



LUND UNIVERSITY
School of Economics and Management

Access to finance: Small and Medium Enterprises effect on Economic Growth

Department of Economics

Author: Ebba Lindgren

Supervisor: Fredrik NG Andersson

NEKN05 – Examensarbete på Civilekonomprogrammet

Abstract

The aim of this paper is to examine the effect small and medium enterprises' (SMEs) access to finance has on economic growth. The relationship will be explored using data from the European Commission's SMAF index covering the 28 EU member countries. By using the System Generalized Method of Moments (GMM) estimator, a significant and robust relationship between access to finance and economic growth is found. The results show that access to finance affects economic growth through Labour productivity and Total Factor productivity growth, but not through GDP per capita growth. Based on these results a discussion is put forward regarding the relationship between SME access to finance and productivity with respect to R&D investments. The SME support programs that the EU are funding are also discussed and whether they are implemented in a way that helps firms gain access to credit and contribute to economic growth.

Table of Contents

1. Introduction.....	4
2. Growth Effects, SMEs and their access to Finance	6
2.1 Small and Medium Sized Enterprises	6
2.2 Hypothesis one: SMEs and economic growth	7
2.3 Hypothesis two: SMEs and Access to finance	9
2.4 The SMEs “Access to finance” situation	11
2.5 SME, Finance and Economic Growth Nexus.....	15
3 Testing the Hypothesis	17
3.1 Method: Introducing the GMM Estimator	18
3.2 The Model	19
4 Empirical Results	23
4.1 The Regression	23
4.2 Robustness	25
5 Analysis & Discussion	29
5.1 Productivity and Access to Finance	29
5.2 Alleviating the SME Finance Situation – Support Programs.....	31
5.3 Future Analysis’ and Short Comings.....	33
6 Conclusion	34
Bibliography.....	35
Appendix.....	39
1 EU-28	39
2 SMAF Explanation.....	41
3 Descriptive Statistics.....	42
4 Causality Check.....	43
5 Time effect Calculations	44

Acronyms

EC	European Commission
ECB	European Central Bank
EU	European Union
GMM	General Method of Moments
IMF	International Monetary Fund
LGA	Loan Guarantee Associations
LP	Labour Productivity
OECD	Organisation for Economic Co-operation and Development
OLS	Ordinary Least Squares
R&D	Research and Development
SAFE	Survey on the Access to Finance of SMEs
SME	Small and Medium sized Enterprise
SMAF	SME Access to Finance Index
TFP	Total Factor Productivity

1. Introduction

Small and medium sized enterprises (SMEs) are the backbone of our economy (EC, 2014). According to the European Commission (EC) 99 out of every 100 businesses are SMEs and they generate 58 cents in every euro of value added (EC, 2014). In 2012 SMEs were hosting 66.5% percent of all European jobs (EC, 2013). SMEs are job creators, labour intensive and value creating, which should positively affect a country's economic growth. They are a seedbed for innovation and future industrial growth, which leads to an increase of competitiveness and stimulates entrepreneurial talent (Biggs, 2002; Beck, 2010). SMEs are a large part of the economy.

Yet, being small comes with many obstacles. It is widely documented that SMEs have a harder time gaining access to credit than larger firms (Schiffer & Weder, 2001). It is argued that this is often due to the company's lack of ability to produce high quality collateral and its lack of transparency on creditworthiness (Ayadi & Gadi, 2013). The recent financial crisis has led to many banks deleveraging and trying to minimize their risks, which has strongly affected SMEs financing situation (Sannajust, 2014).

This thesis aims to examine SMEs access to finance in the European Union (EU) after the recent financial crisis, 2007-2013, and how the situation is affecting the EU's economic growth. Since SMEs are a large part of the domestic market, the financing situation of this sector is interesting to look at, especially if any significant effect on economic growth can be noted in connection with their access to finance.

The hypothesis runs;

Small and medium sized enterprises level of access to finance has a significant effect on economic growth.

For firms to be able to grow they need access to credit. A growing SME sector has a positive effect on the domestic economy (Rajan & Zingales, 1998, Levine, 2004, Rahaman 2011). Using this reasoning it is believed that increased access to credit directly and positively effects the economy's growth. If the case is so, then it would be reasonable to argue that the SME support programs and the banking industry existing in the EU should be trying to help SMEs by alleviating the access to finance problem.

Before testing the hypothesis, two sub-hypothesis; SMEs have an effect on economic growth and SMEs have a problem gaining access to credit, will be researched. They will then be strung together to show why the main thesis hypothesis is reasonable. To emphasize the finance situation of SMEs in

the EU, data from the EC and ECBs "Survey on the access to Finance of Enterprises", SAFE, will be used in a descriptive manner.

The original hypothesis is tested in a panel regression using data from the EC's "SME access to finance index", SMAF. Since economic growth, depends on the growth of previous periods, a dynamic panel model is used. In order to eliminate the risk of dynamic panel bias and since the time period is short, a System General Method of moments (GMM) regression will be implemented. There exists no perfect measure for economic growth. This thesis will use three; the commonly used proxy "GDP/capita growth", as well as Total factor productivity (TFP) growth and Labour productivity (LP) growth in order to see what aspect of economic growth, finance access of small enterprises affects.

Analysing the proposed relationship, between access to credit and economic growth is important. Understanding the consequences a lack of credit due to market imperfection creates, makes it easier to find ways to handle the situation. By acknowledging that an increase in access to finance can lead to more economic growth, the access issue may be more prioritized in the future. It is also important to understand via what channels increased finance affects growth.

The thesis will take a quick look at the existing EU SME support schemes and look at if the support programmes agree with the significant results found using the GMM regression. Based on the significance SMEs access to finance has on productivity, a further look is taken into specifically R&D spending and the productivity relationship.

The paper is structured as follows; section two will cover a background on SMEs and look into the growth effects of the firms and their access to finance, covering the two sub-hypothesis. Section three then discusses the data and method that will be utilized to test the main hypothesis. The results from the GMM regression are presented in section four. The fifth section uses results to analyse why access to finance may only affect productivity as well as reviews the EU SME support programmes. Finally section six covers a short conclusion of the paper.

2. Growth Effects, SMEs and their access to Finance

2.1 Small and Medium Sized Enterprises

It is necessary to classify what constitutes as an SME. The classifications of small, medium and large enterprises vary throughout the world. The definition has an ad hoc nature, varying from data base to data base and between countries. This is a large obstacle when it comes to comparing data where results are firm-size sensitive. One way to classify the size of a company is to look at the amount of employees and at the turnover or balance sheet total of the enterprise. The European Commission (EC) classifies SMEs as enterprises with less than 250 employees and with either a turnover of under 50 million Euros or a balance sheet total of less than 43 million Euros¹, as can be seen in Table 1.

Company category	Employees	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Table 1 – SME Definition according to the European Commission

As this thesis uses data collected by the EC, their definition, which is clearly specified in both SAFE and SMAF, will be used. Further the size of the enterprise, as counted by the number of employees will be used as the prime measurement. Consequently enterprises with less than 250 people employed will be referred to as an SME.

SMEs are a big part of the economy. 99% of all businesses are SMEs (EC, 2012). The average share of enterprises in the EU that are small (under 50 employed) between 2008 and 2013 was 93.54% (94.9% if excluding Austria which has a very large share of “large firms”)². Small and medium sized firms count for ca 60% of the private sector employment (Ayyagari et al, 2011). Small companies tend to

¹ “What is a SME”, 2015. Available from: http://ec.europa.eu/growth/SMEs/business-friendly-environment/sme-definition/index_en.htm . [7 March 2015]

² Calculated from data taken from the OECD Factbook

do most business on the domestic market and are due to this strongly dependent on the domestic economy, including domestic supply and demand, placing SMEs in quite a vulnerable position (EC, 2014)

The growth of the share of SMEs on the market has frequently been researched. Up until the 1970s there had, in advanced economies, been an apparent decline in small business presence, but in the 1980's this took a turn. Loveman & Sengenberger (1991) look at the firm size development in the 1980s in six of the biggest OECD countries and found, though varied, that an increase in the share of people employed by SMEs could be observed. Thurik (2009) looked more recently at the change of firm concentration. He concludes that a higher level of uncertainty (due to e.g. technological change, globalisation, deregulation, changes in supply and demand) has led the industry to shift from large firms and concentration, to smaller firms and decentralisation. A commonly used citation showing the growth of the SME segment comes from Carlsson (1992, 1999). Carlsson looked at the Fortune 500³ and their share of employment in the United States. In 1970, the Fortune 500 stood collectively for 20% of the employment in the United States. In 1980, the share had dropped to 8,5%. This indicates that large enterprises employed less while the employment figures were on the rise within SMEs.

2.2 Hypothesis one: SMEs and economic growth

Before looking at the main hypothesis it is necessary to understand what it is based upon. Two sub-hypothesis are presented in order to motivate the main hypothesis. Considering the size of the SME sector, it should be expected that it has an effect on the economy. The first hypothesis is that;

SMEs and economic growth have a positive relationship.

The effect of SMEs on the growth of an economy is expected to exist, but it has been noted to be hard to see and measure. The sheer size of the SME sector and the size of their share of employment should leave an imprint on the economy. Beck and Demirguc-Kunt (2006) suggest that an explanation for SMEs lack of shown contribution to growth could be due to SMEs growth constraints. The constraints being that SMEs have less access to external finance, which points to a problem of market imperfections. SMEs are collectively impaired and cannot perform at an optimal growth impacting level. Beck and Demirguc-Kunt (2006) state that a big SME sector is a characteristic of a fast-growing economy, but that it is not the large sector per se that causes growth, a view backed up by Beck et al(2005).

³ The 500 largest American firms

There is evidence that points towards a relationship. Ayyagari et al (2003) show that the SME sector's contribution to employment and GDP, has a strong positive correlation with GDP per capita. The wealthier a country is, the more important SMEs in that economy are. Beck (2010) argues that it is the dynamism that SMEs bring to the economy that helps economic growth. SMEs bring innovation, competition, employment and more to the market, and that is what, according to Beck benefits the economy. Ayyagari et al (2011) show that SMEs (here defined as less than 100 employees) have the largest share of job creation and highest sales growth as well as employment growth; this should be noted in the economy. Even Beck et al (2005) find a positive association between SMEs and GDP per capita growth, yet cannot find that SMEs exert a causal impact on growth.

De Gregorio and Guidotti (1995) show that the efficiency of an investment rather than the size of it has the greatest effect on growth. This result can be a reason for the lack of effect SMEs have on economic growth. The money being invested in SMEs may be inefficiently invested, leading to lack of visible impact.

The recent financial crisis hit SMEs hard both via a drop in demand for their goods as well as a tightening of their credit access. Governments have realised that if they want to keep their economy thriving, by keeping employment, innovation and productivity up they need to support the SMEs in their economy, especially during crisis times (OECD 2009). In the OECD report they continue to emphasise SMEs weaker financial structure, lower/no credit rating as well as their heavy dependency on credit and fewer financing options available. The OECD argue that something needs to be done about it. The recent crisis has led to fewer small firms having access to finance and this could also be an explanation for the difficulty in seeing the effect of SMEs on economic growth.

Data suggests that the theory that SMEs should have an effect on economic growth is realistic, but it is hard to show. It may be hard to see since the effects are difficult to isolate as well as market imperfections are holding the small and medium sized firms back. If financial constraints are eased, effects in economic growth could be noted. There is no research stating the SMEs should not have an effect on economic growth, the problem rather seems to lie in confirming the size of the effect and how SMEs effect.

2. 3 Hypothesis two: SMEs and Access to finance

Small firms face many obstacles, whether it is finding customers, competition or gaining access to finance⁴. Small firms with less collateral may find it harder to get access to credit. Hypothesis two is that;

SMEs have a problem gaining access to finance

Many small and medium sized enterprises face bigger constraints gaining access to finance than large firms (see Ayadi & Gadi (2013)). According to the OECD (2012), a small firm in the euro area is typically more dependent on bank lending than a large enterprise. Being both more dependent on financing as well as having more issues getting access to it is problematic. More information regarding financing constraints can be read in for example Schiffer & Weder (2001), Beck et al. (2006) and Beck & Demirguc-Kunt (2006). Schiffer & Weders (2001) paper also shows that it is not just financing that is an obstacle; smaller firms also report problems with taxes and regulations, inflation, corruption, street crime and anti-competitive practices.

A problem small firms face when gaining access to credit is their lack of a relationship with the bank. Financiers state that it takes about the same amount of resources as well as time to research, evaluate, approve and monitor a loan to a SME as it does to do so for a large company. Loans to SMEs are smaller; leading to that the ratio of costs to the size of the loan is proportionately higher. In other words, the revenue generated from an SME loan from interest and fee income is proportionally lower, and this makes giving large loans to large firms more profitable (Brack, 2009).

There is also a large problem of information asymmetry. Differing from large firms, small firms seldom enter into contracts that are visible and viewable to the public. A small firm's contracts with its labour force, suppliers, and customers are often private and thus not publicly traded nor openly available. This makes it harder for a small firm to credibly convey its quality.

Granting a loan to a new and/or small company is also seen as riskier for the bank than loaning to a big company, especially one the bank already has worked with. About fifty percent of SMEs in the EU do not survive past the five year mark⁵ (Schrör, 2009), which increases the investment risk for the bank, especially since many of the firms have little loan collateral. Creditors need guarantees that their loans will be repaid, or at least a promise of some kind of return. Mach & Wolken (2012) state

⁴ See ECB, "Survey on the Access to finance on Enterprises in the Euro Area" (2014)
<https://www.ecb.europa.eu/press/pr/date/2014/html/pr141112.en.html>

⁵ Based on data from 2000-2006

in their research that credit constrained firms were significantly more likely to go out of business than non-constrained firms. This creates a catch 22 situation. Firms have a higher chance of surviving if they get credit, yet it is the risk of not surviving that scares off the investors. This is where institutions and for example the government can enter the picture and help enable creditors to recover their assets in case of bankruptcy by creating i.e. loan guarantee systems⁶, and in such a way make the risk appear smaller and attempt to escape the catch 22 loop.

On top of this the recent financial crisis lead to a significant tightening to the year-to-year growth in granted credit in the Euro area to non-financial corporations (Öztürk & Mrkaic, 2014). This has put even more stress on financially strapped firms. Between 2007 and 2010, SMEs in most countries faced severer credit conditions than large enterprises, noted in the form of higher interest rates, shortened maturities as well as higher requested collateral (OECD, 2012). Deutsche bank research states that the period before the financial crisis was a favourable time where SMEs had easy access to bank loans compared to the situation during the crisis (Kaya, 2014).

The above research all states that SMEs have a tougher time getting access to credit, yet Beck et al (2008) disagree. In their paper they argue that banks in both developing and developed countries see the SME segment as an attractive market with good prospects. They (the banks) not only offer credit, but also other financial services, even if a bigger share of the total amount of loans is granted to large firms. The authors continue to state that the type of loans as well as the pricing does not vary much between firm sizes, which is an opinion that deviates strongly from previous research. There are differences between small and large firms, but the loans themselves are according to Beck et al not significantly different, bank loan access differs more between countries, than firm size. Higher financial development also leads to an increase in access to credit (Cecchetti et al, 2006, Jahan & McDonald 2011) as well as decreased costs of finance (Rajan & Zingales, 1998) which in developed countries should be positive for SMEs and decrease the access to credit problems, making them smaller.

In order to attempt to make the playing field more even between SMEs and large firms, governments implement subsidy programs. There are many different systems which attempt to support SMEs and help the financing situation. Öztürk & Mrkaic (2014) look at how subsidies aimed to specifically help SMEs gain access to finance and show that subsidies can significantly improve the financing situation and help alleviate credit constraints. They state that SMEs clearly struggle with bank financing constraints and that subsidies do have a large positive effect on the results of SMEs. A

⁶ A loan guarantee is a promise by one party to assume the debt of a borrower, if the borrower defaults. More about loan guarantee systems can be read in section 6

study by Banerjee & Duflo (2004) compared Indian SMEs before and after they got access to a directed subsidized lending program. The hypothesis being that firms that are constrained will use the newly gained credit to expand production, whilst firms that are not constrained will substitute other more expensive borrowing with the subsidised borrowing. When the companies got access to additional credit, sales increased proportionately, yet non-subsidized credit was not substituted out, this suggesting that the firms were already credit constrained before gaining access to the subsidized credit. In Pakistan a study (Zia, 2008) found that when small firms lost access to a subsidized export credit, their sales reduced. This indicating that the small firms were credit constrained and in need of the extra funding support. On the other hand, the big firms included in the study did not reduce sales after losing the subsidy, insinuating that a subsidy is a bonus for big firms, but not vital for survival or growth. These two studies show that lack of access to credit is a real problem and obstructs small firms from growing and positively affecting their own domestic economy. It is important to point out that both Pakistan and India are developing countries, which could play a role in the effect of the subsidy.

The Asian Development bank (ADB) and the OECD in a report (2014) conclude that SMEs in OECD countries, which are developed countries, also face structural challenges in their finance access, as well as depend on debt instruments. SME growth in OECD countries is limited by financing problems, and they were especially affected in the financial crisis due to both lack of demand and the credit crunch.

Research shows that SMEs do have problems gaining access to finance, problems which are not seen in larger firms. Lack of information and as well as a high perception of risk scares creditors away. Most research points towards that SMEs needs support in order to become less credit constrained.

2.4 The SMEs “Access to finance” situation

Since the European Union (EU) has a large collection on SME data, this thesis will be looking at the EU. In order to understand the present financing situation for small and medium sized firms in the EU as well as to further emphasize the hypothesis that SMEs have a problem gaining access to finance, the SAFE survey results will be used.

What is SAFE?

SAFE⁷ is a survey conducted by the European Central Bank (ECB) together with the European Commission (EC)⁸. It aims to provide information on the financing needs of SMEs in the EU area today as well as the firms' perceptions of the situation for the future. Since the survey covers both firms who are financially constrained and not, compared to other datasets it gives results with less sample selection bias. This thesis will include results from 2011, 2013 & 2014⁹.

Öztürk & Mrkaic (2014) use SAFE survey data and comment upon the fact that the survey results could systematically report problems in access to finance that do not match the reality firms with identical characteristics face. Fernando & Mulier (2013) look at the SAFE data and compare it with actual financing constraints and can conclude that reality and perception deviate, systematic differences exist¹⁰. This problem can lead to potentially biased results if used in an econometric analysis. The SAFE data is not used econometrically in this thesis, but SMAF is, and SMAF is among other things based on SAFE, so a slight effect could be noted. This bias is believed to be small and only potential and will not be further looked into in this thesis.

Another problem that can be noted in survey based data is that you participate in a survey at your own-will. Alike firms may refrain from answering the same questions leading to common parameters being omitted from the results. This thesis will though not take this into further consideration either.

SAFE Analysis

According to the SAFE survey, an average of 15.5% of the firms find access to finance the most pressing problem^{11,12}, see Graoh 1. The average is not completely representative since results vary greatly between countries. Austria and Luxembourg had the lowest average of perceiving "access to finance" as the most pressing problem, 6.9% and 7.8% respectively, compared to Cyprus and Greece where 33.1% and 31.3% of the firms respectively thought it was the biggest problem. If you look at

⁷ Only SAFE questions and information relative to the hypothesis have been used in this thesis. Some questions in the survey were expressed differently from year to year and have thus been excluded from the analysis due to the risk of getting faulty results as different wording can lead to different interpretations etc.

⁸ An important note is that the SAFE survey takes no consideration to the liability of the firms. If there were no market imperfections, there was perfect information symmetry and an SME was in need of finance it still may not get a loan since it would not be a good investment.

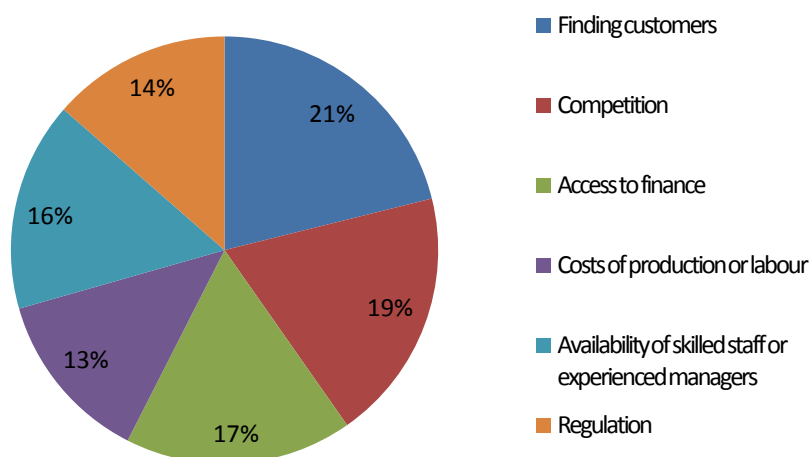
⁹ The SAFE survey was first conducted in 2009, then again in 2011, and from 2013 it is to be conducted annually. The SAFE survey was not conducted in 2012. 2009 years results are not included due to lack of comparable format and difficulty obtaining results. These are regrettably all after-crisis time periods.

¹⁰ In order to prove this many strong assumptions were used.

¹¹ In SAFE "Access to finance" refers to finance in the form of bank loans, trade credit, equity, debt securities and other external sources.

¹² 19% of firms in the EU-28 countries find "finding customers" the most pressing problems. 17.2% find "competition" the most pressing.

the average on a yearly basis, the Eastern European countries have found access to credit to be a decreasing problem over the time period 2011-2014, whilst it varies more for western European countries.



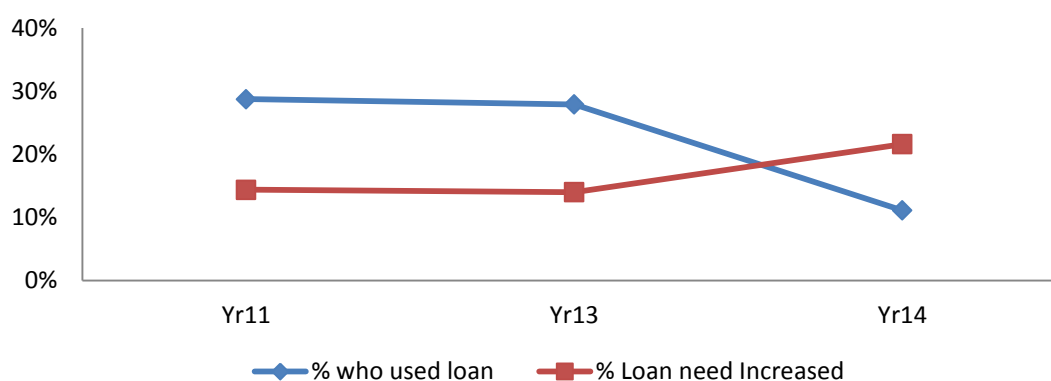
Graph 1 – The most pressing problems perceived by SMEs in the EU, Average 2011-2014

In 2014, the survey asked the participating firms to rank how pressing “access to finance” as a problem was, ranging from 1-10. Of all pressing problems it gets the lowest score, averaging on 4.6 out of 10. This seems quite low, yet access to finance may not be acute and needed straight away for survival, possibly causing the low results. For a firm’s survival, finding customers and competition issues may be more stressful problems, whilst access to finance could be more of a long term issue that is not as stressful, even if it is important.

A look at firms need for bank loans, in 2011 and 2013, shows that 14% of the firms felt that the need for bank loans had increased. In 2014, the percentage had further increased to 22%. The average net increase over the years was 3%¹³, showing an overall increasing need.

In the question “if your firm has used a bank loan in the past 6 months”, ca. 30% of the firms answered yes in 2011 and 2013, yet in 2014 only 11% answered that they had used it. This is interesting as if the results are graphed against the results from the question “if the need for a loan has changed”, looking at the results for “increased”, an interesting result is noted. See Graph 2. The need for a loan has increased quite drastically, yet at the same time the percentage of firms using a loan has decreased. The time span here is extremely short, and it is impossible to tell from this data if this is a new trend and the access to credit is decreasing whilst need is increasing.

¹³ Percentage who felt that the need for bank loans had increased minus the percentage who felt that the need for bank loans had decreased



Graph 2 – Development in percentage of SMEs who used a bank loan and SMEs who perceived the need of bank loan increased

In 2013 just over 50% of the firms had taken a loan in the past two years. On average in the EU, 84.7% of the loan takers were granted a loan from a bank. Banks are also the preferred source of financing (70%). Even if access to credit may not be a pressing problem, 3 out of 5 firms see bank loans as relevant to their firm.

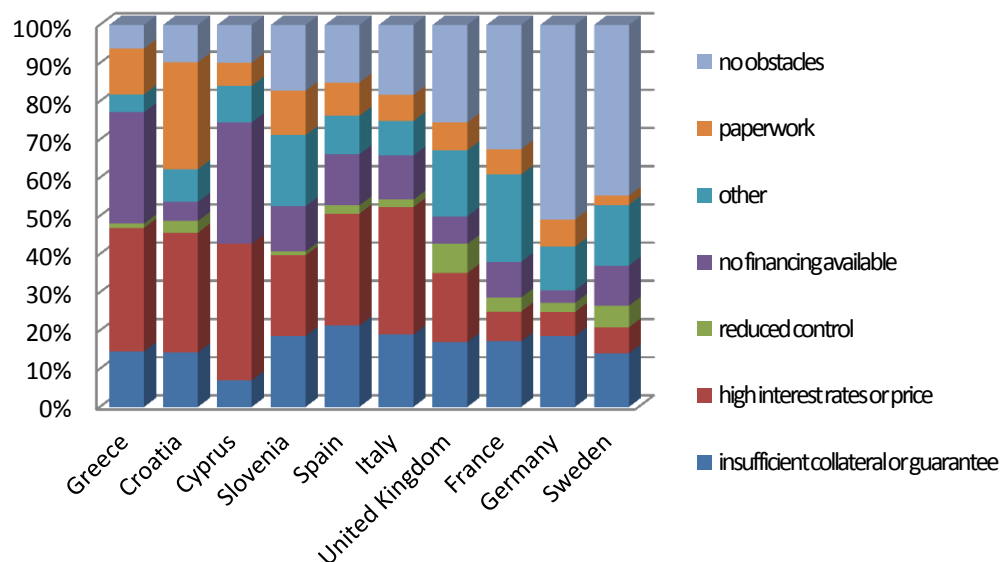
Regarding the availability of bank loans in the future (in the coming 6 months), in 2011 and 2013 the net improvement¹⁴ was -1% and 3 %, meaning the situation is only believed to increase slightly. In 2014, the positive outlook has increased to 6%. The positive outlook stays persistent even if we remove the four countries with the most positive and most negative outlook¹⁵. Most countries do believe though that the situation in six months will be the same as it is today (44% in 2014).

In 2014 when asked if the firm needed financing, “what is the most important limiting factor to get this financing?” The firms that saw obstacles (71% of the firms) rated insufficient collateral or guarantee (19%) as the biggest obstacle, followed closely by “high interest rates or prices” (18%). These results emphasise that SMEs have credibility problems. Once again results differ greatly from country to country. In Germany nearly 50% of all firms did not see any obstacles, whilst in Greece, Romania and Croatia fewer than 10% of the firms believed there to no financing obstacles. Greece and Cyprus are also the countries where the highest amount of firms believe there is no financing available (29% & 32%) In Graph 3 we can see that the big central/west and north European

¹⁴ Percentage believing situation will improve minus situation will deteriorate.

¹⁵ In 2011, the net improvement is 0%, 2013 4,5% and 2014, 7%.

economies¹⁶ have little problems with high interest rates or price, whilst Southern EU countries as well as Eastern¹⁷ find this a larger problem.



Graph 3 - Most Important Limiting factor to get financing (if needed)

The SAFE data backs up sub-hypothesis two; that SMEs have problems gaining access to finance. It is an issue firms are aware of and find important, even if it may not be the most stressful problem. The results and opinions vary greatly between the EU countries, as does the availability. The availability of finance seem to have grown more in Eastern Europe than in Western Europe, which is not completely surprising since Eastern Europe has more catching up to do, to reach the Western levels. Firms believe in growth in the access to credit. Considering the fact that banks are the main as well as the preferred provider, this insinuates a possible positive development between the bank sector and SMEs.

2.5 SME, Finance and Economic Growth Nexus

The information presented, backs up the hypothesis that SMEs have a positive growth effect on the economy and that SME's have a problem gaining access to finance, that larger firms do not perceive. By bringing hypothesis one and two together we can link them to find support for the main hypothesis that;

Small and medium sized enterprises level of access to finance has a significant effect on economic growth.

¹⁶ United Kingdom, France, Germany & Sweden

¹⁷ Greece, Croatia, Cyprus, Slovenia, Spain and Italy

There are studies that look at the effect of access to finance on economic growth. One example is that a lack of access to credit is a market imperfection that should be adjusted in order for economic growth to reach its optimal level. This imperfection not only constrains growth but also innovation. Hyytinen & Toivanen (2005) connect the lack of credit to a decrease in spending on research and development (R&D), which results in a constraint on innovation. They use a model that argues that when the marginal costs of capital are imperfect, the marginal rate of return decreases, R&D spending becomes smaller leading to lower growth in sales.

Beck et al (2012) find a significant relationship between growth and finance for 65% of the included countries¹⁸ in their paper. The relationship effect on GDP per capita growth can though, only be noted for enterprise credit, not household lending. The paper shows that lending to firms is a growth driver, whilst lending to private individuals is not. The paper insinuates private individuals are not creators of economic growth, which could be connected to the loan bubble to real estates that has been largely blamed for the past financial crisis. Thus lending to SMEs who are held back by lack of financing should create growth.

Klein (2014) uses data from IMF and looks at the time period 2002-2012, which includes the financial crisis, as well as before and after. Using panel data the author's results imply that countries with higher shares of registered SMEs, on average have a lower credit growth in 2008-2012, insinuating that a larger prevalence of SMEs leads to a slower economic recovery and slower economic growth after a period of financial stress. This since, SMEs were not granted as much credit during this time period. The impact of a credit supply shock is therefore more visible in a country with a high share of credit-needing SMEs. Klein's results suggest that SMEs have a greater need for credit especially during crisis periods.

Carpenter & Petersen (2002) also look at the connection between access to finance and economic growth. They show that if a small firm has to work with internal financing only, it can only invest with the profits it creates and it will face a dollar-to-dollar relationship between internal financing and growth of its assets. If the firm has access to external funding and for example get access to a loan, an additional dollar of external financing will lead to slightly more than a dollar in growth. Growth changes from linear to expansionary. This can be interpreted as if a small firm has the possibility to access credit it will grow more, and thus have a larger effect on the economy. The Doing Business

¹⁸ 45 developed and developing countries from across the world, see Beck et al (2012) for complete list

Report¹⁹ from 2014 also suggests that if firms have a high sensitivity of investment to internal funds, the firms are facing financing constraints, and if they cannot apply for loans to develop and expand, they can only use their own assets.

SMES have problems gaining access to finance. SMEs are also expected to have an effect on economic growth. The effect seems to be smaller than expected due to for example limitations in access to finance. The strained credit situation seems to be thwarting economic growth. More credit access, leads to more investments that leads to more growth. The hypothesis that SMEs access to finance has an effect on economic growth is backed up by previous research, yet by how much and in what way is still to be answered.

3 Testing the Hypothesis

Data collected in the EU countries, the so called EU-28²⁰²¹, over a time period of seven years will be used in a dynamic panel model to test the hypothesis. Choosing to look at EU countries is not just beneficial because the data uses the same SME-definition which makes the data comparable cross-country and over time. It is also advantageous since only countries with a higher level of financial development are looked at, as emphasized by Claessens & Tzioumis (2006). The World Bank, for example, often focuses on developing countries, but the results can be shown to be less reliable and useful. In many developing countries, the majority of the activities coming from the private sector of SMEs have limited financial data. SMEs in developing countries are usually not obliged to file detailed financial reports nor are financial statements as reliable as those in developed countries. The credibility of data from the developed EU countries is expected to be higher than those in developing and should increase the reliability of the results presented.

To see if access to finance has any statistical significance on economic growth, data measuring a country's level of access to finance will be used in a panel data set up. The motivation for using panel data is that it can compare the within country development of access to credit over time as well as between the EU countries. By using panel data it is also possible to control for unobserved country-specific effects, which otherwise, in a pure cross-sectional regression, would be part of the error term and could cause biasness. The panel consists of data for 28 countries over the time period 2007-2013.

¹⁹ The Doing Business project is created by the World bank and provides objective measures of business regulations for firms in 189 economies

²⁰ See appendix 1 for detailed list of members

²¹ Croatia will be included for the whole time period, even if they first joined the EU in 2013.

3.1 Method: Introducing the GMM Estimator

The panel data being used looks at the same countries every time period which makes the data a function of fixed effects. It follows that past values of growth are also functions of fixed effect, and this causes a correlation with the error term. Error term correlation problems can make an OLS estimator biased and inconsistent and is thus not a recommended estimation method in this case.

Economic growth today, depends strongly on economic growth yesterday which means that growth depends on its own past realisations. To take this into consideration a dynamic panel data model is used. This model contains lagged dependent variables, which are placed in the right hand side of the equation. In other words one or more periods are included in a model due to their persistent effect on the dependant variable today. A problem with this is dynamic panel bias, which is a situation where there exists correlation between the lagged dependent variables and the individual effect (which arises due to the fact that the effect is time invariant). Lagged endogeneity can then be present and this causes estimates to be inconsistent (Mammi, 2011)

The GMM estimator has specifically been developed for dynamic panel data models. It is often used when working with growth models as it escapes the problems of endogeneity an OLS estimator causes²². GMM requires one instrument for every time period. Too many instruments can cause problems²³ and thus GMM is only especially useful when you have a short time series, like in this case ($T = 7$ periods, 4 of which will be used in the regression due to the inclusion of two year past dependence in the regression)²⁴(Woolridge, 2002, see pg204).

The system GMM which will be used is created by Blundell and Bond and builds on the Arellano-Bond first difference GMM estimator. The difference estimator creates instruments by taking the first difference of the model. Blundell and Bond (1998) show that the first difference estimator becomes weak when the autoregressive process becomes too persistent or when the ratio of the variance of the panel-level effects to the variance of the error becomes too large. What the system GMM estimator does to increase the efficiency, is to add a moment condition where lagged differences are used as instruments in addition to the level instruments used in the difference estimator.

²² It does this by relaxing some of the OLS assumptions and instead uses internal instrumental variables.

²³ GMM can become inconsistent and can over fit endogenous variables, see Roodman (2008) & Mehrhoff (2009)

²⁴ Least Square Dummy Variable (LSDV) regression is also a good alternative when investigating growth models, but if T is smaller than 30, which it is in this case, LSDV does not outperform the GMM estimator (Judson & Owen (1999))

3.2 The Model

The Equation

The equation estimated with the help of the system GMM estimator is stated below²⁵. Y stands for the different representations of economic growth, the dependant variable. Since two lags are being used the time period regressed is shortened to only four periods. Both fixed country and fixed time effects are used.

$$Y_t = \beta_1 Y_{t-1} + \beta_2 Y_{t-2} + \beta_3 \text{SMAF} + \beta_4 \text{TERT_SCH} + \beta_5 \text{CREDDEP} + \beta_6 \text{INFL} + \varepsilon_{it}$$

$$\varepsilon_{it} = \gamma_i + \lambda_t + \eta_{it}$$

Variables

A summary of the variables used can be seen in table 2 below.

Dependent Variable – Economic Growth

The dependent variable is economic growth. Economic growth comes either from an economy's increased use of resources or from an economy's more efficient use of existing resources; an increase in productivity. The most common way to measure economic growth is to use GDP per capita growth and has previously been used in SMEs research (e.g. Rioja & Valev (2004a), Beck et al (2012)²⁶), hence this proxy will be used in this thesis too.

Economic Growth can be portrayed in many ways. This thesis looks at finance access and how this effects economic growth. If SMEs get more finance access, this money is most likely unevenly distributed across economic sectors and invested into different areas. Considering this, further representation of economic growth should be included to see if effects differ between growth measures. Two further measures of economic growth with a stronger direct link to productivity growth will be used to see if the effect in growth varies; Total Factor Productivity (TFP) and Labour Productivity (LP) growth.

²⁵ As instruments $Y(-2)$, $\text{SMAF}(-2)$, tertiary schooling, credit depth & inflation are used

²⁶ See these for even further references of GDP/Capita growth examples.

Data on GDP per capita is taken from the World Bank in constant local currency in order not to take the currency effect of the global as well as American economy into consideration²⁷. Data on the growth of labour productivity per employee (%) is used to measure LP growth. TFP measures the part of output not explained by the amount of input used in production. It is often measured by the Solow residual²⁸, which picks up what can't be accounted to capital and labour inputs in production, for example technology and innovation. TFP growth is measured by the Tornqvist index²⁹. Both TFP growth (%) statistics as well as LP growth statistics are collected from "The Conference Board"³⁰.

Independent Variable

The independent variables have been selected with inspiration from Rioja & Valev (2004), Beck & Demirgüç-Kunt & Levine (2005) and Beck & Demirgüç-Kunt & Martínez Pería (2008). The main explanatory variable is access to credit represented by SMAF.

SMAF stands for the "SME access to Finance" index. This index is an attempt to measure the development of small and medium sized firm's access to financial resources, and to facilitate the analysis of differences between member states³¹. Comparing countries has previously been difficult due to lack of information as well as information opacity, but SMAF tries to alleviate this. SMAF covers a consecutive time period from 2007 to 2013.

What the SMAF index does to define the level of access to finance is base its index on two main sub-indices; access to debt finance and access to equity finance³². The index is a weighted mean of the collected data. The reference point of the SMAF index is based on the EU average in 2007 (EU 2007 =100). Year-on-year increases indicate that the country's SMEs are relatively improving their access to credit situation; a decrease shows a worsening scenario. By creating an index it is possible to work around problems that may occur when using answers from surveys³³.

²⁷ If GDP growth in USD were to be used the currency relationship between the USD and domestic currency would affect growth results and put it relative to the USD

²⁸ From the Solow Growth model, a production function model (Solow, 1956)

²⁹ A Törnqvist price index is a weighted geometric average of the price relatives using arithmetic averages of the value shares in the two periods as weights.

³⁰ An unbiased non-profit business membership and research group organisation which aims is to provide practical knowledge to the world's leading organisations in order to improve performance and better serve society.

³¹ See: European Commission: "SME Access to Finance Index". Available from: (http://ec.europa.eu/growth/tools-databases/smaf/index_en.htm)

³² See appendix 2 for more detailed information

³³ The measurement of access to finance can be influenced by the definition, the priority of its dimensions (reliability, convenience, flexibility etc). See Claessens & Tzioumis (2006) for more on this. Firms that are better off tend to complain about their access to finance less than firms with problems.

A number of control variables that are expected to have an impact on economic growth together with SMAF are included as well. Most of the control variables are provided by the World Bank. For a summary see Table 2.

Variable	Name	Source	Units	Transformed	Mean	Standard Deviation
Labour productivity Growth	LP_GRO	The Conference Board	%		0.51	3.09
GDP per Capita Growth	GDP_GRO	The World bank	%		-0.5	4.26
Total Factor Productivity	TFP	The Conference Board	%		-0.94	3.12
SMAF	DLSMAF2	The European Commission	Index	First derivative & log	1.31	4.93
Tertiary Schooling	Tert_sch	The World Bank	%		34.69	10.06
Credit Depth	LCREDDEP	The World Bank	Index	log	1.58	0.25
Inflation	INFL	The World Bank	%		1.96	2.28

Table 2 – Variables included in the main GMM regression

Inflation and GDP growth hold a delicate relation and too high an inflation can be negative for growth. A stable economy with a stable expected future generates loans, growth, expansion etc and making inflation is an important control variable to include as it can affect the relationship between other variables as well as the results.

The depth of credit information is not expected to directly affect economic growth, but since credit information on SMEs is a recorded strong reason for the fact that SMEs have problems with access to finance it is important to include. A high insight into credit information should lead to more bank loans being granted.

Human capital is also a commonly used variable when working with economic growth. School enrolment rates are the most common proxy in representing human capital levels. Based on Barro and Lee's (2010) evidence that the estimated rate-of-return to an additional year of schooling is higher in secondary and tertiary education and the fact that in most EU-28 countries the level of participation in lower education is mandatory and does not vary greatly between countries, tertiary education will be used as the proxy.

Control variables that are not representing growth or are in a percentage format are represented in logarithmic form in order to smooth out effects.

4 Empirical Results

4.1 The Regression

In the following tables * marks significance at a 10% level, ** at a 5% level and *** at a 1% level. The standard errors can be seen in the parenthesis below the coefficients. In Table 3 the GMM estimation results are presented:

Variables ³⁴	Dependent Variable		
	GDP/cap Growth	LP growth	TFP growth
SMAF	-0.0376 (0.0314)	0.0983*** (0.0345)	0.0832*** (0.0332)
GDP/CAP Growth (-1)	-0.2706*** (0.0295)		
GDP/CAP Growth (-2)	-0.3765*** (0.0162)		
Labour Productivity Growth (-1)		-0.4065*** (0.031338)	
Labour Productivity Growth (-2)		-0.4048*** (0.0208)	
Total Factor Productivity(-1)			-0.2513*** (0.0187)
Total Factor Productivity (-2)			-0.3590*** (0.0141)
Tertiary Schooling	1.0114*** (0.0428)	0.7383*** (0.0484)	0.8824*** (0.0594)
Credit Depth	-1.8314*** (0.4151)	-4.9846*** (0.4928)	-5.7811*** (0.4811)
Inflation	0.6652** (0.0844)	0.5553*** (0.1378)	0.6501*** (0.0550)
# of Observations	101		

Table 3 –Regression on Economic Growth using GMM Estimation

³⁴ (-1) represents the economic growth results from one time period before, (-2) from two time periods before. One time period represents a year.

The positive effect between tertiary schooling and economic growth is expected. There are many studies on the topic and even in developed countries the effect can be seen (see e.g. McNeil & Silim, 2012).

The credit depth coefficient shows negative and significant results, meaning that an increase in credit depth has a negative effect on economic growth. This is a bit surprising since the more insight for example banks have into the financial situation of SMEs, the more transparency there should be in the market. It is expected that more transparency and increased information symmetry should lead to higher understanding, better financial development and less market imperfections. The results do not show that. A reason to why this study finds a negative effect coming from an increase in credit depth could be the countries looked at. Stolbov (2015) for example, looks at the causality between credit depth and economic growth and finds in only 4 of 24 OECD countries studied, that causality runs from credit depth to economic growth.

A positive and significant coefficient for inflation, which is seen in all three cases, insinuates that an increase in inflation has a positive effect on economic growth. It is often said that strong economic growth causes higher inflation. Too high an inflation though causes instability in an economy. To what level inflation has a positive effect on growth is unanswered here, and will not be further looked in to. An unstable economy is an unattractive market to investments in, which could affect SMEs financing possibilities.

The most interesting and important coefficient to look at, regarding the hypothesis, is SMAF, which represents "access to finance". The GMM estimates suggest that SMAF exerts a positive and significant effect on economic growth at a 1% significance level, but only on LP growth and TFP growth. On GDP/capita growth the coefficient is neither positive nor significant. The increase in a percentage point in SMAF affects growth of LP and TFP with 0.1% respectively 0.08%. Since the equations used are lagged two time periods, this time effect needs to be taken into consideration.

To do this the SMAF result is divided by one minus the lagged dependent variable coefficients results³⁵. What the results show is that an increase in the SMAF index leads to a 0,05% increase in growth on both LP and TFP. To put the effect into perspective, a 10% increase in SMAF leads to half a percent (0,5%) increase in economic growth. This effect is not large, but there are a lot of aspects that affect economic growth, and access to credit is just one tiny part. The small effect could be due to that it is not access to finance in itself that causes growth, but rather what the finance received can be spent on. A loan can be spent on employing more people, training existing employees or

³⁵ See appendix 5

investing in more productive technology. These examples decrease unemployment and increase productivity and can on their own positively affect economic growth, but would not be possible without credit.

It is interesting that GDP per capita growth is the most commonly used proxy for economic growth, yet access to finance does not affect it. A possible explanation could be due to what GDP per capita measures. GDP is the sum of the total final output an economy produces, it is an aggregate measure. GDP per capita measures to a certain degree an individual's wellbeing in the country, an increase in access to credit to SMEs does not seem to be affecting this directly. An increase in finance to SMEs seems to be increasing the labour productivity of an employee as well as the level of productivity in TFP. This insinuating that SMEs access to finance rather affects the productivity in a country.

Even if access to credit of SMEs does not affect GDP per capita growth, Beck, Demirguc-Kunt & Levine (2005) find a strong positive relationship between SMEs and GDP per capita growth. These results do not have to be exclusive, SMEs and GDP per capita growth may well have a relationship, but it is not through the SME finance access situation. Rather Beck et al's results further agree with this regression since they also cannot find evidence that SME exert a causal impact on growth even if a relationship exists³⁶.

4.2 Robustness

To see if the SMAF effect on economic growth remains robust, more variables were added to the GMM regression. The variables are taken with inspiration from De Haas & Naaborg (2005), Beck et al (2005), papers also looking at SMEs, but testing other hypothesis. Enterprise birth growth³⁷, share of large firms (% in the country) as well as the number of foreign credit institutes (logged)³⁸ are also included. The results can be seen in Table 4.

³⁶ Economic growth measured by GDP per capita growth.

³⁷ The growth of the number of newly started firms

³⁸ Data from the World Bank

Variables	Dependent Variables		
	GD_GDP	LP_GRO	TFP
SMAF	0.3502*** (0.0919)	0.3030** (0.0984)	0.1814*** (0.0497)
GDP/CAP Growth (-1)	-0.1401*** (0.0442)		
GDP/CAP Growth (-2)	-0.4255*** (0.0706)		
Labour Productivity Growth (-1)		-0.3524*** (0.0837)	
Labour Productivity Growth (-2)		-0.4693*** (0.0815)	
Total Factor Productivity(-1)			-0.2137*** (.0462)
Total Factor Productivity (-2)			-0.3472*** (0.0557)
Tertiary Schooling	0.7722*** (0.1635)	0.7241*** (0.1098)	0.6150*** (0.1108)
Credit Depth	4.3745 (4.2418)	5.0279** (2.3739)	-4.8143** (2.0566)
Inflation	0.7533*** (0.1133)	0.6532*** (0.1403)	0.6881*** (0.0905)
Enterprise Birth Growth Rate	0.0268* (0.0138)	0.0117 (0.0128)	0.0179** (0.0078)
# of Foreign Credit Institutes	2.3975 (3.8158)	2.8915 (3.4622)	4.1791** (1.7279)
Share of Large Firms	-6.9611*** (2.3805)	-1.7038 (1.7974)	-4.1213** (1.7507)

Table 4– Robustness Regression on Economic Growth using GMM Estimation

Credit depth decreases in significance and the coefficient changes from negative to positive in two out of three regressions. It does not handle the robustness test well. The number of foreign credit institutes is only significant for TFP, insinuating little effect on economic growth. Tertiary schooling and inflation as well as the lagged dependent variables stay significant proving the importance of these variables.

The significance of SMAF on LP and TFP growth stays significant even when adding the extra variables to the regression. Significance decreases to a 5% level for LP growth, yet stays at 1% significance for

TFP growth. The strength of the coefficient effect changes greatly though. It increases from 0,1 to 0,35 for LP and from 0,08 to 0,18 for TFP. Taking consideration to the time effect, using the same method as used previously, gives the results that a percentage increase in SMAF positively affects LP with 0,166 % and TFP with 0.116%. This is more than double the effect previously noted (ca 0.05%). A 10% increase in SMAF now leads to a 1.66% increase in LP growth and a 1.16% increase in TFP growth.

This increase could be partly due to that the GMM estimator is easily influenced by outliers in the data, which Lucas, van Dijk & Kloek (2007) show in their paper. Krasker et al (1983) argue that abnormal observations are more likely to be found in cross-sectional data than time-series. In the panel data, which is being used here, there is more cross-sectional data, than time periods. The EU-28 data varies greatly in many different aspects, as can be seen in both the SAFE and the raw data³⁹. The results from an unstable economy such as Greece vary greatly compared to the results in a more stable economy like Sweden. Results can also vary greatly between alike countries, in the sense that they could have the same level of SMAF index yet largely deviating credit depth or amount of foreign credit institutes in the country. This could possibly cause the deviating results in the SMAF coefficient.

The coefficient for SMAF on GDP per capita growth becomes significant at a 1% level in the robustness test as well as becoming positive. This is a large difference compared to the results in the previous estimation. The dependent variable GDP per capita growth seems to be highly sensitive to the independent variables included in the regression.

If we regress SMAF simply on economic growth without any other control variables, besides the lagged dependent variable, once again access to finance has no significant effect on GDP per capita growth, yet the significant effect on TFP and LP growth at a 1% level stays persistent. This can be seen in Table 5.

The GDP per capita growth results seem sensitive and not robust, stressing that the variables strongly depends on what independent variables are included in the regression. TFP and LP continuously stay robust, emphasizing the effect of access to credit on these two economic growth terms. In the simple regression shown in Table 5, the size of the TFP and LP regression decreases to levels similar the original regression. It may be so that access to credit clearly effects TFP and LP, but it is sensitive to other levels of development in the country as well.

³⁹ Used in the regression as independent variables.

Variables	Dependent Variables		
	GDP/Cap Growth	LP Growth	TFP Growth
SMAF	-0.014052 (0.016688)	0.071377*** (0.017047)	0.098100*** (0.018593)
GDP/CAP Growth (-1)	-0.148571*** (0.019193)		
GDP/CAP Growth (-2)	-0.507323*** (0.004049)		
Labour Productivity Growth (-1)		-0.271443*** (0.021792)	
Labour Productivity Growth (-2)		-0.484452*** (0.015938)	
Total Factor Productivity (-1)			0.057485*** (0.011649)
Total Factor Productivity (-2)			-0.421305*** (0.010767)

Table 5 – GMM Regression – SMAF on Economic Growth

What does it mean that GDP per capita is not affected by an increase in access to finance, but TFP and LP growth are? TFP and LP are both direct productivity measures. As a country gets a better SMAF index result their productivity per labour employed increases and the total factor productivity increases.

Labour productivity measures the amount of goods or services produced by an employee per one hour of labour. By increasing the financing access of SMEs, the results say that the employees produce more. Employees become more productive. This could possibly be due more investments into machines and equipment used in production, otherwise not afforded since the firm did not have access to the funding. An increase in access to financing may only directly lead to a 0.05% labour productivity growth, but it can also open up doors that can lead to even greater LP growth.

Total factor productivity refers to all the effect in total output not explained by the amounts of input used in production (labour and capital). Technological development for example cannot be measured by amount of labour nor capital put into production and is often measured by TFP. The same argument can be used here as for LP, that an increase in SMAF leads to only a near 0.05% growth in TFP but it can, as for LP growth, create opportunities that lead to even more growth.

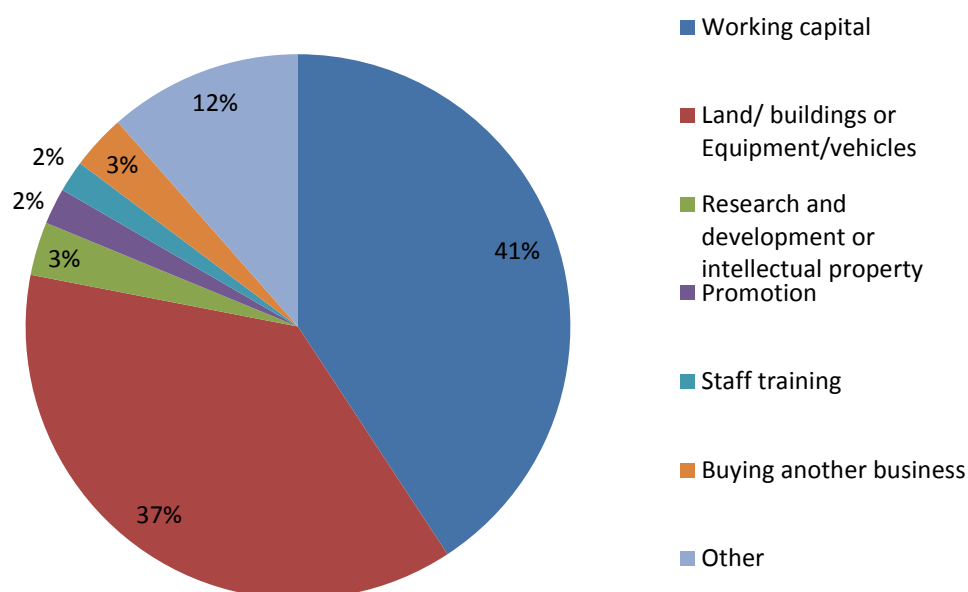
If SMEs get access to finance, this money should be spent on productivity increasing measures. This conclusion is based on the fact that LP and TFP are significantly affected by SMAF, and GDP per capita growth is not. Increasing financing access for small and medium sized enterprises is beneficial for the country with respect to growth if correctly invested. It is important to note that this is only with respect to SMEs. The accessibility to financing for large firms is not covered in this regression.

The effect on growth may be larger if large enterprises gain more access to finance, since large firms play an important role in a country's GDP, or smaller if the large firms already have enough access to credit as they need, and thus more finance would not change the impact already being created on growth, insinuating a saturated credit market. Considering the number of SMEs and how much they bring to the economy, adjusting this small aspect, could lead to a multiplying positive effect for the economy.

5 Analysis & Discussion

5.1 Productivity and Access to Finance

The results from the regression show a strong, yet small connection between access to finance and productivity growth. To further explore this connection, data from the SAFE survey is used. In 2013, the SAFE survey conducted in asked firms "if they applied for a loan in the past 6 months, what was it used for?" The results can be seen in Graph 4.



Graph 4 – If you took a loan in the last 6 months, what was it used for?
– from the SAFE Survey 2013

The results in Graph 4 show that 41% of the loans granted were spent on working capital, which is defined as current assets minus current liabilities. The working capital ratio (Current Assets/ current liabilities) indicates whether a company has enough short term assets to cover its short term debts. If a firm takes a loan in order to balance out this ratio it could insinuate that the firm has more debts than assets. This kind of loan is risky for a creditor as it is a loan possibly taken to cover other debts and the possibility of getting it paid back could be less likely. From a government's point of view, loans taken to cover other debts could insinuate an underperforming economy where companies are struggling to survive. These types of loans are not expected to generate growth.

In the SAFE survey, 37% of the loans in 2013 were spent on land/buildings or equipment/vehicles. Beck et al (2012) show that enterprise credit is positively related to economic growth whilst household credit is not. Using Sweden as an example, presuming that the rest of Europe has similar results, 81% of household credit was housing loans⁴⁰. Household spending a majority of their loans on land and buildings does not generate an effect on economic growth. Does that mean SMEs loans spend on land/buildings or equipment/vehicles does not generate economic growth either?

Research and development (R&D) and staff training could on the other hand be productivity increasing investments. Staff training aims to increase the knowledge and productivity of the employees and can be directly connected to LP. R&D spending increases technological advancements, which increases productivity and relates to TFP. Only a total of 5% of all loans taken were spent on these apparent productivity increasing and economic growth developing investments. If only such a small share of all loans taken are spent in these two areas this may partly explain why an increased access to finance to SMEs has such a small effect on economic growth.

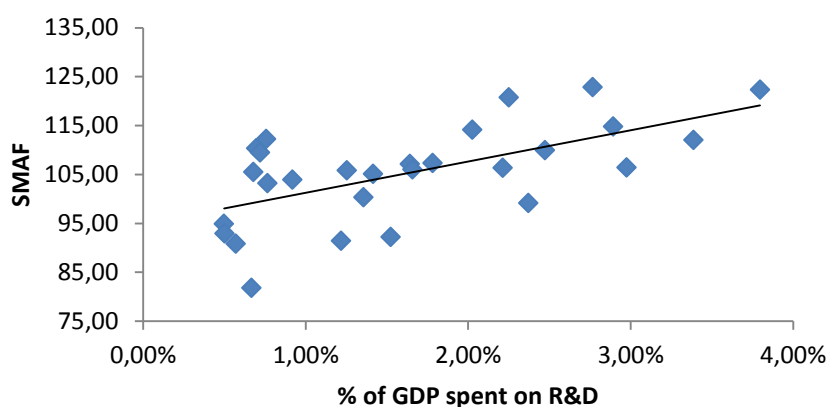
To emphasize the theory, that productivity investments generate growth, data on R&D spending is used. Easterly and Levine (2001) report that 60% of the growth in our economy generates from TFP, and that growth comes from the Solow residuals rather than direct capital and labour inputs⁴¹. Better access to credit could lead to more money being spent on R&D and innovation which would through increased productivity increase TFP. Hyytinen & Toivanen (2005) find that financial constraints hold back innovation and growth and are of the view that government funding can alleviate capital

⁴⁰ Source: Statistiska Centralbyrån (2015) "Continued Growth for Household loans" [Online] Available from: <http://www.scb.se/en/Finding-statistics/Statistics-by-subject-area/Financial-markets/General-statistics/Financial-Market-Statistics/Aktuell-Pong/37270/Behallare-for-Press/388572/> [Accessed: 21st March 2015]

⁴¹ With respect to the Solow growth model. Easterly and Levine say that factor (capital and labour) accumulation is continuously increasing, whilst economic growth is not, and this growth has a stronger connection to TFP increases which fluctuate more.

market imperfections. Hyttinen & Toivanen connect the lack of credit to a decrease in spending on R&D.

If R&D expenditure, as a percentage of GDP⁴², is compared to the SMAF index results, a positive relationship is seen. The higher the SMAF index, meaning the easier it is to get access to financing, the larger the share of GDP is spent on R&D in the country. The blue points in Graph 5 each represent one EU-28 country.



Graph 5 - SMAF vs R&D Spending

A correlation test on the two variables shows that a positive correlation is seen 60% of the time. EU countries with a higher percentage of GDP spent on R&D have in general a higher result in the SMAF index⁴³. A conclusion could then be that an increase in SMAF leads to a higher level of spending on R&D and thus an increase in growth in TFP. That means that firms seem to spend the least amount of money in the areas creating economic growth for the country. This being said, these are results for EU countries, which all are developed. Results may differ in developing countries, or countries in other geographical locations in the world.

5.2 Alleviating the SME Finance Situation – Support Programs

It is agreed that SMEs in the EU have problems gaining access to finance, even if it may not be the most pressing problem (ECB, 2014). The EU government has many support and investment programs that aim to create a SME-friendly environment where SMEs can develop to their full potential and to make sure that the economy can benefit the most from these enterprises. The EU's 2011 "Action

⁴² Data collected from the World Bank. Expenditures for research and development are both current and capital expenditures (private & public). R&D here covers basic research, applied research and experimental development.

⁴³ This is just a very quick and basic analysis, more research into the area needs to be done in order to prove this relationship. This is just one way of showing that access to finance effects productivity.

plan”⁴⁴ states that SMEs will be a source for growth and jobs in Europe but only if their access to finance is improved. The policies are motivated with the argument that SMEs cannot perform at their full potential since they are constrained by institutional and market failures (see Biggs, 2002 for a deeper analysis) and thus these failures should be handled.

According to this thesis though, increasing access to finance may not be increasing economic growth as much as hoped. If a majority of loans taken are continued to be spent on housing and working capital the growth effect may be hard to see, in comparison to investments made to R&D and staff training. At the same time SMEs do employ a majority of the population in Europe and are large value creators, this cannot be ignored. Even if the programs do not explicitly create growth, without them unemployment might increase and have a negative impact on economic growth in the EU. Look at the recent financial crisis. In the period before the crisis SMEs had easy access to bank loans, but during the crisis it became much harder to get a loan (Kaya, 2014). At the same time, during this crisis, unemployment rose greatly in the EU⁴⁵. This insinuates that subsidies can still be of vital use, even if it does not show an immediate effect on economic growth, as the will be effected indirect.

Lerner (1999) examines the “Small Business Innovation Research Program” in the US to see if any clear effect of subsidies can be found. Lerner shows that firms awarded funding from the program grew significantly faster than firms without the funding and that they were also more likely to get venture financing. It is rational, Lerner concludes, for the government to provide subsidized funding.

The “Structural Fund”, one of two large SME funding instruments in the EU, could be used to specifically effect economic growth⁴⁶. As the largest funding instruments benefiting SMEs, its purpose is to promote an economic and social unity and balance within the EU. Receivers from this fund obtain a direct contribution to finance their projects. This direct aid to SMEs is only available though, to SMEs in less developed regions, the so called “convergence regions”⁴⁷. Since the fund received is a direct and company specific contribution, the EU can focus its investments on areas that will generate economic growth, such as areas relating to TFP and LP.

According to the SAFE survey, banks are the preferred loan giver and a majority of loans in the EU are granted by banks. The EU should actively work to make SMEs a more attractive market to invest into,

⁴⁴ European Union (2011), “EU Action Plan: helping SMEs access more Financial Resources” [Online] Source: http://europa.eu/rapid/press-release_MEMO-11-879_en.htm?locale=en

⁴⁵ EU 28 Unemployment lying at 8.4% in 2006, and increasing to 10.4% in 2012, varying greatly between countries depending on how hard their economies were hit by the crisis. Source: Eurostat, (2014) “*Unemployment Rate 2003-2013*” [Online] See: [http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Unemployment_rate,_2003-13_\(%25\)_YB15.png](http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Unemployment_rate,_2003-13_(%25)_YB15.png)

⁴⁶ Also known as the European Regional Development fund (ERDF)

⁴⁷ Regions with a GDP/capita of less than 75% of the average of the average GDP/capita of EU 28. Most of these regions lie in the most eastern part of the EU as well as in parts of Portugal and Italy.

and at the same time they should focus on in what areas these loans should be granted. SME loans do generate growth, but how much depends on what the loans are spent on. This paper motivates more loans with the argument that it increases productivity and thus effects economic growth. The EU must work to make sure that the banks are not making non-performing loans but focus on growth creating loans. The goal is not to lend money to all SMEs that want a loan. If there is a high risk of the firm defaulting then it is not worth investing in. What the subsidy and support programmes should do is help to differentiate between the good risk and bad. What will in the long term create growth, what is growth promoting? The governments should aim to promote efficiency and productivity growth via their subsidy systems.

5.3 Future Analysis' and Short Comings

The data in the thesis does not show how many of the firms that would be granted a loan if market imperfections were ruled out. Having a viable business plan is not always guaranteed and the data used here does not take this into consideration. The more information asymmetries that are ruled out the better banks and other credit institutions become in seeing what firms are the least risky to invest in.

Loans create investment opportunities, but for a firm to survive there needs to be domestic demand, and that demand may not exist. In the SAFE survey, finding customers is referred to as the most pressing problem for SMEs. Without customers with a demand for your goods, better access to finance will not necessarily benefit the economy.

This paper only looks at results in the EU. It would be interesting to look at non-EU countries or more specifically developing countries to see if the same effect can be noted there. The fact that LP and TFP are affected, but not GDP per capita may be something we only see in developed countries. The productivity effect may be even greater in developing countries since it is expected they have a lower level of productivity to start off with. A greater access to credit could create large scale developments than seen in already developed EU countries

It would also be of interest to return to study the effect of access to credit on economic growth when more data has been collected. Regrettably there is no data from pre- and during the crisis period, but the EU aims to keep developing both the SAFE survey and SMAF Index, which in the near future should give more comparable results that cover a longer time period.

6 Conclusion

This thesis proves the hypothesis that; Small and medium sized enterprises level of access to finance has a significant effect on economic growth, is correct. The level of access to finance affects economic growth, but not via GDP per capita growth which might have been expected. If SMEs get more finance, the money is unevenly distributed across sectors and it seems to be that only the money invested in productivity increasing measures creates economic growth.

The GMM results find that access to finance has an effect on Total factor productivity growth as well as Labour Productivity growth, but not on GDP per capita growth. A 10% increase in access to credit (represented by SMAF) leads to a 0.5% increase in economic growth, represented by TFP and LP. The effect is small, but robust. The size of the effect could be related to the fact that a very small share of loans are actually spent on areas connected to LP and TFP, as seen by results from the SAFE survey. 3% of loans taken by SMEs were spent on R&D. When R&D spending was compared to SMAF results a clear positive correlation could be found. An increased level of access to credit, leads to higher spending on R&D, this leading to economic growth.

Even if access to credit only has a small significant effect on economic growth, this does not mean that the EU should not help SMEs with credit access issues. SMEs clearly have obstacles in gaining access to finance. They also stand for an immense share of employment and value added creation in the EU. For firms to be able to grow and survive they need access to credit. If SMEs financing problems increase this may affect employment levels and the domestic supply and demand, so supporting their access is important, even if the economic growth effect is small.

Researching the connection between the small and medium sized enterprise sector, access to finance and economic growth is important. This paper aimed to show that SMEs finance access levels effect growth and that it has, but there is much more to learn about SMEs and their impact on economic growth.

Bibliography

Ayyagari, M. Beck, T. and Demirgüç-Kunt, A. (2003). *“Small and Medium Enterprises across the Globe: A New Database”*. World Bank Policy Research Working Paper 3127

Ayyagari, M, Demirgüç-Kunt, A & Maksimovic V. (2011). *“Small vs Young Firms Across the World – Contribution to Employment, Job Creation and Growth”*. The World Bank Development Research Group, Policy Research Working Paper 5631,

Ayadi, R. & Gadi, S. (2013), *“Access by MSMEs to Finance in the Southern and Eastern Mediterranean: What role for credit guarantee schemes?”*, European Commission, MEDPRO Technical Report No. 35/2013.

Banerjee, A. & Duflo, E. (2004). *“Do firms want to Borrow More? Testing Credit constraints Using a Directed Lending Program”*, CEPR Discussion Paper 4681, London, Center for Economic Policy Research.

Barro, R. & Lee, J. (2010). *“A New Data Set of Educational Attainment in the World, 1950-2010”*. Journal of Development Economics, Elsevier, vol. 104 ©, pp 184-198

Biggs, T. (2002), *“Is small beautiful and worth of subsidy? Litterateur Review”*. IFC Mimeo.

Beck, T., Rioja, F., Büyükkarabacak, B & Valev, N. (2012), *“Who Gets the Credit? And does it matter? Household vs. Firm Lending across Countries”*. The B.E. Journal of Macroeconomics, Vol. 12: Iss 1, Article 2.

Beck, T., Demirgüç-Kunt, A. & Levine, R. (2005), *“SMEs, Growth, and Poverty: Cross-Country Evidence”*. Journal of economic Growth 10 (3): 199-229

Beck, T. (2010), *“SME Finance: What have we learned and what do we still need to learn?”*, World Economic Forum Financial Development Report. Ch 1.3

Beck, T. & Demirgüç-Kunt, A. & Martínez Pería, M. (2008), *“Banking SMEs around the world: Lending practices, business models, drivers and obstacles”*, The World Bank. Policy Research Working Paper, 4785.

Beck, T. & Demirgüç-Kunt, A. (2006), *“Small and medium-size enterprises: Access to finance as a growth constraint”*, Journal of Banking and Finance, 30, 2931-2943.

Beck, T., Demirgüç-Kunt, A., Laeven, L. & Maksimovic V., (2006). *“The Determinants of Financing Obstacles”*. Journal of International Money and Finance 25, 932-952.

Blundell, R., and Bond, S. (1998). *“Initial conditions and moment restrictions in dynamic panel data models”*. Journal of Econometrics 87: 115–143.

- Brack, E. (2009), "*Access to finance in the MENA region, A multi-pronged approach*", French Banking Federation.
- Carlsson, B. (1992). "*The Rise of Small Business: Cause and Consequence*", The Industrial Institute for Economic and Social Research". No 357.
- Carlsson, B. (1999). "*Small Business, Entrepreneurship, and Industry Dynamics*", Z.J.Acs (ed), Are Small Firms Important? Their Role and Impact. Kluwer Academic Publishers. Pp 99-110
- Carpenter, R & Petersen, B. (2002), "*Is the Growth of Small firms constrained by Internal Finance?*". The Review of Economics & Statistics, Vol. 84, No. 2, Pages 298-309
- Cecchetti, S., Flores-Lagunes, A. & Krause, S. (2006). "*Financial Development, Consumption Smoothing, and the Reduced Volatility of Real Growth*". NBER Working Papers 11946, National Bureau of Economic Research.
- Claessens, S. & Tzioumis, K. (2006), "*Measuring firms' access to finance*". The World Bank. Paper presented at Access to Finance: Building Inclusive Financial Systems Conference, 30–31 May, Brookings Institution and World Bank, Washington, DC
- De Gregorio, J. & Guidotti, P. (1995), "*Financial development and economic growth*". World Development 23 (3), 433-448.
- De Haas, R. & Naaborg, I. (2005), "*Does Foreign Bank Entry Reduce Small Firms' Access to credit? Evidence from European Transition Economies*". DNB Working Paper. No. 50.
- Easterly, W. & Levine, R. (2001). "*It's not factor accumulation: Stylized facts and growth models*". The World Bank Economic Review, Vol. 15, no 2, pp 177-219.
- Fernando, A. & Mulier, K. (2013), "*Firms' financing constraints: do perceptions match the actual situation?*" European Central Bank. Working Paper Series 1577.
- Granger, C. (1980). "*Testing for causality: A personal viewpoint*". Journal of Economic Dynamics and Control 2: 329–352
- Hyytinen, A. & Toivanen, O. (2005). "*Do financial constraints hold back innovation and growth? Evidence on the role of public policy*", Research Policy. Vol34, iss 9, pg 1385-1403.
- Jahan, S. & McDonald, B. (2011), "*A Bigger Slice of a Growing Pie*". Finance & Development, Vol.48, No.3
- Judson, R. A., & Owen, A. L. (1999). "*Estimating dynamic panel data models: a guide for macroeconomists*". Economics letters, 65(1), pp. 9-15.
- Kaya, O. (2014), "*SME financing in the Euro Area*". EU Monitor, Global financial Markets. DB Research
- Klein, N. (2014), "*Small and Medium Size Enterprises, Credit Supply Shocks, and Economic Recovery in Europe*", IMF Working Paper.
- Krasker, W.S., Kuh,E., & Welsch,R. (1983): "Estimation for Dirty Data and Flawed

Models," in Handbook of Econometrics I, ed. by Z. Griliches and M.D. Intriligator. Amsterdam: North-Holland, pp. 651–698.

Lerner, J. (1999). *"The Government as Venture Capitalist: The Long-Run Impact of the SBIR Program"*. Journal of Business, Vol. 72, No.3, pp 285-318.

Levine, R. (2004). *"Finance and Growth: Theory and Evidence"*. Working Paper. Carlson School of Management, University of Minnesota.

Levine, R., Loayza, N. & Beck, T (2000). *"Financial intermediation and growth: causality and causes"*. Journal of Monetary Economics 46 (1), 31-77.

Loveman, G. & Sengenberger, W. (1991), *"The re-emergence of small-scale production; an international comparison"*, Small Business Economics, 3:1-37

Lucas, A., Van Dijk, R. & Kloek, T. (2007), *"Outlier Robust GMM Estimation of Leverage Determinants in Linear Dynamic Panel Data Models"*, Unpublished Manuscript, Vrije Universiteit, Amsterdam, The Netherlands.

Mach, T. & Wolken, J. (2012), *"Examining the Impact of Credit Access on Small Firm Survivability"*. The Federal Reserve Board

Mammi, I. (2011), *"Essays in GMM estimation of dynamic panel data models"*, IMT institute for Advances Studies, Lucca.

Mehrhoff, J. (2009), *"A Solution to the problem of too many instruments in dynamic panel GMM"*. Deutsche Bundesbank, Series 1: Economic Studies.

McNeil, C. & Silim, A (2012) *"Further Higher? Tertiary education and growth in the UK's new economy"*, UCU

Rajan, R. & Zingales, L. (1998), *"Financial Dependence and Growth"*, The American Economic Review, Vol. 88, No. 3, pp 559-586.

Rahaman, M (2011). *"Access to financing and firm growth"*, Journal of Banking & Finance. Vol.35, Issue 3, pp 709–723

Rioja, F & Valev, N (2004). *"Does One Size Fit all? A Reexamination of the Finance and Growth Relationship"*. Journal of Development Economics 74, pp. 429-447

Roodman, D. (2008), *"A Short Note on the Theme of Too Many Instruments"*, Center for Global Development, Working paper # 125.

Sannajust, A. (2014) *"Impact of the World Financial Crisis to SMEs: The determinants of bank loan rejection in Europe and USA"*. Working Paper 2014-327. IPAG Business School.

Schiffer, M. & Weder, B. (2001), *"Firm Size and the Business Environment: Worldwide Survey Results"*, International Finance Corporation, Discussion Paper, 43.

Schrör, H. (2009), *"Business demography: Employment and Survival"*, Eurostat, 70/2009.

- Solow, R. (1956), "A contribution to the Theory of Economic Growth", The Quarterly Journal of Economics, Vol 70, pp65-94.
- Stolbov, M. (2015), "Causality between credit depth and economic growth: evidence from 24 OECD countries", Soumen Pankki, Bofit Discussion Papers. 15
- Thurik, A.R. (2009), "Entreprenomics: Entrepreneurship, Growth, and Public Policy", Entrepreneurship, Growth, and Public Policy, 219-249.
- Woolridge, J. (2002), "Econometric analysis of cross section and panel data". Cambridge, Mass: MIT Press, cop. 2002
- Zia. B. (2008), "Export Incentives, Financial Constraints, and the (Mis)allocation of credit: Micro level Evidence from Subsidized export loans". Journal of Financial Economics, 87(2).
- Öztürk, B. & Mrkaic, M. (2014). "SMEs' Access to Finance in the Euro Area: What Help or Hampers?", IMF Working Papers, 14/78.
- The European Union (2015) "Business demography statistics" . Available from http://ec.europa.eu/eurostat/statistics-explained/index.php/Business_demography_statistics [Accessed 10th April 2015]
- OECD & ADB. (2014), "ADB-OECD Study on Enhancing Financial Accessibility for SMEs – lessons from recent crises". Philippines: Asian Development Bank
- OECD. (2009), "The Impact of the Global Crisis on SME and Entrepreneurship Financing and Policy Responses".Boulogne: OECD Centre for Entrepreneurship, SMEs and Local Development
- European Commission. (2014), "A Partial and Fragile Recovery, Annual Report on European SMEs 2013/2014". European Commission
- European Commission, (2013), "A recovery on the Horizon?. Annual Report on European SMEs 2012/2013", European Commission
- European Central Bank, (2014), "Survey on the Access to Finance of Enterprises in the Euro Area". The European Central Bank

Appendix

1 EU-28

To examine the hypothesis that SME access to credit (or lack thereof) has an effect on economic growth data will be used from both the SAFE survey as well as from the SMAF index. Both these sources of data are based on the EU-28 countries and thus this thesis will only be focusing on developed countries. There is research pointing towards that the effect of access to finance on growth is even bigger in developing countries, and that would of course be of interest to look at, but we are limited by the existing macro data.

The EU-28 is a collective term for the 28 member countries of the European Union (EU). The EU was originally founded in 1951 after the Second World War between six European countries. It was and still is an economic and political partnership where the countries are aimed to be interdependent of each other due to i.e. trade in the hope, of among other things, to reduce conflict. The latest member was Croatia, who joined in 2013.

Table 2 – List of EU 28 – The 28 EU member countries

	Country	Eastern Europe Dummy	Year of Access to EU
1	Belgium	0	1958
2	Bulgaria	1	2007
3	Czech Republic	1	2004
4	Denmark	0	1973
5	Germany	0	1958
6	Estonia	1	2004
7	Ireland	0	1973
8	Greece	0	1981
9	Spain	0	1986
10	France	0	1958
11	Croatia	1	2013
12	Italy	0	1958
13	Cyprus	0	2004
14	Latvia	1	2004
15	Lithuania	1	2004
16	Luxembourg	0	1958
17	Hungary	1	2004
18	Malta	0	2004
19	Netherlands	0	1958
20	Austria	0	1995
21	Poland	1	2004
22	Portugal	0	1986
23	Romania	1	2007
24	Slovenia	1	2004
25	Slovakia	1	2004
26	Finland	0	1995
27	Sweden	0	1995
28	United Kingdom	0	1973

Source: The European Union. (2015) *Countries*. Available from: http://europa.eu/about-eu/countries/index_en.htm [Accessed: 18th March 2015]

2 SMAF Explanation

To build the SMAF index, the European Commission used data from ECB, EVCA, EBAN and from the SAFE survey. The index construction can be seen below.

Debt finance sub-index	Equity finance sub-index
% of firms using bank loans	Total venture capital investment in thousands of € (% of GDP)
Interest rates on loans up to 250 thousand €	# of venture capital beneficiary SMES (scaled by GDP)
Interest rates for overdrafts	Total volumes invested by business angels in thousands of € (% of GDP)
% of firms using bank overdraft, credit line or credit cards overdraft	# of deals where business angels invested (% of GDP)
% of firms using leasing or hire purchase or factoring	% of firms feeling confident to talk about financing with equity investors/venture capital firms
% of companies not applying for bank loan because of possible rejection	
% of firms “applied but did not get everything requested”	
Rejected loan applications and unacceptable loan offers	
Willingness of banks to provide a loan	

Table 7 - Construction of SME access to finance index (SMAF)

Source: The European Commission. (2015) Enterprise Finance Index . Available from:
]http://ec.europa.eu/enterprise/policies/finance/data/enterprise-finance-index/index_en.htm
[Accessed: 20th March 2015]

3 Descriptive Statistics

(Common Sample)

	DLSMAF2	LP_GRO	LCREDDEP	TERT_SCH	TFP	GDP_GRO	INFL
Mean	1,31	0,51	1,58	34,69	-0,94	-0,50	1,96
Median	1,15	0,75	1,61	37,20	-0,68	0,05	1,70
Maximum	22,91	13,28	2,08	52,60	8,90	8,82	14,70
Minimum	-14,72	-9,42	0,69	15,40	-13,01	-19,89	-3,90
Std. Dev.	4,93	3,09	0,25	10,06	3,12	4,26	2,28
Observations	149	149	149	149	149	149	149

Table 8 – Descriptive statistics of Variables

Correlation	LCREDDEP	TERT_SCH	TFP	LP_GRO	GD_GDP	DLSMAF2	INFL
LCREDDEP	1.000000						
TERT_SCH	0.946033	1.000000					
TFP	-0.281825	-0.250910	1.000000				
LP_GRO	0.169238	0.176805	0.773002	1.000000			
GD_GDP	-0.099302	-0.114400	0.823618	0.705326	1.000000		
DLSMAF2	0.279333	0.261081	0.108642	0.212982	0.096431	1.000000	
INFL	0.644301	0.579773	0.038786	0.267742	0.226490	0.126957	1.000000

Table 9 – Correlation Matrix of Independent Variables

4 Causality Check

The hypothesis is based on the idea that growth and credit access are cointegrated and that economic growth is affected by access to credit, but does causality flow that way? To make sure that the access to finance affects economic growth a Granger Causality test is used.

Levine, Loayza and Beck (2000) study the effect of financial sector development on economic growth with the help of GMM show causation. The idea though, that it is economic growth that affects the possibility for small firms to gain access to credit could also be realistic. If the economy is better off and there is high growth in the country, this creates a better investment environment and could lead to more firms being invested in, and hence more small firms gain easier access to financing.

Roodman (2008) writes in his paper with respect to Levine, Loayza and Becks paper that “endogenous causation proves hard to rule out, meaning that we cannot be as confident, after all, that financial development causes growth”. Financial development is not access to credit, but countries with higher development on this front tend to have better instruments that increase access availability.

To check for the direction of the causality between SMAF and the measurements of economic growth in this paper a Granger Causality test⁴⁸ is run.

Granger Causality	1 lag	2 lag
GDP/Cap Growth & SMAF	SMAF*** ↔ GDP/CAP gro**	SMAF*** → GDP/CAP gro
LP Growth & SMAF	SMAF*** → LP gro	SMAF*** → LP gro
TFP & SMAF	SMAF*** ↔ TFP*	SMAF*** → TFP

Table 3 – Granger Causality

* = significant at a 10% level, ** = significant at a 5% level, *** = significant at a one percent level

At the 1-lag level, Granger causality flows both directions between GDP per capita growth and SMAF, as well as between TFP and SMAF. When 2 lags are used, at a 1% significance level Granger causality

⁴⁸ Granger Causality defines a causality relationship based on two principles; that cause happens prior to its effect and that the cause has unique information about the future values of its effect. Further information can be found in Granger (1980).

only flows from SMAF to the economic growth representations. It seems to be that the level of access to credit strongly causes an effect on economic growth and not vice versa. Increasing for example GDP per capita growth will not lead to a higher SMAF result in the country, but a better index level of SMAF will generate better GDP/capita growth (or LP or TFP growth).

5 Time effect Calculations

Calculations on how much the SMAF coefficient affects economic growth with respect taken to the dynamic time aspect.

$$\frac{SMAF}{1 - Y(-1) - Y(-2)}$$

$$\text{Effect on Labour Productivity Growth} = \frac{0.0983}{1 - (-0.407) - (-0.405)} = 0,0543$$

$$\text{Effect on Total Factor Productivity Growth} = \frac{0.0832}{1 - (-0.251) - (-0.359)} = 0,0517$$