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FINANCE-GROWTH NEXUS AND CONVERGENCE

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ABSTRACT

This thesis revises the relationship between financial development and the economic growth, the finance-growth nexus. This thesis expands the existing literature by using more sophisticated measures to determine the level of financial development to get a more accurate impression on the effect it has on economic growth.

Economic growth has been a constant long-term trend in the recorded economic history. It can be decomposed to three elements: growth in labour, capital stock, and the total factor of productivity (TFP). The financial sector is mainly able to affect growth through the TFP, although it also plays a central role in enabling investment and thus growing the capital stock of the economy.

The primary function of the financial sector is to allocate the society's resources efficiently under uncertainty. It does so by performing its five basic functions: risk management, transfer of economic resources, corporate control, mobilization of savings, and facilitation of exchange.

I find that all benchmark variables describing financial development have got an effect on economic growth and convergence, depending on the situation and the type of examination. None of the variables show a consistent dominating effect, which supports using the variables as a group instead of solely relying on one of the selected variables.

KEYWORDS: Economic Growth, Financial Development, Finance-Growth Nexus, Convergence, Conditional Convergence

1. INTRODUCTION

The relationship between financial sector and the performance of real economy has been a hot debate in the field of economics for the past century. Over one hundred years ago Schumpeter (1911: 223) argued about the important role of banks in enabling innovation and transferring the innovations into successful businesses in the capitalist system. Even though opposite views have also been expressed, the general consensus among economists is that finance does indeed affect growth. Availability of financing enables innovation to be transferred into products, production methods, and a better overall economy. This helps to create a more efficient aggregate economy, sum of all economic inputs.

Economic growth is the long-term trend in the world economy. In a Solow model, a neoclassical growth model, the drivers of economic growth are capital stock, labour, and technology (Solow 1956). The "technology" has later been formed into total factor of productivity (TFP) residual, which accounts for all the exogenous factors that affect productivity, such as the amount of human capital, legislative and political environment, and health. Much of the recent research in growth theory has been concentrated on determining which are the most important parts of the TFP. One of the suggested elements in TFP decomposition is finance. (Barro & Sala-i-Martin 2004, Burda & Wyplosz 2009: 71–72.)

Empirical studies have shown that the availability of financing helps economies grow faster. Pioneering empirical works of Goldsmith (1969) and McKinnon (1973) have paved the way for more recent studies on the financial system's importance in achieving growth. King and Levine (1993), Rajan and Zingales (1998), and Barro and Sala-i-Martin (2004) are among the researchers who have found that finance bears a significant relation to the rate of growth of an economy. Aghion, Howitt and Mayer-Foulkes (2005) suggest that the importance of finance for accelerating economic growth lies in its ability to enable adaptation of technology, a thought very closely related to Schumpeter's (1911: 223) original proposition.

One way of examining economic growth – or the effects of financial development on it – is by studying the convergence phenomenon. Convergence refers to an implication of the Solow model, which states that the further an

economy is from its steady state, the faster it will grow. Reality has shown, that countries have different production functions (i.e. different steady states in the Solow model). Therefore it is more useful to speak of conditional convergence, where the difference in production functions is taken into account. Conditional convergence implies that the further a country is from its steady state, the faster growth it may experience, contrary to traditional convergence's assumption that the poorer a country is, the faster its economy may grow. (Burda & Wyplosz 2009: 82–85.)

This thesis examines the relationship between the financial sector and the real economy, the finance-growth nexus. This is important information regarding the development of an economy. Developing economies benefit from knowing what's needed to catch up with the more developed economies. The study of general economic theory is a rather vast field of research, where the studies concentrated on the role of financial development in long-run economic growth, and those of convergence are the most relevant for this thesis.

The rest of the thesis is structured as follows. Chapter 1.1. discusses the purpose of the study and derives the hypotheses from the motivation for the research. Chapter 2 presents the theory of economic growth, and discusses its cyclical nature. Chapter 3 discusses the role of the financial sector in the economy, and also explains its role in achieving growth. Both chapters also present empirical studies related to their respective topics. Chapter 4 covers the data and methodology used in this study, and chapter 5 presents the empirical findings from the research. Conclusions and suggestions for future research are presented in chapter 6.

1.1. Purpose of the Study and Research Hypotheses

This study's purpose is to find out whether a country's financial development affects its economic growth. The phenomenon is further reviewed by assuming a conditional convergence between the countries, and reflecting their performance with the assumed growth rate. If financial development is helping to achieve convergence, the impact of financial development should be greater among the countries which have the longest way to go to reach their optimal steady state of the economy.

The primary function of the financial sector in an economy is to allocate the economy's resources correctly in an uncertain environment (Merton & Bodie 1995: 5). Goldsmith (1969) was among the first to point out empirically that developed countries also have more developed and active financial systems, an idea presented originally by Schumpeter (1911: 223).

A well-functioning financial system is able to assist both capital accumulation and technological innovation, which are both factors affecting the overall economic growth in the Cobb-Douglas production function. Capital accumulation affects growth in the Cobb-Douglas production function as a separate factor in the model, and technological innovation is one of the key elements affecting the TFP/Solow residual in the model (Cobb & Douglas 1928, Solow 1957, Levine 1997). Rioja and Valev (2004) show that in less developed countries finance mainly affects growth by affecting the capital stock, and that in more developed countries the growth effect is achieved by the increased TFP.

Just like the financial sector itself, also the level of financial development can be examined from two different points of view: financial markets and institutions. Financial markets, i.e. the stock markets, have a much greater role in more developed economies. Financial institutions are important everywhere in the world, financing private people and companies, storing their savings, and directing the savings into best possible use.

The empirical part of this thesis uses only measures of financial institutions to represent the whole financial sector's development, because the availability of financial market data is limited on global level, and the financial markets' importance in many of the less financially developed countries is relatively small. Moreover, in many less developed economies microfinancing, and the informal financial sector are an important part of the economic system, a part which is difficult to measure and not generally included even in the widest global financing datasets. (Demirgüç-Kunt & Levine 1996, Levine 1997, Todaro & Smith 2011: 731-733, Čihák, Demirgüç-Kunt, Feyen & Levine 2012.)

Early works on the finance-growth nexus have used the size of the financial sector compared to the size of the economy to determine the level of financial development. Goldsmith's (1969: 48) pioneering work uses the size of the formal financial sector compared to the the size of the economy to prove the link

between the two phenomena. While his findings are undoubtedly groundbreaking, they lack the sophistication of more recent econometric measurement and the accuracy of variables to actually measure the financial development from a wider, and more general point of view. The size of the financial sector is probably the simplest and most accurate one variable measure for the financial development but it is not sufficient to describe the phenomenon completely. Or, as Čihák et al. (2012) state: "size [of the financial sector] is not a measure of quality, or efficiency, or stability".

King and Levine (1992 & 1993) criticize the financial development measures used in earlier studies for only covering one dimension of the financial development, and expand the earlier research by using the traditional size of the financial system and combining that with new measures for investment allocation between institutions, credit allocation, efficiency, and economic repression. They use liquid liabilities over GDP to measure the size of the financial sector, size of the commercial banks compared to the central bank to measure the investment allocation, and the share of the credit allocated to private sector and its relation to GDP to measure the credit allocation.

Čihák et al. (2012) propose that financial development should be measured by financial depth, financial access, financial efficiency, and financial stability. These are seen as sufficient measures to give an overall view of the level of financial development in each country. The authors also suggest benchmark variables for each characteristic. Financial depth should be measured by deposit money bank credit to the private sector over GDP. Financial access' benchmark variable is the amount of bank accounts per 1000 adults. Financial efficiency is best measured by the net interest margin. Financial stability is recommended to be measured with the commercial banks' weighted average Z-score, a measure of the banks' distance to default. The benchmark variables proposed by Čihák et al. (2012) are used in the empirical part of this thesis.

The first hypothesis of the study is that the level of financial development, measured by financial depth, financial access, financial efficiency, and financial stability affects the performance of the real economy, measured by the economic growth.

The other important viewpoint is the nature of the relationship between finance and economic growth in different situations. Aghion et al. (2005) find that financial development has eventually a strong and positive but gradually vanishing growth effect on economies. This effect is evidence of conditional convergence, caused by the level of financial development. If the findings of Aghion et al. (2005) hold, financial development should be able to assist countries to grow faster the further away they are from their optimal position, the steady state of the economy. The effect of financial development in economic growth should then be stronger in less developed economies.

Fung (2009) studies the convergence phenomenon in financial development and economic growth. Fung uses level of financial intermediation to represent the level of financial development. This thesis' empirical examination expands Fung's tests for convergence in financial development and economic growth by using the benchmark variables for financial access, depth, efficiency, and stability to determine the level of financial development, as proposed by Čihák et al. (2012) instead of only financial depth. Therefore the second hypothesis of the study is that financial development helps the countries to converge with more developed ones.

2. ECONOMIC GROWTH AND BUSINESS CYCLES

This chapter presents the principles behind economic growth and its cyclical nature – business cycles. Economic growth is seen as the long-term trend and business cycles as short-term fluctuations around this long-time trend line. This chapter also discusses the role of finance in macroeconomic theories. (Burns & Mitchell 1946: 3; Burda & Wyplosz 2009: 233.)

2.1. Economic Growth

One of the most intriguing questions in economics is the phenomenon of growth. During the past 250 years, the era of well-recorded economic history, all economies have been able to grow constantly in the long term. It is not known whether growth can last forever, although we know that our planet's natural resources and ability to carry human population are limited. Some critics (e.g. Meadows, Meadows, Randers & Behrens 1972) think the growth ideology is unsustainable and should therefore be abandoned completely and be replaced with a degrowth ideology. This fascinating debate will not be further discussed in this thesis as the main question is to find out whether the financial sector affects growth in our current economic system. The origins of growth and its variations from normal are the important growth topics in this thesis.

Figure 1 below shows an example of past economic growth, the per capita gross domestic product (GDP) of Finland during the years 1975–2010. The GDP curve, pictured by the continuous line, varies from its long-term trend line, pictured by the dashed linear line. The trend line is the simplistic representation of the direction the economy is supposed, or in this case *was* supposed, to grow. In the selected time period, Finland encountered a period of fast economic growth, growing an average of 7.14% per year. In terms of purchasing power parity (PPP) growth, the growth rate which removes inflation effects, Finland's GDP grew at an average rate of 2.56%. The average growth rate during the time period was still quite high, even with the PPP adjustment. The recessions in the early 1990's and in the late 2000's can be easily spotted from the figure as areas below the trend line, preceded by periods of faster growth. These periods of economic overheating can be recognized from sharp upward movement away from the trend line before the eventual collapse. (Statistics Finland 2011.)

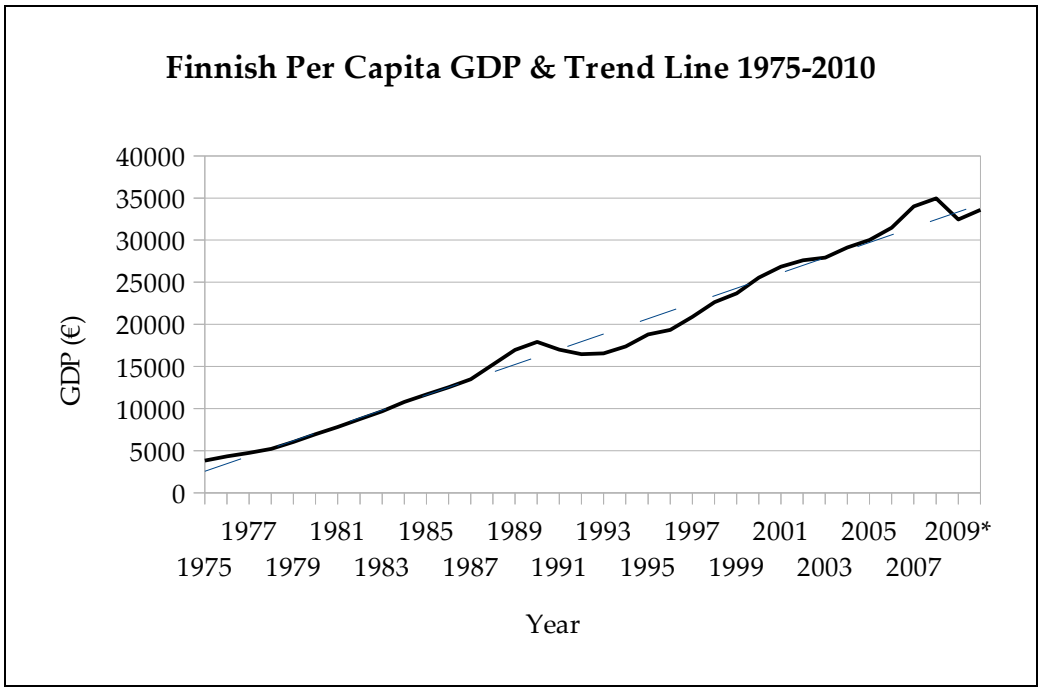

Figure 1. Per Capita GDP of Finland 1975–2010 (Data: Statistics Finland 2011).

The textbooks of macroeconomics tell us that there are three sources of economic growth. These three sources are growth in labour input, growth in capital stock, and technological progress. Growth in the amount of labour occurs when the population grows or when the amount of work within the existing population increases. Growth in capital stock is considered when equipment or structures funded with investments accumulate to make the production more effective. Technological progress is related to improved efficiency of production due to advancements in used production technology. (Cobb & Douglas 1928; Burda & Wyplosz 2009: 57.)

This model of growth is known as the Cobb-Douglas production function. It can be written as

(1) $$Y = AL^{\alpha} K^{1-\alpha}$$

where total production (Y) consists of total factor of productivity (TFP) (A), labour input (L), and capital input (K). α and $1-\alpha$ ($0<\alpha<1$) are elasticities of labour and capital input when returns to scale are constant. TFP (A), also

known as the Solow residual, is the sum of all factors other than changes in capital and labour that affect the level of total production. Development of the financial infrastructure helps to accelerate growth in a Cobb-Douglas function mainly by affecting the TFP and to some extent also assisting in capital accumulation. (Cobb & Douglas 1928; Solow 1957; Neusser & Kugler 1998; Levine 2001; Rioja & Valev 2004; Burda & Wyplosz 2009: 57, 74.)

The Solow residual can be formally stated as

(2) $$\frac{\Delta A}{A} = \frac{\Delta Y}{Y} - [(1 - S_L)\frac{\Delta K}{K} + S_L \frac{\Delta L}{L}]$$

where S_L is share of labour income in the economy, and $1 - S_L$ the share of capital income in the economy. The Solow residual formula extracts the sum of capital and labour incomes' changes from the total change of production, leaving the change in the lump sum of all other factors as the change of TFP. (Burda & Wyplosz 2009: 74.)

One important implication of the neoclassical growth model is the notion of the steady state. In a balanced economy with no government surplus and the imports and exports in balance, the level of investment (I) is equal to the savings proportion (s) of the total GDP (Y):

(3) $$I = sY$$

Moreover, when the savings rate equals the rate of depreciation (δ) of the total capital stock (K), the economy is at its steady state, i.e. the capital-labour ratio does not change anymore. (Burda & Wyplosz 2009: 60–63.)

(4) $$\Delta K = sY - \delta K$$

This notion of the steady state, along with the notion of diminishing marginal productivity together imply that the further a country is from it's steady state, the faster it will grow. If we assume that all countries have the same steady states, this means that a poorer a country is, the faster it will grow. In other words, poor nations should converge with the richer ones automatically. In reality, this is not the case. Different countries have different steady states, because their TFP's are different. The subject of convergence, and conditional

convergence is handled in more detail in chapter 3.5. of this thesis. (Burda & Wyplosz 2009: 60–63, 84–93.)

The Solow model is a basic neoclassical growth model, and simplicity is both its blessing and its curse. Empirical evidence shows that multiple exogenous factors not included in the Solow model affect the growth path of an economy through the TFP. Sala-i-Martin, Doppelhofer, and Miller (2004) identify 67 possible explanatory variables to long-term growth, out of which 18 are found statistically significant. Some of the most important exogenous factors include initial GDP level (convergence), public infrastructure, educational attainment, life expectancy, fertility rate, government consumption, rule of law, and level of investment. (Barro & Sala-i-Martin 2004: 521–534, Burda & Wyplosz 2009: 91–92.)

The traditional macroeconomic models exclude the financial sector as a factor in growth and do not see it as affecting the economic performance. Hicks (1969: 143–145) presents the idea that the development of financial markets had a large impact on the industrial revolution. He argues that it was in fact the development of the financial sector that sparked the industrial revolution, as the technological innovations behind the revolution had been made much earlier than the moment the actual industrial revolution happened. Bencivenga, Smith and Starr (1996: 243) argue that "the industrial revolution therefore had to wait for the financial revolution". It is important to note that the views of Hicks and Bencivenga et al. do not aim to belittle the role of technological advancements but merely to remind that financial development must be considered as an important factor in the development of the current world economy. In fact, Cameron (1967: 2) emphasizes that the financial sector is only a "lubricant" but "not a substitute for the machine".

After Cameron and Hicks' views of the financial sector's role in the economic entity, economists have begun to include financial factors in their models. However, this inclusion of finance in macroeconomic models is not universal. Not all economists agree on the importance of financial development in growth. Many influential development economists have completely ignored the role of finance, even not mentioning it in their articles' omitted topics. Even though some development economists ignore the role of finance in development, international financial institutions such as the World Bank and International

Monetary Fund base their entire existence on the assumption that efficient financial systems have a central role in growth. (Chandavarkar 1992, Levine 1997: 688.)

2.2. Business Cycles

The aggregate economy's actual performance fluctuates around its long-term trend line, as the Finnish GDP progress example showed. Fluctuations in the overall economy are caused by disturbances in goods, financial, or labour markets. These variations around the average eventually turn into business cycles. Economic fluctuations vary both in time and magnitude. In its cyclical behavior, the economy goes through boom periods and recessions and moves from peaks to troughs. (Burda & Wyplosz 2009: 11, 233.)

Schumpeter (1939: 25) describes the phenomenon of business cycles as "irregular regularities of fluctuations". Business cycles do not have a certain universal pattern, they occur at random times and with random fluctuations. In the Schumpeterian era, business cycles were seen to have many different simultaneous trends, from the short-term fluctuations to the Long Wave cycle – the Kondratieff cycle – lasting up to 40 years. (Schumpeter 1939: 169–173.)

This idea of many simultaneous cycles has since been pushed away from the center of business cycle research. This might be due to the limited amount of long wave observations and the random nature of fluctuations in general, both of which make getting any statistical proof of the phenomenon very difficult. The economy is also viewed to be so much more complex today than in the times of Schumpeter that the idea of understanding the world economy through a simplified theory has also been ignored.

2.2.1. Recognizing Business Cycles

Business cycles are usually observed through graphs of past economic performance, or by looking at the data of the overall economic development. Using graphic presentation, a boom period can be recognized from its steep upward slope. A boom period can also be recognized from a position above the trend line. A recession can be recognized from the graph from a more gently

rising or even declining curve, which normally ends below the long-term trend line.

The National Bureau of Economic Research of The United States of America (NBER) is the governing body for tracking economic activity in the USA. NBER sets the standards and definitions that economists often use in business cycle research. NBER's Business Cycle Dating Committee's definition of recession is therefore often referred to as the general definition of recession. They define recession as "a period between a peak and a trough […] during a recession, a significant decline in economic activity spreads across the economy". (NBER 2010.)

The Burns-Mitchell diagram is a useful tool for recognizing the macroeconomic stage of the economy. An example of a Burns-Mitchell diagram is shown in figure 2 below. The diagram consists of a graph showing macroeconomic variables' development before and after a peak. The values' average development during a business cycle is measured against its average performance (100). Some variables act as leading indicators and others as lagging indicators. Some are non-cyclical, not being affected at all by the fluctuations of the economy. Some variables can even be counter-cyclical, going systematically against the development of the real economy. Most macroeconomic variables perform rather coincidentally with the real economy. (Mitchell 1951; Shiskin 1961; Burda & Wyplosz 2009: 12–14.)

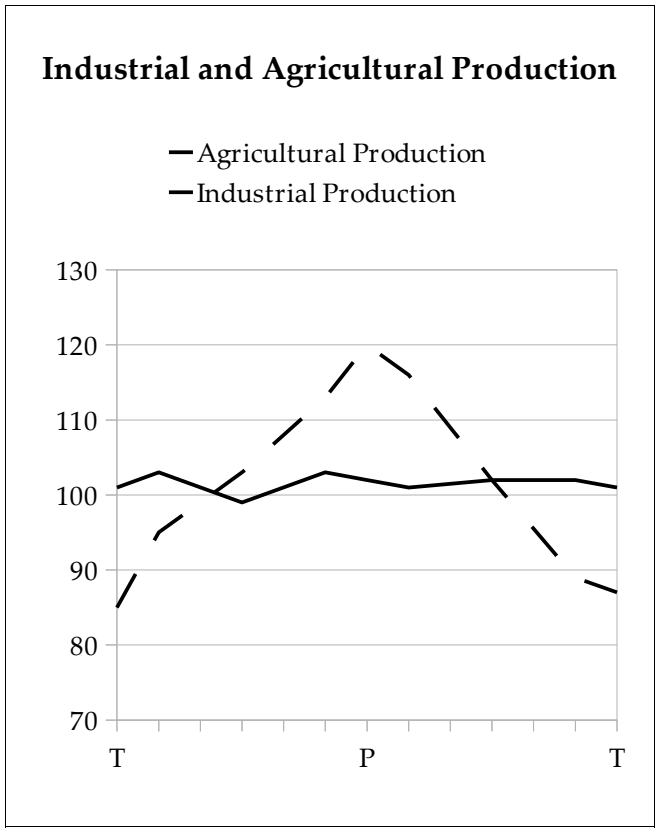

Figure 2. Burns-Mitchell Diagram: Industrial and Agricultural Production (modified from Mitchell 1951: 32).

Figure 2 above presents an example of a Burns-Mitchell diagram. The graph runs through a business cycle, starting from a trough (T), reaching a peak (P) and coming back to another trough. This example is presented in Mitchell's (1951) report on business cycles and it represents the fluctuation of industrial and agricultural production during an average business cycle. The diagram shows that industrial production is highly affected by business cycles. Agricultural production, however, is rather non-cyclical and therefore not affected by business cycles. The timing of an indicator's performance is also an important issue in interpreting a Burns-Mitchell diagram. In this case, industrial production is neither leading nor lagging indicator. In fact, it is highly coincident with the performance of the aggregate economy and it moves parallel to the aggregate economy's performance, only with higher variations than the aggregate economy.

Critics of the Burns-Mitchell method (e.g. Koopmans 1947; Ames 1948) claim that the method is too concentrated on measuring average cycles and lacking any theoretical contribution. Even if its econometric contribution is weak, the Burns-Mitchell method and its successors provide an easily understandable method of identifying business cycles. Especially useful and nowadays often applied is the idea of grouping macroeconomic variables into leading and lagging indicators. This enables forecasting the future path of the aggregate economy more accurately.

2.2.2. Affecting Business Cycles

Business cycles are hard to affect due to their random nature. There are also lags and dysfunctions in certain macroeconomic policies. Changes in the macroeconomic policies are aimed to affecting the business cycle as well as general economic performance. There are two types of macroeconomic policy, monetary policy and fiscal policy. Monetary policy is targeted to control the amount and price of money in an economy, whereas fiscal policy aims to modify the usage of government funds by affecting government revenue collection or government spending. Both monetary and fiscal policies are used in order to smooth the economic development curves, preparing for worse times by tightening up the economy or boosting the economy in a period of slower growth. (Burda & Wyplosz 2009: 207, 417–419.)

Using monetary policy is the fastest way of affecting the economic conditions. During boom periods, the overall aim is to cool down the economy by, for example, raising interest rates or reducing creation of money. These measures will reduce the number of profitable investment opportunities, and encourage saving instead of spending. Vice versa, in the recession periods monetary policies are used to encourage investment and speed up economic activities. The neoclassical view sees monetary policy as the most effective way of changing the path of the economy. (Burda & Wyplosz 2009: 390–392.)

Fiscal policy is another way of trying to change the economy's performance. Changes in government spending and taxation are the main fiscal policy tools. The Keynesian macroeconomic view sees fiscal policy as the preferred means of influencing the economy. Changes in fiscal policy take time, as taxation rates and big government development projects can not be switched on or off as fast

as changes in monetary policies can be applied. These lags in fiscal policy – starting from recognition lag, then the lag in decision making, lag in implementation after the decision is actually made and, finally, the lag from the decision to the policy's effect – are among reasons the neoclassical view on macroeconomics heavily criticizes the importance and effectiveness of fiscal policy on affecting economic performance. (Burda & Wyplosz 2009: 390–392, 398–399.)

2.3. Credit Channels

The effect on fiscal policy is rather straight-forward to explain - changing taxing increases or decreases the amount of money people have for spending, and changing government spending either slows down or speeds up economic activity. The monetary policy effects, however, are a bit more complex and warrant a little more effort to be explained properly. Following chapter presents the theoretical basis and some empirical evidence on the credit channels, or the ways monetary policy affects the economy.

Bernanke and Gertler (1995) describe the real economy transition of changes in monetary policy. In the neoclassical view with the assumption of perfect markets and maximized utility, the monetary policy should not have any substantial effect on long-term interest rates. However, real examples show that there are certain frictions in the real financial markets that seem to transfer the effect on long-term financing as well. Bernanke and Gertler offer two possible ways that monetary policy changes transfer to changes in the required external finance premium (the difference of the price of borrowed money and the required rate for own money, in a sense the measurable "friction price"). These two links are the balance sheet channel and the bank lending channel. A tightening monetary policy has a direct effect on the interest rates for firms' short term loans and usually leads to falling asset prices, thus making the firms' financial position worse. The bank lending channel refers to the dominance of banks as lenders. If they refuse to give more credit to a company with a worsened financial position, the company in question has to look somewhere else for credit. This will not only cause costs by itself but also possibly raise the required external finance premium, as banks are the benchmarks of reducing financial frictions and therefore can offer loans at the most affordable rates. The

cutback on the ability to lend money can also have indirect effects on the balance sheet position, if the firms' customers cut back on their spending due to their worsened financial position and the firm loses some of its income.

Even though Bernanke and Gertler's (1995) model is based on shocks caused by macroeconomic policy changes, it can be easily applied for other external shocks experienced by an economy and the effects to a company. For the purpose of this thesis, the source of the shock is not a critical question. Kiyotaki and Moore (1997) provide a model of credit constraints, where shocks can come from technology or income distribution. Their model shows that small technology or income distribution shocks can generate notable fluctuations in output and asset prices. In the model a firm can only borrow the amount it is able to secure with its durable assets and therefore has natural limitations to credit. The credit constrained agents have to leverage their borrowing and therefore even small shocks can have substantial effects spilling over many time-periods.

Gan (2007) researches the effects of a bank liquidity shock to the state of the real economy using the data from Japanese land market bubble of the early 1990's and finds that banks are credit-constrained in a way that a negative shock in the asset markets limits the exposed banks' ability to lend money. Gan (2007) also finds that individual firms are largely affected by their ability to receive bank credit. Gan suggests that there are no good available substitutes to bank credit and therefore a shock in their financial conditions will have consequences in the real economy's performance. Gan's findings are special, as there have not been many empirical studies on situations where the level of financial infrastructure has suddenly been downgraded after a crisis. The findings on the real economy effects of sudden and unexpected bank lending limitations are in line with the studies of cyclical changes in real performance. Theoretically, Gan's (2007) findings relate closely to Kiyotaki and Moore's (1997) model presented earlier.

Another study on the effects of a banking crisis on growth was conducted by Kroszner, Laeven, and Klingebiel (2007). They find that during normal periods, external finance dependent firms in countries with deep financial systems grow disproportionately fast. The same firms experience similar negative effects during times of crisis. Kroszner et al. point out that this effect is seen only on crises in banking. They also note that in countries with shallower financial

systems, this magnifying effect is not seen, because the firms that require large amounts of external financing are not able to receive similar quantities of financing or are nonexistent because they can not exist without heavy investments.

2.4. Macroeconomic Growth Models with Financial Factors

The textbook models of macroeconomics, such as the Cobb-Douglas production function do not include finance as a factor in the model. In the Cobb-Douglas model with a Solow residual, finance is one factor among others, affecting the TFP residual. The Cobb-Douglas model is a very simplistic presentation of the actual economy. In more complex and more recent models, financial factors have been included as separate factors.

In a leap of progress in the study of financial sector and growth some 20 years ago, economists developed many different macroeconomic models accounting for financial sector's development. The earliest macroeconomic models that had financial markets as a factor in the models, treated them as an exogenous factor that affected the economy from the outside (e.g. Townsend 1978). In more recent models (e.g. Bernanke & Gertler 1989; Greenwood & Jovanovic 1990), financial infrastructure and its laws are included in the models as endogenous factors.

Bernanke and Gertler's (1989) neoclassical business cycle model includes the structure and laws of the financial market as a part of the aggregate model. In their model they suggest that the demand for financing accelerates during booms due to well-conditioned balance sheets and following reduced agency costs. This hike in financing demand further feeds the boom. Vice versa, the demand to financing falls during a recession, following a decrease in possible collateral assets' value and increased agency costs, further subtracting the aggregate economy. Bernanke and Gertler's view is very business cycle orientated. Their model is a good tool for measuring the causes and effects of a business cycle but it does not answer the question of whether the level of financial infrastructure affects the overall economy.

Greenwood and Jovanovic (1990) fill the gap left by Bernanke and Gertler (1989). Their model includes the level financial intermediation as an endogenous factor, which enables a higher rate of return because the financial institutions are able to make better financing decisions and distribute money more efficiently across the economy. Their superiority derives from their extensive knowledge and experience, in addition to large scale that makes involvement in big projects possible. Greenwood and Jovanovic's model does not illustrate the effects of business cycles on growth, it only uses the role of financial infrastructure and intermediaries on growth.

3. FINANCE-GROWTH RELATIONSHIP

This chapter starts with presenting the role of the financial sector in the economy and the reasons for its existence. It is necessary to understand the reason for financial markets' existence and their role in the economic entity to understand the relationship between the financial infrastructure and economic growth. We also take a look at the relationship between the real economy and the financial sector in short and long term. The introduction to the phenomenon of credit channels brings us the theoretical base for the short-term effects that different monetary shocks cause to the real economy. Last, the causality of the finance-growth relationship is discussed.

3.1. Role of the Financial Sector in the Economy

Investors face large information and transaction costs in an economy without any financial system. These extra costs, frictions, create the need for a financial system. The primary function of a financial system is to make efficient resource allocation under uncertainty possible. The financial sector is therefore needed to facilitate the investments for financially challenging projects. (Merton & Bodie 1995: 12–16; Levine 1997: 690–694.)

In an economy without a financial system, it would be near impossible to fund complex and risky projects without the access to vast financial resources. An investor who would be willing to invest in such a project, would have a more limited access to information about possible projects of their interest. It would also increase the riskiness of an investment if it would be near impossible to liquidate one's ownership in a project or to monitor the activities of the entrepreneur. People who would like to participate in investment opportunities with limited funds would basically not have access to the financial markets at all, since it would be of limited interest to the entrepreneur to involve small-scale investors in their projects. On the other hand, people who are not willing to participate in the financial markets as investors would keep their money under a mattress instead of a bank account, limiting the possibilities to get funds for investment. Actually the most likely scenario of what would happen in an economy without a financial system is that a financial sector would naturally emerge either officially or non-officially to fulfill these gaps in the

proper allocation of the society's resources, left by the non-existence of the financial system.

The financial sector consists of two parts: financial institutions and financial markets. Financial institutions such as banks help reduce information costs, facilitate risk sharing and pooling, and mobilize savings. Financial markets help to efficiently allocate capital resources by improving liquidity, exerting corporate control, and risk sharing. (Levine 2001.)

The functional perspective of the financial system views the financial system as a dynamic network of institutions that is changing constantly over time to fulfill its primary function of optimal resource allocation. The financial system does so by completing its five basic functions. These basic functions are risk management, transfer of economic resources, exertion of corporate control, savings mobilization, and facilitation of goods and service exchange. Merton and Bodie (1995: 5) divide the last basic function into two parts: providing price information and providing payment infrastructure. (Levine 1997: 691–701; Merton & Bodie 1995: 5, 11–16.)

The overall role of financial sector in the context of economic growth is shown in Figure 3 below. The economy has an imperfection in form of frictions in information and transaction costs. The financial sector exists to solve this problem by completing its basic functions. When working properly, the financial sector is able to change the overall behaviour of people by lowering the threshold for investing and directing the resources into optimal use. This allows investors to participate in large and risky projects which would otherwise be impossible. The completion of these projects accumulates to one of the basic sources for growth, capital accumulation to technologically innovative (i.e. more profitable) projects. (Levine 1997: 691.)

A properly functioning financial system fulfills its primary function and the mentioned five basic functions. When an economy's financial system performs these tasks as efficiently as possible, the financial infrastructure should set an ideal ground for economic growth. The overall role of the financial sector in economic growth is further explained in figure 3 below, in style of Levine (1997).

Figure 3. Financial Sector's role in Growth (Levine 1997: 691).

There are several possible reasons for the current state of a country's financial development. Huang (2010: 3–7) identifies three main external determinants for the level of financial development in an economy. First, there are institutions, such as legal institutions and the regulatory institutions, which set the rules that guide the financial sector. Second, macroeconomic policies exist to control inflation, encourage investment or enable financing to generate an incentive to invest. Third, geographic factors such as latitude (e.g. countries closer to the equator, in general, have more diseases, worse crops and more fragile soil), availability of waterways usable for trade, and the availability of natural resources are important unique features in each economy that determine the types and amount of economic activity that might be in need of financing. Other factors influencing financial development are level of income, past growth, amount of population, and cultural and ethnic characteristics.

3.2. Role of the Financial Sector in Growth

Schumpeter (1911), Cameron (1967), and Hicks' (1969) views of financial sector's role in enabling economic growth influenced a stream of research on the relationship between financial infrastructure and the real economy. However, not all economists agree that this relationship is of importance. Lucas (1988: 6) states that the role of financial markets in growth has been "very badly over-stressed". Due to Lucas' and some other influential economists' views, the general research on economic growth has largely ignored the role of the financial markets. Financial economists, in general, agree that finance does effect growth, and have tried to make it accepted as one of the factors affecting economic growth. Despite this neglect to consider the role of financial sector in economic growth and business cycles, empirical studies show a strong relation between them (King & Levine 1993; Rajan & Zingales 1998).

Recent macroeconomic theory (e.g. Bernanke & Gertler 1989; Greenwood & Jovanovic 1990; and Bencivenga & Smith 1991) agrees that the level of financial infrastructure has an impact on economic performance and stability and that it should therefore be included in the macroeconomic models presented in Chapter 2. This view is supported by empirical evidence (e.g. Goldsmith 1969; King & Levine 1993; Aghion et al. 2005; Braun & Larrain 2005; Fung 2009).

Financial liberalization might also have some negative impacts in the developing economies. Boyd and Smith (1992) show that a country with deep international financial integration level might experience decreased levels of economic growth if its own institutions and policies do not encourage investment. The capital flows easily away as the domestic investors see better possibilities in foreign countries. This is a fair assumption, as well-functioning financial sector directs investment to the most effective use of the capital, and in some cases the domestic environment is not the best possible for investments. Edison, Levine, Ricci and Sløk (2002) find that international financial integration per se does not accelerate growth, although it is associated to high levels of economic development. This means that the countries with most wealth also have the most developed financial markets, but the level of the developed countries' financial infrastructure is not able to predict their future growth rates.

One common finding in the empirical studies of the relationship between financial infrastructure and growth seems to be that firms with a higher dependency on external financing are more affected by the level of financial development. This effect is suggested to be due to lowered per unit financing costs in the more developed financial markets. (Rajan & Zingales 1998; Braun & Larrain 2005.)

A well-functioning financial system is especially helpful in spurring growth in developing countries and small firms. In mature markets or companies, the need for external financing is not as big as it is in new firms and poor countries. This finding seems logical: where financing is most needed, it has the biggest positive effects. The structure of the financial sector is also related to the level of financial development of an economy; banks play a more important role for economic growth in developing economies, and the importance of securities markets to the level of economic growth increases with the more developed economies. (Beck, Demirgüç-Kunt, Laeven & Levine 2008; Demirgüç-Kunt, Feyen and Levine 2011; Fung 2009.)

3.2.1. Studies on Finance and Long-term Growth

Levine and Zervos (1996) use cross-country regressions to research the connection between stock market development and economic growth. They use indexes of stock market volume, size and international integration to define the level of stock market development and control for known growth-related factors such as political stability, initial macroeconomic conditions, and investment in human capital. They find a positive association between stock market development and long-term growth. However, Levine and Zervos point out that there are flaws in cross-country growth regressions. They mention data quality issues, impossibility of a *ceteris paribus* analysis due to constantly changing conditions, and statistical problems relating with vast differences between countries.

Demirgüç-Kunt and Maksimovic (1998) find that an active stock market and compliance with legal norms helps companies grow at a faster pace than the countries with less active stock markets and not so well-functioning legal systems. The downside to fast growth is a correlation to a lower rate of return in the more developed economies. Rajan and Zingales (1998) use an inter-industry

setup for a rather similar research. They also find that financial development helps growth and assists new innovations' funding. This finding includes the suggestion that new firms are expected to have a disproportional amount of new ideas compared to old companies. Rajan and Zingales' results relate closely to Schumpeter's (1939: 83) widely known idea of creative destruction, which Schumpeter himself labeled "economic evolution".

3.2.2. Studies on Finance and Short-term Growth

Increased financing in competitive industries leads to poor *ex post* stock market returns. This effect is caused by a failure in coordination between the companies in competitive industries and a reliance on common industry signals, leading to a state of over-financing within the industry during a time of positive expectations. The failure in coordination is also seen in analyst forecasts, which have a significant upward bias among the competitive industries. (Hoberg & Phillips 2010.)

Technological revolutions are a common source of disturbances in the financial equilibrium. Estimations of future profits vary widely, and investors think they can not afford to miss the opportunity for the yet undiscovered potential profits of a new technological advancement, further feeding the disequilibrium state. This phenomenon is closely related to the failure of cooperation of competitive industries, studied by Hoberg and Phillips (2010). In both phenomena, the high expected growth causes a market imbalance and a "keeping up with the Joneses" effect among opportunistic investors further amplifies the disequilibrium. This effect can be seen both in stock prices and the amount of received financing. (DeMarzo, Kaniel & Kremer 2007; Pástor & Veronesi 2009.)

The relationship between technological revolutions and blatant over-financing has been known to happen for a long time, and also the empirical studies run a long way back. Among the first examples, Schumpeter (1939: 257–275) describes the 1850's American railroad bubble, where government stimuli were used to build a vast amount of railway coverage in the USA at the same time of rising prosperity due to Californian gold rush and large amount of European credit. During a favourable macroeconomic situation and an appearance of new revolutionary technology, the speculated profits of the new technology were approximated to be too high. The incorrectly evaluated profits eventually lead

to a recession. This pattern is very similar to that studied by DeMarzo et al. (2007), and Pástor and Veronesi (2009).

There is a considerable relationship between the amount of needed external financing and experienced trouble during a recession. In other words, firms that are more reliant on external financing have more trouble getting through a recession, especially in countries where the financial infrastructure is not of the highest quality. (Braun & Larrain 2005.)

The findings by both Hoberg and Phillips (2010), and Braun and Larrain (2005) paint a negative picture for companies which function in competitive industries and which require a large amount of external financing, they are either not getting enough financing or going to be in trouble because of excess financing. This is direct proof of the effects financing has on business cycles. However, according to the mentioned studies, it can not be stated whether finance's effects on growth are positive or negative.

3.3. Global Financial Development

Global financial institutions such as IMF or World Bank are dedicated to improving the level of financial development globally. They have an important role in the global economic development but as stated earlier, finance cannot perform miracles unless the society's overall development level does not allow the financial sector to perform sufficiently. United Nations' (2002) declaration of the Millennium Development Goals list overall development targets, which are amongst the most central development goals related to areas in poverty reduction, education, health, sustainability, and global cooperation issues which would also assist a financial sector to function properly.

The efforts to improve the level of financial development differ from economic policy, because they are aimed to improve the long-term economic growth instead of affecting the economy's short term fluctuations. It is also good to note, that the effects of financial development level improvements are more substantial in developing countries, since the developed countries already enjoy the benefits of reasonably well-functioning financial sectors and have been able to realize the benefits of them already. This notion is closely related to the

studies in the field of causality of the finance-growth nexus, presented in chapter 3.4. of this thesis. (Jung 1986; Fung 2009.)

The developing countries are not very attractive for traditional financial institutions, since the size of an average loan is so small that the associated overhead costs and a risky environment can be a combination unattractive enough to keep the big financial institutions entirely away from these areas. Therefore the entire structure of the financial sector is different in these countries, with more emphasis on the informal financial sector and micro-financing. Also, the government's resources are very scarce, limiting their power to affect the economic policies. Berger, Hasan and Klapper (2004) show that small community banks are linked with faster growth in developing countries, and note that due to loose regulations and informal practices of micro-financing, getting a high level overview on its effects on growth is difficult. (Todaro & Smith 2011: 731–746; Banerjee & Duflo 2011: 269–270.)

Regardless of the type of a development effort, recent research has been emphasizing the importance of implementation in the development projects. Whether it's school funding in Uganda or micro-financing in India, even the most well-intended development efforts might not reach their goals if the implementation has some fundamental flaws. Pouring money into the hands of corrupt governments obviously will not have the wanted effect on a country's economy or attaining the wanted development goal. One key lesson is to understand the differences between the lives of people and the functioning of institutions in the developing and the developed countries. (Reinikka & Svensson 2004; Banerjee & Duflo 2011.)

3.4. The Causality of the Finance-Growth Nexus

One reason for economists' debate on the role of finance on growth is that the causality of this relationship is not clear, even though correlation between the two has been unanimously accepted and proven in empirical studies. There are, however, many different views on the causality, all of which have support from empirical evidence. (Jung 1986; Al-Yousif 2002.)

First, demand-following view sees financial services responding to the demands of the real sector. This stream of research has been heavily influenced by Robinson's (1952: 86) frequently utilized quote ”where enterprise leads, finance follows”. Also some empirical studies' results give support to this view, such as Demetriades and Hussein's (1996) 16-country case-study, which shows that in the majority of the countries the financial services developed according to the economic development path, which supports the demand-following approach.

Second, supply-leading view sees the financial sector's development as a factor for growth. This view originates from Schumpeter (1911: 223), Hicks (1969), and McKinnon's (1973) groundbreaking work on the development of the current capitalist system and finance sector's role in it. The supply-leading view is often assumed and supported empirically in studies of developing countries and their growth progress. King and Levine (1993) show supporting empirical evidence for the supply-leading view. They find that the level of financial development affects growth positively and that it is a good predictor of future growth rates. Xu (2000) uses a multivariate VAR approach to examine the relationship between financial depth and economic growth, and finds that in most of the examined countries (out of which most are developing countries) there is strong evidence that financial development has positive long-term effects on growth.

Third, some empirical studies have found the causality to be bi-directional (Jung 1986; Demetriades & Hussein 1996; Shan, Morris & Sun 2001; Al-Yousif 2002). Bi-directional causality means that the causality flows both ways. Improving financial infrastructure improves growth rates and vice versa. Fourth, in fashion of Lucas (1988: 6), some economists advice to ignore finance as a growth factor altogether.

Despite the widely varying empirical evidence on the finance-growth nexus, newest studies unanimously show the causality running from financial development to accelerated growth in less developed countries, and that developed countries have very mixed results altogether. Results from different countries have a large variance, and the selection of countries in cross-country studies therefore affect the results notably. In poorer countries, a well-functioning financial system is a strong positive indicator of future growth

rates. In more developed countries, the connection can even turn negative. Moreover, in the more developed countries the effect of the financial sector in real performance is not as clear as in the less developed countries. This effect on financial infrastructure on growth in developed countries had not been recognized in the earliest studies. Many cases showing negative correlation have a strong connection to financial crises and unfavourable business cycle positions. (Hicks 1969; Jung 1986; Al-Yousif 2002; Fung 2009.)

The results in the studies on causality of the finance-growth nexus can not be universally applied to predict the performance of an economy due to the complexity of the matter. Each country has a special and unique environment, which makes comparing countries pointless. An effective policy in one country may not work in another one, or might be adopted in a different fashion due to country-specific external factors. This complexity means that the institutions applying the policies have great responsibility in the possible outcome, and arranging a successful implementation. (Demetriades & Hussein 1996; Al-Yousif 2002.)

3.5. Convergence

One of the general economic problems is the question of convergence. The general setting is the argument whether the rich get richer, and the poor get poorer. Or do the poorer economies have the ability to catch up with the richer countries by adopting the same good practices that have worked for the richer countries?

Convergence refers to the phenomenon of catching-up. In a Solow growth model long-run steady state is explained by the saving rates and the level of technological development. The less developed economies should therefore experience faster growth, if their level of technology and savings rate is the same as the more developed countries' as the long-term, because therefore their long-run equilibrium state is same as the developed countries have. (Burda & Wyplosz 2009: 82–84.)

Economists have argued whether convergence between economies actually exists. Using the whole world's every national economy as a sample, it is hard

to find empirical evidence of absolute convergence (Barro & Sala-i-Martin 2004: 45), but selecting a more homogenous sample group, such as continental US states, or original OECD countries (Barro & Sala-i-Martin 1992), evidence of absolute convergence can be found. This might be due to the more limited sample groups' relatively similar steady states, allowing the catching up to happen as expected.

Economists have grouped countries according to their possibilities of achieving convergence by determining whether a country is a member of "the convergence club" or not. This refers to the phenomenon, where the poorest countries remain poor, or get relatively even poorer (and therefore are not members of "the club"), whereas some developing countries seem to have the ability to benefit from convergence. Baumol, Nelson and Wolff (1994: 65) speak of advantages of moderate backwardness as they suggest that an economy needs certain amount of human capital is necessary to be able to benefit from convergence. Sachs and Warner (1995) suggest that instead of the human capital allocation, membership of the "convergence club" should be defined by the policy choices of a country. Open financial markets, clearly defined property rights and other policy choices should boost an economy and allow convergence.

Conditional convergence is a version of convergence where all the other underlying factors affecting growth are expected to be *ceteris paribus*. This means that the performance of an economy is compared to its steady state instead of only a growth percentage. Formally, conditional convergence is defined by the β factor of the equation

(5) $\dot{y}_i = \beta(y_i* - y_i)$

where $\dot{y}_i$ is the actual growth rate of a country, and $(y_i* - y_i)$ represents the difference of the long-run capital income level (steady state) and initial capital income level. If β has a positive value, the economy is said to conditionally converge. (Barro & Sala-i-Martin 1990 & 1991, Sachs & Warner 1995.)

Figure 4 below shows the long-term growth rates of 98 countries (World Bank 2012), where GDP data was available from 1961 to 2010, and the average growth rate of each country. The positive trend line suggests negative convergence, or

existence of a convergence club, as it implies that the richer a country was in 1961, the faster growth it has experienced during the 50 year sample period. It is also worth noting that the values are highly scattered, diminishing the explanatory value of the trend line.

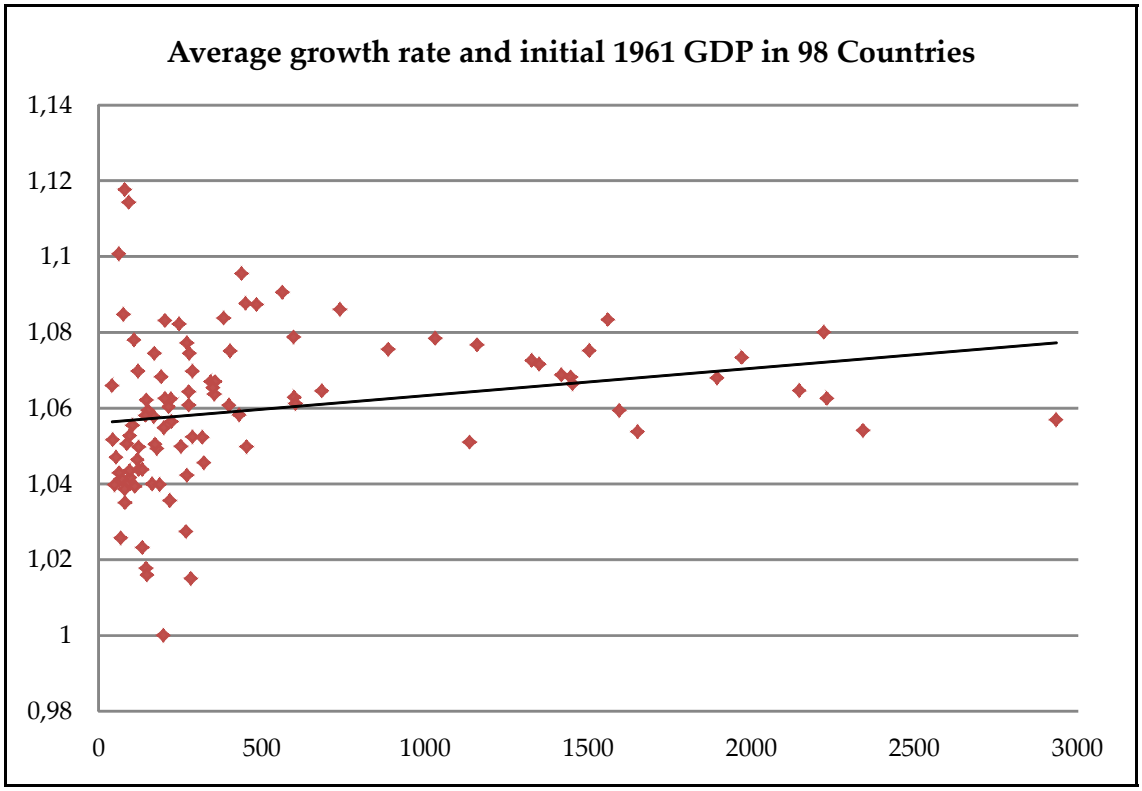

Figure 4. Long-term growth rates of 98 countries from and initial 1961 GDP in current US dollars (Data: World Bank 2012).

Figure 5 below is a visualization of the OECD country example referred earlier (Barro & Sala-i-Martin 2004: 46). In this, more homogenous group of countries the trend line is negative, implying absolute convergence. This sub-sample suggests that the convergence phenomenon should indeed be examined assuming conditional convergence related to the different steady states of different economies. In the OECD country sample group the values are closer to the trend line than in the 98 country sample presented in figure 4. This can be partially due to the smaller sample group, and partially due to similar steady states of the economies.

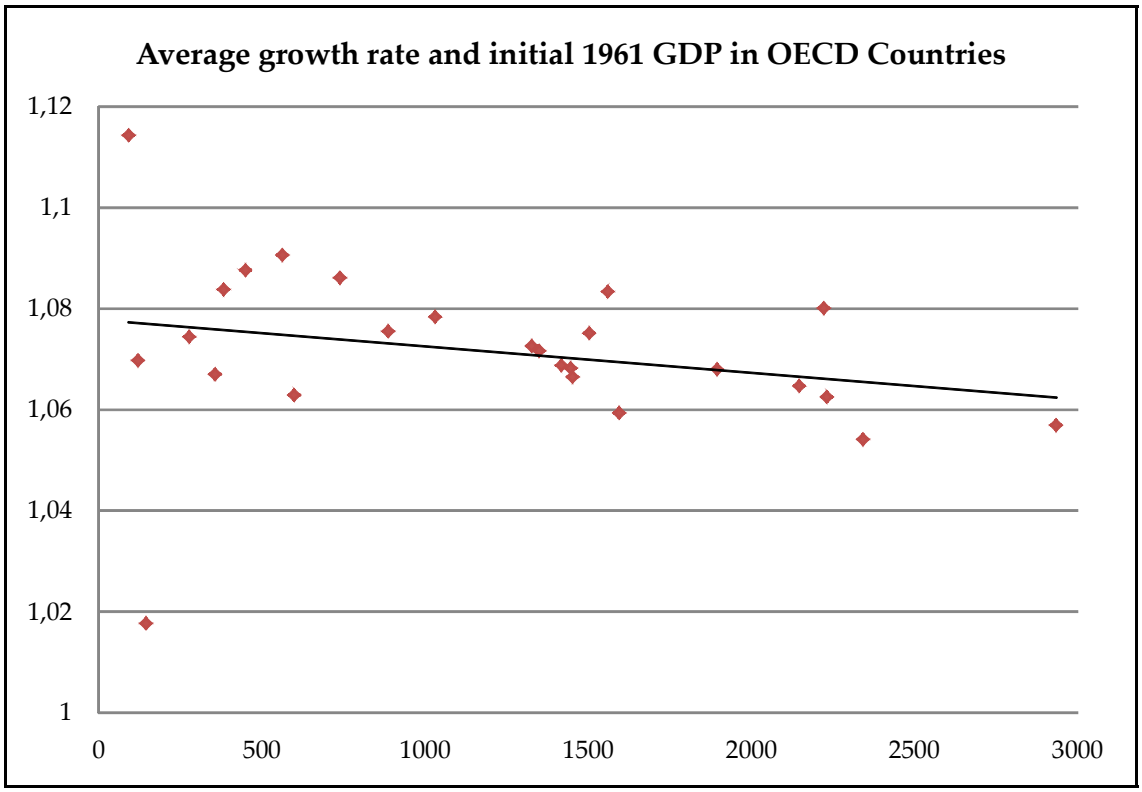

Figure 5. Long-term average growth rates (1961–2010) of OECD countries and initial 1961 GDP in current US dollars (Data: World Bank 2012).

4. METHODOLOGY AND DATA

This chapter presents the methodologies used in the study, as well as the data which is used to conduct the research. The empirical results achieved applying the methodology to the dataset are presented in the next chapter.

4.1. Methodology

This thesis studies the relationship of the financial development and economic growth. Financial development is seen as one of the factors summing up as the total factor of productivity in the equation for economic growth, as well as affecting the economic growth through capital accumulation.

The first empirical researchers of the connection between financial development and economic growth (e.g. Goldsmith 1969) used the size of the financial sector to indicate the level of financial development in an economy. Judging a financial sector solely by its size has its shortcomings: measuring by size alone, the US financial sector seemed to be at its top condition in 2008, just before the subsequent financial crisis. It is therefore better and more informative to measure the financial development from more points of view than just the size of the financial sector.

The more recent research has extended this view to include also other factors than the possibly misleading size of the financial sector. King and Levine (1993) use four different indicators to determine the level of financial development. First indicator is the ratio of liquid liabilities to GDP, measuring the total size of the financial system in comparison of the real economy. Second indicator is deposit banks' credit to central bank's credit, aimed to measure the efficiency of resource allocation within the financial sector. Third indicator is credit issued to real sector private firms to all credit issued to nonfinancial sector. Fourth, and the last indicator is credit issued to real sector private firms to the overall GDP.

The inclusion of several variables explaining the level of financial development is a step towards the right direction but the selection of indicators can be criticized for lacking a structured approach and using inaccurate measures for the intended purpose. This is perhaps caused by the limited availability of the

data; a concern which King and Levine themselves also raise in their research (King & Levine 1993).

Fung (2009) uses the traditional size indicators to determine the level of financial development in his study on convergence in financial development and economic growth. The size of the financial system does not tell the full picture. A financial system might be very big, but not directing the resources to the most efficient possible usage or to the hands of the right people, or very small but enabling just the right investment opportunities to be more effective than its size would indicate. Thus, the information needs to be gathered from differing points of view and in a structured way.

Levine (2005) points out that measuring financial development should be concentrated to measuring the way the financial sector is able to provide its primary functionality of optimal resource allocation through its five basic functions of risk management, transfer of economic resources, corporate control, mobilization of savings, and facilitation of exchange. Neusser and Kugler (1998) and Beck, Levine, and Loayza (2000), examine the TFP effect achieved by development in financing. They find that growth in finance increases TFP, supporting Schumpeter's (1911) views in the importance of banks enabling innovation and proving that finance can assist in achieve a better resource allocation within a society.

This study expands the research made by King and Levine (1993) on the subject of financial system and the economic growth, and Fung's (2009) analysis of convergence in financial development and economic growth by including more sophisticated measures on the level of financial development. Both King and Levine's, and Fung's analysis concentrate on comparing the quantitative measures on the size of the financial sector to the economic growth, which is giving an incomplete view of the performance of the financial sector. The depth of the financial sector might be the single best measure of the performance of the financial sector but judging the financial sector only by its size does not cover the important topics of who is able to receive financing in the economy, is the financial sector financing the right projects, and whether the financial institutions are functioning at the correct level measured by the system's stability.

Čihák et al. (2012) suggest, that the level of financial development should be evaluated using four different characteristics: financial depth, financial access, financial efficiency, and financial stability. Financial depth is the traditional view of financial development, where size is all that matters; financial access provides us with information on the ubiquity of the financial systems and their usage; financial efficiency tells us whether the financial system is functioning at its full potential; and financial stability gives us the overview of the system's riskiness, and a good control variable for too large financial depth (oversized markets with too loose credit conditions).

To get a better overview on the financial development, the amount of variables measuring the different aspects of financial development must expand beyond the size of the company, as Čihák et al. (2012) state. Table 1 shows the benchmark variables for each dimension of the financial system's institutions characteristics.

Financial institution's characteristic	**Benchmark variable**
Depth	Private sector bank credit to GDP
Access	Bank accounts per 1000 adults
Efficiency	Net interest margin
Stability	Weighted average commercial bank Z-score

Table 1. Benchmark variables for measuring financial institutions' characteristics (Čihák et al. 2012).

Financial depth, as mentioned, has traditionally been used as the single measure of financial development. In this study the benchmark variable used to measure the financial depth is private sector bank credit to GDP ratio. The ratio measures the amount of credit given out by financial institutions compared to the size of the real sector economy.

Financial access is the second dimension to measure the level of financial development. The benchmark variable used in this study is the amount of bank accounts per thousand adults. This measure can point out the differences in financial development between development economies and economically developed countries quite well. Its weakness, however, is that it is not possible to identify people with multiple bank accounts, which is giving an overly

positive image of financial access for economies where this is common. (Čihák et al. 2012.)

The third dimension used is the financial efficiency, measured by the net interest margin. The net interest margin is able to portray how close the financial institutions are able to function to the optimal level, portrayed by the market interest rate. Using the net interest margin instead of measures such as financial institution's return on assets or equity helps to account better for economical fluctuations, which affect the returns of financial institutions differently during different periods. (Čihák et al. 2012.)

Fourth, and final dimension of characteristics of financial development is the stability of financial institutions. The benchmark variable for financial institutions' stability is the weighted average commercial bank Z-score. It is a measure used to predict upcoming financial distress by utilizing the existing knowledge of the firm's previous success and comparing them to the riskiness of the business. The Z-score result can be interpreted as the number of standard deviations a firm's realized returns would need to fall in order to consume all the equity of the company. The Z-score was originally proposed by Altman (1968), and further developed into a simplified formula by Boyd & Runkle (1993). The Z-score formula can be written as

$$Z = (k - \mu)/\sigma \quad (6)$$

where Z is the measure indicating probability of future insolvency (the lower the score, the higher the probability of future bankruptcy); k is equity capital as a percentage of assets; μ is return as a percentage of assets; and σ is the standard deviation of asset returns, giving an indication on the volatility or riskiness of the business. (Boyd & Runkle 1993.)

While the Z-score is a simple and easily applicable measure to compare companies' risk of default universally because it utilizes purely accounting data, it also has its weaknesses. Due to being based on accounting data, poor accounting quality can cause severe problems in the interpretations of the score. Also due to the same reason, the Z-score is purely backward looking, and is not able to predict the future volatility. It is not either including the risk another company's insolvency might cause to another companies in the economy, which

is a notable risk especially for inter-dependent financial institutions. (Boyd & Runkle 1993; Čihák et al. 2012.)

4.2. Data

The study uses data from the World Bank Global Financial Development Database (GFDD). The database is recently introduced, and it contains measures of financial depth, access, efficiency and stability (World Bank 2012; Čihák et al. 2012).

There are a total of 203 economies included in the GFDD dataset. All economies are not included in every equation in the empirical part in chapter 5, due to the limited availability of some countries' data observations in the GFDD database. The data selected for this thesis is collected from a 50 year period, from 1961 to 2010. Due to the time period where observations on some GFDD benchmark variables (namely financial access and stability) are available, the empirical examination in this thesis is limited to the past 13 years, unless otherwise mentioned.

Table 2 below shows the division to top, middle and bottom thirds based on the GDP values of 2010. The top third contains most of the EU and OECD countries, as well as the richest countries in other continents. Middle third consists of a wide variety of industrializing countries widely spread throughout the continents. Bottom third is the home of many landlocked Asian countries, many South East Asian countries, and the majority of sub-Saharan Africa. A total of 198 countries out of the total 203 were given a categorization in the division to top, middle, and bottom thirds. The remaining five countries did not have a comparable GDP value from the past 10 years which could have been utilized to put them into a scale with the other countries with this logic.

Top Third
Monaco, Liechtenstein, Luxembourg, Bermuda, Norway, Qatar, Switzerland, San Marino, Denmark, Macao, Australia, Isle of Man, Sweden, United States, Netherlands, Canada, Ireland, Kuwait, Faeroe Islands, Andorra, Austria, Finland, Japan, Belgium, Singapore, Germany, United Arab Emirates, Iceland, France, United Kingdom, Italy, New Zealand, Hong Kong, Brunei Darussalam, Spain, Cyprus, Israel, Greece, Slovenia, Bahamas, Portugal, Oman, Equatorial Guinea, Korea Rep., Aruba, Malta, Czech Republic, Bahrain, Saudi Arabia, Slovak Republic, Trinidad and Tobago, Barbados, French Polynesia, Estonia, Croatia, Venezuela, Antigua and Barbuda, Hungary, St. Kitts and Nevis, Chile, New Caledonia, Poland, Uruguay, Seychelles, Lithuania, Brazil
Middle Third
Latvia, Russian Federation, Turkey, Libya, Lebanon, Mexico, Argentina, Kazakhstan, Gabon, Malaysia, Palau, Suriname, Costa Rica, Panama, Mauritius, Romania, Grenada, Botswana, South Africa, Dominica, St. Lucia, Maldives, Montenegro, Bulgaria, Colombia, St. Vincent and the Grenadines, Azerbaijan, Belarus, Cuba, Peru, Serbia, Dominican Republic, Jamaica, Namibia, Thailand, Algeria, Iran, Macedonia, China, Bosnia and Herzegovina, Jordan, Angola, Tunisia, Belize, Ecuador, Turkmenistan, Albania, Fiji, Swaziland, El Salvador, Tonga, Cape Verde, Samoa, Tuvalu, Kosovo, Armenia, Marshall Islands, Guyana, Ukraine, Congo Rep., Indonesia, Syrian Arab Republic, Vanuatu, Guatemala, Paraguay, Morocco
Bottom third
Egypt, Micronesia, Georgia, Iraq, Sri Lanka, Mongolia, Philippines, Bhutan, Honduras, Bolivia, Moldova, Sudan, Kiribati, Papua New Guinea, Uzbekistan, India, Ghana, Yemen Rep., Solomon Islands, Zambia, Nigeria, Vietnam, Sao Tome and Principe, Djibouti, Cote d'Ivoire, Lao PDR, Cameroon, Nicaragua, West Bank and Gaza, Mauritania, Senegal, Pakistan, Lesotho, Kyrgyz Republic, Tajikistan, Cambodia, Kenya, Timor-Leste, Chad, Benin, Comoros, Bangladesh, Haiti, Mali, Gambia, Zimbabwe, Guinea-Bissau, Burkina Faso, Nepal, Rwanda, Togo, Tanzania, Uganda, Afghanistan, Guinea, Central African Republic, Madagascar, Eritrea, Mozambique, Ethiopia, Niger, Malawi, Sierra Leone, Liberia, Burundi, Congo Dem. Rep.

Table 2. Countries in GFDD dataset divided to subsets of top, middle and bottom, based on 2010 (or latest, if not available) GDP values. Cayman Islands, Korea Dem. Rep., Myanmar, Somalia, and Virgin Islands are excluded from the split due to missing GDP data from past 10 years.

Table 3 below shows the continental split of the GFDD dataset countries. Africa, Asia, and Europe have most countries included in the dataset, and North America, Oceania and South America have fewer economies representing each respective continent. The countries are split to top, middle, and bottom terciles for their Human Development Index (HDI) ranking and their GDP value, as shown also above in table 2 for each individual country.

The HDI rankings give rather similar results than the GDP rankings, from both it is obvious that Europe is the richest or most developed continent, and Africa holds the last place in both rankings. Asia, Oceania, and the Americas fall somewhere in between, with vast Asia having the largest differences between

single countries within a continent. The differences in the HDI ranking and GDP ranking can be seen in few countries when drilling down to individual country level but they don't change the overall statistics heavily. Differently positioned countries in the HDI and GDP rankings are e.g. Equatorial Guinea, where the oil wealth explains high GDP values but has not transferred yet to high living standards for the people of the country. A contradictory example can be found in Cuba, where the communist regime has left its mark on low GDP but also managed to maintain a comparably good living standard HDI-wise for the country's citizens.

Continent	**# of Countries**	**% of Subset of Countries**
Africa	54	26,60%
Asia	45	22,17%
Europe	51	25,12%
North America	27	13,30%
Oceania	15	7,39%
South America	11	5,42%

HDI Placement (2011)	**Top Third**	**Middle Third**	**Bottom Third**
Africa	1	9	43
Asia	14	14	14
Europe	35	11	0
North America	10	11	2
Oceania	3	6	2
South America	2	9	0

GDP Placement (2010)	**Top Third**	**Middle Third**	**Bottom Third**
Africa	2	13	38
Asia	13	11	19
Europe	34	15	2
North America	9	14	2
Oceania	4	7	4
South America	4	6	1

Table 3. Continental split, HDI and GDP placement for the GFDD countries (United Nations Development Programme 2012; World Bank 2012).

The variables of the GFDD database are divided into four different categories. Variables are either measuring the depth, access, efficiency, or stability of the

financial system (or measuring GDP). Furthermore, the variables are measured for either the financial institutions or for the financial markets. In this study the focus is on the financial institutions, due to better coverage throughout the different economies and the time dimension of the material. Data on the financial markets is scarce for smaller and less developed economies. For most of the variables for both financial institutions and financial markets the time series do not go back to the beginning of the 50 year period.

4.2.1. Data on Economic Growth

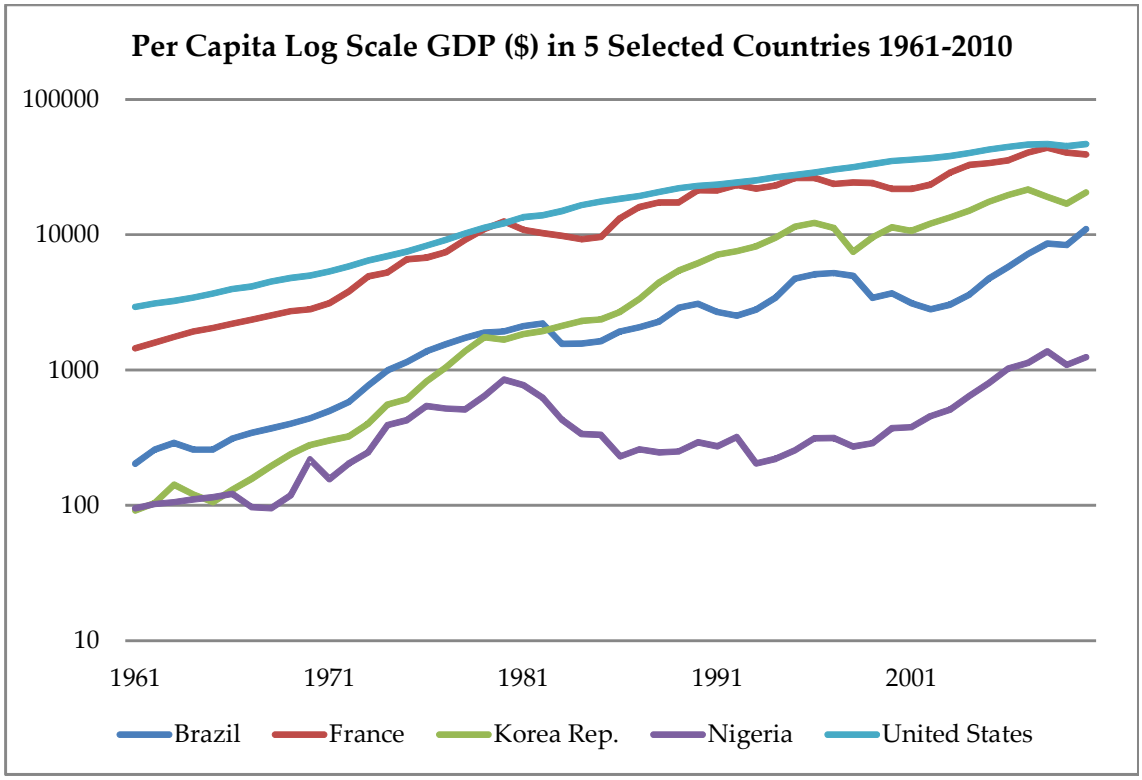

Figure 6. Per capita logarithmed GDP in Brazil, France, Korean Republic, Nigeria, and United States from 1961 to 2010. (Data: World Bank 2012.)

Figure 6 above shows the logarithm of the GDP per capita in five selected countries from each continent from 1961 to 2010. From the graph it is obvious that the long term trend in the past 50 years has been economic growth, even if at times almost all of the the economies have taken a temporary turn for the worse, such as Nigeria in the 1980's after its oil crisis related growth spurt of the

1970's, or Brazil in the late 1990's after the Asian and Russian financial crises. Brazil's recent economic uprising can also be seen from the graph as steep hike during the past ten years. Another notable finding from the graph is Korea's rise from same levels of economic output with Nigeria to its current state, where Korea's economic output per inhabitant is over 16 times larger than the level of output Nigeria currently has. It is also worth while noting that since the GDP values are measured in current US dollars, the US growth curve is not affected by fluctuations in currency rates, unlike those of the other countries.

4.2.2. Data on Financial Depth

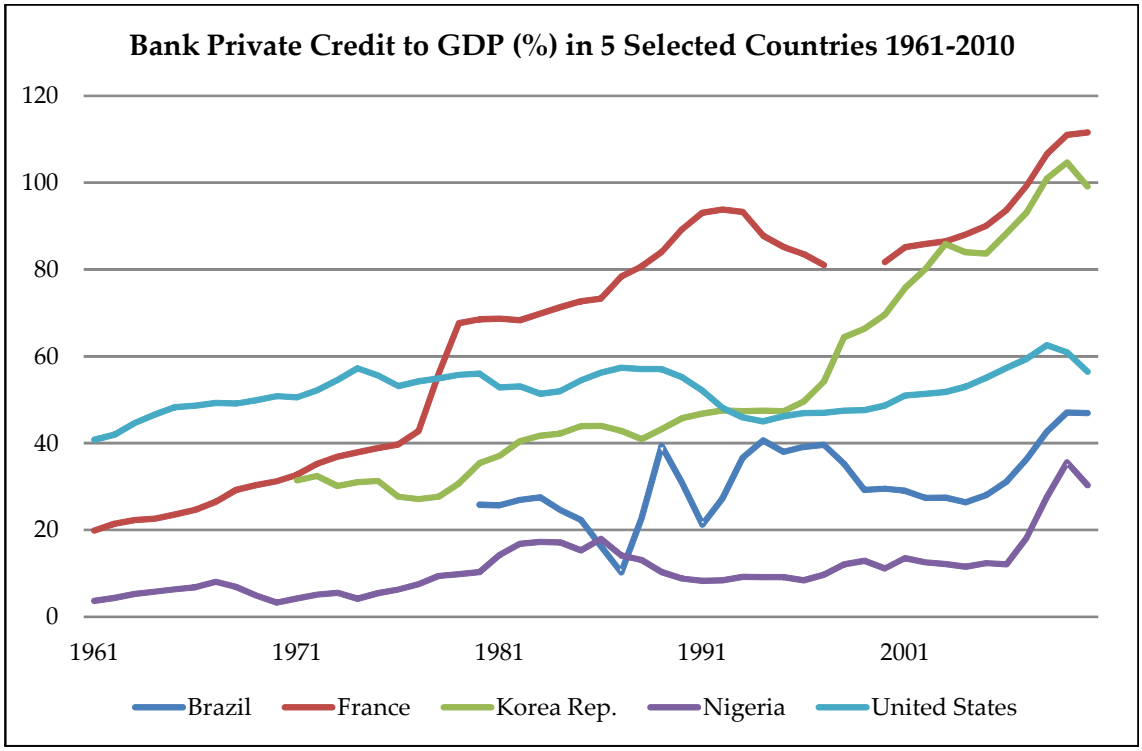

Figure 7. Financial Depth, measured by the bank private credit to GDP percentage in five selected countries from 1961 to 2010. (Data: World Bank 2012.)

Figure 7 measures the depth of the financial sector, using the bank private credit to GDP as an indicator. The graph shows that the relative size of the United States' financial sector has been quite constant during the 50 year period but in other four selected countries, there is a clearly observable growth pattern for the financial sector. This can be seen especially in the French economy, where the comparative size of the financial sector has grown from one fifth of the GDP to

over one hundred percent of the GDP. Perhaps surprisingly, the financial sectors of France and Korean Republic display greater proportional depth than the financial sector of the United States. Brazil and Nigeria's financial sectors unsurprisingly show the least depth in the sample period, with Nigeria being the most financially shallow of the selected economies.

4.2.3. Data on Financial Stability

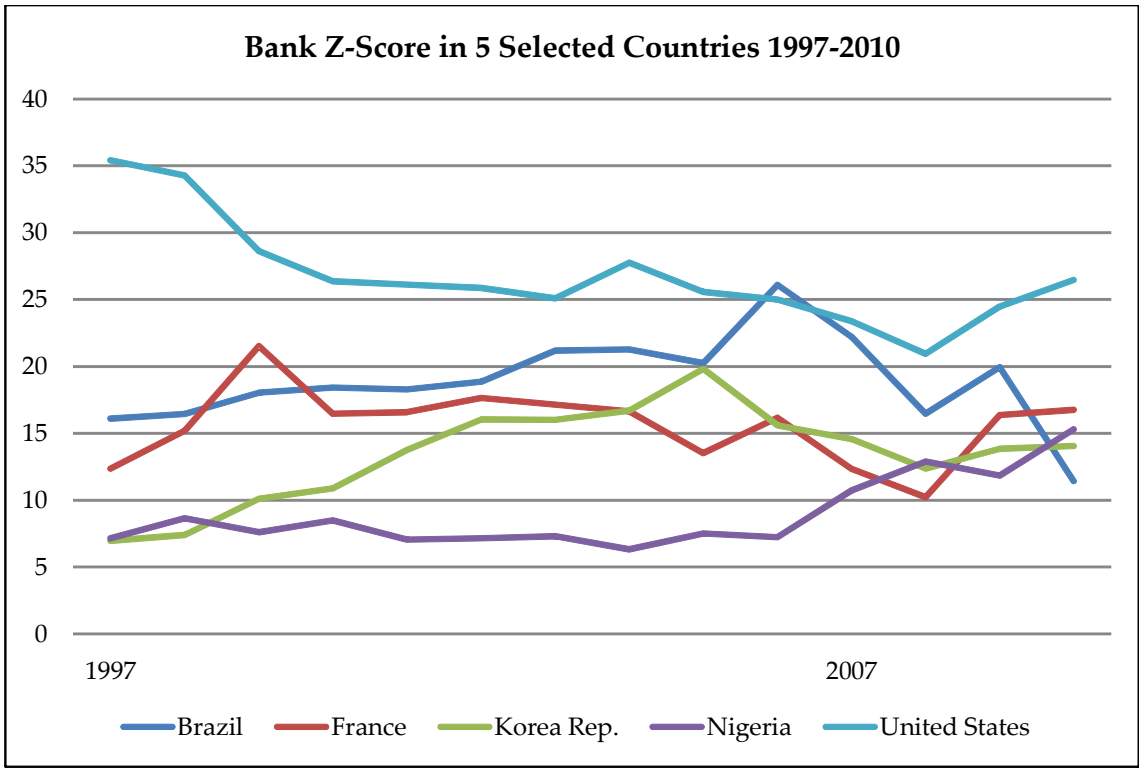

Figure 8. Weighted average commercial bank Z-Score in five selected countries from 1997 to 2010. (Data: World Bank 2012.)

Financial stability, portrayed by the weighted average of commercial banks' Z-scores, is shown for the selected five countries in figure 8. Based on the graphical presentation, the commercial banks' stability seems to be quite similar in the selected countries. Latest observations show that Brazil, France, Korean Republic, and Nigeria all have Z-scores between 11 and 17, whereas the average Z-score for American banks is at a notably higher level at over 26. Bank stability in the United States has, however, gone down during the 14 year period, while the other countries' trend lines are more even and do not seem to have a distinct

trend lasting throughout the whole sample period. During the past few years, the Brazilian banks' stability has decreased alarmingly, perhaps due to increased volatility in the Brazilian markets or decreased profitability in the Brazilian banking sector, bringing the Brazilian banks' Z-score lower than the current stability level of Nigerian banks, the presumably least stable of our selected five economies.

4.2.4. Data on Financial Efficiency

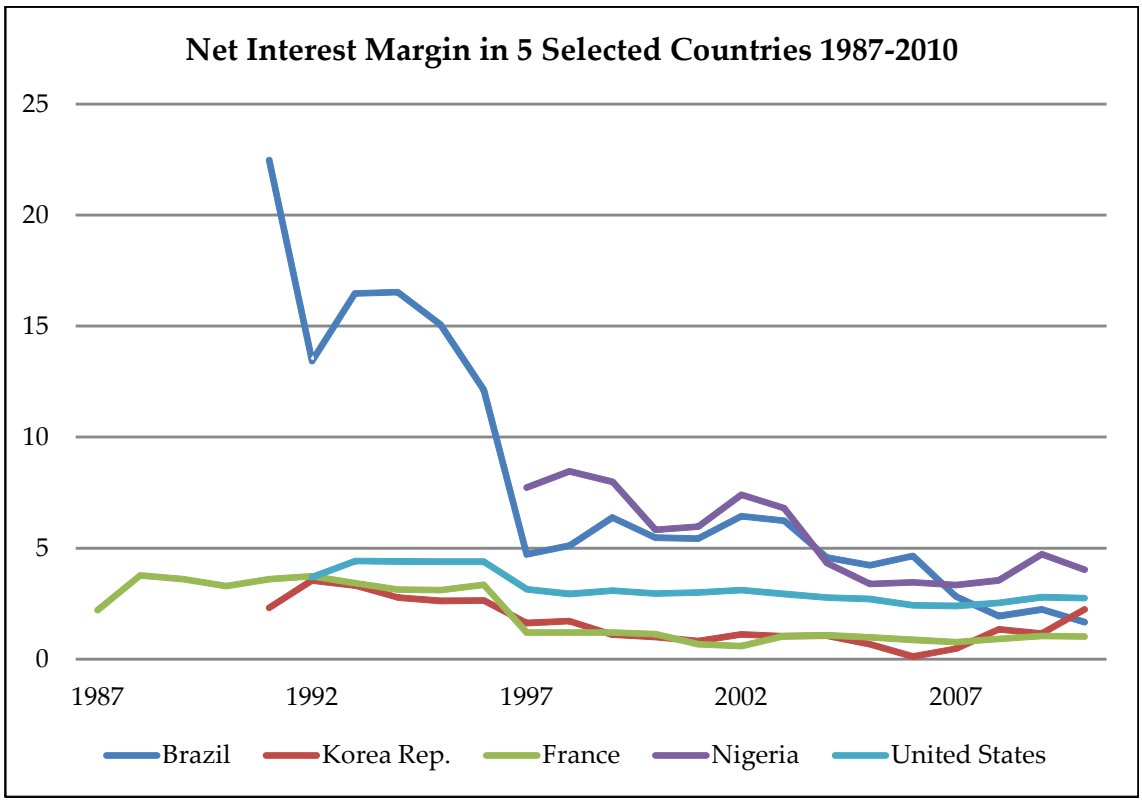

Figure 9. Net interest margin in 5 selected countries from 1987 to 2010. (Data: World Bank 2012.)

The benchmark variable for financial efficiency is the net interest margin, displaying banks' price for the money, i.e. how efficiently they are able to finance individuals and companies in an economy. In our selected five countries the general level of net interest margin seems to be quite stable, excluding the 1990's Brazil, where its turbulent economy and high inflation influenced comparatively high interest margins. Generally the net interest margin has been below five percent in the sample period for our countries. Net interest margin does not seem to have a trend line through time.

4.2.5. Data on Financial Access

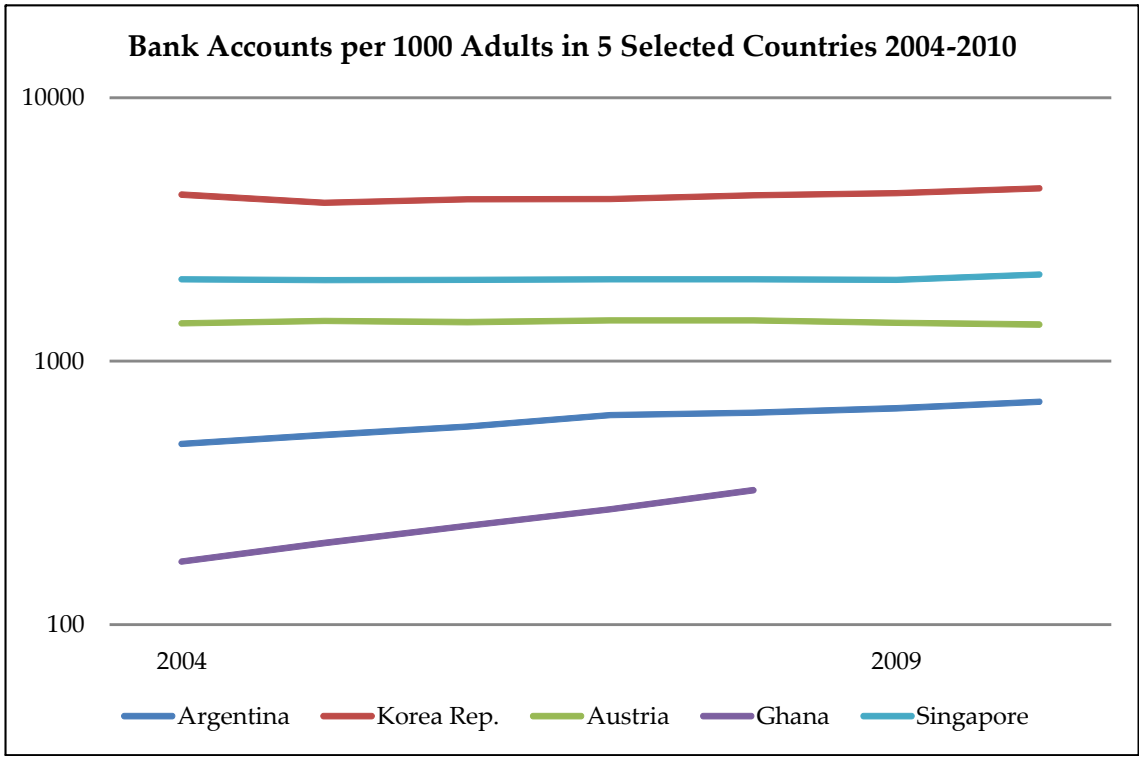

Figure 10. Bank Accounts per 1000 adults in 5 selected countries from 1987 to 2010, log scale. (Data: World Bank 2012.)

The data availability for variables of financial access is still scarce. Three countries from our group of five selected countries did not have any data on the recommended benchmark variable, number of bank accounts per 1000 adults. Therefore the group of countries presented in this graph is different from the other variables. Global coverage is, however, intended to be quite similar to the group of countries used in the other graphs. Also the time period of the available observations is short, ranging only from 2004 to 2010.

The differences in the amount of bank accounts per 1000 adults are large between the countries. The developing economies, Ghana and Argentina, show a clear upward trend in the amount of bank accounts and have a far smaller amount of bank accounts per 1000 adults than the more developed economies. The more developed countries included in this graph have a substantially

higher amount of bank accounts per 1000 adults, and do not either have a clear trend. Especially the observations in Austria and Singapore are very stable, with less than 5% overall variation throughout the 7 year sample period. It is also notable that the amount of bank accounts per 1000 adults in Korean Republic is very high, at about four bank accounts per person, suggesting that it is very common for a single person to have multiple bank accounts.

5. EMPIRICAL ANALYSIS OF THE DATA

This chapter presents the results of all the statistic analyses conducted to the sample material. The tests are conducted to the global financial development dataset, and to the variables presented in the previous chapter (World Bank 2012).

5.1. Descriptive Statistics

Table 4 below presents the descriptive statistics for individual observations for each time series for each country. Out of the selected benchmark variables, GDP values differ substantially throughout the period, which is expected since the statistic shows per capita GDP in current US dollars for a wide selection of poor and rich countries. The lowest observations come from the 1960's from the world's poorest countries at that time. Financial access also has very large cross-country variations. Apart from the vast difference in minimum and maximum values, the big difference in mean and median values, as well as the high skewness and kurtosis statistics also confirm this finding. Depth, efficiency and stability have smaller variations between observations and countries but also their distributions have positive skew and positive excess kurtosis. Efficiency and stability also have few notable odd observations bringing the minimum and maximum values to very extreme levels although the general variance is quite small.

Statistic	GDP	Access	Depth	Efficiency	Stability
n (max. 10150)	7882	514	5884	2681	2388
Mean	6023,61	780,8	34,94	2,73	18,79
Median	1345,21	389,95	24,12	2,37	16,28
Maximum	186242,9	7984,93	361,69	30,65	467,04
Minimum	35,37	0	0	-67,25	-17,18
Std. Dev.	12446,89	1150,5	34,37	3,05	21,56
Skewness	4,68	3,39	2,35	-3,41	14,42
Kurtosis	36,77	17,81	11,47	110,89	287,39

Table 4. Descriptive Statistics for the individual time series observations.

The maximum amount of observations for the 203 countries and the 50 year period is 10150. From the amount of observations we can see that GDP and financial depth observations are widely available for the whole sample period, whereas observations for financial access are very scarce throughout the 50 year sample period. The availability of financial access observations is indeed so low, that it is limiting the possible time frame of this thesis, not allowing the utilization of the whole 50 year period. Financial efficiency and stability fall somewhere between, as their availability is high for the latest 10–20 year period of the whole sample period. The availability of observations per 10 year periods is described more closely in table 5.

Sub-period	GDP	Access	Depth	Efficiency	Stability
1961-1970	1143	0	692	0	0
1971-1980	1328	0	942	0	0
1981-1990	1593	0	1143	76	0
1991-2000	1888	27	1444	1004	648
2001-2010	1930	487	1663	1601	1740
1961-2010	7882	514	5884	2681	2388

Table 5. Amount of observations per 10 year sub-periods.

5.2. Unit Root Test

One of the assumptions underlying an OLS estimation is the stationarity of the stochastic process. To test for the stationarity of the test variables, I conduct a panel data unit root test analysis. Levin, Lin and Chu (2002) have developed a panel data unit root test suitable for the dataset used in this thesis. The Levin, Lin and Chu t-statistic is reported in table 6 below.

The unit root test reveals that the levels of financial depth and GDP have unit root, which can be removed by using the first difference of each time series. Financial access, efficiency, and stability variables do not show significant signs of unit root even in level test, so the analysis for these variables can be conducted with level values. The first difference test reveals that there is no sign of unit root for any of the variables, and that the changes in the time series from one period to the next one are in fact stationary. This means that there is no

need to measure the variables using a second difference.

Variable	Access	Depth	Efficiency	Stability	GDP
Level					
Levin, Lin & Chu t-statistic & Probability	-2,069 **	5,142	-2,047 **	-3,747 ***	17,881
1st Difference					
Levin, Lin & Chu t-statistic & Probability	-9,346 ***	-16,013 ***	-16,485 ***	-7,844 ***	-17,390 ***

Table 6. Levin, Lin and Chu panel unit root test. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

5.3. Ordinary Least Squares Estimation of Finance-Growth Nexus

First hypothesis of this thesis is to find out whether the level of financial development affects the level of economic growth. At its most simple, the relation can be tested by comparing the rate of economic growth to the contemporaneous level of financial development. This is measured by the simple regression

$$(7) \qquad \Delta GDP_{it} = \beta_1 ACCESS_{it} + \beta_2 DEPTH_{it} + \beta_3 EFFICIENCY_{it} + \beta_4 STABILITY_{it} + e$$

Which uses the benchmark variables for each financial development factor. GDP is measured per capita in current US dollars. Results for this regression are found in the table below. Although the dataset in use extends back to the 1960's, the availability of observations in the benchmark variables of financial access and financial stability only reaches back to the switch of the millennium. Therefore, the analysis on the regression (7) are conducted based on data only for the last 13 periods of the dataset, from 1998 to 2010.

Variable	Coefficient	Std. Error	t-Statistic	P-value	
ACCESS	0,002	0,078	0,024	0,981	
DEPTH	3,414	2,411	1,416	0,158	
EFFICIENCY	-91,318	39,443	-2,315	0,021	**
STABILITY	8,626	6,810	1,267	0,206	

R-squared: 0,060

Table 7. Financial development and contemporaneous economic growth. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

In the simple regression model only financial efficiency proves to be significantly explaining the contemporaneous economic growth, which it does to the 5% level of significance. The smaller the net interest margin, the bigger the same period's economic growth. Financial access, stability, and depth, however, do not seem to bear significant relation to the simultaneous economic growth. The model is able to explain 6,0% of the change in the gross domestic product per capita.

When comparing the financial environment to the next period's economic growth, the results differ slightly.

Variable	Coefficient	Std. Error	t-Statistic	P-value	
ACCESS (t-1)	0,091	0,088	1,034	0,302	
DEPTH (t-1)	1,394	2,733	0,510	0,610	
EFFICIENCY (t-1)	-72,703	42,150	1,725	0,086	*
STABILITY (t-1)	15,852	7,489	2,117	0,035	**

R-squared 0,060

Table 8. Financial development and next period's economic growth. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

When comparing to the next period's economic growth, financial stability does seem to have the most significant relationship, predicting next period's economic growth at 5% significance. The further away banks are from bankruptcy this year, the better news it is for next period's economy. Financial efficiency is also able to explain the next period growth close to the 10%

significance level but not to the sufficient 5% level, though. Financial access and depth are not able to explain the subsequent economic growth at a significant level.

Since the unit root test suggests that the variables have unit root which can be removed by using the first difference for each variable, a better equation than equation 7 can also be formulated, as suggested in following equation 8 for the time period setting shown in table 8.

$$(8) \quad \log GDP_{i(t+1)} = \beta_1 \log GDP_{it} + \beta_2 \log A_{it} + \beta_3 \log D_{it} + \beta_4 \log E_{it} + \beta_5 \log S_{it} + e$$

In the equation A presents access, D depth, E efficiency and S stability. The efficiency variable is presented here as a discount factor instead of the percentage value of the net interest margin in order to allow for logarithmic transformation. Using the first difference for the variables helps to analyze the relationship without exposing to unit root biased results. Equation 8 has been formulated as Fung (2009) suggests as standard for financial development research, but formulated using the GFDD benchmark variables instead of financial depth only.

Variable	Coefficient	Std. Error	t-Statistic	P-value	
log GDP (t-1)	0,983	0,007	138,441	0,000	***
log ACCESS (t-1)	0,017	0,008	2,115	0,035	**
log DEPTH (t-1)	-0,037	0,013	-2,858	0,005	***
log EFFICIENCY (t-1)	-0,724	0,377	-1,918	0,056	*
log STABILITY (t-1)	-0,008	0,011	-0,749	0,455	
R-squared 0,993					

Table 9. First difference of previous period's financial development and economic growth explaining next period's economic growth. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

The results shown in table 9 are supporting Fung's (2009) earlier findings that financial depth is able to significantly explain the level of next period's economic activity, in addition with the obvious notation that this period's GDP explains a vast majority of next period's activity level. Financial depth's effect on economic growth is, however, negative. In addition to that, financial access is another explanatory variable which is able to explain next period's economic

activity with a high level of certainty. Financial efficiency and financial stability are not able to explain next period's economic activity with needed certainty, although financial efficiency comes close at a 10% significance level.

Variable	Bottom	P-value		Middle	P-value		Top	P-value	
log GDP (t-1)	0,987	0,000	***	1,029	0,000	***	1,010	0,000	***
log ACCESS (t-1)	0,020	0,008	***	0,012	0,214		0,015	0,032	**
log DEPTH (t-1)	-0,011	0,460		-0,044	0,001	***	-0,054	0,001	***
log EFFICIENCY (t-1)	0,566	0,029	**	-0,329	0,491		-0,509	0,388	
log STABILITY (t-1)	0,035	0,004	***	-0,014	0,238		0,032	0,001	***

R-squared 0,999 in all terciles.

Table 10. Financial development's effect on economic growth in subsamples of top, middle and bottom countries based on 2010 GDP level. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 10 above describes financial development's effect on economic growth in bottom, middle and top terciles split by the countries' ranking on GDP level of 2010 shown in chapter 4. None of the benchmark variables remain significant throughout all three terciles but all of them have a significant effect in at least one of the three subgroups. Financial depth's effect does not turn positive in any subgroup where it has a significant growth effect. Financial efficiency is a significant factor only in the bottom tercile, where it has a positive effect, i.e. countries where financial institutions enjoy bigger margins should be experiencing quicker growth.

5.4. Testing for Convergence

The second hypothesis of the study is that financial development helps the countries to converge with more developed ones. As mentioned in chapter 3.5. there is no sign of absolute convergence between countries if the sample group is the world's every economy. This is partially explained by the different steady states of countries.

To test for the effect of financial development on convergence, we must first create a variable for measuring convergence. Convergence is a phenomenon describing less developed economies' quicker growth compared to the more developed ones. I create a variable comparing each economy's performance to the past century's – and the scientific world's – dominating economy, the US economy.

(9) $$CONV_{it} = \Delta GDP_{it} - \Delta GDP_{USt}$$

Whenever the CONV variable gets a positive value, the country has achieved convergence to the US economy in that fiscal year i.e. grown at a faster pace than the US economy. If the value of the CONV variable is zero, the growth rate has been equal to the US growth rate and no convergence has happened. Should the value be negative the growth rate has been smaller than that of the United States and the country is actually experiencing divergence.

With the addition of the CONV variable, we are able to develop a regression equation to measure the effect financial development has on convergence, and to test the second hypothesis. As a measure of the financial development, we once again use the benchmark variables, as proposed by Čihák et al. (2012).

(10) $$CONV_{it} = \beta_1 ACCESS_{it} + \beta_2 DEPTH_{it} + \beta_3 EFFICIENCY_{it} + \beta_4 STABILITY_{it} + e$$

The results from equation 10 are shown below in table 11.

Variable	Coefficient	Std. Error	t-Statistic	P-value	
ACCESS	-0,033	0,064	0,514	0,608	
DEPTH	-7,049	1,984	3,554	0,000	***
EFFICIENCY	-53,493	32,457	1,648	0,100	
STABILITY	-4,351	5,604	0,776	0,438	
R-squared 0,064					

Table 11. Financial development's effect on convergence. Dependent variable is scaled 10^4 from equation (10). *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

The only explanatory variable in general level affecting the convergence significantly is the financial depth, i.e. the comparative size of the financial

sector. Other benchmark variables do not have a significant effect on the general level. In this general level with no subsampling, financial effect actually has a negative effect on convergence, a phenomenon which can be predicted from figure 4 shown earlier but which seems to be contradicting with the past evidence on financial depth being able to boost economic growth.

As stated, the convergence phenomenon is hard to measure on a global level due to different steady states. The best possible way to overcome this would be to use each country's steady states to build up a measure of conditional convergence. Due to limitations on data and the scope of this study, I instead use terciles of the data based on 2010 GDP level dividing the countries to top, middle and bottom terciles. There are 66 countries in each tercile. Dividing countries into smaller subgroups based on current GDP should lead into evening out some differences on the steady states of the countries, as a small step towards displaying actual conditional convergence. Results on equation 10 in the subgroups can be seen in table 12 below.

Variable	Bottom	P-value		Middle	P-value		Top	P-value	
ACCESS	0,016	0,959		0,170	0,221		0,030	0,263	
DEPTH	15,415	0,039	**	-4,021	0,224		-2,834	0,003	***
EFFICIENCY	53,276	0,003	***	158,441	0,000	***	159,156	0,000	***
STABILITY	13,234	0,032	**	5,785	0,463		8,926	0,003	***

R-squared 0,228, 0,134, and 0,150 respectively.

Table 12. Financial development's effect on convergence in subsamples of top, middle and bottom countries based on 2010 GDP level. *** Significant at 1% level, ** significant at 5% level, * significant at 10% level.

The results vary somewhat between different terciles and the effect of financial development on convergence. Not all differences between countries can be explained by a rough split into terciles based on GDP but this split gives a good rough overview of the differences in steady states, as well as the evolution of the effects of financial development on convergence at different stages of economic development.

In the bottom third financial depth, efficiency, and stability are all able to significantly explain the level of convergence. All of them have a positive effect on it, even financial depth which seemed to have a negative effect in the "all countries" sample group.

In the middle third only financial efficiency is able to explain the level of convergence. In fact, financial efficiency has a significant and positive relationship to convergence in all terciles. This raises a question on the direction of the relationship. The results imply that the higher the net interest margin is, the higher the level of convergence achieved, leading to think that convergence could be achieved by worse performing and less effective financial institustions.

In the top third financial depth, efficiency, and stability all have a very significant relationship with convergence. The results in the top third are rather similar to those of the bottom third, with one major difference: in the top third financial depth has a negative relationship with convergence, whereas in the bottom third financial depth actually has a positive effect on convergence. This might have something to do with a lot of recent overheating events experienced in the richer countries of the EU and also elsewhere globally among the top third group of countries. The level of financial depth obviously has its limits. Studying national economies, Reinhart and Rogoff (2010) find that at about 90% level of government debt the median growth rates start to fall. Financial institutions are not countries but there might still be an intrisic limit also to the level of financial depth within a country's financial institutions where a similar effect occurs, extra financing will not lead to faster growth anymore.

6. CONCLUSIONS

This thesis has examined the relationship between finance and economic growth, as well as the financial development's effects on convergence. Discussion on the finance-growth nexus has remained active ever since Schumpeter (1911) introduced readers to the idea of bankers enabling innovation, a discussion which is very closely related to the whole raison d'être of the financial sector.

Neoclassical growth models state that economic growth can be explained by changes in labour, capital, and total factor of productivity. Financing, on the other hand, enables transferring innovations into business, gradually developing the whole society and moving the resources to best possible use. Finance affects growth through two channels, capital accumulation and the total factor of productivity. As earlier studies (e.g. Rioja & Valev 2004) have shown, less developed countries experience a stronger effect through capital accumulation, and more developed ones through an increase in the total factor of productivity.

The most important role of the financial sector is to make optimal resource allocation possible in a society. The financial sector therefore helps to turn innovation into successful business. This enables faster growth and accelerates the renewal of society – or as it's often labeled – creative destruction. However, a well-functioning financial system is not by itself enough to create growth. There will not be any real progress in a society where innovation and technological progress is nonexistent, even if financial markets were working perfectly. This is why the financial sector is seen as an important factor but not the only reason behind growth.

In my study I expand the existing literature by using a recently introduced Global Financial Development Dataset (GFDD) (World Bank 2012), and by utilizing benchmark variables as proposed by Čihák et al. (2012) to measure the financial development. The benchmark variables expand the traditional way of examining financial development solely by the relative size of the financial sector, a measure which can be misleading and encourage policy makers to focus only on actions aimed at increasing the size of the financial sector.

The benchmark variables used in this thesis' empirical examinations are measuring the financial sector from four different points of view: financial access, financial depth, financial efficiency, and financial stability. The variables are only measuring financial development from financial institution's point of view, and excludes the financial market data entirely due to limited availability of data globally and limited importance of the financial markets in less developed economies.

The first hypothesis examines whether financial development affects economic growth. The empirical results lend some support to the hypothesis. When examining the phenomenon in style of Fung (2009) using the GFDD variables, financial access and financial depth are the two benchmark variables to have a significant effect on economic growth. When the same test is divided into terciles, each benchmark variable has a significant effect at some point. One notable finding here is that financial depth actually has a negative effect on the middle and top countries. Also the financial efficiency, i.e. the net interest margin seems to bear a positive relationship to subsequent economic growth.

The second hypothesis uses a variable comparing each country's growth rate to the US economy's growth rate to measure for convergence. Testing the effects of financial development on convergence for all countries at once shows that only variable significantly decreasing convergence was financial depth, an observation which is in line with the observation of no absolute convergence in the whole world's scale. When dividing the convergence observations to subgroups of top, middle and bottom, few notable observations can be made. Financial depth has a positive and significant effect on the bottom group of countries, and a significant yet negative effect on the top countries. Financial efficiency retains its positive and significant effect in all terciles. Financial access has no significant effect on achieving convergence in none of the subgroups.

This thesis' results lead to some suggestions for future research. Firstly, the cause of high net interest margin's positive growth effect warrants some further discussion. Does the effect vanish when the sample period is longer, or is there an unseen stabilizing mechanism which maybe helps avoiding the riskiest investments to take place, therefore making the economy more effective even if the financial institutions will get a bigger share of the profit instead of the entrepreneur? Does this have something to do with the financial institutions'

stability, which has a positive growth effect according to the findings of this thesis?

Secondly, this thesis only uses data from the financial intermediaries and excludes the data from financial markets altogether. In today's world the effect of financial markets is getting bigger and bigger, especially in the current developing economies. Also the data availability for financial markets is getting better, enabling a global reach in the coming years or decades.

Thirdly, it would be interesting to use the updated GFDD dataset to repeat some of the past studies, such as has been done already partially for King and Levine (1993) in the Čihák et al. (2012) paper introducing the GFDD dataset. It would be especially interesting to use the GFDD dataset to examine how financial development affects capital accumulation and total factor of productivity in the fashion of Rioja and Valev (2004), something that was not possible for data availability reasons in the scope of this thesis.

Fourthly, a more general discussion needs to continue among financial economists on the proper levels of financial intermediation. This will be especially interesting to policymakers if the empirical evidence lends further support to the idea that there is indeed an optimal zone for financial depth within an economy, such as there is for national economies (Reinhart & Rogoff 2010).

All in all, the introduction of new datasets, and the continuous work done in global financial institutions and in the scientific world to collect and analyze the data leads me to believe that in the future we will continue to understand the relationship of finance and economic growth even better. Importance of financing in achieving economic growth is already widely accepted and understood but we still have a long way to go to thoroughly prove the mechanisms within this phenomenon, and ultimately to implement needed changes in the macroeconomic policies effectively to maximize the world's well-being.

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