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Master's Thesis

2016 **Buuruljin Enkhbold**

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Finance and Growth Nexus: CEE & Central Asia and Beyond

Master's Thesis

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Abstract

This thesis investigates the effect of financial development on economic growth using both global sample and regional samples focusing on Central and Eastern Europe (CEE) and Central Asia during the time period 1960-2013. The results of fixed effect panel and system GMM estimators suggest that the effect of private credit on growth had been neutral until 2007 and the effect turns negative if the time period is up to 2013. The negative effect of private credit on growth has been the largest for CEE and Central Asia, particularly for non-EU countries in the region. Stock market capitalisation and lending deposit spread have consistent effects regardless of the choice of time frame which implies that economies benefit from larger stock markets and lower lending deposit spread.

Keywords: financial development, credit, stock market, spread, growth, CEE and Central Asia, generalized method of moments (GMM)

Abstrakt

Tato diplomová práce zkoumá vliv finančního vývoje na ekonomický růst s využitím jak globálního vzorku, tak vzorku ze střední a východní Evropy a střední Asie v rozpětí let 1960 až 2013. Z výsledků estimátorů fixních vlivů dle panelových dat a estimátorů zobecněné metody momentů (GMM) vyplývá, že vliv privátních půjček na růst byl do roku 2007 neutrální. Jakmile bylo v úvahu vzato období do roku 2013, byl tento efekt negativní. Tento negativní vliv privátních půjček na růst je největší ve střední a východní Evropě a ve střední Asii, zejména u zemí z těchto regionů, které nejsou členy Evropské unie. Kapitalizace akciových trhů a rozpětí mezi úrokovými sazbami z úvěrů a z vkladů má konzistentní vliv bez ohledu na zvolený časový rámec, což naznačuje, že na ekonomiku mají příznivý vliv větší akciové trhy a menší rozpětí mezi úrokovými sazbami.

Klíčová slova: finanční vývoj, půjčky, akciový trh, rozpětí, růst, střední a východní Evropa a střední Asie, zobecněná metoda momentů (GMM)

Range of thesis: 20,000-25,000 words; 60-70 pages

Declaration of Authorship

1. The thesis is 21,200 words in length, excluding Appendices.

2. The author hereby declares that she compiled this thesis independently, using only the listed resources and literature.

3. The author hereby declares that all the sources and literature used have been properly cited.

4. The author hereby declares that the thesis has not been used to obtain a different or the same degree.

Prague … **18 May 2016** **Buuruljin Enkhbold /……./**

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Institute of International Studies
Master's thesis proposal

Topic:

Finance and Growth Nexus: CEE & Central Asia and Beyond

Characteristics:

This thesis will investigate the effect of finance on growth using a global sample as well as regional samples where I will focus more on CEE and Central Asia. My thesis will differ from the existing studies in the following ways. First, the estimations will be conducted on both global sample and regional samples, therefore it will be possible to examine and compare the effects of finance on growth for different regions including CEE and Central Asia. This thesis can contribute to the discussion of finance and growth nexus in CEE and Central Asia as research on the region has been neglected due to limited data availability. Second, as existing studies mainly use private credit to GDP, I will use several financial development variables in order to capture the diverse aspects of financial development. Third, I will use GMM estimators so that my results will not be affected by endogeneity problems.

Hypotheses:

1. Whether the effects of finance on growth are the same for different time periods or not?
2. How the effects of finance on growth differ for regional samples especially for CEE and Central Asia?
3. How the effects of different financial development variables such as efficiency and depth are varied?

Data and Methodology:

Recently published World Bank development indicators data between 1960 and 2013 will be used as main variables. Fixed effect panel estimations will be employed for regional samples because GMM estimators require larger sample size and GMM estimators will be conducted on the whole sample and two income groups: high income and middle & low income countries.

Preliminary Outline:

Introduction

1. Literature Review
2. Data and Summary Statistics
3. Methodology: 3.1 Fixed effect panel data
   3.2 GMM estimators
4. Results: 4.1 Fixed effect panel estimations
   - 4.1.1 Whole sample and regional samples
   - 4.1.2 CEE & Central Asia

   4.2 GMM estimations
5. Robustness Checks
6. Policy Implications for CEE and Central Asia
7. Conclusion

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Contents

Introduction

Finance and growth nexus has been a subject of debate for several decades and researchers have been coming up with different answers. Although the positive effect of financial development on growth has become "stylised fact" based on various global evidence, the studies conducted on transition economies, i.e., Central and Eastern Europe (CEE) and Central Asia, do not always find the same positive results (Dawson, 2003; Gillman and Harris, 2004; Djalilov and Piesse, 2011; Caporale, et al., 2009). Their explanations appear to be largely similar, for instance, Djalilov and Piesse (2011) suggest that these countries do not have enough financial depth to diffuse the positive effect of finance on growth.

Schumpeter (1911) pioneers the idea that finance has positive effect on economic growth because financial intermediaries manage risks, mobilize savings, evaluate and monitor projects as well as facilitate transactions. Goldsmith (1969) and Shaw (1973) support this view by noting that development in the financial sector promotes investment and output growth. Levine's seminal empirical papers such as King and Levine (1993) and Levine (1999) find finance promotes capital accumulation and the efficiency of resource allocation.

There are opponents to this view such as Robinson (1952) and Lucas (1988) who point out that the role of finance is overemphasized and financial expansion simply follows economic needs. Some economists such as Kindleberger (1978) views financial expansion as a negative threat to economy, while Kaminsky and Reinhart (1999) find that credit expansion is one of the most important predictors of financial crisis.

Because of the enormous attention this topic has received over the years, numerous empirical studies have been conducted and majority of their findings support "positive effect" view which can be verified by the results of Valickova, Havranek and Horvath (2015). They note that around half of the 1334 estimations on finance and growth nexus in their summary, find positive and significant effects.

Nevertheless, as more data becomes available, recent studies propose alternative views such as non-linear relationships between finance and growth or heterogeneous effect across countries and regions. Many of the regional studies such as those conducted on CEE and Central Asia region find non-conventional evidence and

sometimes no concluding results. More conclusive studies are needed to be conducted on this region as they can become foundations for future effective policies on how to develop their financial systems. There are two reasons why the studies on finance and growth nexus of transition economies are not viewed as enough to derive policy implications.

First, the number of studies focused on CEE and Central Asia is small and the main reason is limited data availability. There is no data available for those countries before 1990 as there had been no real financial systems (Hermes and Lensink, 2000, p.508). Moreover, many countries have missing data even in the beginning of 1990. Due to limited data availability, the research on finance and growth nexus of transition countries have been usually neglected. These days, it has become more feasible to obtain significant results than before as the available data is increasing even though they still have smaller data compared to other countries.

Second, because some studies include only transition economies in their sample, they have the disadvantage of less comparability. It is important to compare and assess the results with the results of other countries and regions in order to verify the true effect of finance on growth. Djalilov and Piesse (2011) and Caporale, et al. (2009) for instance, find that the shallow credit depth of transition countries prevent them from benefiting from credit expansion. It is a doubtful explanation due to the fact that many studies find finance has no positive effect on growth for countries with high credit depth (Law and Singh, 2014; Arcand, Berkes and Panizza, 2012).

The aim of this study is therefore to examine the effect of finance on growth using evidence from both global and CEE and Central Asia regional samples. Obtaining the regression results on eight geographical and income regions (World Bank classification) enable me to compare the effects among groups of countries with similar income or financial depth level. Furthermore, this study differs from other studies and contributes to the literature by using the most recent data available, capturing different aspects of financial development through financial depth and efficiency variables and solving endogeneity problems.

This thesis employs the most recent data for financial development indicators from World Bank published in September 2015 which allows me to study the effect over the time period from 1960 to 2013. The choice of time period seems crucial as studies indicate varied results based on the choice of their sample time periods. It is observed that majority of the “conventional” papers were conducted or used time frames

before early or mid-2000. Valickova, Havranek and Horvath (2015) note that the positive effect of finance on growth weakened since 1980. Bezemer (2014) highlight that there are more evidence for negative effect of financial deepening on growth since 1990.

In my study, financial depth variables such as private credit, liquid liability and stock market capitalisation, and financial efficiency variables including lending deposit spread are used in order to capture the diverse aspects of financial development. Private credit is the most used financial development variable in the earlier studies due to its larger data availability even though it cannot be the sole representor of financial sector development. As more data has become available, few studies have used more indicators such as financial efficiency and their results suggest that the effects of different financial development indicators on growth are varied (Shen and Lee, 2006; Hasan, Horvath and Mares, 2015). Access to finance and stability measures are initially discussed in this thesis, however, they are dropped later due to small observations they have.

This thesis adopts dynamic panel estimators in order to tackle endogeneity problems. Studies that employ only fixed effect panel estimations or pure cross sectional regressions without addressing endogeneity tend to overestimate the effect of finance (Valickova, Havranek and Horvath, 2015). In terms of regional samples, fixed effect panel estimations are used because GMM estimators require large number of individuals. Therefore, system GMM estimations address the endogeneity for the whole sample and two income groups only.

Using the sample of 202 countries over the period 1960-2013, my thesis concludes that private credit has, at best, neutral effect on growth while stock market capitalisation has positive effect on growth and economy benefits from efficient banks with less lending deposit spread. My results from fixed effect panel and GMM estimations are consistent in general although the magnitudes of the coefficients of fixed effect panel estimations are larger which implies that they overstate the effects.

Private credit, in general, has neutral effect on growth and the effect is positive only for the countries with low credit depth when the sample period is up to 2007. Nevertheless, it turns negative when the sample includes time period up to 2013. Among the regions, CEE and Central Asia has suffered the most which indicates that the level of credit expansion in the region affected the growth negatively during the global financial crisis and thereafter. This result is consistent with Kaminsky and

Reinhart (1999) and Gourinchas and Obstfeld (2012) who suggest that credit expansion is one of the most important predecessors of financial crisis.

When the region is divided into two groups such as 11 more advanced economies in the new EU group and 19 other countries in non-EU group, the effect appears to be most negative for non-EU countries in the region. The non-EU countries in the region has experienced rapid credit expansion for the past years. The size of private credit as a proportion of GDP had increased four times from 2000 to 2007 in non-EU countries in the region.

The effect of private credit on growth has been insignificant before 2007 in CEE and Central Asia region for both non-EU and new EU countries. These are consistent with the results of Dawson (2003), Gillman and Harris (2004), Djalilov and Piesse, (2011) and Caporale, et al. (2009) although my results do not support the explanation of how low level of credit depth prevents them from diffusing positive effect of finance on growth because 1) the effect of private credit on growth before 2007 seems to be insignificant for most of the regions regardless of the level of financial depth 2) other regions with similar credit deepening had not experienced the same negative effects during the financial crisis as they had.

Instead, there can be two explanations for the strong negative effect CEE and Central Asia has experienced until 2013. First, there is a possibility that the rapid credit expansion has been driven by household debt and therefore has a negative effect on growth as Jappelli and Pagano (1994), Beck, et al. (2012), Bezemer (2014) and Tunc and Yavas (2016) propose. Caporale, et al. (2009) for instance, examine the financial development of new EU countries and highlight that the household debt has been the most important factor for credit expansion for those countries. If the size of private credit is mainly driven by household debt, it does not serve its purpose of promoting and allocating savings efficiently, instead it can lead to less private savings rate and negative economic growth. Second, low quality credits can result in harming economy even if the credit has been allocated to firms rather than households. It is particularly applicable to non-EU countries in the region where soft budget constraints on state-owned or former state-owned firms are common (De Haas, 2001).

This is not to suggest that bank credit has negative effect on growth, however, to emphasize that the composition and quality of credit to private sector matters as private credit stimulates economic growth only when the investments are allocated to well performing enterprises. Although the effect of private credit does not seem to be

promising, economy appears to benefit from bank efficiency as the effect of lending deposit spread on economic growth is negative as expected.

The effect of stock market capitalisation is consistently positive according to both of my fixed effect panel and GMM estimators' results although the former seems to overstate the effects. This is consistent with numerous studies such as Hermes and Lensink (2000), Levine (1991) and Bencivenga, Smith and Starr (1995) who suggest that stock market promotes economy as it allocates resources to the best performing projects. Perhaps it is advisable for middle income regions such as CEE and Central Asia to focus more on developing stock markets.

The remainder of the thesis is constructed as follows. Section 1 covers the literature review of finance and growth nexus. Initially it focuses on the conventional papers, moves on to the papers with extended "non-conventional" views and then examines the studies conducted on CEE and Central Asia. Second section analyses the data employed in this thesis, their summary as well as simple correlation statistics. Then it goes on to the main methodology section introducing fixed effect panel and GMM estimators. Section 4 presents the results obtained from the main methodologies and states global and regional evidence focusing on CEE and Central Asia region. It then continues with robustness checks and policy discussions for CEE and Central Asia. The final section concludes that the effect of private credit on growth is neutral in general, however, it turns negative during the recent financial crisis period. Stock market capitalisation and smaller lending deposit spread appear to promote economic growth. These results are consistent for both global sample and CEE and Central Asia although the negative effect of private credit is the highest for CEE and Central Asia particularly for the non-EU countries in the region. Short recommendations on future research are also included in the final section.

1. Literature Review

A large number of studies has been undertaken on finance and growth nexus and not only the results they have reached are different but also the methodological approaches are varied. This literature review has been organised into three sections: original views from papers with conventional results, extended (mixed) views from more recent studies, and lastly, studies focusing on CEE and Central Asia.

1.1 Review of original views

The original theoretical framework of finance and growth nexus in the literature can be generally divided into three main types of lines: positive, neutral and negative effects. Some studies pioneered by Schumpeter (1911) state that finance has positive impact on growth and it might be the case that they have bi-directional causality. Another group of papers argues that finance does not spur economic growth, instead it follows and fulfils economic growth and needs (Robinson, 1952; Lucas, 1988). The third group supports the idea that too much finance has negative effect on growth (Kindleberger, 1978).

The most popular "stylised fact" view on finance and growth nexus is perhaps, that finance promotes growth significantly and therefore less than optimal financial development hurts economic growth. Schumpeter (1911) pioneers this view by pointing out that financial intermediaries manage risks, mobilize savings, evaluate and monitor projects as well as facilitate transactions. Later, studies such as Goldsmith (1969) and Shaw (1973) stress the importance of financial development in promoting investment and output growth. Through summarising the empirical results of past studies, Valickova, Havranek and Horvath (2015) find that around half of the 1334 estimations on this topic indicate positive and significant effect of finance on growth.

"Positive effect" conclusions are suggested by the empirical results of seminal papers such as King and Levine (1993), Levine (1999) and Beck, Levine and Loayza (2000). King and Levine (1993) for instance, suggest that financial development leads to economic growth by promoting capital accumulation rate and efficiency. Their results are based on cross-sectional analysis of 80 countries over the period of 1960-1989, therefore, do not solve endogeneity problems. Later, Levine (1999) and Beck, Levine and Loayza (2000) improve the methodology by using law and regulatory environment as instrumental variables as well as adopting dynamic panel techniques to assess the exogenous effect of finance on growth. Using private credit, liquid liability and bank credit as financial development variables, they conclude that well-functioning financial intermediaries affect growth through improving resource allocation and boosting total factor productivity growth.

Besides banking development, stock market development, usually denoted by stock market capitalisation to GDP, has also been commonly discussed as a contributor to growth as its effect is deemed as important as banking system in accelerating

economic growth. For instance, stock markets accelerate growth because it not only enables executives to manage risks and but also prevents from pre-mature liquidity (Levine, 1991; Bencivenga, Smith and Starr, 1995). Later, Levine (1997) points out that stock market enables trade ownership, therefore, investors monitor the activities of firms more carefully. Rousseau and Wachtel (2000) emphasize stock market's role in spurring economic growth as it offers investment information, exit opportunity for venture capitalists, increased liquidity for international portfolio and diversification and access to permanent capital for firms. Ang (2008) notes that stock markets are more likely to have short term effects as participating firms focus more on their immediate performances while banks tend to have long-term effects as they offer longer term funding.

Beck and Levine (2004), one of the recent studies, find that both stock market and bank development have positive effects on growth. Their Generalized Method of Moments (GMM) estimations on 40 countries over the period from 1976 to 1998 suggest that the impact of financial deepening is significantly positive regardless of other control variables in the regressions.

Among the time-series analysis, Luintel and Khan (1999) employ multivariate vector auto-regression model to investigate the causal relationship between finance and growth. Covering the sample of 10 countries with the time spans of 36 to 41 years, they conclude that there is a bi-directional positive causal relationship between them.

Calderon and Liu (2003) offer comprehensive study on the relationship between finance and growth using data of 109 countries between 1960 and 1994 and conclude that, in general, financial development leads to economic growth. They expand the study by adopting granger causality test and find that bi-directional causality link exists between the two variables and the effect is greater for developing countries. The study also emphasizes the influence of sampling time period interval that the effect is larger if the interval is longer. According to them, the main channel through which finance promotes growth is productivity growth followed by capital accumulation.

A significant number of studies denies the causal effect of financial development on economic growth. Robinson (1952) and Lucas (1988) for instance, argue that economists "overemphasize" the role of finance on growth that financial development is simply induced by economic growth. Chandavarkar (1992) points out that none of the pioneers in development economics considered finance as a contributor of growth. Later, economists such as Greenwood and Smith (1997) and Berthelemy and

Varoudakis (1996) support the view that more finance does not cause growth, instead growth in the real sectors demands more finance and leads to financial deepening. Nevertheless, they acknowledge that financial repression is very likely to harm growth.

Among the recent empirical studies, Zang and Kim (2006) find no causal effect from financial development variables (such as banks assets to commercial bank plus central bank assets, private credit to GDP and liquid liability to GDP) to economic growth. Instead, they find an evidence that the latter substantially causes the former based on their studies on 74 countries over the period from 1961 to 1995, employing a Sims–Geweke causality test. They also suggest that positive results of Levine, Loayza and Beck (2000) might have been influenced by general macroeconomic conditions.

The third line of economists views that financial sector development has negative effect on growth. Kindleberger (1978) points out that unstable speculations and expectations can harm economy severely. Minsky (1992) stresses 1) the fragility of expanded financial sector because economic growth can encourage more risk-taking behaviours and 2) over-leverage that can lead to devastating financial crisis. This view probably has the lowest number of support evidence according to Valickova, Havranek and Horvath (2015) that less than 10% of all estimations in their summary (128 out of 1334 estimates) show negative and significant results.

The "negative effect" view is associated with several studies that find credit boom to be one of the major contributor of financial crisis. Among them, Kaminsky and Reinhart (1999) find that crises are tend to be preceded by credit expansion caused by increase in economic activity, capital inflows and overvalued currency. They note that financial integration and liberalisation are likely to activate this boom-bust cycle. This evidence is shared by Gourinchas and Obstfeld (2012) who propose that the volume of domestic credit together with real exchange rate appreciation are two most robust and significant predictors of financial crisis. Their panel analysis employing data over the time frame 1973-2010 suggests that the countries that avoided credit boom were more likely to avoid the harmful effect of recent global financial crisis and emerging economies suffered more than advanced economies.

For stock market development, Singh (1997) questions the benefit of stock market in promoting economic growth. He suggests that not only arbitrariness and volatility of the stock market prevents it from allocating investment efficiently but also when it is combined with unfavourable shocks it could lead to macroeconomic instability. According to him, stock markets have more problems with asymmetric

information than banks do. Furthermore, he points out that focusing on stock markets might undermine banking system's development which has well proven merits in some regions such as East Asia.

1.2 Review of extended (mixed) views

The line of researchers in this group find mixed, sometimes threshold (non-linear) effects of finance on growth. The "mixed effect" group seems to be the most recent line of finance and growth nexus and various results have been estimated by a large number of papers. The popularity of this view is perhaps due to two factors.

First, intuitively, it is more likely that financial development has different effect on different groups of countries as countries have heterogeneous social, economic and financial systems and structures. Second, growing data availability has made it possible to increase the number of countries (developing countries in particular) and variables in the sample, as well as to study the effect using a long time horizon.

This mixed view group can be divided into sub-groups according to whether the mixed effect is associated with the choice of financial development variables or it is more related to the level of certain performances such as financial development, income level or other factors such as the level of institutional quality.

It is no mystery that financial depth or deepening (in particular, the depth of the bank credit) is the most used financial development measure in the literature. The available data of this indicator is substantially larger than that of others which made it one of the few (if not the sole) variable to use for researchers who want to obtain significant results. For financial depth, researchers often use liquid liability to GDP (M2 or M3), bank ratio, financial activity denoted by private credit to GDP, or stock market capitalisation to GDP (Valickova, Havranek and Horvath, 2015).

Apart from financial depth, financial system efficiency is also used more recently as a level of financial development. Shen and Lee (2006) include lending deposit spread and stock market turnover ratio as financial efficiency variables on top of financial depth indicators in their study. They highlight that lending deposit spread alone has a significant positive effect on growth among the bank development variables.

Recently, Hasan, Horvath and Mares (2015) include net interest margin and stock market turnover ratio as financial efficiency variables and z-score as stability measure in addition to their financial depth indicators. Their results from Bayesian model averaging indicate that net interest margin appears to matter the most while stock

market turnover ratio and z-score have moderate effect on growth. These results are consistent with Rousseau (1998) who points out that reductions in lending deposit spread have positive effect on financial depth and economic growth.

Optimal financial structure has been promoted by several economists as an important factor for promoting economy. Ergungor (2008) for instance, suggests that financial structure is important and he adds that stock market development is more crucial for countries with flexible judicial system. Lin, Sun and Jiang (2009) propose that factor endowment structure should be important foundation for deciding financial structure since different types of industries require different types of risks and capital allocations, therefore they can thrive more if the type of financial structure is aligned with their operational characteristics. According to their study, it is necessary to have optimal financial structure for each stage of development because the characteristics of industries change as country develops.

Demirguc-Kunt, Feyen and Levine (2011) also underscore the importance of financial system structure that deviation from optimal level results in less economic activity based on their empirical study. They contend that as country develops, it requires different sets of financial services and consequently stock market development becomes more important than bank development. They define the optimal structure empirically based on the structure of OECD countries which is questionable as one cannot say that OECD countries possess optimal financial structures.

Some studies propose threshold effect that financial deepening has positive impact on growth up to certain point and the impact turns negative and harms economic growth after that. For instance, the results of Law and Singh (2014), based on the data of 87 countries between 1980 and 2010, show significantly negative impact, -0.188, when financial depth surpasses the threshold of 88%. The authors offer possible explanations to this non-linear relationship such as 1) consumption loans might hurt growth while investment loans promotes it and 2) financial deepening helps countries catch up with the productivity frontier and the effect turns weak or negative when they reach the frontier.

Rioja and Valev (2004)'s results based on GMM analysis, with the sample data from 1961 to 1995 covering 74 countries, indicate that the regions with moderate financial development benefits from the positive effect the most, while the effect is weak for the region with high financial development and uncertain for countries with low financial development. According to them, the threshold from weakly developed

financial sector to moderately developed financial market is 0.14 for private credit and 0.21 for liquid liabilities.

Shen and Lee (2006)'s study, using 48 countries over the period from 1976 to 2001, also proposes a non-linear relationship (inverse U shape) but in a weak form. According to their panel data analysis, only stock market capitalisation shows positive results among the financial development variables, and lending deposit spread shows positive effect after including its squared term while bank depth variables still remain negative after including their squared terms.

Similarly, Arcand, Berkes and Panizza (2012) highlight that the effect of finance on growth can turn negative if the size of the financial sector is too large, in other words, when the credit to GDP surpasses 80-100%. According to their study, the effect is positive and significant for countries with small or mid-sized financial depth, therefore, there is a strong evidence for "vanishing effect" and researchers should take into account the quadratic form of financial depth variables. They conclude that the main reasons for vanishing effect are volatility and economic crashes, as well as possible misallocation of resources (Minsky, 1974; Tobin, 1984). Cecchetti and Kharroubi (2012) share the same view, the effect of finance is inverse U shaped and can undermine growth after certain point. They conclude that the reason might be that financial sector has to compete with other real economy sectors for scarce resources.

Another group of economists suggests that the effects are varied across income groups therefore, countries with different income levels might benefit from financial development in varied ways. Hassan, Sanchez and Yu (2011) investigate the effect of finance on growth using multivariate granger causality test and conclude that the effect in general is positive. Nevertheless, when they divide countries into regions based on their income levels, the regions with high income countries show negative effect of private credit on growth while the regions with developing countries exhibit the opposite.

The opposite evidence is obtained by Deidda and Fattouh (2002) that the positive effect holds for only high income group while there is no significant effect for low income group. On the other hand, Beck, Degryse and Kneer (2014) find slightly different evidence that in high income countries, larger financial sector size might spur economic growth at the expense of higher volatility and it may acts as a stabilizer in low income countries.

There are other studies that look at threshold effects, not according to income or financial development levels but institutional quality and inflation levels. Law, Azman-Saini and Ibrahim (2013) find that the effect of finance on growth is non-existent up to certain institutional quality level and the effect turns into positive and significant when institutional quality surpasses the threshold based on sample data covering 85 countries over the period from 1980 to 2008. They recommend "better finance" for economic growth which implies low institutional quality prevents countries from benefiting from financial deepening. This result is aligned with the previous results that the effect of finance on growth is positive for high income countries because high income countries tend to have better institutional quality. On the other hand, Rousseau and Wachtel (2002) suggest that finance affects growth positively unless the inflation level exceeds a threshold point.

Some studies suggest that effect is varied depending on whether they look at long term impacts or short term ones. Loayza and Ranciere (2006) propose that the short term effect of financial depth on growth is usually negative while the long term impact tend to be positive based on the sample with 75 countries during the period from 1960 to 2000. They explain that the path to growth is not smooth and negative growth can occur in short term due to financial fragility and increased volatility. Using the data of 71 countries covering the period of 1960-2004, Bangake and Eggoh (2011) obtain similar results, suggesting the impact of finance on growth is positive and there is significant bi-directional causality effect in the long run. Nevertheless, in the short run, the effect holds for only high-income countries and the link is absent for low and middle income countries.

Relatively few number of researchers propose that not all private credit have the same effect on growth and it is important to take into account of credit composition. According to them, domestic credit to private sector can be divided into two groups. First one is the credit allocated to efficient firms and investment projects that usually lead to higher economic growth. Second one is household debt related credit which can have negative effect on growth. Beck, et al. (2012) highlight that only bank lending to enterprises boosts economic growth based on their cross-country study of 45 countries over the period 1994-2005. According to them, credit allocated to households does not lead to growth although majority of the private credit boom is accounted for household credit.

Bezemer (2014) and Bezemer, Grydaki and Zhang (2016) suggest that unproductive credit allocated to households has driven the increase of private credit to GDP and its effect on growth is negative while credit that is given to the productive sector stimulates growth. Jappelli and Pagano (1994) emphasize that liquidity control on households can increase savings rate and productivity growth based on their study on OECD countries. Sharing this view, Tunc and Yavas (2016) find that household mortgage credit undermines the private savings rate and investment, therefore harms economic growth.

There are many studies in the literature that support "mixed effect" view and it appears that the effects might be varied depending on income, financial development or other performance (such as institutional quality) levels. It might be therefore informative, if researchers look at regional level or country level studies. In that case, the results might turn out more accurate because researchers focus on regions or countries with similar characteristics. There is a great deal of studies focusing on a single (or few) country or a single region, however, the results obtained from those studies also reveal mixed effect of finance on growth.

For high-income regions, Carlin and Mayer (2003) investigate the relationship of finance and growth for OECD countries with the data collected from 1970 to 1995 and suggest that the effects are varied depending on the economic structure and financial system of each country. Arestis, Demetriades and Luintel (2001) study the relationship using time-series data from 1970's to 1990's of high income countries such as Germany, the United States, Japan, the United Kingdom and France. Their VAR analyses results support mostly positive causality from finance to growth or bi-directional relationships and the effect of banking development appears to be greater than that of stock market development.

In contrast, Koetter and Wedow (2010) find positive effect of banking efficiency on economic growth in Germany using 97 economic regions during the period of 1995 to 2005, however, credit volume to GDP does not show any effect on growth. Their study indicates that higher mean mark-up of banks harms growth, therefore, anti-competition policy might hurt economic activities. Similarly, Hasan, Koetter and Wedow (2009)'s study on banks of 11 countries (147 regions) in Europe proposes that the effect of banking efficiency is three times higher than that of credit volume.

In the case of developing countries, De Gregorio and Guidotti (1995) write that private credit affect growth positively in a cross-country sample, but the effect is

negative for Latin America and they associate the result with poor regularity systems in the region. In contrast, Bittencourt (2012)'s evidence, coming from panel time-series analysis for four Latin American countries, states that more finance supports economic growth as it enables investment in productive activities. Ang and McKibbin (2007) states that financial depth and economic growth are positively correlated in Malaysia using the time series data from 1960 to 2001, however, finance follows economic growth rather than the other way around.

Rousseau and Vuthipadadorn (2005) study finance and growth nexus using time-series data of 10 Asian countries over 1950-2000 with vector autoregressive models (VARs) and vector error correction models (VECMs), and suggest that the key channel finance affects growth is through investment. Esso (2010)'s study on West African countries (ECOWAS) also proposes similar result, saying that finance and growth have long run positive relationships and for some countries in the region, finance granger causes economic growth. Nevertheless, Demetriades and James (2011)'s study on Sub-Saharan Africa concludes that bank liabilities follow economic growth while the link between private credit and economic growth does not show.

1.3 Review of finance growth nexus in CEE and Central Asia

Previous parts of this literature review have demonstrated that there are heterogeneous effects of finance on growth across countries or regions. Transition countries are certainly not a homogenous group, however, their economic and social systems are seen to be more similar to each other than that of other countries. Transition countries, for example, had not had a real financial system until the end of 1980 or the beginning of 1990 and their financial systems had been merely a part of the planned system until then (Hermes and Lensink, 2000, p.508). In the case of stock market development, these countries have relatively small stock markets with little trading activities and it is very likely that the stock markets in these countries stay small (Claessens, Djankov and Klingebiel, 2000). In addition, the lack of well-functioning markets and institutions, still in-progress privatisation as well as soft budget constraints on state-owned or former stated owned firms are part of the well-known problems about transition countries (De Haas, 2001).

There is a number of studies conducted on finance and growth nexus of transition economies although the number is somewhat limited mainly due to restricted data availability. Results obtained for transition economies are as contrasting as that of

studies with global scope; some economists conclude finance has insignificant effect on growth in transition countries while others argue the effect is not only positive but also stronger in transition countries than advanced countries.

Dawson (2003) states that according to his study, the effect of finance on growth in 13 Central and Eastern European countries appears to be insignificant. His panel approach adds liquid liability as a variable of financial development, to functions of Solow (1957)'s growth model such as capital and labour and conclude that his results do not support the view that finance has a positive effect on economic growth. Gillman and Harris (2004) study 13 transition countries over the period 1990 to 2002, and their panel analysis suggests that financial deepening does not affect growth positively in transition countries nor in developed countries, after controlling for investment and inflation levels.

Djalilov and Piesse (2011) also exhibit similar results using dynamic panel data approach employing the data of 27 countries during the period from 1992 to 2000. They underscore that private credit to GDP, as a proxy for financial development, does not show any significant effect on growth and explain that the low levels of financial depth in transition countries are not sufficient enough to diffuse the positive effect of finance on economic growth.

The explanation is not valid considering that the effect of finance on growth for developed countries is not certain. It appears that studies with only single region or country suffer from not only less data availability but also comparability to validate and crosscheck their results with other regions. Their study also obtains negative sign of lending deposit spread on growth and explains that transition countries are sensitive to this spread. This explanation is clearly questionable as lending deposit spread tends to have negative association with growth in general because lowering the spread leads to more financial deepening and greater growth (Rousseau, 1998).

Caporale, et al. (2009) investigate the relationship for ten new EU members and point out that the increase in private credit in these countries are largely associated with household debt related loans. Their analysis with GMM approach over the period from 1994 to 2007 suggest that credit to private sector does not have significant effect on growth while stock market capitalisation has weak but significant effect. Liquid liabilities to GDP shows both positive and significant result on economic growth which supports the idea that increase in money supply leads to growth. On the other hand, financial efficiency indicator measured by net interest margin has highly significant

effect on economic growth which implies that reduction in interest margin can promote economic growth.

In contrast, Masten, Coricelli and Masten (2008) find that countries with less developed financial systems (transition countries) benefit more from financial deepening than the other European countries with higher financial depth, based on both of their macro and micro level analyses. They indicate that financial depth between 90% and 150% of GDP is more likely to impact growth positively, however, they also suggest that once countries have sufficient financial depth, financial integration may promote growth.

Fink, Haiss and Vukšić (2009) share similar view, pointing out that the effect of financial development on growth is varied depending on the economic development of countries. Their results indicate that bank credit and stock market deepening seem to promote economic growth in the early stage of transition, however, the results are not significant for cohesion (structural fund) and mature economies. For latter, the effect of domestic and private credit turns out even negative. The authors suggest that domestic credit and bond market appear to influence growth more than private credit and stock market capitalisation.

Similarly, Akimov, Wijeweera and Dollery (2009) write that financial development in transition countries has positive effect on economic growth. Their study includes 27 transition countries during the period of 1989 to 2004 and the results of panel data analyses and endogenous growth model indicate that the positive link persists regardless of the choice of financial development proxies. The authors highlight that it is necessary to cover different measures of financial development to capture the diverse aspects of financial development. Therefore, they include liquid liabilities to GDP, domestic credit to GDP, private credit to GDP as proxies for financial development. The authors acknowledge the study's limitation that they did not assess direction of causality.

Kenourgios and Samitas (2007) study Poland's case and conclude that credit to private sector has been a strong contributor to GDP growth in the country while stock market capitalisation does not show any effect.

2. Data and Summary Statistics

This thesis uses data of 202 countries over the period between 1960 and 2013 from the newest financial development database of World Bank which was published in September 2015. Although researchers use various indicators as financial development variables, the most common indicators are financial depth indicators because of their larger data availability. Other indicators such as efficiency and access have been commonly ignored, therefore, this thesis intends to employ varied financial development measures to assess broad aspects of financial development instead of focusing on only one.

2.1 Financial development indicators

2.1.1 Global sample

This thesis initially starts with eight financial development indicators: private credit to GDP, liquid liabilities (M3) to GDP and stock market capitalisation to GDP as financial depth measures; lending deposit spread, net interest margin, stock market turnover ratio as financial efficiency measures; number of accounts per thousand people as an access to finance indicator; bank z score as a banking sector stability measure. The World Bank definitions for these variables and the rationale to consider those variables in this study are stated below.

1. Private credit to GDP is the amount of domestic credit allocated to private sector by deposit money banks as a percentage of GDP. Higher private credit to GDP means higher financial system depth and domestic investment level. Financial systems that allocate more credit to the private sector are more likely to be efficient at mobilizing savings, imposing risk and corporate control (Levine, 2005).
2. Liquid Liabilities to GDP (M3) is a broad money as a percentage of GDP. Broad money includes M0 (deposits and currency in Central Bank), M1 (electronic currency and transferable deposits), M2 (time deposits such as savings deposits), and commercial paper, foreign currency time deposits, etc. M3 indicates the intensity in the banking system (Hassan, Sanchez and Yu, 2011).
3. Stock Market Capitalisation to GDP is the value of all listed shares in a market divided by total GDP. It shows the depth of the stock market. A number of

researchers emphasizes that stock market development is crucial for promoting economic growth. Levine (1991) and Bencivenga, Smith and Starr (1995) for instance, highlight that stock markets help firms maintain their capital by reducing risks of pre-mature liquidity.

4. Lending-Deposit Spread is the difference of lending and deposit rates and it denotes the efficiency of the banking system. According to Rousseau (1998), cuts in spread deepen the amount of credit as it becomes easier to take loans and therefore promote economic growth.
5. Bank Net Interest Margin is the accounting value of bank's interest revenue (net) to its interest-bearing assets. It is employed by several papers as a banking efficiency variable (Hasan, Horvath and Mares, 2015).
6. Stock Market Turnover Ratio is the value of traded shares to market capitalisation during the respective period. It shows stock market activity, therefore is often used as a stock market efficiency measure (Shen and Lee, 2006).
7. Number of accounts per thousand adults denotes how many people have access to bank service.
8. Z score denotes stability as it captures the probability of the commercial banking system's default. It is calculated by dividing return on assets (ROA) plus equity as a proportion of assets by the standard deviation of ROA.

As Table 1 demonstrates, financial development measures are largely different and have varied correlations to each other which proves that private credit alone should not represent the whole concept of financial development. Consistent with intuition, private credit to GDP and liquid liability to GDP have high positive correlation which makes the variables interchangeable for my analysis. The correlation between lending deposit spread and private credit to GDP is negative because the more developed the financial system is, the lower the spread tend to be which is consistent with Rousseau (1998). However, the correlation between them is only -0.3 which implies that the impacts of those indicators on economic growth are very likely to be varied.

Lending deposit spread and net interest margin have a correlation of 0.38 which is not high due to the difference in the size of interest bearing assets in banks. Access to finance shows medium to weak relationship to every other financial development variables which suggest that the benefits of increased financial depth and efficiency are

allocated to small portion of population and leaving behind a large number individuals without access to finance. It should be particularly true for less developed countries as they have more restricted access to finance. Z score has weak correlations with other financial development measures which implies that there have been many cases where financial deepening and efficiency were not accompanied by stable banking systems.

Table1: Financial development indicators correlation

		Depth			Efficiency			Access	Stability
		Credit	M3	SMC	Spread	NIM	SMTR	Accounts	Z score
Depth	Credit	1							
	M3	0.77	1						
	SMC	0.52	0.39	1					
Efficiency	Spread	-0.30	-0.25	-0.15	1				
	NIM	-0.60	-0.59	-0.42	0.38	1			
	SMTR	0.41	0.40	0.28	-0.13	-0.35	1		
Access	Accounts	0.45	0.15	0.35	-0.23	-0.24	-0.06	1	
Stability	Z score	0.18	0.36	0.19	-0.07	-0.17	0.07	0.13	1

Credit: Domestic credit to GDP; SMC: Stock Market Capitalisation; Spread: Lending Deposit Spread; NIM: Net Interest Margin; SMTR: Stock Market Turnover Ratio; Accounts: Number of Accounts per 1000 adults; Z score: Z score

Table 2 shows the summary statistics of dependent and financial development variables. Each variable is first computed as a time-series average for each country and then combined with the averages of other countries in the same region. The whole sample is divided into eight regions using World Bank classification in order to assess the regional difference of finance on economic growth. High-income countries are classified by OECD membership while less developed countries are classified according to their geographical regions. Several Central and Eastern European (CEE) high-income countries are moved into CEE and Central Asia group in order to assess the effect for transition countries specifically. In addition, their characteristics are more relatable to CEE region historically than to high-income countries.

The dependent variable of the estimations is GDP per capita growth which is calculated by taking logarithm differences of GDP per capita and its lagged value and then multiplying by 100. As Table 2 indicates, the average economic growth of 202

countries during the whole sample period has been 2% per year. East Asia and Pacific has had 2.3% GDP per capita growth as the region's economy has been booming for the last decades. CEE and Central Asia also has experienced higher than average growth particularly since the collapse of socialist system. Sub-Saharan Africa has had the lowest growth rate which can be reflected in its poverty level. Latin America & Caribbean as well as Middle East & North Africa have had slightly lower than average growth rate. Although GDP per capita level in South Asia has been the lowest on average, it has experienced the highest average growth among the regions.

In terms of financial depth, the global average private credit to GDP and stock market capitalisation to GDP are 34% and 44% respectively and the computation is based on the mean of time-series average of each country. Consistent with intuition, high income countries, both OECD and non-OECD members, have the highest value of bank depth while the numbers for South Asia, Sub-Saharan Africa and Middle-East & North Africa are on the low end. The rest of the regions have financial depth similar to the global average. In terms of stock market size, high-income countries have the largest stock market capitalisation, while CEE and Central Asia and South Asia have the lowest. The numbers for CEE and Central Asia are consistent with Claessens, Djankov and Klingebiel (2000).

Financial efficiency in my sample can be divided into bank efficiency and stock market efficiency. As of bank efficiency, CEE and Central Asia has the highest average lending deposit spread 11.5% which is substantially higher than 8.3% which is the mean spread in the whole sample. The numbers for Latin America and Caribbean and Sub-Saharan Africa are on the high end. Similarly, these 3 regions have higher than average net interest margin. On the other hand, high-income countries and Middle East & North Africa have lower than average spread and their net interest margin is therefore low as well. East Asia and Pacific as well as South Asia have similar banking efficiency with global average.

As of stock market efficiency, high-income OECD countries have the highest performance on average, followed by South Asia, East Asia and Pacific, and CEE and Central Asia. High-income non-OECD countries have high stock market depth, however, the stock market turnover ratio is slightly less than the global average. Stock market turnover ratio for Sub-Sahara region on average is the lowest, followed by Latin America & Caribbean, and Middle East & North Africa. This suggests that, although

Sub-Saharan Africa and Middle East & North Africa have moderate sized stock markets, their trading volumes are relatively low.

Table 2: Summary Statistics, N=202, 1960-2013

	Economic development		**Financial Development**							
			Depth			***Efficiency***			***Access***	***Stability***
	GDP per capita	GDP growth	Credit	M3	SMC	Spread	NIM	SMTR	Access	Z score
Total, N=202										
mean	9073.9	2.0	34.3	46.4	41.4	8.3	4.9	39.9	541.2	15.0
median	2555.7	2.0	24.7	35.1	25.7	6.7	4.5	23.6	348.5	13.7
min	162.6	-2.2	2.4	8.2	0.6	1.5	0.7	0.4	10.2	-3.1
max	106172.8	7.1	151.2	230.1	203.0	39.1	12.4	195.0	2968.5	46.8
East Asia and Pacific										
mean	1841.1	2.4	33.2	46.0	49.1	7.7	4.6	45.8	486.6	14.2
median	1282.6	1.6	24.7	33.1	41.6	5.6	4.8	38.7	236.3	13.5
min	402.9	-0.9	5.6	16.4	5.7	2.4	1.9	0.4	10.2	1.8
max	9152.2	7.1	97.2	119.3	150.6	19.5	6.7	150.1	1493.1	29.8
CEE and Central Asia										
mean	4702.9	2.8	29.1	36.4	17.7	10.9	5.5	41.3	1026.6	13.3
median	3260.2	2.5	25.5	31.8	17.5	9.4	5.6	23.2	951.9	11.7
min	431.3	0.0	6.0	13.6	1.0	4.7	0.9	4.3	157.0	3.0
max	17016.4	5.5	60.3	66.8	78.1	21.6	11.7	148.4	2968.5	46.8
High-income OECD										
mean	26726.1	2.4	72.2	74.0	68.4	4.3	2.2	73.5	985.6	18.0
median	26210.8	2.3	60.9	64.7	59.0	4.0	2.1	69.6	1013.4	17.3
min	8109.4	1.0	42.4	42.6	19.5	1.5	0.7	0.9	779.7	-0.7
max	50600.3	5.8	131.9	158.1	169.4	10.8	3.7	195.0	1163.9	42.6
High-income non-OECD										
mean	29804.8	1.8	53.6	76.0	77.3	4.6	2.9	37.1	1090.2	15.2
median	22238.9	2.0	48.6	63.2	65.4	4.0	2.8	30.0	1047.1	15.2
min	5409.3	-2.2	9.0	11.6	25.7	2.2	0.7	4.0	168.0	3.6
max	106172.8	5.5	151.2	210.3	203.0	11.8	5.5	86.8	2099.9	40.1
Latin America & Caribbean										
mean	3328.4	1.8	30.4	39.8	21.0	10.7	6.2	12.8	666.5	14.2
median	3297.2	1.7	24.6	31.7	16.6	8.1	6.0	5.3	593.9	13.5
min	484.1	-0.4	9.7	21.2	0.6	3.5	2.2	0.9	110.7	-3.1
max	9380.8	3.5	66.8	92.0	86.8	39.1	10.5	71.9	1775.6	35.4
Middle East and North Africa										
mean	2337.8	1.8	28.3	63.3	35.2	4.9	3.4	19.2	432.2	22.3
median	1436.2	2.1	26.6	54.0	29.3	4.4	3.0	19.3	382.1	17.6
min	747.7	-0.2	5.5	20.3	12.0	2.4	1.8	8.2	61.3	7.3

max	7379.2	3.1	77.7	230.1	99.3	9.6	6.3	28.6	830.1	41.6
South Asia										
mean	972.9	3.3	20.1	36.9	18.0	6.0	4.9	69.6	451.4	14.8
median	477.7	3.2	19.9	39.1	16.2	5.7	4.1	67.0	329.9	12.1
min	237.4	1.6	6.7	28.5	5.7	4.0	3.3	4.6	121.7	2.2
max	4147.2	5.0	30.1	45.6	42.9	9.0	7.9	158.6	1065.2	31.4
Sub-Saharan Africa										
mean	1196.6	1.2	14.9	26.2	32.1	10.4	6.8	6.3	199.4	12.9
median	504.7	1.1	12.4	23.4	13.4	8.2	6.2	4.3	119.1	12.9
min	162.6	-2.0	2.4	8.2	3.9	4.0	1.4	1.0	12.3	1.2
max	7981.2	5.2	54.9	60.3	155.9	34.3	12.4	33.1	1262.1	37.8

Credit: Domestic credit to GDP; SMC: Stock Market Capitalisation; Spread: Lending Deposit Spread; NIM: Net Interest Margin; SMTR: Stock Market Turn-over Ration; Accounts: Number of Accounts per 1000 adults; Z score: Z score

Access to finance and stability indicators are largely ignored by literature due to limited data availability. According to the summary statistics in Table 2, Sub-Saharan Africa has the lowest number of accounts per thousand adults while the number is the highest for high-income countries. In terms of z-score, East Asia and Pacific, CEE and Central Asia as well as Sub-Saharan Africa show below average stability while the numbers for Middle East and North Africa and high income OECD members are on the high end.

2.1.2 Financial development indicators in CEE and Central Asia

The historical performance of financial development variables in CEE and Central Asia from Table 2 can be summarised as following. Despite having more than average GDP per capita and high economic growth, the region's credit depth has been on the low end and the stock market capitalisation in the region has been the lowest according to its time-series average. Furthermore, lending deposit spread in the region has been the highest in the world and net interest margin is therefore on the high end. Although the region has moderate access to finance, it appears that bank stability in the region has been one of the worst.

In my sample, CEE and Central Asia region has 30 countries and they can be divided into 2 groups of more advanced countries (new EU members) and less developed countries (non-EU countries). New EU members include countries in the CEE regions that have accessed to the European Union such as Bulgaria, Croatia, Czech

Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia.

According to their mean statistics which are derived from the time series average of each country, new EU member countries have had not only much larger per capita income but also greater economic growth.

Table 3: Mean statistics for CEE and Central Asia

			Depth			***Efficiency***			***Access***	***Stability***
	GDP per capita	GDP growth	Credit	M3	SMC	Spread	NIM	SMTR	Access	Z score
New EU:										
mean	8790.1	3.3	37.6	48.1	16.1	7.8	3.7	30.6	1406.0	16.0
median	9067.0	2.6	33.9	48.8	18.2	6.3	3.8	23.4	1293.1	14.6
min	3216.2	1.5	21.1	29.2	5.5	4.7	1.9	6.0	1010.7	3.0
max	17016.4	5.5	52.5	66.8	28.0	13.5	6.0	66.2	2027.2	46.8
Non-EU:										
mean	2336.7	2.5	23.5	28.9	19.2	13.6	6.6	52.1	874.8	11.6
median	2189.1	2.5	19.8	27.2	16.8	14.9	6.5	13.6	680.1	10.5
min	431.3	0.0	6.0	13.6	1.0	6.6	0.9	4.3	157.0	3.7
max	5014.2	5.5	60.3	64.2	78.1	21.6	11.7	148.4	2968.5	24.8
Total:										
mean	4702.9	2.8	29.1	36.4	17.7	10.9	5.5	41.3	1026.6	13.3
median	3260.2	2.5	25.5	31.8	17.5	9.4	5.6	23.2	951.9	11.7
min	431.3	0.0	6.0	13.6	1.0	4.7	0.9	4.3	157.0	3.0
max	17016.4	5.5	60.3	66.8	78.1	21.6	11.7	148.4	2968.5	46.8

Credit: Domestic credit to GDP; SMC: Stock Market Capitalisation; Spread: Lending Deposit Spread; NIM: Net Interest Margin; SMTR: Stock Market Turnover Ration; Accounts: Number of Accounts per 1000 adults; Z score: Z score

As Table 3 shows, new EU countries have had approximately 50% larger private credit size than non-EU countries in CEE and Central Asia over the years. Non-EU countries, for example, Central Asia experienced economic reform much later than CEE countries (Djalilov and Piesse, 2011) which is reflected on its size of private credit. As for lending deposit spread, non-EU countries have had larger spread than new EU members which can be explained by its less developed financial system and higher inflation level.

Stock market capitalisation on the other hand, shows opposite results. Over the sample period, the stock market size for the two regions have been almost the same although non-EU countries have had slightly larger stock market capitalisation as a proportion of their GDP levels than new EU countries. Stock market turnover ratio for non-EU countries appears also higher than that of new EU members which implies that stock markets have been more active in non-EU countries than the new EU members in the CEE and Central Asia region. However, these numbers seem to be driven by high performance of few countries as the median statistics indicate that new EU members have larger and more active stock markets.

As for other variables, more people have had access to finance and the banking sector has been more stable in new EU members than non-EU countries.

2.1.3 A note on private credit to GDP

A growing number of studies suggests that the functional differentiation of private credit matters for economic growth (Beck, et al., 2012; Bezemer, 2014). They agree that household mortgage and consumption debts do not lead to higher economic growth, instead it might even harm the savings rate, therefore hurt economic growth (Tunc and Yavas, 2016). Another point they agree on is that household debt has been rapidly increasing during the recent decades, therefore studies using sample periods in the earlier times could have obtained different results than the studies that use recent time periods.

Nevertheless, there is no systematic data on the composition of private credit to GDP that covers every country, therefore, researchers tend collect the data on their own from diverse sources and use their own computations. Beck, et al. (2012) for instance, collect enterprise credit data from each of the 45 countries in their sample and their definitions of enterprise credits are therefore, varied. According to their calculations, between 1994 and 2005, the household debts for low and middle income countries accounted for 40% and 63% of the total credit respectively, and the figure was 70% of the total credit for high income countries. Furthermore, they underscore that global increase in private credit has been mainly driven by the increase in household loans.

Bezemer (2014) notes that in 2007, the “unproductive credit” accounted for approximately two third of the total credit and it has been the main driver of the increase in credit since 1990 in the US. According to Tunc and Yavas (2016), about 40% of the

total private credit to GDP in Turkey in 2014 was mortgage loans and the number is expected to increase.

The study of Caporale, et al. (2009) on new EU member countries point out that the rapid expansion in private credit in those countries were mainly driven by increase in household loans. At the beginning of 2000, the household credit to GDP for the new EU members were ranging from 1.2% to 11.3%. However, in 2007, the figures had expanded up to the highest of them reaching 43.3% and the lowest one equivalent to 16.3% of GDP. The size of household loan had grown by approximately 18 times over the seven years in Lithuania.

It appears that there is no doubt that a significant proportion of private credit to GDP accounts for mortgage and household loans. Growth rates of these loans have been rapid, therefore, they have become the main driver for the increase in private credit during the recent decades.

2.2 Control variables

My estimations include other control variables that can influence economic growth and acknowledged so by broad literature. These include government spending, trade, institution quality, mean years of schooling, macroeconomic instability, gross domestic savings and inflation.

Government spending is the total government current expenditures as a proportion of GDP while trade is import plus export to GDP. Gross domestic savings is computed by subtracting final consumption of the country from its GDP and dividing it by the total GDP. Institution quality is obtained from Heritage foundation index of economic freedom and it is the total index that take into account of various measures including poverty rights, corruption and business freedom. Average years of schooling is from United Nations Development Program and it measures the mean number of years of education that adults older than 25 tend receive. Macroeconomic instability is a dummy variable which takes 1 if one of the following conditions meet: the external (or central government) debt to GDP or unemployment level of the country increases more than 20% of its time-series average level. Detailed information about the sources and descriptions of the control variables can be found at Appendix 1.

As Table 4 indicates, higher income countries have had higher amount of international trade, institution quality and schooling while they have had lower number of cases of macroeconomic instability.

During the sample period, CEE and Central Asia region has had moderate amount of international trade, government spending and gross domestic savings similar to global average, fewer cases of macroeconomic instability, slightly less than average institutional quality and one of the highest number of average years of schooling.

Table 4: Summary Statistics, N=202, 1960-2013

	Economic Development		Control Variables						
	GDP per capita	GDP growth	Trade	GOV	Instability	Institution	Schooling	Inflation	Gross Domestic Savings
Total, N=202									
mean	9073.9	2.0	80.9	17.2	0.2	58.1	6.6	25.7	15.7
East Asia and Pacific									
mean	1841.1	2.4	84.5	24.0	0.1	51.1	6.5	11.5	5.8
CEE and Central Asia									
mean	4702.9	2.8	91.7	17.6	0.1	56.8	9.5	49.6	16.1
High-income OECD									
mean	26726.1	2.4	68.1	17.9	0.1	71.0	9.8	6.5	25.0
High-income non-OECD									
mean	29804.8	1.8	127.4	17.7	0.1	69.9	7.7	3.9	30.9
Latin America & Caribbean									
mean	3328.4	1.8	74.0	14.4	0.2	60.2	6.8	43.0	16.0
Middle East and North Africa									
mean	2337.8	1.8	72.4	18.9	0.2	49.8	4.3	9.8	13.3
South Asia									
mean	972.9	3.3	60.5	12.0	0.2	53.7	3.7	7.8	15.1
Sub-Saharan Africa									
mean	1196.6	1.2	68.5	16.2	0.3	52.5	3.6	35.2	7.9

GOV: Total government spending to GDP; Trade: Export plus import; Instability: Dummy variable for macroeconomic instability; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: CPI; Gross domestic savings: GDP less final consumption

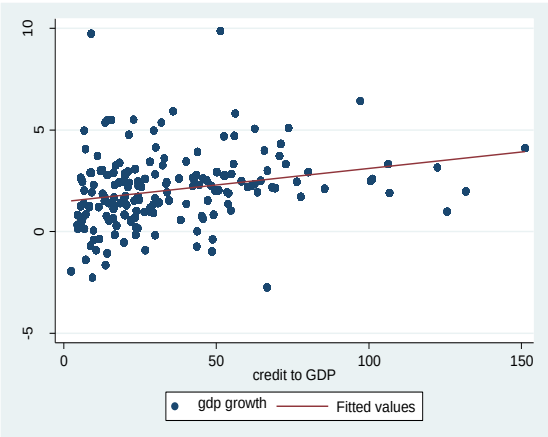
2.3 Relationships between variables

Figure 1 illustrates the relationship between GDP growth and four financial development indicators and each dot represents time-series average of economic growth and financial development indicator of a single country (The same graphical illustration

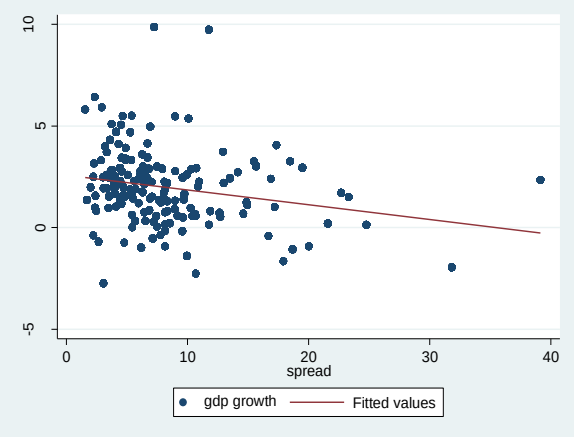
for each region can be found at Appendix 2). It can be seen that private credit to GDP has positive while lending deposit spread has negative association with economic growth in the long run. On the other hand, stock market capitalisation has neutral association with growth while stock market turnover ratio has slight positive association with economic growth. It seems that there are long run relationships between the variables, however, they turn insignificant when I run OLS regression including other control variables (see Appendix 3).

Although this graphic illustration can be seen as a glance at the long run relationships, it has major drawbacks similar to the limitations of pure cross-country regressions. One of them is that it ignores the actual level correlations of variables and can lead to spurious correlation because the variables are averaged over time (Ang, 2008). Ericsson, Irons and Tryon (2001) emphasize that using long-term averaged values fails to investigate level relationships.

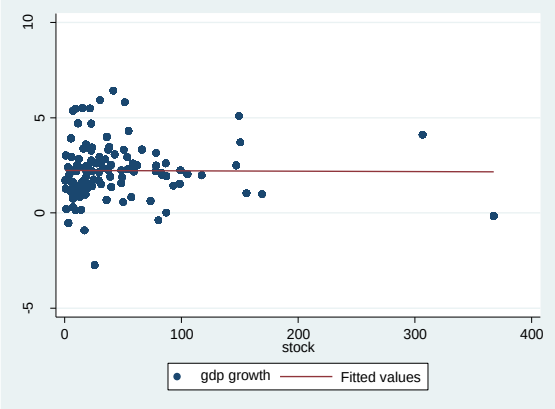
Figure 1: GDP growth and financial development scatter plot and fit line



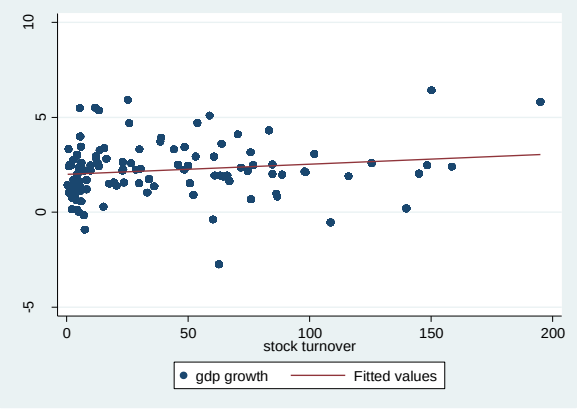
GDP growth and private credit



GDP growth and spread



GDP growth and stock market capitalisation



GDP growth and stock market turnover

After investigating the summary statistics as well as the correlations of the variables employed in this thesis, I run a simple pooled OLS regression to have a look at the relationships between economic growth and each financial development measure. This time, annual data is used to assess contemporaneous relationships instead of time-series averaged data because of the reasons mentioned in the previous paragraph. As significant number of papers propose a non-linear relationship between finance and growth (Law and Singh, 2014; Shen and Lee, 2006), squared values are used to test non-linear relationships between finance and growth.

Table 5: Pooled OLS regression, 1960-2013

Variables	**Dependent Variable: GDP growth**							
Trade	.007***	.007***	.004**	.006***	.006***	.005***	0.002	.006***
GOV	-.052***	-.063***	-.065**	-.060***	-.051***	-.068***	-0.037	-.048***
Log initial GDP	-.598***	-.573***	-.627***	-.594***	-.958***	-.671***	-.693***	-.940***
Institution	-0.004	-0.017	-.042**	-.046***	-.024*	-0.021	0.009	-0.020
Schooling	.349***	.323***	.272***	.319***	.432***	.265***	.350***	.440***
Credit	0.009							
Credit^2	-.0001***							
M3		-0.004						
M3^2		-0.000						
SMC			.008*					
SMC^2			-0.00					
Spread				-.070***				
Spread^2				0.000				
NIM					0.090			
NIM^2					-.012***			
SMTR						.010***		
SMTR^2						-.000***		
Accounts							0.000	
Accounts^2							-0.000	
Z score								.036*
Z score^2								-.000*
_cons	5.02***	6.11***	8.55***	8.67***	8.33***	7.59***	4.97***	7.46***
N	2352	2358	1624	1852	2016	1613	646	2019
R^2	0.084	0.068	0.067	0.084	0.120	0.062	0.057	0.106
R^2_a	0.081	0.066	0.063	0.080	0.118	0.058	0.046	0.103

Trade: Export plus import; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Credit: Domestic credit to GDP; SMC: Stock Market Capitalisation; Spread: Lending Deposit Spread; NIM: Net Interest Margin; SMTR: Stock Market Turn-over Ratio; Accounts: Number of Accounts per 1000 adults; Z score: Z score

Significance level: * p<.1; ** p<.05; *** p<.01

As Table 5 shows, squared terms are not largely significant, however, there is a possibility of a slight non-linear relationship particularly in the case of credit depth. Moreover, according to this OLS regression, financial depth variables have weak and insignificant effect on growth. The effect of private credit to GDP is small and insignificant while that of stock market capitalisation to GDP is significant but not large. On the other hand, financial efficiency variables exhibit stronger and significant effects compared to financial depth variables. Lending deposit spread shows significant negative effect as expected while the coefficient of stock market turnover ratio is both positive and significant. Bank z-score has positive coefficient as stable banking system is associated with more economic growth.

As for control variables, trade and schooling have positive significant effects on economic growth. Initial GDP, and government spending show negative effects as expected while institutional quality shows insignificant and negative effects. The latter can be due to 1) regressions with annual data cannot capture effect of institution on growth 2) it can be a sign of non-linear relationships between institution and growth. For instance, Law, Azman-Saini and Ibrahim (2013) note that there is a threshold effect of institutional quality on growth.

Using contemporaneous variables also has its limitations because it is sensitive to cycles and country specific shocks. Thiel (2011) questions the ability of aggregate level analysis to assess the finance growth relationship and suggests adopting long-term data because economic growth should be viewed as a long-term process.

Considering the both sides of the arguments of short term and long term views, it appears to be worth adopting five or three year intervals for each variable to smoothen the effects of cycles and shocks. Five or three years seem to be long enough to capture the complex effect of finance on growth and yet short enough not to fall into spurious correlation, therefore it is used by many studies (Beck, Levine and Loayza, 2000; Rioja and Valev, 2004; Cecchetti and Kharroubi, 2012).

Access to finance is dropped from further analysis. Although it is a crucial indicator that should be studied, it is not possible to include it in my analysis due to the fact that it has the least number of observations among the financial development variables therefore, its effect on growth is invisible and insignificant which can be seen from the results of the simple OLS regression. However, I acknowledge that this indicator should be studied once there is more data available in the future.

Simple pooled OLS was used to investigate relationships between variables, however, it is not suitable when there are unobserved individual-specific characteristics or endogeneity problems. According to Ang (2008, p.554) grouping countries together is dangerous as there are large number of cases where the results vary depending on the selection of countries and time horizons. The section 3 focuses on the main methodologies adopted in this thesis.

3. Methodology

Empirical studies on finance and growth nexus employ diverse methodologies and each of them has advantages and drawbacks. The choice of methodology can certainly alter the results, therefore using a methodology that is appropriate for the nature of the research question is important. Studies in this field have mainly used three types of methodologies: cross-section, time-series approach such as VAR, and panel data approach such as fixed or random effect panel and dynamic panel estimators.

As demonstrated in the previous paragraph, a pure cross-sectional approach is not suitable for the nature of my research question as it can lead to spurious correlation and fail to analyse the level relationships (Ericsson, Irons and Tryon, 2001; Ang, 2008). Therefore, time-series and panel approaches are left to pursue.

Time-series techniques are one of the most popular approaches to solve endogeneity problems and their results on this topic often show causality from finance to growth, growth to finance or two-way causal relationships. Luintel and Khan (1999), for instance, use annual data of four variables, logarithm of GDP per capita, financial depth, real interest rate, and logarithm of real capital stock per capita and find bi-directional causality. Hassan, Sanchez and Yu (2011) include six variables in their multivariate analysis such as economic growth, private credit, gross domestic savings, trade, government spending and inflation. Their results find short run bi-directional causality for regions other than East Asia & Pacific and Sub-Sahara. However, combining with other results from panel analyses, they conclude that positive relationship exists for developing countries and contradictory results are found for developed countries.

Nevertheless, time-series approach can be problematic for this research because of the following reasons. First, only annual data is available from World Bank database while time-series techniques require higher frequency data. Particularly, the data for developing countries in my sample have shorter time-horizon which makes them not suitable for time-series analysis. Economists such as Gupta (1984) uses quarterly observations to increase the size of sample data, however, according to Ang (2008) this method cannot capture the long-term effect of finance on growth.

Second, past time-series analyses on finance and growth nexus include only few variables and therefore are subject to omitted variables bias (Ang,2008). For instance, it appears that the results of Luintel and Khan (1999) might suffer from omitted variable bias because it uses only four variables. Also, the dependent variable is logarithm of GDP per capita instead of economic growth which easily can result in wrong interpretation.

Third, the results of the granger causality tests should be interpreted carefully because the expectation of future economic growth may induce current decisions to engage more in financial services therefore, it cannot be interpreted as finance causing growth (Ahmed, 1998). Studies focused on single or few countries might bring more accurate results, however, it is not possible to make generalisation out of single country results.

Dynamic panel estimations combine time-series dimensions with cross-sectional effect, therefore has gained substantial attention in recent years for both macro and micro level analyses. Studies adopt dynamic panel estimations because they solve endogeneity problems.

Nevertheless, this approach is not free from limitations. According to Ang (2008), dynamic panel estimations can also suffer from omitted variable problems. As can be seen from the literature review demonstrated in the previous section, results tend to alter once the authors group countries into regions which means that the results are sensitive to country-specific effects (Rioja and Valev, 2004; Shen and Lee, 2006; Beck, Degryse, and Kneer ,2014). Also, dynamic panel estimations require large sample data which makes the results insignificant once the countries are grouped into regions which makes the samples smaller.

Fixed effect panel data is therefore used first in order to assess regional results and smoothen heterogeneity bias. Later, dynamic panel estimations (Arellano-Bond and Arellano-Bover / Bludendell-Bond) are employed to tackle endogeneity problems.

3.1 Fixed effect panel approach

Fixed effect panel estimator is applicable when there are individual-specific characteristics across groups that should be controlled (Hausman and Taylor, 1981). Fixed effect panel estimations remove individual-specific effects by transforming data with mean-deviations differencing. In my thesis, annual data is used for fixed effect panel estimations in order to maintain the large number of observations which is necessary for dividing it into sub-samples. Average of 5 year interval data is used for robustness check later.

This thesis estimates the effect of financial development on economic growth using fixed effect panel data for 1) whole sample and 2) regional samples. There is substantial amount of difference in terms of economic systems and income levels across countries and controlling for fixed effects will deliver results that are not affected by country-specific differences. Countries in the same regions on the other hand, have more similar economic conditions and income levels to each other. Regional estimations therefore, allow me to investigate the effect of financial development on economic growth for each region and income group.

Among panel data estimations, De Gregorio and Guidotti (1995) employ random effect panel using the data of 99 countries over the period 1960-1985. They assess the effect of finance on growth for different regions and income groups. The authors find that the effect is negative for Latin America and explain that it is due to the region's high level of financial repression. Their results might be influenced by country specific effects as they use random effect panel estimations. On the other hand, Rousseau and Wachtel (2002) use fixed effect panel techniques to investigate finance and growth nexus and find that finance has positive impact on growth up to certain point until inflation level exceeds the threshold. This study may control for country-specific effects successfully, however do not address endogeneity.

Following equation can be derived on the relationship between financial development and economic growth,

$$y_{i,t} - y_{i,t-1} = \beta\, FD_{i,t} + \gamma X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (1)$$

where y denotes the logarithm of GDP per capita, FD is financial development variables, X is other control variables, μ is country-specific unobserved effects and ε is error terms.

Although fixed-effect panel estimators control for unobservable country-specific characteristics, it does not solve endogeneity problems as one cannot be sure whether financial development variable is uncorrelated with error terms. In other words, it does not eliminate dynamic panel bias (Nickell, 1981). Replacing independent variables with their 1 year lagged values can smoothen the problem as we can look at the effect of past year's financial development level on current year's economic growth. However, using lagged values alone is not deemed to eliminate endogeneity problems fully. Arellano Bover and Bludenll Bond estimators as an extension of Arellano Bond estimator are therefore, employed next as dynamic panel estimators.

3.2 GMM approach (Arellano Bond and Arellano Bover/ Blundell Bond estimators)

Arellano Bond estimator has been broadly used for dynamic panel data estimations since it was first developed by Arellano and Bond (1991). It adds autocorrelation test among others for the previous GMM estimations developed by Holtz-Eakin, Newey and Rosen (1988). Roodman (2009b) states that the estimator can be adopted when one or more of the following conditions take place:

1) Large number of individuals over small number of periods
2) Linear functional relationship
3) Dependent variable is dynamic
4) Explanatory variables are endogenous
5) Fixed individual effects
6) Autocorrelation and heteroscedasticity within panel individuals

The characteristics of the variables in my analyses are largely consistent with the above conditions. The dependent variable, GDP growth, is dynamic as it is influenced by its past values. Independent variables in my estimations, not only financial development variables but also other control variables, are endogenous as they are influenced by other variables including GDP growth and their own past values.

Arellano Bond estimator is particularly useful when there is no good instrument available, that the only instruments are the internal ones – based on their lags (Roodman, 2009b). In the case of finance and growth nexus, internal instruments are employed because external strong instruments have not been identified yet largely because they not only have to be informative but also, as Angrist and Krueger (2001) states, have to be 1) exogenous 2) not correlated with the omitted variables or error

terms and 3) correlated with the dependent variable only through the endogenous regressor.

The equation for the GMM estimations in this thesis is similar to that of Caporale et.al (2009), Rioja and Valev (2004) and Beck and Levine (2004).

$$y_{i,t} - y_{i,t-1} = (a-1)y_{i,t-1} + \beta' X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (2)$$

where y denotes the logarithm of GDP per capita, X is explanatory variables which include both financial development variables and other control variables, μ is unobserved country-specific effects, and ε is error terms. Eq. (2) therefore demonstrates that a country's economic growth is influenced by its past GDP per capita growth, financial development, real economy control variables, unobserved country-specific effects and error terms. Eq. (2) can be transformed as following for simplicity.

$$y_{i,t} = a y_{i,t-1} + \beta' X_{i,t} + \mu_i + \varepsilon_{i,t} \quad (3)$$

The proposal of Arellano and Bond (1991) is to transform Eq. (3) by taking the first difference to eliminate the fixed effects which results in the following equation:

$$y_{i,t} - y_{i,t-1} = a(y_{i,t-1} - y_{i,t-2}) + \beta'(X_{i,t} - X_{i,t-1}) + (\varepsilon_{i,t} - \varepsilon_{i,t-1}) \quad (4)$$

where Δy denotes GDP per capita growth, y is the logarithm of GDP per capita, X denotes the explanatory variables which include both financial development variables and other control variables, and ε is error terms. There would be a bias if newly introduced error term $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ is correlated with lagged dependent variables, and if explanatory variables are endogenous. Therefore for GMM estimators, lagged values of explanatory variables are employed as instruments under the following 2 conditions:

1) $E[y_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$ for s≥2, t=3…..T
2) $E[X_{i,t-s}(\varepsilon_{i,t} - \varepsilon_{i,t-1})] = 0$ for s≥2, t=3…..T

The first equation conditions that error terms are not correlated to the dependent variables and the second one conditions that lagged values of explanatory variables are not correlated to the future error terms.

Arellano and Bond (1991) suggest two step GMM estimate employing these conditions. The first step assumes error terms to be homoscedastic over the time period and across countries. The second step constructs variance covariance matrix based on

residuals from the first step estimate and does not rely on the assumptions of independency and homoscedasticity. Second step estimator therefore can give more realistic results (Beck and Levine, 2004, p.432). Finally, two tests including Hansen test and test for serial correlation of error terms in the difference equation will be used to evaluate the results (Roodman, 2009b).

There are two main types of GMM methods applicable to this research question. When all regressors are transformed by first differencing, it is called difference GMM. When the level regressors are employed together with the differenced ones based on the assumption that the first differences of instrumental variables are not correlated with the fixed effects, it is called system GMM developed by Arellano and Bover (1995) and Blundell and Bond (1998).

According to Roodman (2009b, p.104), with difference GMM, lags of regressors become orthogonal to error terms and can be used as instruments which is its distinction from mean-deviations differencing. He explains that lagged observations are not included in the formula which makes them appropriate for instruments. According to him, Arellano and Bover (1995)'s orthogonal differencing is suggested when the data has missing values which is problematic for first differencing. Also, system GMM is recommended when data is close to random-walking, therefore the changes/differences are used as instruments for level variables (Roodman, 2009b).

Considering the characteristics of difference and system GMM, both estimators are used and the results are compared in the next section. Rioja and Valev (2004) and Beck and Levine (2004) adopt difference GMM while Levine, et al. (2000) and Caporale, et al. (2009) suggest system GMM. Orthogonal differencing is adopted due to the missing values (see Roodman, 2009b).

Arellano Bond and Arellano Bover / Blundell Bover estimators require small time period and a large number of individuals. According to Roodman (2009b), the number of time periods should be small otherwise it leads to "too many instruments" bias for which fixed effect panel estimators work better.

Subsequently, the whole 50 year time period between 1964 and 2013 is first divided into ten periods with each variable is calculated by taking average over five year interval. The observations during 1960-1963 are eliminated because they possess more missing values than the observations in recent time periods. Later when the analyses are conducted for different time-frames, three year average values are used in order to

maintain ten time periods. The analyses will also be conducted on high and middle & low income groups in order to examine income effects.

4. Results

4.1 Fixed effect panel data

4.1.1 Global evidence

First, this study investigates the general effect of finance on growth using the total sample of 202 countries. Fixed effect panel estimations are used in this section in order to eliminate country-specific effects. Furthermore, Hausman test is conducted to assess whether fixed or random effect model is more applicable to our data and it supports fixed effect panel estimations (see Appendix 3). Initial GDP is omitted from the regressions due to collinearity. Inclusions of squared terms and interactions of the financial development variables do not change the coefficients significantly and their results are examined in the robustness checks section.

As Table 6 shows, the effects of financial development variables are varied. Both private credit to GDP and liquid liabilities to GDP variables indicate similar negative and significant effects. Their similar coefficients are consistent with the expectation as these two variables are highly correlated as demonstrated in the summary statistics section, however, the negative values are counter-intuitive. Using the average of 5 year intervals do not change the results significantly as can be seen from robustness checks section.

On the other hand, stock market capitalisation has small positive effect according to Table 6. As expected, spread has negative coefficient which means that the larger the lending deposit spread is, the less the economic growth tends to be. The coefficients of net interest margin, stock market turnover ratio and z-score are small and insignificant and not enough to affect the dependent variable independently. Therefore, they are eliminated from further analyses, however, are used for interaction terms in the robustness checks section.

In the case of control variables, trade, government and instability variables have the expected coefficients. The negative coefficients of schooling and institution might indicate non-linear relationships between growth and those variables.

Table 6: Fixed Effect Panel Data, N=202

Variables	**Dependent Variable: GDP per capita growth**						
Trade	.033***	.038***	.012**	.024***	.022***	.023***	.022***
GOV	-.238***	-.204***	-.388***	-.217***	-.387***	-.464***	-.383***
Instability	-.875***	-.876***	-.903***	-.955***	-1.382***	-1.119***	-1.382***
Institution	-0.007	-.059***	-.171***	-.123***	-.071***	-.168***	-.076***
Schooling	.158**	.166**	-.202**	-0.081	-.285***	-.225***	-.284***
Inflation	-.015***	-.014***	-.013***	-.037***	-.0366***	-.061***	-.037***
Credit	-.054***						
M3		-.057***					
SMC			.023***				
Spread				-.079***			
NIM					-0.000		
SMTR						0.002	
Z score							0.007
Constant	5.309***	8.112***	19.529***	13.242***	13.662***	21.235***	13.723***
N	2215	2221	1561	1704	1859	1536	1859
R^2	0.131	0.104	0.129	0.082	0.096	0.126	0.096
R^2_a	0.065	0.036	0.063	0.007	0.012	0.059	0.014

Trade: Export plus import; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation; Spread: Lending Deposit Spread; NIM: Net Interest Margin; SMTR: Stock Market Turnover Ratio; Z score: Z score

Significance level: * p<.1; ** p<.05; *** p<.01

As the results might be varied across countries with different income levels, it is necessary to investigate the finance and growth relationship for each regional group. Although I control for crisis period with macroeconomic instability variable, it is necessary to investigate the results separately for the period before 2007 in order to assess the impact of crisis fully. The results of fixed effect panel data estimations on regional groups are summarised into Table 7. Only the coefficients of financial development variables are presented to compare the results.

The results of the estimations on regional and income groups imply that the effects of financial development are varied depending on the characteristics and economic performance of the regions. For the whole sample period from 1960 to 2013, less developed countries show uncertain effects of private credit on growth; Middle East and North Africa as well as Sub-Saharan Africa have small and negative effects while South Asia has small but positive effect. None of the private credit coefficients are

statistically significant for these three groups of countries. On the other hand, medium and high developed countries significantly exhibit negative effect of bank deepening on growth. These results might be partly consistent with Hassan, Sanchez and Yu (2011) that credit expansion has negative effect for highly developed countries.

Table 7: Fixed effect panel, the effect of finance on growth across regions

Period: 1960-2013

Regions	**Sample countries**	**Private Credit to GDP**	**Liquid Liabilities to GDP**	**Stock Market Capitalisation to GDP**	**Lending Deposit Spread**
East Asia & Pacific	23	-.052***	-0.035	.068***	-.094*
CEE and Central Asia	30	-.105***	-.225***	.071***	-.091**
High-income OECD	26	-.028***	-.042***	.016***	0.202
High-income non-OECD	27	-.083***	-.038*	0.026*	.828**
Latin America & the Caribbean	29	-.053***	0.020	.023*	-.058**
Middle East & North Africa	13	-0.007	-0.025	0.007	-.353*
South Asia	8	0.022	0.034	.054***	0.150
Sub-Saharan Africa	46	-0.055	-.063**	.026*	-0.064
Total	202	-.054***	-.057***	.028***	-.079***

Period: 1960-2007

Regions	**Sample countries**	**Private Credit to GDP**	**Liquid Liabilities to GDP**	**Stock Market Capitalisation to GDP**	**Lending Deposit Spread**
East Asia & Pacific	23	-.107***	-.099**	.062***	-0.006
CEE and Central Asia	30	0.038	-0.071	.063**	-.127***
High-income OECD	26	-0.007	-.019*	0.003	0.301
High-income non-OECD	27	-0.023	0.025	.034**	1.068***
Latin America & the Caribbean	29	-.097***	0.035	.035**	-0.051
Middle East & North Africa	13	-0.030	0.008	-0.017	-0.276
South Asia	8	0.054	-0.018	.097***	-0.224
Sub-Saharan Africa	46	-0.009	-0.071	.046**	-0.174
Total	202	-.031***	-.028***	.021***	-.105***

Significance level: * p<.1; ** p<.05; *** p<.01

Bank lending deposit spread, on the other hand, indicates that the less spread the region has, the more the economic growth tends to be. This panel analysis suggests that among the bank development indicators, decrease in lending deposit spread has the largest positive effect on growth which is consistent with Rousseau (1998), Shen and Lee (2006) and Hasan, Horvath and Mares (2015).

The coefficients during the period before 2007 indicate quite different results implying that global financial crisis has played a large role on the effect of private credit on growth. The effect for total sample of 202 countries before 2007 show slightly less negative coefficient of private credit on growth than that of the whole time period which means that financial crisis has worsen the impact of credit on growth.

The regional results of private credit also support this view because many of them turn insignificant once the sample period is up to 2007. Nevertheless, East Asia and Pacific and Latin America and Caribbean regions show more negative effects of private credit on growth during 1960-2007 than the whole time period. It is probably because these two regions did not suffer from recent financial crisis as much as other regions, instead, they suffered more from previous crises such as Asian financial crisis and Latin American debt crisis.

The results of stock market deepening on the other hand, are consistently positive. The coefficients of stock market capitalisation for every region is positive and significant except for Middle East & North Africa where the result is positive but insignificant during the whole period and insignificant and negative before 2007. These results imply that the benefit of stock market deepening is more than that of bank credit which is consistent with Levine (1991), Bencivenga, Smith and Starr (1995), Shen and Lee (2006), and Caporale, et al. (2009).

The insignificant results for Middle East and North Africa region might be associated with its small sample size. The effect of stock market before 2007 is insignificant for high-income OECD countries which imply that the effect might be weaker for high income countries because they have already reached their productivity frontier (Law and Singh, 2014). The latter interpretation demands further analysis on groups with high and low levels of financial development.

Further analyses are conducted to investigate whether the effects of private credit and stock market capitalisation are varied for groups with low, middle and high levels of financial depth. Law and Singh (2014) and Arcand, Berkes and Panizza (2012) find non-linear relationship when the threshold of financial depth surpasses 80-90%.

Therefore in this study, the threshold for high level of financial depth is set at 80% of GDP, medium level is set from 30% to 80% and low level is equal to financial depth less than 30% of GDP.

As Table 8 shows, the effects are varied depending on the level of financial depth. It appears that private credit had had positive effect on growth for countries with low credit depth before 2007 and the effect turned into insignificant when the period is up to 2013. The coefficients of private credit does not change between the two time periods for countries with high credit depth. The highest difference occurs for countries with moderate amount of private credit that their coefficient changes from insignificant to strongly negative.

The effect of stock market capitalisation is largely consistent for all groups although it is higher during the period of 1960-2007 than during 1960-2013 for countries with low stock market depth. For the countries with moderate and high stock market depth, the effect is higher during 1960-2013 than 1960-2007. As Table 8 indicates, the effect of stock market capitalisation does not necessarily decrease as stock market depth increases, however, the countries with low level of stock market depth seem to benefit more from additional deepening.

Table 8: Low, middle and high financial depth

	Low depth (<30%)	**Moderate depth (30%-80%)**	**High depth (>80%)**
		Period : 1960-2013	
Private Credit	-0.040	-.085***	-.040***
Stock Market Capitalisation	0.048*	0.024**	0.032***
		Period : 1960-2007	
Private Credit	0.074*	-0.029	-0.037***
Stock Market Capitalisation	0.075***	0.003	0.025***

Significance level: * p<.1; ** p<.05; *** p<.01

4.1.2 Evidence from CEE and Central Asia region

According to Table 7 in the previous section, the effect of private credit on growth is the worst for CEE and Central Asia region during the period 1960-2013. Moreover, the difference of private credit coefficients between two periods for CEE and Central Asia region is the largest among the regions. There are papers which results suggest that the effect of finance on growth is insignificant for transition countries due to low financial depth they have (Dawson, 2003; Gillman and Harris 2004; and Djalilov and Piesse, 2011).

Nevertheless, this explanation is not supported by my results because of two reasons. First, the impact of private credit on growth up to 2007 appears to be insignificant for majority of the regions including CEE and Central Asia regardless of their credit depth levels. Second, other regions with similar even less credit depth still show better coefficients than CEE and Central Asia region during the time frame 1960-2013.

In order to investigate this further, I run the regressions separately for new EU members and others. New EU members include 11 countries in the CEE regions that have accessed to the European Union such as Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, and Slovenia. Non-EU group consists of the other 19 countries in the region. Table 9 shows the results for the two groups.

Table 9: Fixed effect panel model for CEE and Central Asia

	Sample countries	**Private Credit to GDP**	**Liquid Liabilities to GDP**	**Stock Market Capitalisation to GDP**	**Lending Deposit Spread**
			Period : 1960-2013		
EU members in CEE and Central Asia	11	-.107***	-.303***	.084**	-0.176
Non-EU member in CEE and Central Asia	19	-.218***	-.251***	0.034	-0.027
			Period : 1960-2007		
EU members in CEE and Central Asia	11	0.013	-.084*	0.032	-0.101
Non-EU member in CEE and Central Asia	19	0.062	-.181*	0.021	-0.067

Significance level: * p<.1; ** p<.05; *** p<.01

According to Table 9, the results are worse for non-EU countries in the CEE and Central Asia region which is consistent with Djalilov and Piesse (2011). Another thing

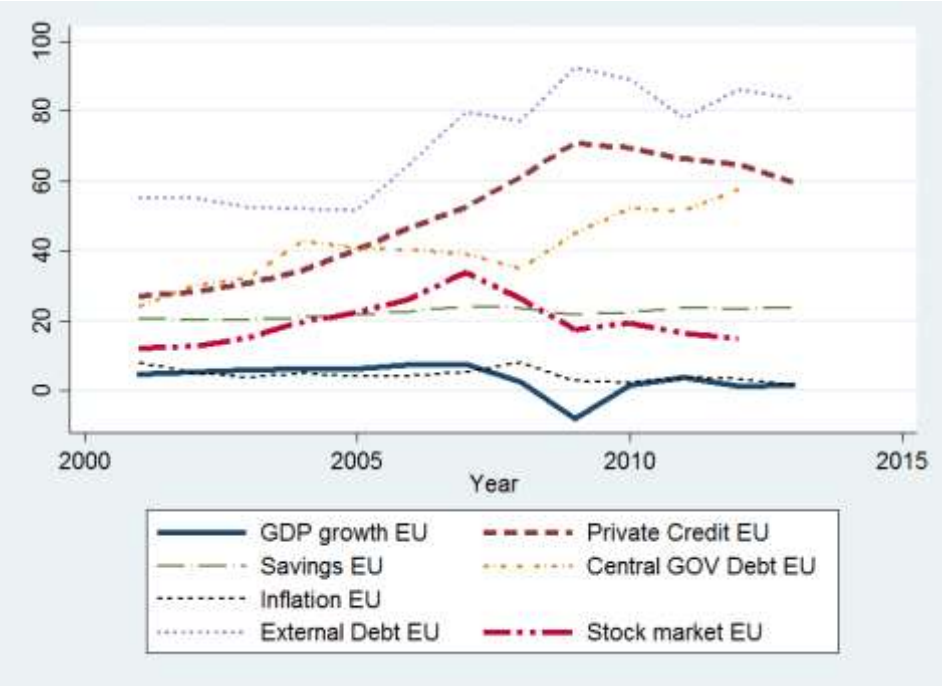
to notice is that the difference between the effects of private credit on economic growth for the two periods is substantially high, especially for non-EU countries in the region.

Subsequently, I look at the graphical illustrations for financial depth and economic growth variables as well as other indicators such as inflation, government and external debt to GDP, and gross domestic savings to GDP. Values for each variable is averaged for each year, in other words, the numbers for new EU members in the region came from average of 11 countries while that of non-EU countries in the region are derived from the rest, 19 countries. In order to capture the effect of financial crisis, the graphs show the time period from 2000 to 2013.

As Figure 2 illustrates, the economic growth of the new EU members in CEE and Central Asia region suffers during the financial crisis, around 2007-2009, similar to other regions. Inflation level and gross domestic savings to GDP stayed around the same for the period 2000 to 2013 which indicates that they are probably irrelevant for examining the different effect of private credit on growth between the two sub-regions.

Stock market size on the other hand, increases up to 2007 and then decreases as economic growth declines. The relationship between stock market capitalisation and economic growth is therefore on the positive side consistent with what fixed effect panel data results suggest. This also highlights the flexibility of the stock market reaction to economic activities.

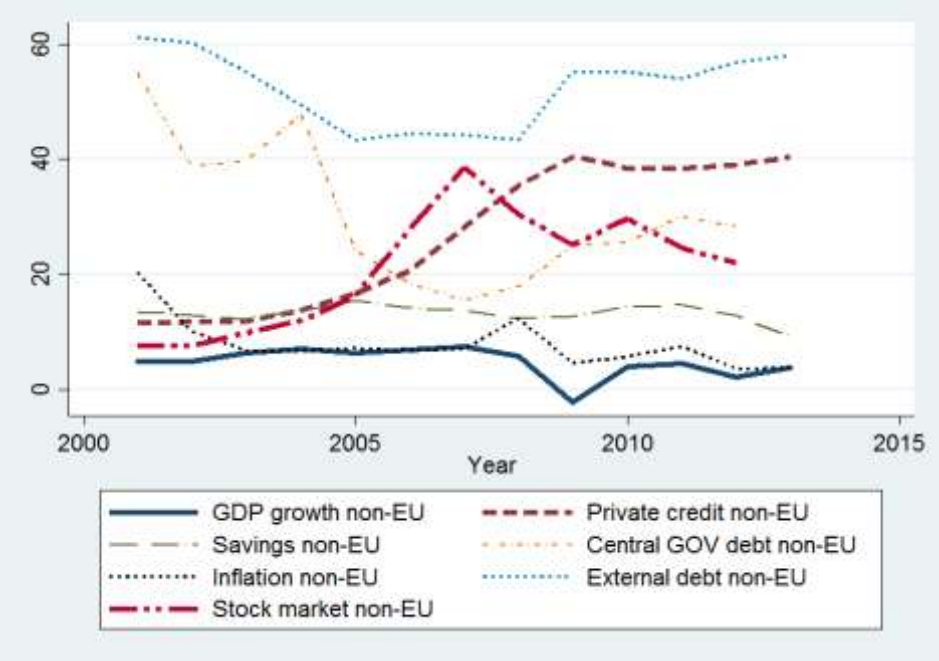
Figure 2: Financial Depth of New EU members in the CEE and Central Asia region



Private credit to GDP had increased more than 2 times during 2000 to 2007 in this sub-group. Private credit appears not as flexible as stock market activities as it increases until economic growth reaches the lowest point and then decreases. The variables that move closely with private credit are external debt and central government debt to GDP as shown in Figure 2.

The graphical illustration for non-EU countries in the CEE and Central Asia region is not as smooth as that of new EU members, however, the patterns are still visible in Figure 3. The economic growth in this sub-region was the lowest in 2008 similar to other regions and inflation had small fluctuations around 2007 while gross domestic savings to GDP does not change over the period.

Figure 3: Financial Depth of Non-EU members in the CEE and Central Asia region



As for financial depth indicators, stock market activities have positive correlation with economic growth while private credit increases till the economic growth reaches its lowest point, and then decreases. Central government debt and external debt figures are correlated with private debt since 2005 as shown in Figure 3. The patterns seem similar to that of new EU members. However, the percentage increase of credit is much larger in the non-EU countries because private credit to GDP and stock market capitalisation to GDP had increased approximately four times in these countries between 2000 and 2007.

It appears that the substantial difference between the coefficients of private credit on growth for two sub-regions, new EU and non-EU countries, in CEE and Central Asia is derived from the difference in their credit deepening growth. Private credit to GDP has grown too quickly in non-EU countries in the region, that it shows 2 times more negative effect than new EU members, on average.

Now it is natural to ask, whether this interpretation of credit growth effect on economic growth in CEE and Central Asia applies to other regions as well or not. To assess how financial deepening growth influences the effect of finance on growth, private credit growth and stock market growth are calculated by taking logarithm difference of current year and previous year's values. They do not show any significant results when they are applied to the whole sample which can be seen from robustness checks section.

There are two possible explanations for the negative effect of private credit on growth in CEE and Central Asia region. First, the effect might turn negative if most of the private credit expansion has been driven by increase in household depth (Beck, et al., 2012; Bezemer 2014). Furthermore, the strong negative effect that non-EU countries in the region has experienced might be due to the fact that the banking sectors in those countries practice ineffective operations such as soft budget constraints on state owned or former state owned firms (De Haas, 2001).

The results of fixed effect panel estimations might suffer from endogeneity. For instance, they cannot answer whether stock market activity leads to economic growth or it just follows and reacts to economic activities. The answer to this question is presented in the next section with GMM estimators.

4.2 GMM estimators

As specified in the methodology section, ten time periods during 1964 to 2013 are covered and therefore average values of five year interval (three year when more observations are necessary) are used. Five or three year interval is deemed to be long enough to avoid cyclical effects and short enough to maintain the total number of observations not too small.

Table 10 compares the results of difference GMM and system GMM estimators. The results of the system GMM estimations are much more efficient than that of difference GMM estimations which is consistent with Arellano and Bover (1995) and Blundell and Bond (1998). Arellano Bond test for AR (2) in differences is rejected at

only 10% significance level for some cases of difference GMM estimations. Furthermore, system GMM can keep more observations as level instruments can be used (Roodman, 2009b). Subsequently, system GMM will be used for further regressions.

Important thing to consider when using GMM estimator is that the instruments cannot be too many compared to the number of observations. As system GMM estimators use level equations as well, the number of instruments tend to be higher. For instance, according to Roodman (2009a, p.151), 80 instruments for 138 observations can be considered too many and a suspicious sign is Hansen test showing a perfect p-value of 1.000. In my case, the number of instruments is not deemed too many compared to the number of observations, however, when the instruments seem too many as indicated by the perfect p-value of 1.000 by Hansen test, the method of collapsing the instrument matrix is used to tackle the problem (Roodman, 2009a).

As system GMM results in Table 10 indicate, private credit to GDP has slight negative effect on growth while stock market capitalisation has positive effect. The coefficient of lending deposit spread is, as expected, negative which means that economies benefit from smaller spread. Moreover, economic growth seems to be highly dependent on its past values. Although system GMM results will be used further in order for greater efficiency, the signs and magnitudes of the coefficients of difference GMM estimators are consistent with that of system GMM estimators as well.

Control variables such as initial GDP, trade, government spending, schooling and inflation have the expected coefficients. The negative and sometimes insignificant effects of institution quality might indicate a non-linear relationship between institution and growth.

These results are similar to that of fixed effect panel estimations, however, the magnitude is smaller. For instance, according to fixed effect panel estimations, the effects of private credit and stock market capitalisation on growth are -0.054 and 0.023 while the coefficients for system GMM estimations are -0.022 and 0.012 respectively which are approximately two times smaller than those of fixed effect panel estimations. Difference between the results of two methodologies show that fixed effect panel estimations can exaggerate the effects due to endogeneity. Although the effect of spread is similar in signs for both methodologies, the coefficient is insignificant for system GMM estimations.

Table 10: Difference and System GMM estimators; period: 1961-2013; 5 year interval

Variables	**System GMM**				**Difference GMM**			
Lag GDP growth	.108**	.097**	-0.015	0.058	0.093	.124*	-0.077	-0.097
Log initial GDP	-0.414	-0.394	-0.358	-0.004	0	0	0	0
Trade	0.009	0.010	-.014**	0.002	.036**	.033*	-0.017	.016*
GOV	-0.111	-0.125	-.227**	-.170*	-.274**	-.228**	-.434***	-.265**
Institution	0.042	-0.026	-0.077	-.144**	0.081	-0.061	-.154**	-.164**
Schooling	.343***	.257**	.215*	.412***	.271*	.323*	-0.265	0.101
Inflation	-.001*	-.001**	-.018*	-0.007	-0.002	-0.002	-.025**	-0.017
Credit	-.022***				-.073***			
M3		-0.010				-.061***		
Stock			.012*				.037***	
Spread				-0.033				-.077*
_cons	2.253	6.439**	13.061***	10.969***				
Observations	497	501	364	395	346	350	258	264
Instruments	145	145	129	136	120	120	105	111
Arellano Bond test for AR(1) in differences (*p*-value)	0.002	0.003	0.004	0.000	0.004	0.002	0.016	0.021
Arellano Bond test for AR(2) in differences (*p*-value)	0.269	0.160	0.317	0.172	0.099	0.119	0.090	0.301
Hansen test of joint validity (*p*-value)	0.395	0.398	0.892	0.767	0.264	0.284	0.604	0.526
Difference-in-Hansen tests of exogeneity of instrument subsets:								
Hansen test excluding group (*p*-value):	0.321	0.249	0.552	0.389				
Difference (null H=exogenous) (*p*-value)	0.617	0.809	1.000	0.998				

Trade: Export plus import; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation; Spread: Lending Deposit Spread

Notes: All regressions are robust, two-step GMM. Orthogonal deviations are used to tackle panel gaps.

Significance level: * p<.1; ** p<.05; *** p<.01

The next step is to investigate the effects during different time periods because the results of fixed effect panel estimations have suggested that the effects substantially differ if the time periods are varied. In order to capture this difference, system GMM analysis will be carried out for the time period until 2007 and then until 2013. In order to maintain ten time periods for each analysis, only three year interval will be used this

time instead of five year interval. Subsequently, the first sample period is between 1978 and 2007 and the second sample period is between 1984 and 2013. Table 11 shows only the coefficients of financial development and growth variables and does not include that of control variables in order for simple presentation. The coefficients of control variables are similar to that of Table 10.

Unlike previous estimations, the analyses for the period between 1984 and 2013 require more lagged variables as order 2 serial correlation is rejected. Deeper lags are used when Arellano Bond test for AR (2) in differences is rejected and when the instruments show weak effects. Employing more lags increase the number of instruments, therefore, could lead to a bias with too many instruments compared to the number of observations. Roodman (2009a, p.148) recommends collapsing the instrument matrix by combining instruments into sets for this case. Collapsing the instruments enables me to include more lagged variables when the original instruments are weak.

Table 11: System GMM estimations for 2 time periods; 3 year interval

Variables	**1978-2007**				**1984-2013**			
Lag GDP growth	0.264***	0.264***	0.171*	0.092	0.245***	0.243***	0.086	0.043
	(0.001)	(0.002)	(0.059)	(0.195)	(0.000)	(0.000)	(0.203)	(0.504)
Private Credit to GDP	-0.008				-0.034***			
	(0.588)				(0.000)			
Liquid Liabilities to GDP		0.014				-0.016*		
		(0.446)				(0.093)		
Stock Market Capitalisation to GDP			0.012*				0.015**	
			(0.057)				(0.023)	
Lending Deposit Spread				-0.123				-0.106**
				(0.105)				(0.025)
N	554	549	401	453	823	821	597	641
Instruments	63	59	62	60	107	103	78	74
AR (1), *p*-value	0.001	0.001	0.007	0.002	0.000	0.000	0.000	0.000
AR (2), *p*-value	0.242	0.213	0.013	0.101	0.058	0.046	0.003	0.004
AR (3), *p*-value			0.223		0.121	0.111	0.206	0.221
Hansen, *p*-value	0.127	0.121	0.361	0.139	0.108	0.042	0.131	0.112

Notes: All regressions are robust, two-step GMM. Orthogonal deviations are used to tackle problems with panel gaps. Instrument matrix is collapsed in order to avoid too many instruments bias. *p*-values are in parentheses.

Significance level: * p<.1; ** p<.05; *** p<.01

According to Table 11, there is a substantial difference between the effects of private credit on economic growth during 1987-2007 and 1984-2013. If the sample does

not include 2008-2013, the period with financial crises and sluggish growth, the effect of private credit on growth appears insignificant which suggests that private credit does not influence economic growth either positively or negatively. On the other hand, if the sample includes period after 2007, the negative effect of private credit becomes significant which implies that the more private credit the country has, the more likely it experiences decline in growth during the second time period.

Other variables and diagnostic tests show expected coefficients. Past economic growth rates had had more effect on contemporary growth rate before 2007. Stock market deepening has, similar to previous analysis, positive effects on growth for both time periods. On the other hand, lending deposit spread becomes insignificant during the period of 1978-2007.

If I compare these results with that of the fixed effect panel estimations conducted for two time periods, the signs appear to be similar. Both methods suggest that the negative effect of private credit on growth is smaller or insignificant if the time period is up to 2007. Nevertheless, the magnitude of the results of system GMM estimations are smaller than that of the fixed effect panel estimations which again verifies that the latter overestimates the real effects. For instance, according to fixed effect panel estimations for the sample period 1978-2007, the effects of private credit and stock market capitalisation are -0.031 and 0.021 while GMM results for those indicators show -0.008 (insignificant) and 0.012 respectively.

Ideally, the next step would be to investigate whether the results differ if system GMM estimators are conducted for each region, in particular, for CEE and Central Asia where the negative effect was the highest according to the fixed effect panel results. However, small regional sample size does not allow me to obtain statistically significant results with GMM estimators as they require a large number of observations. In order to capture the effect of income difference, the sample is now divided into two groups, high-income countries and middle & low income countries. High-income countries are those who have GDP per capita more than 18000 USD approximately (log GDP per capita of 9.8).

Table 12 shows the coefficients of the financial development variables of system GMM regressions for the two income level groups between 1978 and 2007. The coefficients of control variables are not presented here and are similar to that of Table 10. Although the coefficients turn insignificant due to small sample size, it is still possible to compare the results for the two income groups.

According to Table 12, the effect of private credit on growth is small negative but insignificant for both groups of countries while the magnitude is slightly larger for middle and low income countries. Stock market capitalisation shows positive effect on growth for high income countries while it shows insignificant effect for middle and low income countries.

Table 12: System GMM estimations for high-income versus middle & low income countries; 3 year interval

Period: 1978-2007								
Variables	**Middle and Low income**				**High income**			
Lag GDP growth	0.202*	0.219*	0.253***	0.154**	0.143*	0.168**	0.038	0.080
	(0.052)	(0.040)	(0.002)	(0.033)	(0.093)	(0.028)	(0.802)	(0.508)
Private Credit to GDP	-0.023				-0.009			
	(0.148)				(0.204)			
Liquid Liabilities to GDP		-0.001				-0.007		
		(0.965)				(0.550)		
Stock Market Capitalisation to GDP			-0.006				0.013**	
			(0.644)				(0.025)	
Lending Deposit Spread				-0.057				0.245*
				(0.413)				(0.086)
N	424	420	277	348	132	131	124	105
Instruments	63	63	60	63	59	59	56	59
AR (1), p-value	0.018	0.009	0.005	0.002	0.008	0.009	0.063	0.077
AR (2), p-value	0.359	0.324	0.085	0.286	0.393	0.394	0.374	0.519
Hansen, p-value	0.167	0.087	0.331	0.256	0.999	1.000	1.000	1.000

Notes: All regressions are robust, two-step GMM. Orthogonal deviations are used to tackle problems with panel gaps. p-values are in parentheses. Only the coefficients of the financial development variables are presented in this table although all the control variables are used for estimations.

Significance level: * p<.1; ** p<.05; *** p<.01

Table 13 shows the effect of financial development on growth during the period 1984-2013 for middle & low income countries and high income countries separately. Similar to the results of Table 12, high income countries show insignificant coefficients for some variables due to small sample size. However, one can clearly see the difference between the coefficients for two groups of countries. The negative effect of private credit on growth is significant for both groups of countries although the effect is

stronger for middle and low income countries during 1984-2013. This is very consistent with the results of fixed effect panel estimations in the previous section.

Table 13: System GMM estimations for high-income versus middle & low income countries; 3 year interval

Period: 1984-2013								
Variables	**Middle and Low income**				**High income**			
Lag GDP growth	0.196**	0.215***	0.101	0.051	0.307***	0.364***	0.255**	0.165*
	(0.010)	(0.001)	(0.128)	(0.339)	(0.000)	(0.000)	(0.032)	(0.064)
Private Credit to GDP	-0.060***				-0.028***			
	(0.000)				(0.007)			
Liquid Liabilities to GDP		-0.024*				-0.031		
		(0.077)				(0.112)		
Stock Market Capitalisation to GDP			0.003				0.022*	
			(0.663)				(0.078)	
Lending Deposit Spread				-0.082*				0.278
				(0.073)				(0.217)
N	638	638	415	513	185	183	182	128
Instruments	74	81	73	74	61	61	60	61
AR (1), p-value	0.000	0.000	0.001	0.000	0.002	0.005	0.014	0.058
AR (2), p-value	0.036	0.021	0.001	0.003	0.684	0.805	0.849	0.445
AR (3), p-value	0.100	0.129	0.201	0.199				
Hansen, p-value	0.201	0.144	0.386	0.283	0.996	0.997	0.991	1.000

Notes: All regressions are robust, two-step GMM. Orthogonal deviations are used to tackle problems with panel gaps. p-values are in parentheses. Only the coefficients of the financial development variables are presented in this table although all the control variables are used for estimations.

Significance level: * p<.1; ** p<.05; *** p<.01

Further, stock market capitalisation has positive effects for both groups even though the effect is insignificant for middle and low income countries. The coefficients of spread indicates that, smaller lending deposit spread can support economic growth for middle and low income countries. The result of spread is insignificant for high-income countries mainly due to the small number of observations. However, the reason

might be due to the fact that high-income countries tend to have less lending deposit spread in the first place.

Comparing Table 12 and Table 13, one can examine the difference between the results of the two periods. During the first time period, from 1978 to 2007, private credit to GDP had had negative but insignificant effect on growth for both groups of countries. However, during the second sample period, 1984-2013, the effect of private credit is significant and negative for both groups of countries although the negative effect is stronger for middle and low income countries than high income countries, -0.060 as opposed to -0.028. This is consistent with Gourinchas and Obstfeld (2011) that developing countries were hit harder by financial crisis than developed countries.

Furthermore, it can be an indication that the choice of time frame can alter the results of the estimations. Because the effect of private credit on growth had been insignificant before 2007 and the effect turns to significant and negative when the period 2007-2013 is included, studies that use earlier time period are more likely to avoid the negative effect of growth during the latter period.

Stock market capitalisation on the other hand, consistently has positive and sometimes strongly significant effect on growth. Lending deposit spread persistently shows negative effect which indicates that economies benefit from bank efficiency measured by low spread.

5. Robustness Checks

The results are consistent after specification alterations such as controlling for interactions and time periods, changing variables, and dropping some countries from the sample. First, I examine whether the results of fixed effect panel estimations change if the average of five year interval values are used instead of annual data. Five year interval is recommended by many researchers as they claim that annual data is sensitive to cyclical effect and cannot capture long term effect of finance on growth (Ang, 2008). As Table 14 shows, the results with the five year average data are consistent with that of annual data.

Table 14: Fixed effect panel data with 5 year interval average

Variables	**Dependent Variable: GDP growth**			
Trade	.032***	.036***	.014*	-0.000
GOV	-.163***	-.118*	-.104	-.279***
Instability	-1.294***	-1.370***	-1.442***	-1.314***
Institution	0.022	-0.028	-.152***	-.193***
Schooling	0.161	0.114	-0.002	-0.183
Inflation	-.001***	-.001***	-.005*	-.023***
Credit	-.046***			
M3		-.049***		
Spread			-.098***	
SMC				.018**
_cons	2.018	5.084**	13.656***	20.660***
N	504	507	401	370
R^2	0.240	0.192	0.167	0.273

Trade: Export plus import to GDP; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic private credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation to GDP; Spread: Lending Deposit Spread

Significance level: * p<.1; ** p<.05; *** p<.01

Interaction variables can show the joint effect of financial development indicators on growth. Following the results of Hasan, Horvath and Mare (2015), the interactions of bank z-score and other bank development variables are examined. Bank z-score measures the stability of the banking system, therefore it is a crucial indicator of financial development.

Only fixed effect panel regressions are used because interactions cannot be employed for GMM estimators. Similar to the previous regression, data averaged for five year interval is used to avoid cyclical effects. Although the interaction of spread and z-score as well as that of spread and credit show significant results, they are minor and do not change the signs or magnitudes of the original results of financial development variables as indicated by Table 15.

The next thing to consider is whether the results are sensitive to additional variables. For instance, credit growth rate might be an important variable for economic growth as implied in my previous analysis. Credit growth is calculated by taking logarithmic difference of current and lagged variables. Moreover, inverse U shaped relationship is found by many studies that examine the finance and growth nexus and they include squared values of the financial development variables (Cecchetti and Kharroubi, 2012).

Table 15: The joint effect; fixed effect panel data with 5 year interval average

Variables	**Dependent variable: GDP growth**			
Trade	.017*	.023***	-0.003	-0.000
GOV	-.247***	-.162***	-.223**	-.284***
Instability	-1.798***	-1.237***	-2.588***	-1.332***
Institution	.015	-.066*	-0.066	-.191***
Schooling	.110	0.114	-.419*	-0.196
Inflation	-.027**	-0.002	0.054	-.023***
Credit	-.046***	-.052***		
Z-score	.017		-0.046	
Spread		-.161***	-.188***	
Credit*Z-score	-.000			
Credit*Spread		.002**		
Spread*Z-score			.008**	
SMC				.018*
SMTR				0.002
SMC*SMTR				-0.000
_cons	5.654*	9.833***	15.531***	20.628***
N	380	390	297	367
R^2	.306	0.268	0.270	0.274

Trade: Export plus import to GDP; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation to GDP; Zscore:Bank stability measure; Spread: Lending Deposit Spread

Significance level: * p<.1; ** p<.05; *** p<.01

In addition, I include time dummies because 1) Roodman (2009b, p.128) states that inclusion of time dummies can support the assumption "no correlation across countries in the idiosyncratic disturbances" 2) many papers control for time periods when they employ GMM estimators (Levine, Loayza and Beck, 2000). After including the additional variables for robustness check, the results of system GMM estimations are shown in Table 16.

As Table 16 shows, including those additional variables in my estimations do not change the original results greatly, although inclusions of them sometimes lead to insignificant results. For instance, private credit growth does not change the original sign and magnitude of private credit while stock growth variable makes the regression

results insignificant. Those private credit and stock growth variables are therefore, not deemed to be important factor for economic growth. Squared variables also do not lead to any significant and meaningful results.

Table 16: System GMM, growth and squared variables as additional variables

Variables	**Dependent Variable: GDP growth**				
Lag GDP growth	.204***	0.128	.236***	.200***	.220***
Trade	.011**	0.002	.010***	-0.004	0.006
GOV	0.003	-0.074	0.027	-0.000	0.026
Instability	-0.408	-0.357	-0.606	-0.431	-.720*
Institution	0.002	-.112***	-0.028	-.087**	-.062**
Inflation	-0.001	-.007*	-0.000	-.014*	-0.003
1969-1973	0 (omitted)	0	0	0	0
1974-1979	0 (omitted)	0	0	0	0
1979-1983	0 (omitted)	0	0	0	0
1984-1988	0 (omitted)	0	0	0	0
1989-1993	0 (omitted)	0	0	0	0
1994-1998	0 (omitted)	10.055***	0	8.575***	4.576**
1999-2003	-0.228	10.118***	-0.203	8.420***	4.306*
2004-2008	.878***	11.248***	.805***	9.662***	5.602**
2009-2013	-1.224***	9.046***	-1.250***	7.231***	3.401
Credit	-.019***		-0.009		
Credit growth	0.007				
Stock		0.004		-.021*	
Stock growth		0.004			
Credit Square			-0.000		
Stock Square				.000**	
Spread					0.101
Spread square					-0.002
_cons	1.784	0	2.953	0	0
N	502	339	523	376	417
AR (1), p lvalue	0.042	0.170	0.003	0.003	0.002
AR (2), p value	0.235	0.210	0.151	0.149	0.297
Sargan test, p value	0.000	0.000	0.000	0.000	0.000
Hansan test, p value	0.896	0.956	0.784	0.935	0.914

Trade: Export plus import to GDP; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic private credit to GDP; SMC: Stock market capitalisation to GDP; Spread: Lending Deposit Spread

Significance level: * p<.1; ** p<.05; *** p<.01

The final robustness check is to verify the results with smaller sample. Here, countries with very small economies are eliminated as their economies can be vulnerable to external shocks regardless of their financial development level. Around 30 countries with constant GDP less than 600 million USD are therefore not included in the

following regression. As Table 17 shows, the results are similar to the original results suggesting that they are robust.

Table 17: System GMM estimators; Period:1961-2013; 5 year interval

Variables	**Dependent Variable: GDP growth**			
Lag GDP growth	0.087	0.098*	-0.011	0.006
Log initial GDP	-0.402	-0.331	-0.371	-0.302
Trade	0.007	0.012	-0.013**	-0.002
GOV	-0.122*	-0.128*	-0.218**	-0.091
Institution	0.063	-0.013	-0.077	-0.082*
Schooling	0.345***	0.256**	0.210*	0.348***
Inflation	-0.001**	-0.001**	-0.017*	-0.006
Credit	-0.025**			
M3		-0.012		
Stock			0.012*	
Spread				-0.047
_cons	1.381	5.276*	13.003***	9.464***
Observations	492	496	364	390
Instruments	160	160	134	150
Arellano Bond test for AR(1) in differences (*p*-value)	0.004	0.003	0.003	0.000
Arellano Bond test for AR(2) in differences (*p*-value)	0.234	0.171	0.322	0.167
Hansen test of joint validity (*p*-value)	0.729	0.793	0.940	0.935

Trade: Export plus import; GOV: Total government spending to GDP; Institution: Institution quality; Schooling: Average years of schooling for adults; Inflation: Consumer price index; Credit: Domestic credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation; Spread: Lending Deposit Spread

*Note*s: All regressions are robust, two-step GMM. Orthogonal deviations are used to tackle panel gaps.

Significance level: * p<.1; ** p<.05; *** p<.01

6. Discussions for CEE and Central Asia Region

The main roles of financial institutions are mobilizing savings and allocating them to the most efficient investment projects (Hermes and Lensink, 2000). Although positive effect of financial development, particularly the sizes of bank credit and stock market, on economic growth has become a stylised fact, some studies conducted on Central and Eastern Europe and / or Central Asia regions do not suggest consistent results. The authors explain that the financial depth in the region is too low to diffuse

the positive impact of credit and stock market deepening on economic growth (Djalilov and Piesse, 2011; Caporale, et al., 2009).

CEE and Central Asia region has experienced one of the largest increase in private credit over the last 2 decades. However, the effect of private credit deepening on growth in this region is the worst among the regions according to my fixed effect panel estimations for the time period up to 2013. Low level of financial depth does not seem to be the reason to be blamed because other regions with same levels of financial depth exhibit better results.

It appears that financial development indicators have varied effects on economic growth. Private credit to GDP has, at best, no effect on growth for both whole sample and CEE and Central Asia which can be reflected by its insignificant results during the period before financial crisis. Therefore, studies that used a time frame before 2007 might have avoided the strong negative effect of private credit on growth because when the time period covers up to 2013, the effect of private credit turns negative and significant.

There can be two explanations for the negative effect of private credit on growth in middle income regions or regions with moderate amount of financial depth such as transition countries. First, private credit might not go to the most efficient firms in these countries because they either lack the effective ways to find the best performers or simply fund ineffective firms such as state firms (De Haas, 2001).

Second, the increase in household debt, which is included in the domestic credit to private sector, can explain why the effect of private credit appears to be negative. For instance, a large part of the private credit expansion in CEE countries is derived from consumer lending such as mortgage and credit card debts according to Caporale, et al. (2009). They point out that in 2007, household credit to GDP in the new EU countries were ranging from 16% to 43% while the numbers were 1.2% to 11.3% in 2000. Increase in household credit can reduce private savings rate and investment, therefore can harm economic growth (Jappelli and Pagano, 1994).

Stock market capitalisation appears to have more consistent positive effect on growth in either time period according to both of my fixed effect panel and system GMM estimations. Well-functioning stock markets affect economy positively because they allocate resources to the best performing firms and provide liquidity insurance to the shareholders (Hermes and Lensink, 2000; Levine, 1991; Bencivenga, Smith and Starr, 1995).

The size of stock market capitalisation in CEE and Central Asia region has been, on average, one of the lowest in the world. Nevertheless, according my fixed effect panel estimations for CEE and Central Asia region, the effect of stock market capitalisation on growth is positive and it is significantly positive for new EU member countries which implies that it might be beneficial to focus more on the development of stock markets.

Policies should not simply depend on the popular opinion that economy benefits from larger size of private credit without studying it in detail. According to the results of my estimations, the effects are varied not only across regions but also across different time frames. A policy that supports the expansion of private credit can be flawed as the effect of private credit appears negative especially for countries in CEE and Central Asia during the last decade.

This is not to suggest that financial development affects growth negatively because the size of private credit cannot represent the level of financial development. Perhaps the credits that is allocated to efficient firms boost economic growth but it is overlooked by the negative effect of household debt or low quality credits. The results of the bank efficiency for instance, measured by the lending deposit spread, show promising effects in general that those countries that have less lending deposit spread seem to benefit from greater economic growth which is consistent with Rousseau (1998), Shen and Lee (2006) and Hasan, Horvath and Mares (2015).

7. Conclusion

This thesis has argued that there is a heterogeneous effect of financial development on growth depending on the choice of sample countries, time-periods and financial development variables, therefore it is not advisable to derive a generalisation. According to my fixed effect panel and system GMM estimations for whole sample group and regional sample groups, the most commonly used financial development variable - private credit to GDP has, in general, neutral effect on growth although its effect turns negative when the time frame is up to 2013. On the other hand, stock market capitalisation and smaller lending deposit spread favour economic growth. My focus

region, CEE and Central Asia, has experienced the most negative effect of private credit on growth during the financial crisis time period.

Using the most recent data published in September 2015, I have examined the effect of financial development on growth on global sample of 202 countries, and eight regions particularly focusing on CEE and Central Asia. This thesis have focused on four financial development variables, private credit to GDP, liquid liability to GDP, stock market capitalisation to GDP and lending deposit spread in order to capture the diverse aspects of financial development.

The results of system GMM and fixed effect panel estimations were consistent although the magnitudes of the GMM estimations' results were smaller which suggest that fixed effect panel estimations overestimated the effects due to endogeneity. According to my GMM estimations, private credit had had neutral effect on growth till 2007. Fixed effect panel estimations also found neutral effect for majority of the regions except for countries with low credit depth which showed positive effect. These are consistent with Robinson (1952), Greenwood and Smith (1997) and Zang and Kim (2006) that there is, in general, no significant effect of private credit on growth.

When I included the period 2007-2013 into the time frame, the effect of private credit turned negative which was supported by both of my fixed effect panel and GMM estimations. These are partly consistent with Kaminsky and Reinhart (1999) and Gourinchas and Obstfeld (2012) that the credit expansion has been one of the most important predictors of financial crisis. The results of GMM estimations have suggested that the negative effect appeared to be more prominent for middle and low income countries than high income countries during this period.

Because it was not possible to run GMM estimations for each of the eight regions due to small sample size, I have used fixed effect panel estimations on them. The negative effects of private credit on growth were varied across regions however, CEE and Central Asia, similar to other regions with moderate financial depth, had experienced the largest negative effect of private credit on growth during the period 2007-2013. When the countries in the CEE and Central Asia were divided into two groups, as more advanced new EU members and less developed other countries in the region, the negative effect of private credit appeared two times higher for non-EU countries in the region than new EU members. The non-EU countries in the region had experienced the highest credit expansion, the size of private credit as a proportion of GDP in 2007 was four times higher than that in 2000 for those countries.

As for CEE and Central Asia, the insignificant results for the time period up to 2007 are similar to the conclusions of studies such as Dawson (2003), Gillman and Harris (2004) and Djalilov and Piesse (2011). However, this thesis does not support their explanation that insignificant effect of finance on growth in the region was due to its low level of bank depth, because my study indicated that some regions that have similar or lower bank depth than CEE and Central Asia had experienced better effects.

This shows that it is necessary to study further, perhaps the composition of the private credit can be a crucial factor as it includes not only credit to enterprises but also credit to households and the latter has been the largest driver for private credit expansion (Beck, et al., 2012; Bezemer, 2014, Tunc and Yavas, 2016; Caporale, et al., 2009). In particular, middle income countries have experienced a large increase in private credit in recent years as suggested by the results of CEE and Central Asia regional analyses. Moreover, it appears that studies that do not use recent time period can easily obtain different results because the effects of private credit on growth were varied for the two time periods in my analyses.

This is not to suggest that financial development has negative effect on growth, however, the size of credit to private sector cannot represent the development of financial system. The results of lending deposit spread for both fixed effect panel and GMM estimations for instance, have consistently suggested that less spread can lead to more growth which implies the efficiency of the banking sector matters for growth. The results of stock market capitalisation were also consistent according to the results of both estimations and it seems that stock market development has favoured economic growth regardless of the choice of countries.

Studying the real effects of finance on growth is particularly important for the policymaking of regions such as CEE and Central Asia which has relatively new financial sector and can use its financial system for boosting economic development. Further research should adopt more financial development indicators as data allows in order to capture various aspects of financial development. Private credit to GDP serves less and less the purpose of allocating savings to the best performing projects but rather has become partly defined by household loans. Therefore, investigating the compositions and functional differentiation of private credit is recommended when more systematic database on the composition becomes available.

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List of Appendices

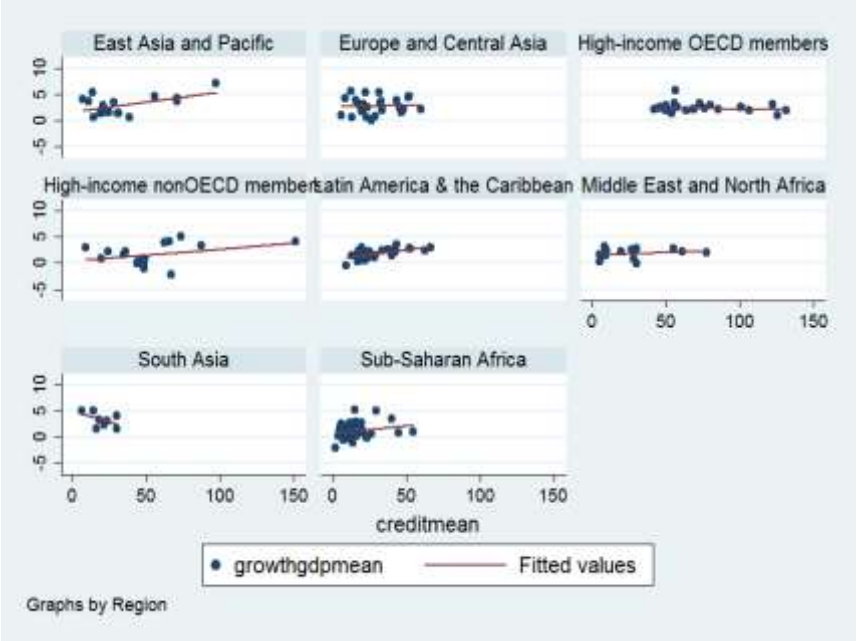
Appendices

Appendix 1: Sources and Description of Variables

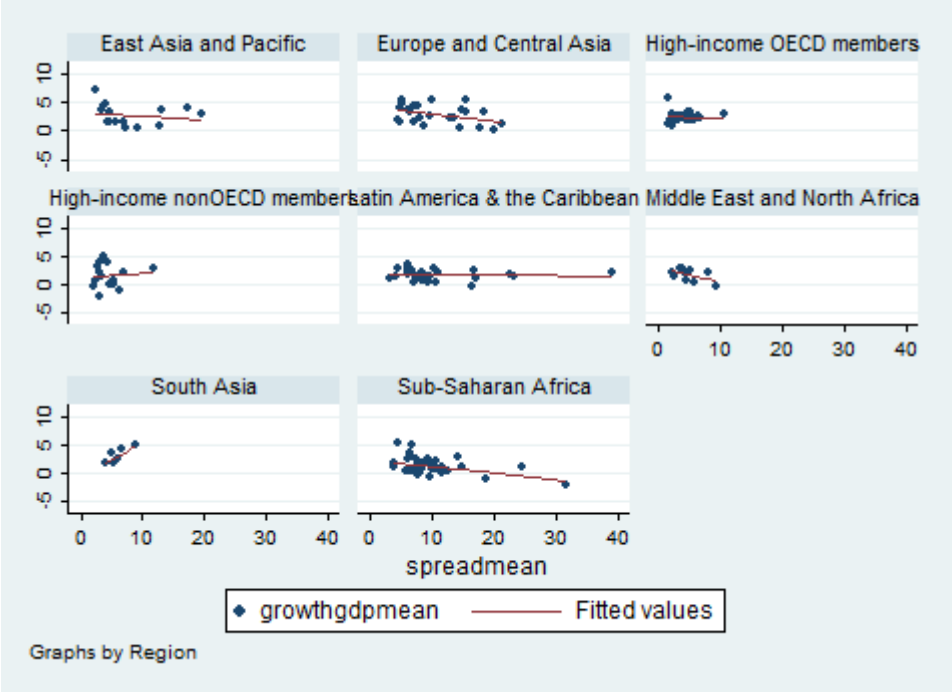
Name	Definition	Unit	Source
Schooling	Average years of schooling for adults	level	United Nations Development Programme, Human Development Reports
Trade	The sum of exports and import of goods and services to GDP	%	World Bank
Inflation	Inflation, consumer prices (annual %)	%	World Bank
GDP per capita	GDP per capita (constant 2005 US$)	level	World Bank
Institution	Total index of economic freedom which includes property rights, corruption, investment freedom, etc.	%	Heritage Foundation
Gross domestic savings	GDP minus final consumption as a proportion of GDP	%	World Bank
GOV	General government final consumption expenditure (% of GDP)	%	World Bank
SMC	Stock market capitalisation to GDP (%)	%	World Bank Development Indicators
M3	Liquid liabilities (M3) to GDP	%	World Bank Development Indicators
Credit	Private credit by deposit money banks and other financial institutions to GDP	%	World Bank Development Indicators
SMTR	Stock market turnover ratio	level	World Bank Development Indicators
Spread	Lending deposit spread	level	World Bank Development Indicators
NIM	Net interest margin	%	World Bank Development Indicators
Accounts	Bank accounts per 1000 people	level	World Bank Development Indicators
Z-score	Default probability of banking sector	level	World Bank Development Indicators

Appendix 2: Graphical illustration for each region based on the time-series average of each country

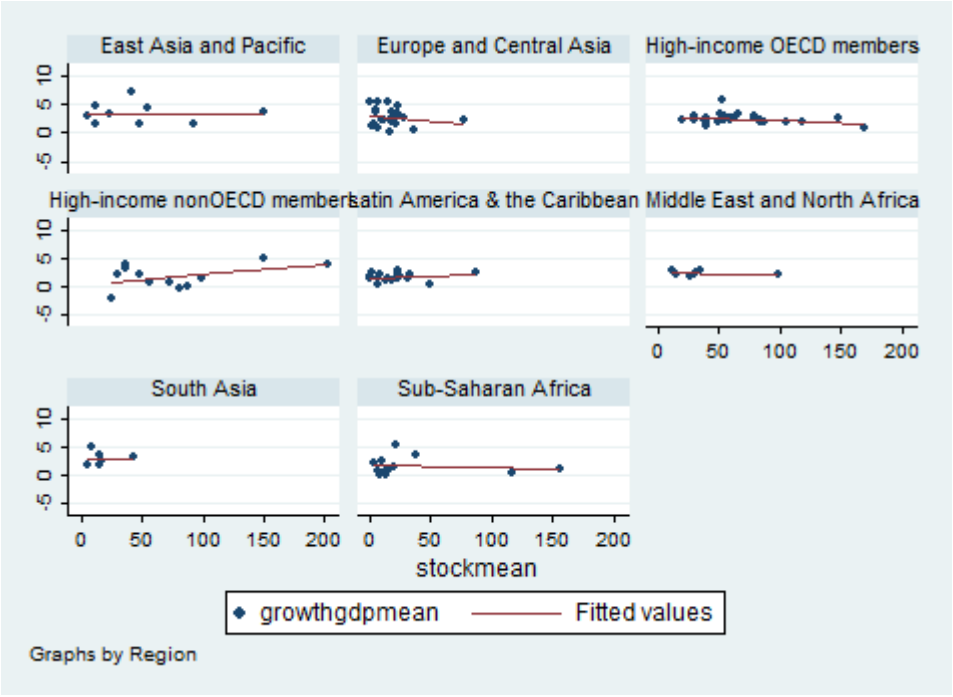
Appendix 2A: Private credit to GDP and growth



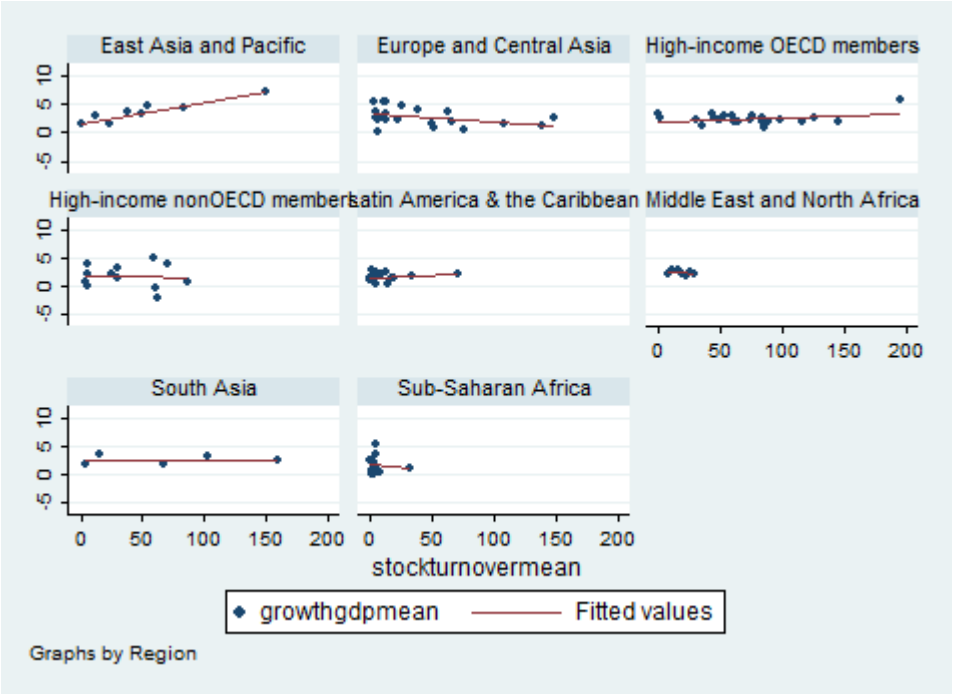
Appendix 2B: Lending deposit spread and growth



Appendix 2C: Stock market capitalisation to GDP and growth



Appendix 2D: Stock market turnover ratio and growth



Appendix 3: The OLS regression for long term effect based on the time-series average of each country

Table 18: OLS long term relationships

Variables	Dependent Variable: GDP per capita growth mean			
Trade mean	.005*	0.006	.006**	.006**
GOV mean	0.003	-0.019	0.007	-0.028
Schooling mean	0.064	0.068	.111***	0.070
Inflation mean	-0.003	-0.001	-0.002	-0.001
Credit mean	0.006			
SMC mean		-0.002		
Spread mean			-0.016	
SMTR mean				0.004
_cons	1.049***	1.754***	.894*	1.561***
N	165	110	155	108
R^2	0.113	0.050	0.138	0.072
R^2_a	0.085	0.004	0.109	0.026

Trade: Export plus import; GOV: Total government spending to GDP; Schooling: Average years of schooling for adults; Inflation: CPI; Credit: Domestic credit to GDP; M3: Liquid liabilities to GDP; SMC: Stock market capitalisation; Spread: Lending Deposit Spread; SMTR: Stock Market Turnover Ratio

Significance level: * p<.1; ** p<.05; *** p<.01

Appendix 4: The result of the Hausman test

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. hausman fixedhausman randomhausman, sigmamore
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	Coefficients (b) fixedhausman	(B) randomhaus~n	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
credit	-.0544378	-.0334513	-.0209865	.0031276
trade	.0335743	.0121662	.0214081	.0040457
govspending	-.2381327	-.0932261	-.1449066	.0304149
instability	-.8751947	-.8322303	-.0429644	.0443651
institution	-.0069804	.0037779	-.0107583	.0158533
schooling	.1579532	.2657287	-.1077755	.0579973
inflation	-.0154258	-.0129604	-.0024654	.000619

b = consistent under Ho and Ha; obtained from xtreg
B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 130.71
Prob>chi2 = 0.0000

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