influencing economic growth and not the opposite. This is possible when correcting for endogeneity with instrumental variables.

***Instrumental variables***

In order for the equation (8) to provide consistent and unbiased coefficients a key requirement is that the explanatory variables should be exogenous [ E ($\varepsilon_{it}X_{it}$)=0] . The use of instrumental variables (IV) is suggested to correct for the correlation between the independent variables and the error term and reduce the bias on the estimated coefficients induced by endogeneity. The independent variables should not be correlated with the error term as this implies a bi-directional causal relationship between the independent variables and the dependent variable.

Quite some evidence is found of the bi-directional causality relationship between financial development and economic growth in the previous studies (see Hussein & Demetriades, 1996; Luintel & Khan, 1999; Khalifa Al-Yousif, 2002; Shan, Morris & Sun, 2001). This suggests that the estimation of the growth equations based solely on the supply-leading phenomenon without correcting for the endogeneity of the financial development's variable would have as a result biased and inconsistent coefficients. The financial development's variable endogeneity brings along shortcomings to the growth equations if not properly controlled for. A case can also be made for the endogeneity of the other explanatory variables. If this is so this must also be controlled for.

When the independent variables $X_{it}$are correlated with the error term $\varepsilon_{it}$, they are considered endogenous. In order to correct for this endogeneity the option is to find other variables $Z_{it}$ that are correlated with the independent variables $X_{it}$ but not correlated with the error term $\varepsilon_{it}$, these variables are then considered exogenous.

$$X_{it} = a_i + Z_{it}\beta + u_{it} \quad (9)$$

$$\hat{X}_{it} = \hat{a}_i + Z_{it}\hat{\beta} \quad (10)$$

A regression is estimated with the endogenous variables as the dependent variable and the IV's as the independent variables. The fitted values $\hat{X}_{it}$ of this regression are then included in the original regression instead of the endogenous variables. This method is known as TSLS. This estimation method allows for analyzing the intended relationship with consistent and unbiased coefficient estimates according to OLS.

The regression equation becomes:

$$y_{it} = a_i + \hat{X}_{it}\beta + \varepsilon_{it} \quad (11)$$

The economic growth is now explained by the fitted values of the growth rates of the independent variables and an error term. The TSLS estimation method provides a way to estimate the relevant growth equation based on the supply-leading phenomenon. The results from this estimation could either verify or reject this hypothesis. The endogeneity of the financial development variable is controlled for and so making sure that the analyzed impact is only from financial development leading economic growth. By including IV's for the other explanatory variables other possibilities of endogeneity are also taken care off.

The search for proper IV's is quite challenging because of the threat of using weak or invalid instruments that will have inefficient estimates than OLS as a result. A common option in the literature is the use of lagged values of explanatory variables as the instruments (Barbosa & Eiriz, 2009). These values from previous periods are not expected to be correlated with the current error term and their relations to the explanatory variables are basic reasons why they are chosen as IV's. In this study I choose to use lagged values as IV's and I will use three different instrument sets (Cheng & Kwan, 2002).

# Chapter 4 Results

In this section I present the outcome of the estimations assessing the financial development and economic growth relationship. Some descriptive statistics are stated with the purpose of shining some light on financial development and economic growth of the Latin American countries. Subsequently, I continue with the different growth equations and their estimations using IV's. Similar projections are carried out with data from the developed countries whose tables are available in the appendix. These are done in order to provide a benchmark for the Latin American countries. To finish, a different measure of economic growth and different instrument sets are used for the estimations with the purpose of analyzing the robustness of the findings.

## Descriptive Statistics

**Table 1: Growth percentages Latin America**

| | G_DCPS | G_M2 | G_GDP | G_GNI | G_INV | G_POP | G_TO | G_GOV |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.009 | 0.016 | 0.011 | 0.011 | -0.001 | 0.017 | 0.011 | 0.003 |
| Maximum | 1.175 | 0.827 | 0.151 | 0.142 | 1.006 | 0.035 | 1.094 | 1.513 |
| Minimum | -1.110 | -1.298 | -0.164 | -0.256 | -0.895 | -0.009 | -0.558 | -0.854 |
| Std. Dev. | 0.191 | 0.171 | 0.043 | 0.052 | 0.172 | 0.008 | 0.132 | 0.134 |

Note: This table includes the summary values including the mean and standard deviation of the growth rate of the ratio of domestic credit to the private sector to GDP (G_DCPS), the growth rate of the ratio of broad money to GDP (G_M2), the growth rate of real Gross Domestic Product per capita (G_GDP), the growth rate of real Gross National Income per capita, the growth rate of physical capital (G_INV), the growth rate of labor (G_POP) and the growth rate of government's involvement in the economy (G_GOV). These values are calculated from the common sample of 18 Latin American countries.

In table 1 it is seen that every variable has a positive mean percentage of growth except for physical capital which is not growing at all. The growth percentages are less than one percent per year for both the developing and the developed countries' sample. The growth of labor has the highest mean growth percentage of all the variables to be included in the model. From the two financial development indicators, G_M2 has the highest mean growth percentage. The financial development indicators and GDP growth for the developed countries (see appendix table 10) show higher mean growth percentages compared to the Latin American countries. Additionally, the G_DCPS financial development indicator has the highest mean percentage of the variables to be included in the model for the developed economies.

The summary statistics above provide a start for the assessment of the relationship and possible differences between countries with different levels of development. The differences in economic growth were expected which is one of the criteria used by the World Bank in the classification of the countries in groups by level of development. In addition, the higher growth percentages of the financial development indicators for the developed countries also corroborate their status as countries with a higher level of development. The next step is to explore if there is the possibility of an existing linear relationship between financial development and economic growth. This can provide some insight regarding a possible impact relationship. The correlation values and their potential statistical significance can at least verify the presence of a linear relationship.

**Table 2: Correlation Matrix Growth Rates Latin America**

| | G_DCPS | G_M2 | G_GDP | G_GNI | G_INV | G_POP | G_TO | G_GOV |
|---|---|---|---|---|---|---|---|---|
| G_DCPS | 1 | | | | | | | |
| G_M2 | 0.582*** | 1 | | | | | | |
| G_GDP | 0.100** | 0.036 | 1 | | | | | |
| G_GNI | 0.123*** | 0.086* | 0.908*** | 1 | | | | |
| G_INV | 0.100** | 0.107** | 0.461*** | 0.401*** | 1 | | | |
| G_POP | -0.031 | -0.005 | -0.158*** | -0.189*** | -0.027 | 1 | | |
| G_TO | -0.007 | 0.043 | -0.001 | -0.155*** | 0.255*** | -0.056 | 1 | |
| G_GOV | 0.311*** | 0.297*** | 0.057 | 0.076 | 0.055 | -0.020 | -0.022 | 1 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level. These are the Pearson correlation values of the variables to be included in the models with each other. The variables are the growth rate of the ratio domestic credit to the private sector to GDP (G_DCPS), the growth rate of the ratio of broad money to GDP (G_M2), the growth rate of real GDP per capita (G_GDP), the growth rate of real GNI per capita, the growth rate of physical capital (G_INV), the growth rate of labor (G_POP) and the growth rate of the government's involvement in the economy (G_GOV).

The relevant figures in the matrix above suggest that there is a linear relationship between financial development and economic growth. Nonetheless, from the size of the correlation statistic this linear relationship is considered a weak one. Both financial development indicators are positively correlated with G_GDP, but for only G_DCPS this correlation is statistically significant. The strength of the positive linear relationship between G_DCPS and G_GDP is weak. Both financial development indicators have a statistically significant correlation with GDP growth in the developed countries (see appendix table 11). Both the growth of the country's openness to trade and the growth of the government's participation in the economy have no

statistically significant linear relationship with economic growth in Latin America. In the case of the developed countries there is evidence of a highly statistically significant linear relationship with the G_GDP for both financial development indicators. A statistically significant positive linear relationship between economic growth and physical capital growth is seen for both the developing and the developed countries. This points out once again to their positive association. Regarding the linear relationship between the growth of labor and economic growth there is no difference for the developed and developing countries where both groups exhibit a statistically significant negative one as suggested by Solow (1956).

## Fixed Effects

Consequently, I proceed with the estimations based on equation (9). A total of three models are estimated which include the two basic estimations, each time including one of the financial development indicators and the third one including both of the financial development indicators. The equations were estimated when necessary with White robust standard errors to account for autocorrelation which is not unusual in regressions estimated with time series data.

In table 3 on the following page it is seen that in all three models that financial development has no statistically significant impact on economic growth in Latin America. None of the financial development indicators are found to be statistically significant. The models estimated with the developed countries' data (see appendix table 12) show not statistically significant coefficients for all the financial development indicators included in the three models. Instead, the growth of physical capital has a statistically significant positive impact on economic growth in all the models for both the developed and the developing countries which support the importance of capital accumulation for economic growth for all countries at different levels of development. An increase in the growth of labor has a statistically significant negative impact on economic growth for both the developing and the developed countries. The growth of a country's openness to trade is not statistically significant in both the developing and the developed countries. The growth of the government's involvement in the economy has no statistically significant impact on the growth of developing economies, but it does have a highly statistically significant negative impact on the growth of the developed economies.

**Table 3: FE Latin America, G_GDP as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.007 | | 0.015 |
| | (0.55) | | (1.07) |
| G_M2 | | -0.007 | -0.015 |
| | | (-0.50) | (-1.01) |
| G_INV | 0.122*** | 0.123*** | 0.122*** |
| | (6.85) | (7.10) | (6.94) |
| G_POP | -2.271*** | -2.276*** | -2.261*** |
| | (-3.36) | (-3.39) | (-3.38) |
| G_GOV | 0.002 | 0.008 | 0.005 |
| | (0.14) | (0.63) | (0.32) |
| G_TO | -0.048 | -0.049 | -0.047 |
| | (-1.48) | (-1.56) | (-1.46) |
| $\bar{R}^2$ | 0.28 | 0.28 | 0.31 |
| F-statistic | 10.53 | 10.56 | 10.16 |
| DW-statistic | 1.36 | 1.35 | 1.36 |
| N | 538 | 541 | 538 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistic based on White standard errors given in parenthesis. The adjusted R squared, the F-statistic, the Durbin Watson statistic and the amount of observations are stated. Economic growth measured with the real GDP per capita (G_GDP) is the dependent variable. The explanatory variables in all the estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), the government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

Based on the results stated, I fail to reject the hypothesis of financial development growth having no impact on economic growth. This suggests that the development of the financial sector in Latin American countries has no statistically significant influence on economic growth. The financial sector's development similarly has no statistically significant impact on economic growth in the developed countries, suggesting that regarding this matter there is no obvious difference between the developed and the developing countries. These results of the financial development having no impact on economic growth are not encouraging for the next step of finding evidence of the supply-leading phenomenon however biased caused by endogeneity in the equations could have been one reason for this matter where not statistically significant coefficients were found for the financial development indicators.

## Instrumental Variables

Next, the equations were re-estimated with IV's to control for the alleged endogeneity present in the equations. So, allowing the focus to lie on investigating the presence of the supply-leading phenomenon in this region.

**Table 4: FE-IV (1) Latin America, G_GDP as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.139 | | 0.138 |
| | (1.20) | | (1.33) |
| G_M2 | | -0.040 | -0.128** |
| | | (-0.72) | (-2.31) |
| G_INV | 0.123*** | 0.111*** | 0.122*** |
| | (2.96) | (3.11) | (3.25) |
| G_POP | -1.472 | -1.937** | -1.326 |
| | (-1.57) | (-2.02) | (-1.44) |
| G_GOV | 0.019 | 0.084 | 0.132 |
| | (0.23) | (1.28) | (1.80) |
| G_TO | -0.151 | -0.144 | -0.128 |
| | (-0.73) | (-1.16) | (-0.70) |
| F-statistic | 3.21 | 2.89 | 3.47 |
| DW-statistic | 1.94 | 1.60 | 1.89 |
| N | 497 | 502 | 497 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors are given in parenthesis. The F-statistic, Durbin Watson statistic and number of observations are stated. Economic growth measured by the growth of real GDP per capita (G_GDP) is the dependent variable. The first instrument set lagged values of the explanatory variables (-1 to -2) is used. The explanatory variables in all the estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

To begin with, I note that from table 4 above it is clear that in the developing countries the growth of the government's involvement in the economy and the growth of a country's openness to trade are again not statistically significant. In addition, the growth of physical capital in the developing countries has once more a statistically significant impact on economic growth in the estimations using IV's. The growth of labor now only has a statistically significant negative impact in model (II). Additionally to these there is now the growth of financial development also

having a statistically significant impact on economic growth. Model (III) has a statistically significant financial development indicator however its minus sign suggests a negative impact from financial development on economic growth. Model (III) included both G_DCPS and G_M2 but only the latter was statistically significant. If G_M2 increases by 1% this causes a decrease of 0.13% growth of the economy on average.

I find that there is no support for the supply-leading phenomenon in this region based on two models with not statistically significant coefficient for the financial development indicators and the third one with a negative statistically significant coefficient which show no support for the hypothesis of financial development leading economic growth. The negative relationship between financial development and economic growth is also found in a study by Gregorio and Guidetti (1995). The negative impact of the developments in the financial sector could be seen as a result of non-well-functioning set of financial institutions and organizations. The functions of the financial sector are not well carried out and then it obstructs smoothing business transactions aimed to increase the amount of investments and technologies that can enhance economic growth in the Latin American countries. From the developed countries sample (see appendix table 13) there is a slight support for the supply-leading phenomenon. Model (I) has a slight statistically significant positive coefficient for the G_DCPS financial development indicator. The three models now only show a statistically significant role of the physical capital growth for the growth of the developed economies. The growth of labor and the growth of the government's participation in the economy are not statistically significant anymore.

The results of the FE-IV estimations do not provide support for the supply-leading phenomenon in Latin America. The financial development indicators have not statistically significant coefficients in all the estimations. Therefore financial development is not leading economic growth in Latin America. There seems to be a slight difference between the developing and the developed countries regarding the relationship between financial development and economic growth. For the developed countries support is found for the supply-leading phenomenon from one third of the models. Thus, in the developed countries the development of the financial sector has a statistically significant impact on economic growth and leads to a higher GDP per capita whereas in the group of developing countries in Latin America there is less evidence for this

matter. The financial development effects on economic growth appear to be minor in comparison to the contribution of physical capital accumulation. An evidence of this is observed from its consistent statistically significant role in every FE and FE-IV estimated equations for the Latin American countries and the developed countries. The importance of the growth of physical capital is shown as irrelevant to the level of development of the country because the growth of physical capital has a consistently statistically significant impact on economic growth for both the developing and the developed countries.

## Robustness Analysis

In order to check the robustness of the results I chose to use a different measure of economic growth, GNI growth, as the dependent variable in the FE and FE-IV estimations. Additionally, I also make use of other instrument sets for the FE-IV estimations. Subsequently, I present the results where I note if there are differences in the estimations with the use of a different economic growth variable and different instrument sets. Most importantly this analysis attempts to check if the different dependent variable and different instrument sets change the conclusions regarding the no impact of financial development on economic growth and the no case for the supply-leading phenomenon in Latin America.

G_GNI and G_GDP have the same mean percentage growth for the Latin American countries as seen in table 1. For the developed countries (see appendix table 10) there is a small difference between the two where G_GDP is the largest. Regarding the correlation analysis for the Latin American countries in relation to this new dependent variable, I found that G_GNI shows statistically significant positive correlation coefficients with both of the financial development indicators contrary to G_GDP having only a statistically significant linear relationship with G_DCPS in table 2. The developed countries (see appendix table 11) have no drastic changes there is again a statistically significant linear relationship between financial development and economic growth, one negative and the other positive, between both the financial development indicators and G_GNI.

**Table 5: FE Latin America, G_GNI as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.015 | | 0.013 |
| | (0.83) | | (0.65) |
| G_M2 | | 0.016 | 0.005 |
| | | (0.58) | (0.27) |
| G_INV | 0.140*** | 0.141*** | 0.140*** |
| | (5.81) | (5.98) | (5.77) |
| G_POP | -3.098*** | -3.122*** | -3.102*** |
| | (-3.34) | (-3.43) | (-3.33) |
| G_GOV | 0.002 | 0.005 | 0.001 |
| | (0.10) | (0.25) | (0.06) |
| G_TO | -0.120*** | -0.122*** | -0.120*** |
| | (-2.86) | (-2.98) | (-2.89) |
| $\bar{R}^2$ | 0.29 | 0.28 | 0.28 |
| F-statistic | 10.72 | 10.74 | 10.23 |
| DW-statistic | 1.67 | 1.66 | 1.67 |
| N | 513 | 516 | 513 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistic based on White standard errors are in parenthesis. The adjusted R squared, the F-statistic, the Durbin Watson statistic and the amount of observations are stated. Economic growth measured by real GNI per capita (G_GNI) is the dependent variable. The explanatory variables in all the estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

After a short analysis of the descriptive statistics of G_GNI in relation to the other variables in the models I continued with the FE estimations with G_GNI as the dependent variable. The major change in the FE-estimations from the Latin American countries seen in table 5 above is the now statistically significant negative impact of the growth of a country's openness to trade on economic growth. None of the financial development indicators included in the three models are statistically significant. This is the same results that were obtained from the estimations with G_GDP as the dependent variable. Therefore, the hypothesis of financial development having no impact on economic growth is supported with two different measures of economic growth. In regards to the developed countries (see appendix table 12) there are no major changes. None of the financial development indicators were statistically significant. Once more the only variables

that have a statistically significant impact on economic growth are the growth of physical capital, the growth of labor and the growth of the government's involvement in the economy.

Next the FE IV's were estimated with G_GNI as the dependent variable allowing for finding evidence for the supply-leading phenomenon in Latin America. The IV-estimations results noted in table 6 below indicate no support for the supply-leading phenomenon in the Latin American region. This finding is similar to the results found with G_GDP as the dependent variable.

**Table 6: FE-IV (1) Latin America, G_GNI as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.142 | | 0.104 |
| | (1.48) | | (1.26) |
| G_M2 | | 0.046 | -0.008 |
| | | (0.60) | (-0.09) |
| G_INV | 0.144*** | 0.175*** | 0.166*** |
| | (2.73) | (2.62) | (3.16) |
| G_POP | -2.105 | -3.054 | -2.096 |
| | (-1.11) | (-1.25) | (1.14) |
| G_GOV | 0.088 | 0.167 | 0.156 |
| | (0.56) | (1.18) | (-1.19) |
| G_TO | -0.481** | -0.641** | -0.488** |
| | (-2.08) | (-2.49) | (-2.39) |
| F-statistic | 3.93 | 3.59 | 3.87 |
| DW-statistic | 2.02 | 2.08 | 2.07 |
| N | 474 | 479 | 474 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistic based on White standard errors are given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured by real GNI per capita (G_GNI) is the dependent variable. The instrument set is lagged values of the explanatory variables (-1 to -2). The explanatory variables in all the estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

All the financial development indicators in the models have coefficients that are not statistically significant. The growth of physical capital, the growth of labor and the growth of a country's trade openness remain having a statistically significant impact on economic growth in the region. For the developed countries (see appendix table 13) there is now no support from the models for

the supply-leading phenomenon. None of the coefficients for the financial development indicators were statistically significant. The growth of labor is slightly statistically significant in model (I). The only variable to have a statistically significant impact on economic growth in all the three models is the growth of physical capital.

In short, the first attempt of a robustness check showed that the result of financial development having no impact on economic growth is supported with two different economic growth variables. The lack of support for the supply-leading phenomenon in Latin America is supported by the use of two different economic growth measures. In order to investigate further the supply-leading phenomenon in Latin America, the models were estimated with IV's using two more instrument sets. First, the instrument sets were used in the FE-IV with economic growth measured by G_GDP as the dependent variable. Then, the same is done but this time economic growth is measured by G_GNI as the dependent variable. These results can provide additional backup to conclusions regarding the supply-leading phenomenon in the Latin American region and apparent differences with the group of the developed countries.

The outcomes of the models estimated with G_GDP as the dependent variable and the second instrument set lagged values of the explanatory variables (-1 to -3) showed no evidence of the supply-leading phenomenon in Latin America. Model (III) in table 7 on the following page shows a statistically significant negative impact of financial development on economic growth. A 1% increase in G_M2 causes a 0.09% decrease in economic growth. This is the opposite of the supply-leading phenomenon because the financial development is influencing the growth of the economy but it results in a decrease instead of an increase of its growth level. The growth of physical capital is the only variable that is statistically significant in all the three models. The growth of labor, the growth of a country's trade openness and the growth of the government participation in the economy are not statistically significant in all models. Therefore, no support is found for the supply-leading phenomenon in Latin America with G_GDP as the dependent variable and the two different instrument sets. In all the three models for the developed countries support is shown for the supply-leading phenomenon (see appendix table 14). The growth of physical capital is once more statistically significant in all the three models whereas the growth of labor has only a slightly statistically significant impact on economic growth in model (II). The

growth of the government's participation in the economy has no statistically significant impact on economic growth in the three models and the growth of a country's trade openness has a statistically significant impact which is negative in model (III).

**Table 7: FE-IV (2) Latin America, G_GDP as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.107 | | 0.084 |
| | (1.04) | | (1.00) |
| G_M2 | | -0.039 | -0.094* |
| | | (-0.81) | (-1.79) |
| G_INV | 0.116** | 0.102** | 0.117** |
| | (2.17) | (2.52) | (2.72) |
| G_POP | -1.910 | -2.182 | -1.802 |
| | (-1.36) | (-1.51) | (-1.43) |
| G_GOV | -0.033 | 0.016 | 0.055 |
| | (-0.50) | (0.18) | (0.80) |
| G_TO | -0.312 | -0.303 | -0.256 |
| | (-1.51) | (-1.61) | (-1.54) |
| F-statistic | 3.19 | 3.27 | 3.28 |
| DW-statistic | 1.94 | 1.76 | 1.83 |
| N | 477 | 483 | 477 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured by real GDP per capita (G_GDP) is the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -3). The explanatory variables in all estimations are the growth rates of the following variables: physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

The models were estimated with FE-IV's using a third instrument set which was lagged values of the explanatory variables (-1 to -4) and G_GDP as the dependent variable. The results (see appendix table 15) show support for the supply-leading phenomenon. Two of the three models include a statistically significant positive coefficient for the G_DCPS financial development indicator. The G_DCPS financial development indicator in model (I) has the largest positive impact on economic growth. A 1% increase in financial development causes a 0.16% increase in economic growth on average. Thus, now with G_GDP as the dependent variable and the use of

three different instrument sets there is support for the supply-leading phenomenon from only two models with the use of the third instrument set. The other statistically significant variables are the growth of physical capital, the growth of labor and the growth of a country's trade openness which are yet again the other statistically significant variables in all three models. For the developed countries (see appendix table 15) there is also support from two of the three models for the supply-leading phenomenon. The growth of physical capital and the growth of labor are the only other factors to have a statistically significant impact on economic growth.

Subsequently, I carry on with the results from the FE-IV's with G_GNI as the dependent variable and using the second instrument set lagged values of the explanatory variables (-1 to -3). There is some support for the supply-leading phenomenon in Latin America (see appendix table 16) where model (I) has a statistically significant positive coefficient for the financial development indicator for G_DCPS. It suggests that a 1% increase in financial development causes a 0.13% increase in economic growth on average. The growth of physical capital and the growth of a country's trade openness are the only two other statistically significant variables in all models. The same model that shows support for the supply-leading phenomenon in Latin America also shows some support for the supply-leading phenomenon in the developed countries but the coefficient of the financial development indicators is smaller than the one of the Latin American countries suggesting perhaps the minor impact of financial development on economic growth in the developed countries. Similar to some of the previous results with G_GDP as dependent variable, the growth of physical capital and the growth of labor are the only two variables that have a statistically significant impact on economic growth.

The results of the FE-IV's using the third instrument set lagged values (-1 to -4) with G_GNI as the dependent variable (see appendix table 17) for the Latin American countries displayed that most of the models show support for the supply-leading phenomenon. The financial development indicator G_DCPS in model (I) has the largest statistically significant impact on the growth of the Latin American economies. A 1% increase in financial development causes a 0.16% increase in economic growth in this region. The growth of physical capital and the growth of a country's openness to trade are again the only other variables to have a statistically significant impact on economic growth in all three models. The growth of labor has a statistically significant negative

impact on economic growth in all models except model (II). For the developed countries there is a slight support for financial development leading economic growth where model (I) includes a slight statistically significant positive coefficient for G_DCPS. Once more the growth of physical capital and the growth of labor are the only other variables that exercise a statistically significant impact on the growth of the developed economies.

The robustness analysis indicated that there are certain differences between the use of different dependent variables and instrument sets when concluding if the supply-leading phenomenon is evidenced in Latin America. The results confirm that financial development has no statistically significant impact on economic growth when failing to control for endogeneity. In regards to the supply-leading phenomenon there is a contradiction where support is found from some of the models that included statistically significant positive coefficients for financial development indicators.

**Table 8: Overview support for the Supply-Leading phenomenon**

| | Latin America | | Developed countries | |
|---|---|---|---|---|
| Instrument sets | G_GDP | G_GNI | G_GDP | G_GNI |
| 1 | 0 | 0 | 1 | 0 |
| 2 | 0 | 1 | 3 | 2 |
| 3 | 2 | 2 | 2 | 1 |

Note: the numbers are the number of models that included a statistically significant coefficient for at least one of the financial development indicators supporting financial development leading economic growth. Instrument sets which were used for the FE_IV estimation; 1) lagged values explanatory variables (-1 to -2); 2) lagged values explanatory variables (-1 to -3); 3) lagged values explanatory variables (-1 to -4).

A total of 18 models were estimated with IV's with either GDP growth or GNI growth as the dependent variable. Less than one third of the models showed support for the supply-leading phenomenon in Latin America as summarized in table 8. Half of the models for the developed countries supported the case of the development of the financial sector leading economic growth in the developed countries. The G_DCPS financial development indicator is mostly the one with the statistically significant positive impact on economic growth. This is common with previous literature where there is a slight preference for this financial development indicator capturing the level of credit in the economy. The studies by Ansari and Ahmed (1998), Bittencourt (2012) and

Ghirmay (2004) found a statistically significant positive relationship between the two variables which leads to the conclusion of the importance of financial development to economic growth.

The results stated differently suggest that more than two thirds of the models may support the other phenomenon described by Patrick (1966). This signals some deeper issue which is that in Latin America the other phenomenon mentioned by Patrick (1966), demand-following may be in place. Blanco (2009) study found exactly this and rejected the presence of the supply-leading hypothesis for this region. Her conclusion was that the financial sector is actually developing following the demand of the population. The case here is where a product is not developed until there is significant demand for its use. The financial sector itself is a complex set of institutions and organizations and development is considered complicated. The development of the financial sector may not be a priority if the domestic population needs for them is not clear. The Latin American countries have several structural issues that have to be dealt with and the financial sector's development may not be one that receives the most attention as other matters are seen as a priority by the national authorities (Smulovitz & Peruzzotti, 2000; Lora & Barrera, 1997).

# Chapter 5 Conclusions

In order to assess if financial development has an impact on a country's economic growth in Latin America I estimated several growth equations with economic growth as the dependent variable. These were estimated with the fixed effects model and instrumental variables which corrected for the alleged endogeneity in the equations. Data from sources of economic growth such as physical capital, labor, trade openness and the government's involvement in the economy from 18 Latin American countries were collected for the analysis. Moreover, a group comprised of 18 developed countries included in the analysis provided the opportunity for a comparison where I could analyze if the relationship is different for developing and developed countries. The use of two financial development indicators allowed for analyzing whether the indicators of the development of the financial sector can influence the outcome.

The analysis of the relationship focused both on the impact and the causal relationship between financial development and economic growth for the Latin American region. The results showed no evidence of the impact from financial development on economic growth in these countries from the FE models. Regarding this matter there is no difference with the developed countries because the financial development also has no impact on economic growth as seen from the FE models. After finding no support from the data for financial development influencing the growth of the Latin American economies, I proceeded with finding evidence of the supply-leading phenomenon. This is done after controlling for the endogeneity present in the equations. The results pointed out to some support for the supply-leading phenomenon from the FE-IV models where the financial development has a positive impact on economic growth. The majority of the models estimated in the analysis however pointed towards the presence of the demand-following phenomenon in the Latin American region. The developed countries showed more evidence of the presence of the supply-leading phenomenon than the Latin American countries. Both groups of countries had quite a number of models supporting the demand-following phenomenon. This suggests that financial development's impact on economic growth may not differ significantly between countries at different levels of development. Thus, the countries at different levels of development slightly differ regarding the relationship between financial development and economic growth.

The findings also suggested that the financial development indicators chosen can influence the observed relationship between financial development and economic growth. The domestic credit to the private sector to GDP ratio had a positive relationship with economic growth and the ratio of broad money to GDP had a negative relationship with economic growth. Therefore, depending on the choice of financial development indicator the conclusions drawn can change. In this case the conclusion can change from a statistically significant negative relationship to a statistically significant positive relationship between economic growth and financial development. The latter is supporting the supply-leading phenomenon and the former the demand–following in the estimations were the endogeneity was controlled for. The results of this study may not be a clear display of the development of the financial sector's role for economic growth for this region but it does provide some insight. One point suggested by the findings of this study is noting that the financial sector's development is not completely irrelevant in regards to the growth of their economies. Its relevancy suggested that perhaps the development of the financial sector should not be ignored by the national governments. This along with the recent developments of the financial sector's impact on the economy should be a sign for the national governments in order to take the development of their financial sector into consideration.

Further research is recommended to further clarify financial development's impact on economic growth in Latin America. This analysis focused on the fact of the Latin America economies as bank-based financial system for the selection of financial development indicators. Another option would be the inclusion of other financial development indicators capturing the impact of a market-based financial system. This could complement what the financial development indicators that were chosen aimed at capturing the impact of the financial development of the bank based systems in on the growth of the economies. The financial systems in the Latin American countries may be considered mainly bank-based financial system but that may not entirely exclude market-based financial system impact on economic growth as minor as it is. The impact of the market-based financial system together with the bank-based financial system may have a different impact size on economic growth. A start of point for further research can be the slight difference found between the developing countries located in Latin America and the developed countries regarding financial development and economic growth. This time by using the developing countries located in other continents for example Africa and Asia could help

shine some light on whether the slight difference is specific to the location of the developing countries in Latin America or not. Additionally a comparison of the developing countries located in different continents could add to the study of the impact of financial development on economic growth. If the location, which suggests differences in the financial sector and the economic environment, of both groups of developing countries impacts the relationship between financial development and economic growth.

The limitations of this study are mostly caused by the lack of data of this region that firstly lead to the use of an unbalanced panel which may have influenced the results. In addition, the inclusion of additional control variables for example human capital or education could have changed the results but there was not enough data for their inclusion. By controlling for other sources of economic growth this analysis could have been more accurate in capturing financial development's impact on economic growth. There is a need of better data collection in the Latin American region which would allow for improved analysis. Furthermore, relating back to the matter of financial development indicators this study was limited to the impact of the chosen financial development indicators on economic growth. Even though I believe in the suitability of the financial development indicators that were used, other financial development indicators used together with the two financial development indicators that were used in this study may provide another relevant view of the relationship between financial development and economic growth.

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# Appendix

**Table 9: List of Countries**

| Latin America (developing) | OECD (developed) |
|---|---|
| Argentina | Australia |
| Bolivia | Canada |
| Brazil | Denmark |
| Chile | Finland |
| Colombia | Hungary |
| Costa Rica | Iceland |
| Ecuador | Ireland |
| El Salvador | Israel |
| Guatemala | Italy |
| Guyana | Japan |
| Honduras | Korea, Rep. |
| Mexico | Netherlands |
| Nicaragua | New Zealand |
| Panama | Norway |
| Paraguay | Sweden |
| Peru | Switzerland |
| Uruguay | United Kingdom |
| Venezuela | United States |

Note: Latin America (developing) → Classification from the World Bank in the Latin American region and as developing countries, OECD(developed)→ Part of the OECD and classification developed countries from the World Bank.

**Table 10: Growth percentages Developed Countries**

| | G_DCPS | G_M2 | G_GDP | G_GNI | G_GOV | G_INV | G_POP | G_TO |
|---|---|---|---|---|---|---|---|---|
| Mean | 0.032 | 0.027 | 0.019 | 0.018 | 0.002 | -0.010 | 0.007 | 0.009 |
| Maximum | 1.356 | 1.364 | 0.096 | 0.105 | 0.876 | 0.370 | 0.060 | 0.328 |
| Minimum | -0.841 | -0.378 | -0.127 | -0.194 | -0.777 | -0.572 | -0.011 | -0.342 |
| Std. Dev. | 0.123 | 0.108 | 0.027 | 0.031 | 0.062 | 0.085 | 0.007 | 0.068 |

Note: This table includes the summary values from the common sample including the mean and standard deviation of the growth rate of the ratio of domestic credit to the private sector to GDP (G_DCPS), the growth rate of the ratio of broad money to GDP (G_M2), the growth rate of real Gross Domestic Product per capital (G_GDP), the growth rate of real Gross National Income per capita, the growth rate of physical capital (G_INV), the growth rate of labor (G_POP) and the growth rate of government's involvement in the economy (G_GOV). These values are calculated from the common sample of 18 OECD countries.

**Table 11: Correlation matrix growth rates Developed Countries**

| | G_DCPS | G_M2 | G_GDP | G_GNI | G_INV | G_POP | G_TO | G_GOV |
|---|---|---|---|---|---|---|---|---|
| G_DCPS | 1 | | | | | | | |
| G_M2 | 0.410*** | 1 | | | | | | |
| G_GDP | 0.075* | -0.089** | 1 | | | | | |
| G_GNI | 0.118*** | -0.092** | 0.892*** | 1 | | | | |
| G_INV | 0.139*** | -0.049 | 0.662*** | 0.618*** | 1 | | | |
| G_POP | 0.030 | 0.064 | -0.032 | -0.067 | -0.035 | 1 | | |
| G_TO | -0.067 | -0.127*** | 0.155*** | 0.089** | 0.159*** | -0.060 | 1 | |
| G_GOV | -0.028 | 0.104** | -0.516*** | -0.448*** | -0.389*** | -0.008 | -0.179*** | 1 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level. These are the Pearson correlation values of the variables to be included in the models with each other from the common sample. The variables are the growth rate of the ratio of the domestic credit to the private sector to GDP (G_DCPS), the growth rate of the ratio of broad money to GDP (G_M2), the growth rate of real GDP per capita (G_GDP), the growth rate of real Gross National Income per capita, the growth rate of physical capital (G_INV), the growth rate of labor (G_POP) and the growth rate of government's involvement in the economy (G_GOV).

**Table 12: FE developed countries**

| | G_GDP as the dependent variable | | | G_GNI as the dependent variable | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| G_DCPS | -0.002 | | -0.001 | 0.010 | | 0.017 |
| | (-0.48) | | (-0.19) | (0.57) | | (0.78) |
| G_M2 | | -0.005 | -0.005 | | -0.015 | -0.025 |
| | | (-0.60) | (-0.53) | | (-1.37) | (-1.29) |
| G_INV | 0.184*** | 0.184*** | 0.184*** | 0.190*** | 0.193*** | 0.189*** |
| | (10.11) | (10.38) | (10.18) | (13.06) | (12.48) | (13.50) |
| G_POP | -0.433* | -0.432* | -0.432* | -0.927** | -0.910** | -0.899** |
| | (-1.93) | (-1.93) | (-1.92) | (-2.12) | (-2.08) | (-2.10) |
| G_GOV | -0.098*** | -0.097*** | -0.097*** | -0.143*** | -0.140*** | -0.139*** |
| | (-2.68) | (-2.67) | (-2.67) | (-7.94) | (-8.50) | (-7.81) |
| G_TO | 0.009 | 0.009 | 0.009 | -0.022 | -0.026 | -0.025 |
| | (0.35) | (0.34) | (0.33) | (-0.73) | (-0.82) | (-0.82) |
| $\bar{R}^2$ | 0.59 | 0.59 | 0.59 | 0.53 | 0.53 | 0.53 |
| F-statistic | 36.02 | 36.06 | 34.43 | 27.66 | 27.71 | 26.86 |
| DW-statistic | 1.31 | 1.31 | 1.31 | 1.89 | 1.87 | 1.86 |
| N | 545 | 545 | 545 | 529 | 529 | 529 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The adjusted R squared, F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured with either the growth rate of real GDP per capita (G_GDP) or the growth rate of real GNI as the dependent variable. The explanatory variables included in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

**Table 13: FE-IV (1) Developed countries**

| | G_GDP as the dependent variable | | | G_GNI as the dependent variable | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| G_DCPS | 0.163* | - | 0.199 | 0.098 | - | 0.096 |
| | (1.72) | | (0.93) | (1.47) | | (0.60) |
| G_M2 | - | 0.308 | -0.067 | - | 0.195 | 0.038 |
| | | (1.27) | (-0.15) | | (1.42) | (0.16) |
| G_INV | 0.158* | 0.173* | 0.159* | 0.226*** | 0.242*** | 0.215*** |
| | (1.83) | (1.78) | (1.96) | (3.56) | (5.77) | (3.85) |
| G_POP | -0.716 | -1.314 | -0.515 | -1.174* | -1.493 | -1.294 |
| | (-1.19) | (-1.14) | (-0.43) | (-1.75) | (-1.54) | (-1.63) |
| G_GOV | -0.140 | 0.029 | -0.127 | -0.085 | -0.010 | -0.079 |
| | (-0.66) | (0.14) | (-0.51) | (-0.40) | (-0.05) | (-0.35) |
| G_TO | -0.203 | 0.035 | -0.203 | -0.144 | -0.026 | -0.117 |
| | (-1.03) | (0.12) | (-0.61) | (-0.89) | (-0.13) | (-0.64) |
| F-statistic | 5.76 | 5.60 | 5.51 | 4.97 | 5.11 | 4.82 |
| DW-statistic | 1.97 | 1.87 | 1.99 | 2.10 | 2.11 | 2.09 |
| N | 507 | 507 | 507 | 493 | 493 | 493 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured either with the growth rate of real GDP per capita (G_GDP) or the growth rate of real GNI per capita (G_GNI) as the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -2). The explanatory variables in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

**Table 14: FE-IV (2) Developed countries, G_GDP as the dependent variable**

| | I | II | III |
|---|---|---|---|
| G_DCPS | 0.173** | | 0.181* |
| | (2.42) | | (1.80) |
| G_M2 | | 0.261* | -0.033 |
| | | (1.67) | (-0.20) |
| G_INV | 0.165*** | 0.185*** | 0.173*** |
| | (3.45) | (3.19) | (3.82) |
| G_POP | -0.665 | -1.302* | -0.532 |
| | (-1.21) | (-1.72) | (-0.72) |
| G_GOV | -0.105 | -0.133 | -0.105 |
| | (-1.01) | (-1.00) | (-1.00) |
| G_TO | -0.151 | -0.141 | -0.160* |
| | (-1.54) | (-1.17) | (-1.70) |
| F-statistic | 6.11 | 6.17 | 6.13 |
| DW-statistic | 1.95 | 1.96 | 1.95 |
| N | 488 | 488 | 488 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured with the growth rate of real GDP per capita (G_GDP) is the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -3). The explanatory variables in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

**Table 15: FE-IV (3), G_GDP as the dependent variable**

| | Latin America | | | Developed countries | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| G_DCPS | 0.156** | - | 0.141* | 0.110** | | 0.122 |
| | (2.20) | | (1.72) | (2.58) | | (1.59) |
| G_M2 | | 0.004 | -0.053 | | 0.115** | -0.015 |
| | | (0.12) | (-1.01) | | (2.12) | (-0.16) |
| G_INV | 0.135*** | 0.129*** | 0.141*** | 0.185*** | 0.206*** | 0.186*** |
| | (2.87) | (2.98) | (3.61) | (4.84) | (4.96) | (5.35) |
| G_POP | -2.137** | -2.785* | -2.168** | -0.443 | -0.658 | -0.375 |
| | (-2.20) | (-1.84) | (-2.20) | (-1.02) | (-1.33) | (-0.87) |
| G_GOV | -0.082 | 0.001 | -0.022 | -0.078 | -0.078 | -0.074 |
| | (-1.46) | (0.01) | (-0.41) | (-1.20) | (-0.93) | (-1.09) |
| G_TO | -0.215* | -0.328*** | -0.217** | -0.088 | -0.102 | -0.082 |
| | (-1.94) | (-2.82) | (-2.26) | (-1.20) | (-1.33) | (-1.06) |
| F-statistic | 3.70 | 3.54 | 3.63 | 6.13 | 6.15 | 6.11 |
| DW-statistic | 1.97 | 1.91 | 1.92 | 1.78 | 1.74 | 1.80 |
| N | 457 | 464 | 457 | 469 | 469 | 469 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, DW-statistic and amount of observations are noted. Economic growth measured with the growth rate of real GDP per capita (G_GDP) is the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -4). The explanatory variables in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

**Table 16: FE-IV (2), G_GNI as the dependent variable**

| | Latin America | | | Developed countries | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| G_DCPS | 0.132* | | 0.095 | 0.108* | | 0.135 |
| | (1.79) | | (1.32) | (1.85) | | (1.07) |
| G_M2 | | 0.044 | 0.013 | | 0.177 | -0.029 |
| | | (0.72) | (0.23) | | (1.57) | (-0.16) |
| G_INV | 0.154** | 0.143** | 0.171*** | 0.234*** | 0.241*** | 0.233*** |
| | (2.51) | (2.18) | (3.03) | (5.60) | (5.60) | (5.86) |
| G_POP | -2.141 | -2.968 | -2.192 | -1.393** | -1.670** | -1.342* |
| | (-1.11) | (-1.17) | (-1.15) | (-2.09) | (-2.03) | (-1.72) |
| G_GOV | 0.079 | 0.095 | 0.113 | -0.079 | -0.062 | -0.069 |
| | (0.63) | (0.78) | (1.26) | (-0.53) | (-0.39) | (-0.48) |
| G_TO | -0.492** | -0.609** | -0.489*** | -0.160 | -0.102 | -0.158 |
| | (-2.50) | (-2.40) | (-2.74) | (-1.44) | (-0.91) | (-1.36) |
| F-statistic | 3.39 | 3.18 | 3.32 | 5.94 | 5.99 | 5.98 |
| DW-statistic | 2.01 | 2.04 | 2.04 | 2.10 | 2.15 | 2.09 |
| N | 455 | 461 | 455 | 475 | 475 | 475 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured by the growth rate of real GNI per capita (G_GNI) is the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -3). The explanatory variables in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)

**Table 17: FE-IV (3), G_GNI as the dependent variable**

| | Latin America | | | Developed countries | | |
|---|---|---|---|---|---|---|
| | I | II | III | I | II | III |
| G_DCPS | 0.162*** | | 0.118** | 0.072* | 0.090 | 0.081 |
| | (3.27) | | (2.10) | (1.87) | (1.60) | (1.18) |
| G_M2 | | 0.038 | 0.041 | | | -0.010 |
| | | (1.18) | (0.70) | | | (-0.09) |
| G_INV | 0.147*** | 0.137*** | 0.165*** | 0.248*** | 0.271*** | 0.253*** |
| | (3.07) | (2.60) | (3.84) | (6.93) | (7.37) | (7.49) |
| G_POP | -1.935* | -2.721 | -2.019* | -1.266** | -1.245* | -1.151* |
| | (-1.74) | (-1.49) | (-1.70) | (-2.04) | (-1.69) | (-1.85) |
| G_GOV | -0.021 | 0.064 | 0.005 | -0.083 | -0.036 | -0.062 |
| | (-0.20) | (0.67) | (0.06) | (-0.89) | (-0.35) | (-0.71) |
| G_TO | -0.239** | -0.391*** | -0.272** | -0.141 | -0.084 | -0.107 |
| | (-1.98) | (-3.52) | (-2.54) | (-1.53) | (-0.95) | (-1.18) |
| F-statistic | 2.97 | 2.62 | 3.01 | 6.27 | 6.20 | 6.18 |
| DW-statistic | 1.89 | 1.99 | 1.98 | 2.10 | 2.16 | 2.10 |
| N | 436 | 443 | 436 | 457 | 457 | 457 |

Note: *, **, ***, reflects significance at the 10%, 5% and 1% level, t-statistics based on White standard errors given in parenthesis. The F-statistic, Durbin Watson statistic and amount of observations are noted. Economic growth measured with the growth rate of real GNI per capita (G_GNI) is the dependent variable. The instrument set used is lagged values of the explanatory variables (-1 to -3). The explanatory variables in all estimations are the growth rates of the following variables, physical capital (G_INV), labor (G_POP), government's involvement in the economy (G_GOV) and the country's trade openness (G_TO). The growth rates of these financial development indicators are included; in model (I) the ratio of the domestic credit to the private sector to GDP (G_DCPS), in model (II) the ratio of broad money to GDP (G_M2); in model (III) both (G_DCPS) and (G_M2)