Borrow more and promote economic growth?

A Granger causality analysis

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ABSTRACT

Before the financial crisis in the US, many politicians and scholars considered credit as something positive and important for an economy. After the financial crisis in the US the view on credit somewhat changed. This thesis provides new evidence on how credit and economic growth is related. Previous studies which have investigated the relationship between credit and economic growth have used the measurement "credit to private sector as a percentage of GDP", which includes both household and enterprise credit. Since household and enterprise credit may have different impact on economic growth it is important to evaluate these variables separately. In this study credit to private sector has been decomposed into household and enterprise credit to evaluate the causal relationship. By performing a Granger causality test on 24 developed countries, this study finds a bi-directional causal relationship between household credit and economic growth. This is an important result, since it confirms the potential consequences of monetary policy. Previous theoretical and empirical literature predicts a positive relationship between enterprise credit and economic growth. This study, however, provides evidence that there is a negative causal linkage running from enterprise credit to economic growth.

"Credit growth drives economic growth, until it doesn't."

– Richard Duncan

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1. INTRODUCTION

A majority of developed countries use monetary policy to stabilise the economy and keep the inflation rate at a low and stable level[1]. For example, the European Central Bank has lowered the real interest rate the last three years in order to stimulate the activity in the EMU countries and increase the inflation rate. The Swedish Central Bank follows the same pattern, which has lowered the real interest rate to fulfil the target of a 2% inflation level. However, this has created an intensified debate among economists, policy-makers and scholars. The discussion is not about whether a country should have an inflation target or not, but the potential consequences monetary policy has on the economy. Lowering the real interest rate does not only increase the inflation rate, but also the demand for credit. Credit is often considered as an important driving factor of the economy. If credit is used for investments and consumption this has a positive effect on the economy. However, if the credit market is not regulated, or if credit is not used for the right reason, this may harm the economy.

Already in 1912 Schumpeter argued that finance and financial development is important to promote economic growth. The main idea of Schumpeter's theory is that if an economy has a well-functional financial system, banks can be used to channel savings into its most efficient use. This means that banks can lend out money to enterprises with feasible projects or investments, which will increase the possibility of an innovation and hence promote economic growth. This idea is supported both theoretically and empirically by Goldsmith (1969), McKinnon (1973), Shaw (1973), Demirguc-Kunt & Levine (2008) and Johannes et al. (2011), among others.

Even if this theory is well established and has been adopted by many scholars and policy-makers, there are however some disagreement whether credit really has a positive effect on economic growth. Robinson (1952) argued that finance do not promote economic growth, if anything, economic growth has an impact on finance. The idea of this view is that as the economy grows there is a higher demand for goods. To meet this demand enterprises need more finance to increase the supply, by hiring more people and increase production output. This idea is supported both theoretically and empirically by Gurley and Shaw (1967), Jung (1986), Lucas (1988), Muhsin and Eric (2000) and Favara (2003), among others.

These two assessments show that there is no consensus whether credit has a positive effect on economic growth, or if the causal linkage runs the other way. One possible explanation to

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[1] All countries included in this study have an inflation target.

this may be that previous studies have used the wrong measurement investigating the credit-growth nexus. The studies, which have investigated the effect of credit, finance or financial development on economic growth have used the variable "credit to private sector as a percentage of GDP". This is one of the most commonly used measurement (see for example De Gregorio and Guidotti (1995); Levine et al. (2000); Aghion et al. (2005)). According to Calderón and Liu (2003) and De Gregorio and Guidotti (1995) credit to private sector is the best measurement of finance and financial development since it excludes credit to public sector and credit issued by central banks. There is, on the other hand, a problem with this measurement, or rather the composition of this measurement. Credit to private sector includes both household and enterprise credit, but in theory these two types of credit have different impact on the economy (Beck et al., 2012). It is therefore important to distinguish between household and enterprise credit to analyse the effect on economic growth. If a larger share of credit to the private sector is channelled to households, which use the credit for housing, and not for consumption, this should not have a positive effect on economic growth. Previous literature that has investigated the relationship between finance and economic growth has primarily assumed that credit is channelled to enterprises used for investments which promotes economic growth.

Even if the increased credit was one of the main reason for the financial collapse in the US the credit to private sector has continued to increase due to the low interest rates. In 1970 the level of domestic credit to private sector was 21% of GDP in the United Kingdom and in 2012 it had increased to 177%. The same pattern can be observed for the United States, where the credit level increased from 87% in 1970 to 184% in 2012. Figure 1 shows the average total credit to private sector as a percentage of GDP for the 24 developed countries used in this study[2] from 1995 to 2012. Already in 1995 total credit exceeded more than 100% of GDP, and in 2008 it peeked and almost reached 180% of GDP. Credit to GDP cannot grow forever, but still what is illustrated in the figure is a positive trend of credit growth. If the central banks keep lowering the interest rate and the credit market is not regulated, this positive trend is likely to continue, which is one of the main concerns today among politicians and economists.

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[2] The countries are listed in Table 1 (p. 11).
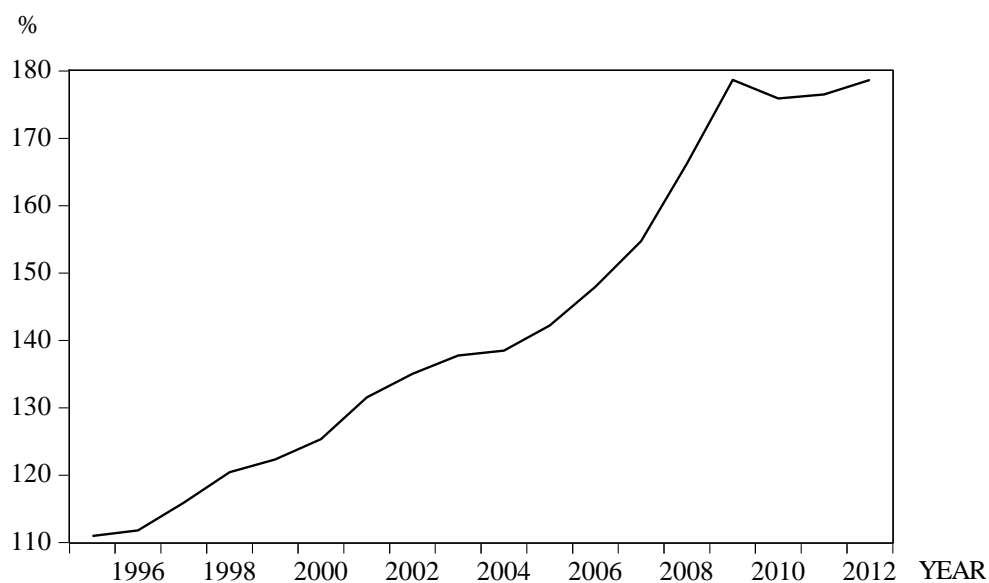
Figure 1. Average total credit as a percentage of GDP, 1995-2012.

The purpose of this study is to investigate the causal relationship between credit and economic growth, by decomposing credit to private sector into household credit and enterprise credit. A Granger causality test is performed to investigate if credit affect economic growth, and if economic growth may have an impact on the credit behaviour as well.

The focus is to specifically evaluate the causal linkage between credit to private sector and economic growth, and therefore the discussion on financial development is excluded. However, with credit to private sector being the most commonly used measurement when investigating the relationship between financial development and economic growth, this study can be generalised and used for that purpose.

Not only does this study add to the literature on the causal relationship between credit and growth in the area of finance and financial development. It also contributes by what seems to be the first study distinguishing between household and enterprise credit when examining the granger causality relationship.

The main findings are the following: By decomposing the credit variable into household and enterprise credit, the Granger causality test indicates that economic growth has a positive effect on enterprise credit. The causal linkage running from enterprise credit to economic growth is somewhat ambiguous, since the Granger causality test provides evidence of both a positive and a negative linkage, depending on lags included. The finding of a negative causal linkage running from enterprise credit to economic growth is not consistent with a majority of previous literature, suggesting that enterprise credit should affect economic growth positively

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through investments. The Granger causality test is only used to evaluate the short-term relationship between credit and economic growth. Since economic growth is a long-term concept the long-term relationship has been calculated. These results show evidence that enterprise credit may have a positive effect on economic growth in the long-run if three lags are included. However, including only one and two lags indicate that enterprise credit has a negative effect on economic growth, even in the long-run. The conclusion that economic growth affects enterprise credit positively remains when calculating the long-run effects.

The findings from the investigations of the causal relationship between household credit and economic growth provide ambiguous results. The Granger causality test shows convincing evidence that economic growth has a positive impact on household credit. If the causal relationship runs the other way, that is, if household credit affects economic growth is less convincing. Nevertheless, relying on literature and previous empirical studies, combined with the results from this study shows that household credit should positively affect economic growth through consumption. Calculating the long-run relationship between household credit and economic growth show that there is a possible bi-directional long-run relationship between these two variables.

Finally, there is a negative correlation between total credit and economic growth, and most findings of this study do not support the view that enterprise credit promote economic growth. The study finds, however, convincing evidence that household credit has an impact on the economy.

The rest of this thesis is structured as follows: chapter 2 presents a theoretical framework in order to clarify how credit and economic growth may be linked. Chapter 3 describes the data, the empirical model and the econometric methodology. The empirical results is presented in chapter 4, including an analysis of the results. Chapter 5 summarizes the main results and provide suggestion for further research.

2. THE EFFECT OF CREDIT AND ECONOMIC GROWTH

In countries where inflation targeting is the primary objective, monetary policy can be used to control the real interest rate. A change in the interest rate has a direct effect on the credit market behaviour, which in turn has an effect on economic growth, both in the short-run and in the long-run. If the economy is growing fast, facing a boom, an increase in interest rate can help to dampen the economy. Credit demand will fall, due to higher interest rates, meaning that consumption and investments decreases. Analogous, the interest rate can be used to boost the economy, where a lower interest rate should increase the demand of credit and hence increase consumption and investments.

This is a short story of how credit can affect economic growth and vice versa. This chapter will provide a more detailed analysis on the effect of credit and economic growth. The interest rate variable will not be included in the empirical model, it is however important to understand how it affects the behaviour of the credit market, which in turn will have an effect on the economy (Bernanke and Gertler, 1995) and is therefore included in the theoretical framework.

The theoretical framework follows partly a Neo-Kaleckian model by Isaac and Kim (2013) but with some modifications to better fit the empirical model conducted in this study. Since the empirical model tests both the short-run and the long-run effect between credit and economic growth, and previous literature has given ambiguous results, this chapter aims to explain different hypotheses on the causal relationship.

2.1 Assumptions

To analyse the relationship between credit and economic growth some assumptions has to be made. These assumptions are mainly made for simplicity. We assume that in each economy there is a central bank controlling the real interest rate based on the economic condition in the country. For simplicity, we assume no governmental interventions.

In the economy there are four different agents; households, enterprises, banks and the central bank. The only role of the central bank is to control the real interest rate depending on the economic condition. If the economy is facing a boom the central bank increases the interest rate to prevent an overheating of the economy and vice versa. As in the model of Isaac and Kim (2013) we assume that the borrowing rate and lending rate is equal for all agents. Credit rationing is often taken into consideration in the discussion of the credit market and economic growth. Since this study does not focus on the effect of credit rationing, this will be excluded in this model, but may have an effect on the credit market (Bernanke, Gertler and Gilchrist, 1998). Finally, the credit behaviour of households and enterprises are unrelated, meaning that

if credit to enterprises increases this does not affect the behaviour of the households, and vice versa (Hung and Cothren, 2002).

2.2 Central bank and banks

According to the Neo-Kaleckian growth model used by Isaac and Kim (2013) banks do not earn profits, since the lending rate and the borrowing rate are equal. Banks are the only financial intermediaries in the economy and hence the only agent reallocating savings deposits from the households into loans, granted to enterprises and households (Lavoie and Godley, 2001). The borrowing and lending rate can only be changed by open-market operations by the central bank. A principal-agent problem exists between banks and borrowers, meaning that banks cannot fully control the intention of the loans granted to households and enterprises. This means that some of the loans may or may not have a positive effect on economic growth. For further discussion about the principal-agent problem in the credit market see for example Bernanke (1995).

2.3 Enterprises

Enterprises borrow money for two reasons; to consume or to invest, assuming that consumption does not have any effect on economic growth. The investment behaviour of enterprises is dependent on the interest rate. The amount that an enterprise has to borrow to consume or invest, depends on retained earnings, meaning that the external funds are dependent on the internal funds. Another assumptions is that there are both feasible and infeasible investments, where only feasible investments will have a positive effect on economic growth. A feasible investments yields a higher probability of an innovation, which enhance economic growth (Aghion and Howitt, 2009). Enterprises can choose to borrow money both for short-term and long-term investments.

According to Bernanke and Gertler (1995) a change of the real interest rate by the central bank should only affect the short-term interest rate. It has however been shown that the long-term interest rates are affected as well, therefore we assume that a change in interest rate affect both short-term and long-term investments decisions.

2.4 Households

There are two types of households that are working and receive wage incomes. The first type of households (H1), deposit the wage income into the bank and earn income on the interest rate. A small fraction of this interest income is used for consumption and the rest is re-deposit in the bank (Isaac and Kim, 2013). The other type of households (H2) uses all income for

consumption, such as housing, durable goods, and interest payment on outstanding loans. If H2 wish to consume more than their disposable income they can finance consumption through loans (Isaac and Kim, 2013). Another reason for households to borrow is to smooth the consumption over time and protect themselves against idiosyncratic shocks (Melzer, 2011). Households demand for credit is dependent on the interest rate.

As for enterprises, the argument about a change in interest rate by the central bank should only affect the short-term interest rate, but has proven to have an effect on long-term interest rate is true for households as well (Bernanke, 1995). We therefore assume that a change in interest rate affects both the short-term and the long-term consumption of households. That is, if a household wishes to buy durable goods or a house the effect of a change in interest rate has the same effect on the borrowing preferences of households.

2.5 The economy and economic growth

Replicate the case when the economy is facing a boom and the central bank wants to prevent an overheating in the economy, by using open-market operations to increase the interest rate. Due to the situation the different agents will act differently.

Consider first the households which deposit money into the bank (H1). If the interest rate increases, these households become willing to save more. Consequently, these households earn more on the saving rate and increases their consumption, which is a small fraction of the interest income (Isaac and Kim, 2013). Additionally, there will be more funds available for households and enterprises, which can be used for consumption and investments. This should have a positive effect on the economic growth.

Secondly, consider the other type of households (H2), which use their wage income for consumption and interest payment on outstanding loans. If the real interest rate increases new loans will be more expensive, which leads to a fall in the demand of credit and consumption. Since the level of consumption is higher than for the other type of households (H1), the total consumption level of the economy should decrease and thereby have a negative effect on the economy. Another consequence is the interest payment on outstanding loans, which become more expensive due to the higher interest rate. If the interest rate increases to a level where households are unable to repay the loans this can have fatal consequences on the economy. If the real interest rate has been on a low level during an extended period of time, house prices and asset prices have likely increased. If suddenly households are unable to repay the loans and pay for their living, they may have to sell their houses to buy something smaller or rent an apartment instead. However, if the demand for houses has fallen and households are not able to

sell their houses, the risk of personal bankruptcy becomes a reality.

On the other hand, Melzer (2011) states that if the households are valuing current consumption higher than future consumption, high interest rate might not affect the demand of credit. Still, if the households are not able to repay the costs of borrowing the problem of personal bankruptcy still remains.

Consider next the enterprises. Since households (H1) are saving more due to the increased interest rate, more credit is available for enterprises. Nevertheless, new loans are more expensive and the borrowing costs on outstanding loans increases. This should decrease the demand of credit, resulting in less investments, which has a negative effect on economic growth. According to Ramey (1993) enterprises which are dependent on external funds are more likely to change their investment behaviour due to the increased interest rate, rather than enterprises holding a larger amount of internal funds. Indirectly, there is a connection between the decreasing demand of household credit and enterprises' production. If consumption fall, enterprises have to reduce output, which in the worst case may lead to higher unemployment and even less consumption.

Figure 2 illustrates a simply cycle of how the credit market and economic growth is correlated. It is simple in the figure, but complicated in reality. The Central banks cannot change the real interest rate in order to stimulate economic growth and leave out the effect on the credit market. In similar fashion the credit market cannot be regulated without having an effect on economic growth.
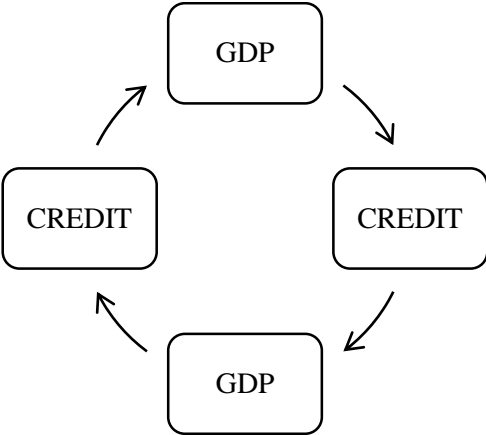
Figure 2. Credit market and economic growth cycle.

2.6 Summary

Before presenting the data and the methodology this section presents the hypotheses arising from the theoretical framework. As the theory is ambiguous, it is not clear what should be expected from the empirical results. There are four possible outcomes based on the theoretical framework.

1) If increased enterprise credit leads to more feasible investments it should have a positive effect on economic growth. If this is true, there should be a positive causal link running from enterprise credit to economic growth.

2) If higher economic growth leads to higher enterprise credit there should be a positive causal link running from economic growth to enterprise credit. This may appear when enterprises choose to borrow money to increase output due to higher demand caused by higher growth rate.

3) If increased household credit leads to economic growth, this means that the consumption market are highly correlated with the economic growth rate. If this is true, there should be a positive causal link running from household credit to economic growth.

4) If household credit is affect by economic growth, there should be a positive causal link running from economic growth to households. If this is the case economic growth can increase the wealth among individuals, when house and asset prices increases. To be able to buy more houses and assets, household borrow money.

It is highly possible that two or more cases occur at the same time, meaning that there is a bi-directional causality between the considered variables.

3. DATA AND METHODOLOGY

The theory on how credit and economic growth is linked is ambiguous, indicating that the causality between credit and economic growth can run in both directions and the correlation could be either positive or negative. This chapter presents the data and the method used to evaluate the causal relationship.

3.1 Data

This study analyses panel data for 24 developed countries over the time period 1995-2012. To investigate the causal relationship between household credit, enterprise credit and economic growth, data from three databases is collected; OECD Statistics, the World Bank and the Bank for International Settlements (BIS). Household and enterprise (non-financial corporations) credit include loans and debt securities on a yearly average basis and the data for the credit variables is obtained from BIS. To calculate "household credit as a percentage of GDP" and "enterprise credit as a percentage of GDP", data for GDP in national currencies is obtained from the OECD Statistics. Economic growth is measured as annual percentage growth rate of GDP per capita and is obtained from the World Development Indicators (WDI) of the World Bank[3]. The growth rate of GDP per capita is a commonly used measurement of economic growth (see for example Huang et al., (2008); Hassan et al., (2011); Aisen and Veiga, (2013); Sassi and Gasmi, (2014)).

Table 1 lists all countries included in this study and are all ranked as "Very high human development" according to the Human Development Index (HDI). The countries in the study have been chosen for two reasons. First, and most important, all countries are developed countries with inflation target as primary objective, meaning that the interest rate is an important instrument in these economies and has a direct effect on the credit market and economic growth. Second, data for all variables were available for these countries and due to missing data before 1995 for some countries, the time period in this study is limited to 1995-2012. The sample consists of 432 observations.

Some of the previous literature on economic growth has averaged the data over a five years period to remove business cycle events (see for example Siddiqui and Ahmed (2013); Hou and Chen (2013); Sassi and Gasmi (2014)). In this study, the time period only includes 16 years, which would only give three time periods if averaging the data. This is too small to estimate and could therefore give unreliable results and hence yearly data is used, which is

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[3] Data on annual percentage growth rate of GDP per capita has for Singapore and Hong Kong been obtained from respectively Government statistics. See Appendix A.

preferable to avoid seasonal effects. As a robustness check, to avoid the results to be affected by the financial crises, the years during the crises and after the crises (2007-2012) is excluded.

Table 1. Countries list

Australia	Finland	Italy	Portugal
Austria	France	Japan	Singapore
Belgium	Germany	Republic of Korea	Spain
Canada	Greece	Netherlands	Sweden
Czech Republic	Hong Kong	Norway	United Kingdom
Denmark	Hungary	Poland	United States

3.2 Descriptive statistics

Table 2 shows the average growth rate per capita GDP, household credit, enterprise credit and total credit for all 24 countries from 1995 to 2012. Only 5 of 24 countries had a total credit of GDP *below* 100%. Belgium is the country with highest enterprise credit with an average of 137.5%. Denmark has both the highest household credit and the highest total credit, which is on average 106.9% and 203.6%, respectively.

In a study conducted by Arcand, Berkes and Panizza (2012), they found that credit to private sector (total credit in this case) is positive for economic growth until it reaches 100% of GDP. When credit to private sector is more than 100% of GDP it has no longer a positive effect, but a negative effect on economic growth. This would then imply that for 19 countries the correlation between total credit and economic growth should be negative.

The highest average growth rate during these years had Poland, with a rate of 4.42%, and the lowest average growth rate was 0.53% in Italy. The low growth rate of Italy may be explained by the crisis the country faced during 2010. Note that Greece, Portugal and Spain, which also were facing a crisis at the same time have a higher growth rate, indicating that the crisis is not the only explanation of the low growth rate of Italy. Interesting to notice is that both Poland and Italy has a total credit to GDP which is below 100%. If only focusing on these two countries, this may prove what the theory predicts, that is, ambiguous results on how credit affects economic growth. Denmark, which had the highest average credit to GDP had an average growth rate of 0.95% which is among the lowest average growth rates during this period.

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Table 2. Average growth rate per capita GDP (%), household credit (% of GDP), enterprise credit (% of GDP) and total credit (% of GDP), 1995-2012.

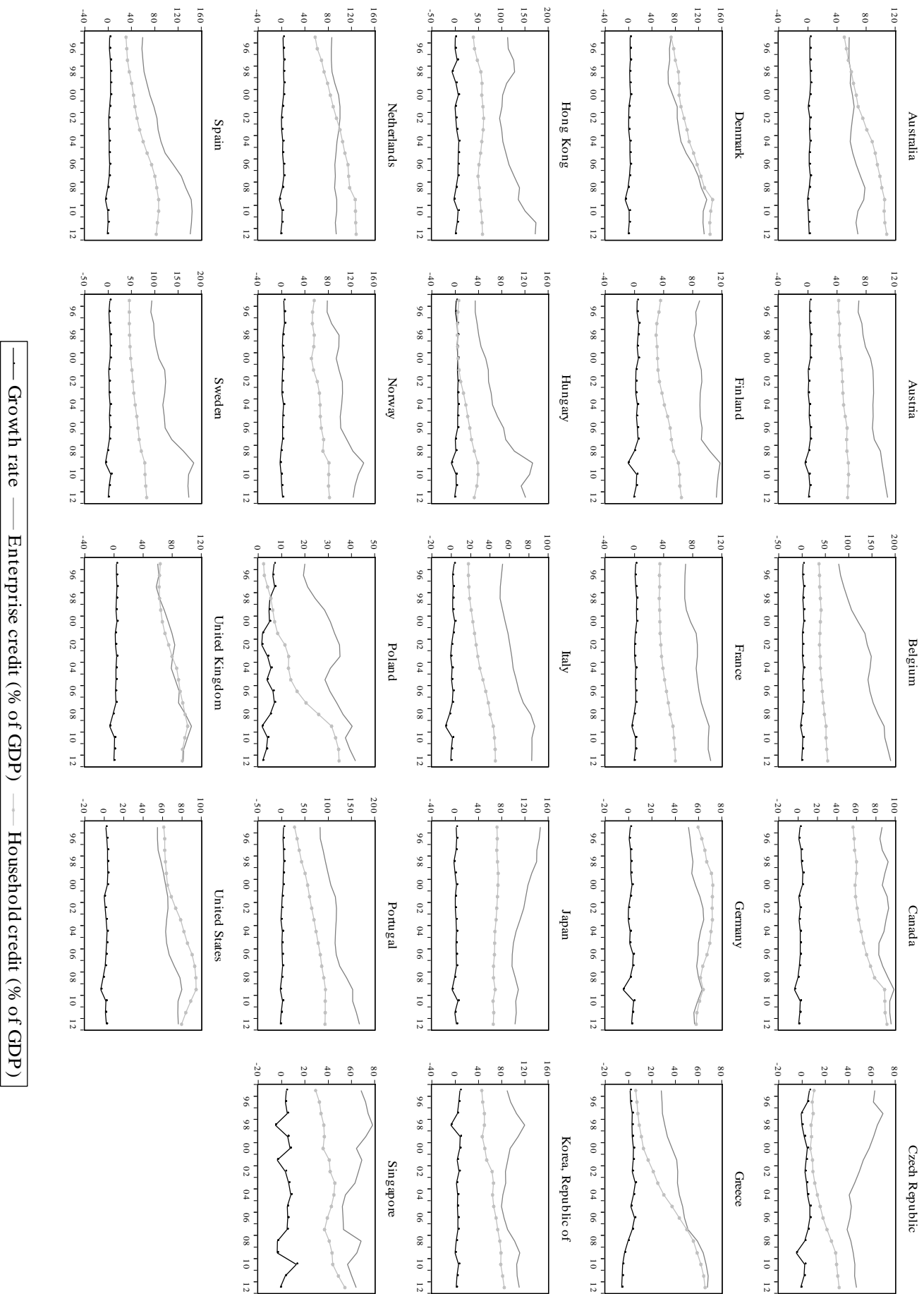| Country	Growth rate per capita GDP	Enterprise credit	Household credit	Total credit
Australia	2.05	63.81	81.84	145.65
Austria	1.73	89.10	49.09	138.19
Belgium	1.26	137.48	42.89	180.37
Canada	1.59	89.89	69.33	159.22
Czech Republic	2.72	50.47	16.36	66.83
Denmark	0.95	96.70	106.93	203.63
Finland	2.31	95.16	43.60	138.76
France	1.04	85.64	41.85	127.49
Germany	1.46	58.18	65.98	124.17
Greece	1.20	45.90	32.43	78.32
Hong Kong	2.57	122.87	53.77	176.64
Hungary	2.26	73.54	18.41	91.95
Italy	0.53	65.98	30.31	96.29
Japan	0.75	116.82	69.46	186.27
Korea, Republic of	3.75	97.07	63.77	160.85
Netherlands	1.55	92.73	98.51	191.24
Norway	1.50	105.67	65.20	170.87
Poland	4.42	31.45	15.76	47.21
Portugal	1.27	119.41	68.23	187.64
Singapore	3.05	64.07	40.36	104.44
Spain	1.37	97.44	59.46	156.90
Sweden	2.18	128.70	59.89	188.59
United Kingdom	1.71	81.47	80.52	161.99
United States	1.53	66.37	77.33	143.70
All	1.86	86.50	56.30	142.80

Figure 3 displays how the average level of credit to enterprises as a percentage of GDP (CE) and credit to households as a percentage of GDP (CH) have increased from 1995 to 2012 for all 24 countries combined. Both credit to enterprises and households exhibit a positive trend during the time period, except for a small decline right after the financial crisis in 2008.

In the beginning of the sample period the gap between enterprise and household credit is larger than in the middle of the period (before the crisis). This implies that household credit has grown faster than enterprise credit from 1995 to 2007. The gap is again larger after the crisis, but this is caused by a larger increase in enterprise credit.
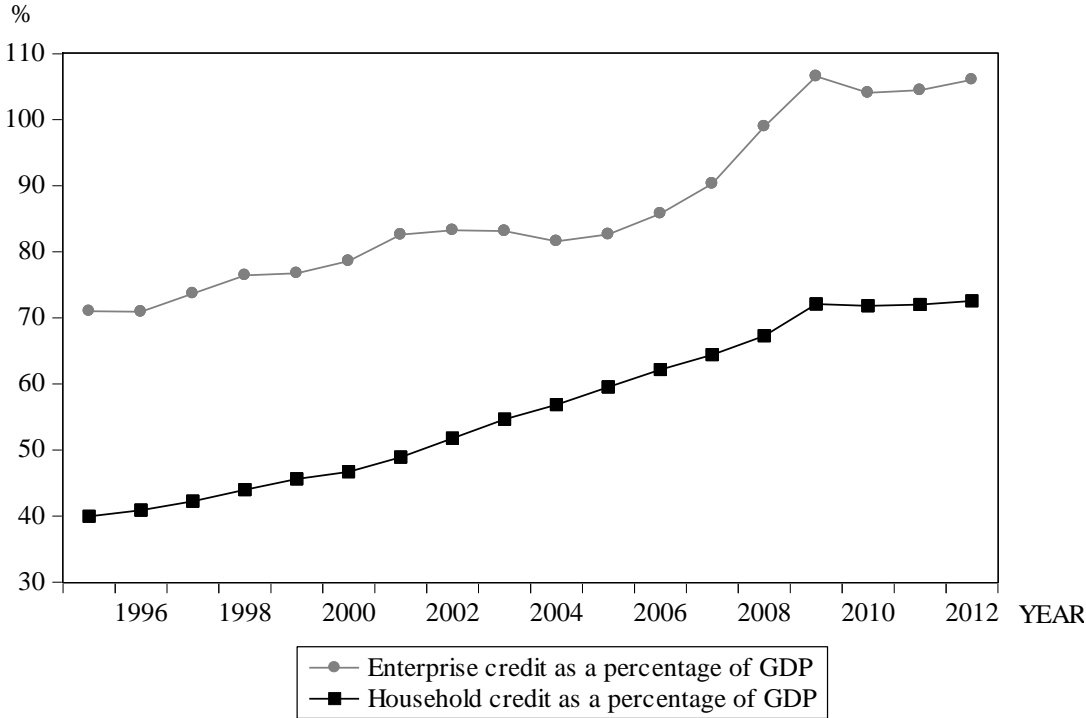
Figure 3. Average enterprise credit to GDP and household credit to GDP, 1995-2012.

It may be the case that this upward going trend of the credit variables are not the same for all countries. Figure 4 shows the average credit variables and average growth rate of per capita GDP for each country from 1995 to 2012. A majority of the countries have had an upward going trend during this period for both credit variables. Recalling from Table 2, Poland was the country with highest average growth rate and with low household and enterprise credit. Nonetheless, looking at Figure 4 reveals that both credit to households and credit to enterprises have increased during the sample period, starting at low levels, compared to other countries. For most countries credit to enterprises is still larger than credit to households. There are however four countries where household credit is larger than enterprise credit. These countries are Australia, Denmark, Germany and United States.

Figure 4. Average growth rate per capita GDP, household credit and enterprise credit for each country,

Growth rate — Enterprise credit (% of GDP) — Household credit (% of GDP)

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It is difficult to evaluate the relationship between credit and economic growth in Figure 4, since the pattern of credit growth is different for each county. Note that for a majority of the countries the credit level of households and enterprises have increased during the sample period. According to theory and previous empirical research a majority find a positive correlation between credit and economic growth. Even when not distinguishing between enterprises and households, that is, considering the total credit as a percentage of GDP, many researchers find a positive correlation between these two variables (see for example King and Levine, 1993). However, Cecchetti et al. (2011) argue that there is only a positive relationship between economic growth and enterprise credit if enterprise debt is below 90% of GDP, and for household the debt should be below 85% of GDP. For many countries these percentage have been exceeded.

Figure 5 displays a scatter plot of total credit and the growth rate of per capita GDP. There is no indication of a positive relationship between total credit to GDP and the growth rate. Indicated by the trend line in Figure 5, it appears to be a negative correlation between total credit and economic growth. Excluding the crisis years does not change the correlation (not shown here).
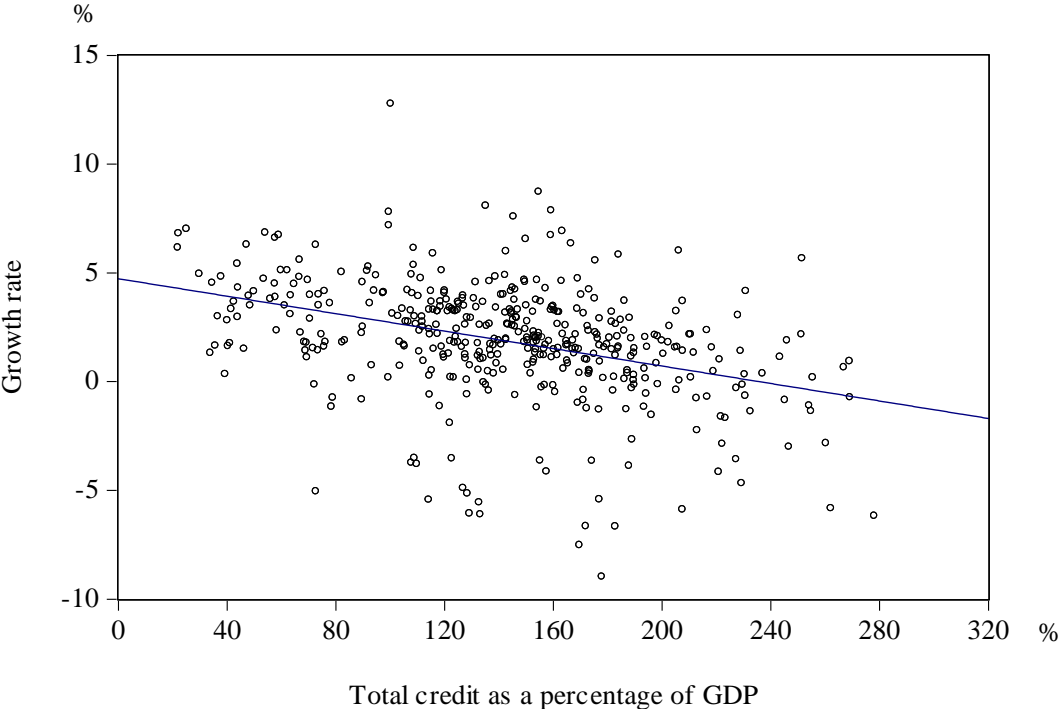
Figure 5. Average growth rate of per capita GDP and total credit, including household and enterprise credit, 1995-2012.

Total credit includes both household and enterprise credit. Even if household credit may have a positive effect on economic growth (if credit is used for consumption) the credit to enterprises should have the greatest effect on economic growth. Credit to enterprises can be used for investments, which may increase the possibility of an innovation. Increased investments may effect the output of enterprises, increase labour demand and hence increase the overall wealth in the economy. Increased wealth may lead to a higher consumption level among households, promoting economic growth. Figure 6 presents a scatter plot between enterprise credit and economic growth. Even when excluding household credit, it still appears to be a negative relationship between enterprise credit and the growth rate.

Intersting to notice is the statement of Arcand, Berkes and Panizza (2012) who claim that when credit to private sector exceeds 100% of GDP, credit does no longer have a positive effect on economic growth. If only including credit to enterprises when it is 60 to 100% of GDP, this study also finds a positive relationship between enterprise credit and economic growth (not shown here). However, indicated in Table 2, a majority of the countries included in this study have a enterprise credit to GDP ratio greater than 100% or is very close to reaching that level. Therefore it is still interesting to evaluate the causal relationship.
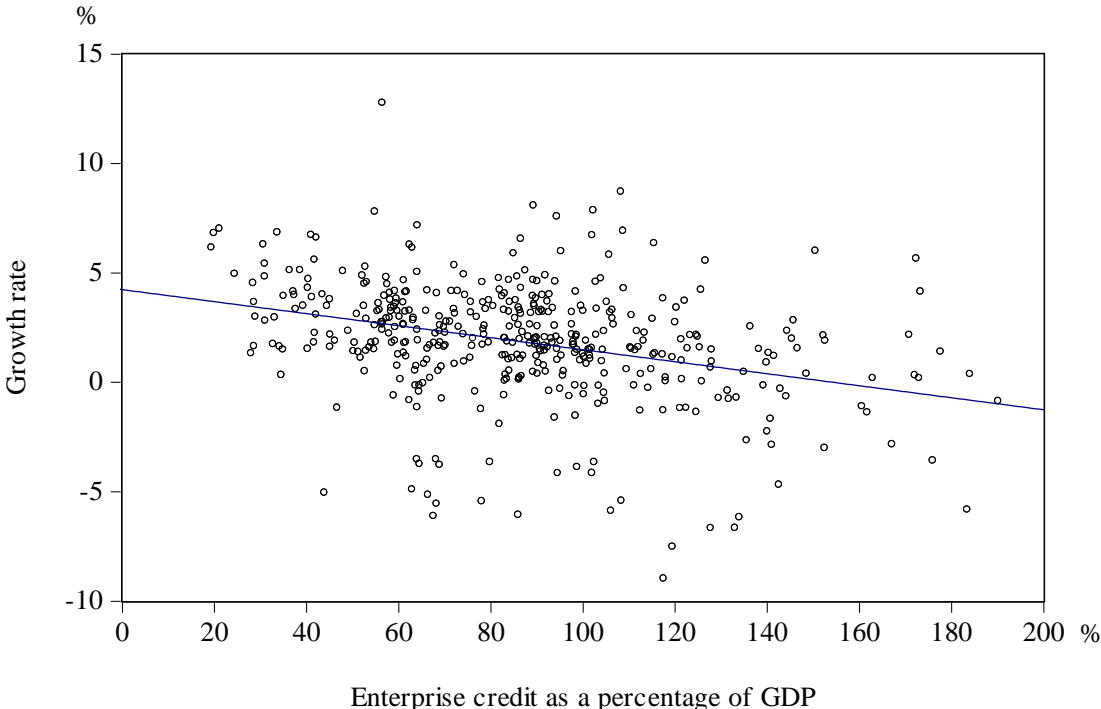
Figure 6. Average growth rate of per capita GDP and enterprise credit, 1995-2012.

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The relationship between household credit and economic growth is illustrated in Figure 7. As for the enterprise credit, there seems to be a negative relationship between household credit and economic growth. According to theory enterprise credit should be positively correlated with economic growth through investments, and household credit should be positively correlated through consumption. However, according to the Figure 6 and 7 there seems to be a negative correlation.
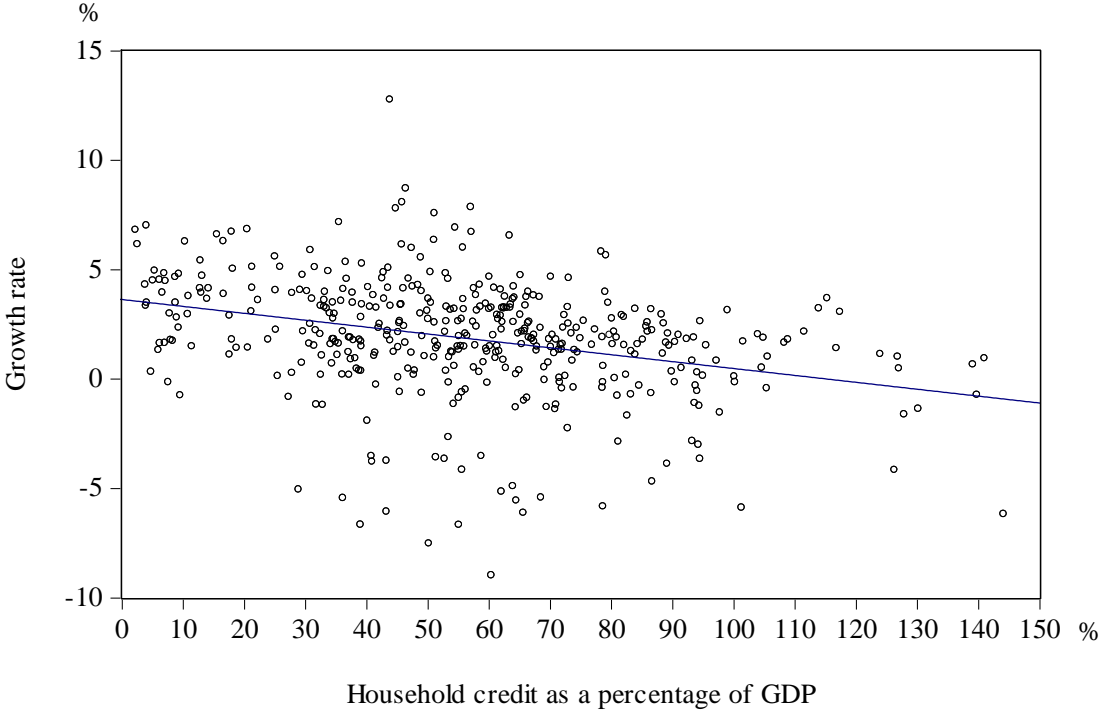
Figure 7. Average growth rate of per capita GDP and household credit, 1995-2012.

Table 3 presents the correlation between the credit variables and growth rate of per capita GDP. As indicated in Figure 3 there is a negative correlation between total credit to GDP and the growth rate. Both credit to enterprises and credit to households are negatively correlated with economic growth. The correlation remains negative, if somewhat smaller, even when lagging the credit variables. The correlations are expected to be fairly close to the correlation matrix in the study of Sassi and Gasmi (2014), which have evaluate the relationship between household, enterprise credit and economic growth for 27 European countries over the same sample period, 1995-2012. They found a positive correlation between enterprise credit and economic growth, and a negative correlation between household credit and economic growth. An explanation to the different results of the correlation matrix may be different measurements of the credit variables, since the data has been obtained from two different sources. Even if both studies

investigate the correlation for developed countries, the countries included in the studies are not identically and may further explain the different results.

Table 3. Correlation matrix

	Growth rate	Enterprise credit	Household credit	Total credit
Growth rate	1.000			
Enterprise credit	-0.329	1.000		
Household credit	-0.322	0.459	1.000	
Total credit	-0.381	0.879	0.828	1.000

1 lag

	Growth rate	Enterprise credit	Household credit	Total credit
Growth rate	1.000			
Enterprise credit	-0.286	1.000		
Household credit	-0.295	0.466	1.000	
Total credit	-0.338	0.878	0.833	1.000

2 lags

	Growth rate	Enterprise credit	Household credit	Total credit
Growth rate	1.000			
Enterprise credit	-0.248	1.000		
Household credit	-0.294	0.473	1.000	
Total credit	-0.314	0.877	0.838	1.000

3 lags

	Growth rate	Enterprise credit	Household credit	Total credit
Growth rate	1.000			
Enterprise credit	-0.232	1.000		
Household credit	-0.289	0.477	1.000	
Total credit	-0.301	0.875	0.842	1.000

3.3 Empirical model

To investigate the causal relationship between household credit, enterprise credit and economic growth a Granger causality test is performed. Both a two-step difference GMM and a system GMM estimator is used. In general the system GMM estimator is preferred, since it has proven to give more efficient estimates. Nevertheless, if the sample is too small the system GMM may give downward bias results and hence the difference GMM will be used as well (Siddiqui and Ahmed, 2013). The following VAR model is estimated

$$GC_{it} = b_{10} + b_{11}GC_{i,t-i} + b_{12}\Delta CH_{i,t-i} + b_{13}\Delta CE_{i,t-i} + b_{14}X_{i,t-i} + \varepsilon_{1it} \qquad (1)$$

$$CH_{it} = b_{20} + b_{21}GC_{i,t-i} + b_{22}\Delta CH_{i,t-i} + b_{23}\Delta CE_{i,t-i} + b_{24}X_{i,t-i} + \varepsilon_{2it} \qquad (2)$$

$$CE_{it} = b_{30} + b_{31}GC_{i,t-i} + b_{32}\Delta CH_{i,t-i} + b_{33}\Delta CE_{i,t-i} + b_{34}X_{i,t-i} + \varepsilon_{3it} \qquad (3)$$

Where *GC* is the GDP per capita growth rate, *CE* is the credit to enterprises as a percentage of GDP and *CH* is the credit to households as a percentage of GDP. The control variables inflation, trade openness and government expenditure are represented by X, and ε_{it} is the error term. The control variables are often used in growth models (see for example Sassi and Gasmi, (2014); Beck et al., (2000)) where inflation is the annual percentage change in consumer price index, government expenditure is total government consumption as a percentage of GDP and trade openness is the sum of export and import as a percentage of GDP (see Appendix A for description of the variables).

The GMM estimator has been specifically developed for dynamic panel data models by Arellano and Bond (1991) and Arellano and Bover (1995) and is commonly used in the case of growth models. Estimating this VAR model with OLS could give inconsistent and biased results due to country-specific effects and endogenous variables (Levine, Loayza and Beck (2000); Bond et al., (2001); Siddiqui and Ahmed, (2013)). Least Square Dummy Variable Regression (LSDV) is the best alternative model when investigating growth models, but if T is smaller than 30, which it is in this study, LSDV does not outperform the GMM estimator (Judson and Owen, 1999). Hence, the panel GMM estimator is the best estimator in this case.

4. RESULTS AND DISCUSSION

The first section of this chapter presents the results and a discussion concerning the Granger causality test. The VAR model has been estimated including 1 up to 3 lags and the results are all reported in the first section. Section 4.2-4.4 furthermore discuss and present the estimated parameters from the Granger causality test including 1 lag. The reason for reporting the estimated parameters exclusively for 1 lag, and not for the other lags, is because this model gives the most efficient estimates. Additionally, as a robustness check, the 1-lag VAR model has been re-estimated excluding the crisis years and the results of this model is reported in section 4.2-4.4. Finally, section 4.5 presents the calculation of the long-run effect between credit and economic growth.

4.1 The Granger causality test

The results from the Granger causality test is reported in Table 4. The first part of the table presents the results obtained by the difference GMM estimator and the second part presents the results from the system GMM. One disadvantage using two estimators is the risk of ambiguous results, which may occur if one estimator is more efficient than the other. However, if both estimators show similar results these may be considered as robust. In this study there are two results which are supported by both estimators (regardless of lags included). The first is that the GDP per capita growth rate (GC) positively affects enterprise credit (CE). This finding is consistent with the idea that higher growth rate increases the aggregate demand of an economy, leading to an increased production output. More human and physical capital may be acquired by the enterprises, whereby external funds is needed, leading to a higher demand for credit.

The second result which is obtained by both estimators is that the GDP per capita growth rate (GC) positively affects household credit (CH). This is an important result in this study, since it confirms the potential consequences of monetary policy. If central banks decide to lower the real interest rate in order to stimulate the economy, this increases the demand of household credit. If the real interest rate is kept at a low level during a longer time period this might have devastating consequences on the economy. What happens in the economy, if the interest rate is kept at a low level, is that the demand of credit sustains. As the economy grows, prices start to increase and households which have borrowed money for housing become wealthier. If the households believe that the interest rates are staying at low levels and that the economy will continue to grow they borrow more for housing, to increase the wealth additionally. The last financial crisis in the US provides evidence on what happens when the household debt level is

becoming too large and households are not able to repay the loans. This is of course one of the worst case scenarios, but still, existent evidence on what might happen.

Table 4. Granger causality test

Difference GMM	1 lag	2 lags	3 lags
Granger causality between GC and CE	CE* $\leftrightarrow$ GC	GC $\rightarrow$ CE	GC $\rightarrow$ CE
Granger causality between CH and CE	-	-	-
Granger causality between GC and CH	GC $\rightarrow$ CH	GC $\leftrightarrow$ CH	GC $\leftrightarrow$ CH
System GMM	1 lag	2 lags	3 lags
Granger causality between GC and CE	CE* $\leftrightarrow$ GC	CE $\leftrightarrow$ GC	GC $\rightarrow$ CE!
Granger causality between CH and CE	-	-	-
Granger causality between GC and CH	CH $\leftrightarrow$ GC	GC $\rightarrow$ CH	GC $\rightarrow$ CH!

Note: The causality test is based on a 5% significance level- "–" indicates no granger causality. * indicates a negative effect. "!" indicates that these results should be taken with cautiousness, since the estimates do not pass the Sargan and Hansen test.

Furthermore, the findings from the Granger causality test provide evidence that the causality runs from household credit to economic growth, as well. This support the theoretical view of Pereira (2008) who argues that relaxing the borrowing constraints of households can increase production and positively affect economic growth. If household credit is used for consumption, this may increase the growth rate of the economy in the short-run. According to Wunder (2012) many economists and researchers argue that the business cycle has mainly been driven by household consumption and not by enterprise investments the last couple of years.

Recalling the theoretical view of Schumpeter (1912) which states that finance is important to promote economic growth, by channel funds from savers to its most efficient use. If an economy has well-functional banks which can lend money to enterprises with feasible projects, this may lead to an innovation and hence enhance economic growth (Aghion and Howitt, 2009). It seems, however, to be the case that credit is no longer channelled mainly to enterprises with feasible projects, but to households as well. If households use the credit for consumption this may, as stated before, drive the growth rate of the economy. Nonetheless, according to Durkin et al. (2010) the largest part of household credit is used for housing, which should not have a positive effect on the growth rate of the economy. The positive relationship

found in this study may be explained by the fact that if households are using the credit for housing and the house prices increases, households are likely to use the increased wealth for consumption and hence positively affect economic growth.

Finally, the results from the Granger causality test reports ambiguous results whether enterprise credit has an effect on economic growth, and if this effect is positive or negative. The difference and system GMM indicate that when one lag is included enterprise credit has a negative effect on economic growth. The finding of a negative causal relationship running from enterprise credit to economic growth is discussed in next section.

4.2 The effect on the growth rate

Table 5 reports the estimated parameters when economic growth (GC) is set as dependent variable. The first and second column reports the results from the difference and system GMM, respectively. Both estimators show negative and significant coefficients (-7.025 and -10.764) for the enterprise credit variable. This indicate that lending money to enterprises, do not enhance economic growth, but rather decrease the growth rate. This result is somewhat surprising, since a majority of previous literature, both theoretical and empirical, find a positive causal linkage between enterprise credit and economic growth (see for example Demirguc-Kunt & Levine (2008) and Johannes et al. (2011)). A possible explanation why this finding is not consistent with theoretical predictions is because theory mainly refers the positive link between enterprise credit and economic growth as a long-term relationship. Enterprises may borrow money for investments, which should have a positive effect on the economy, but it is important to remember that the positive impact of investments may take time and thereby affect the economy in a future time period. If the investments are leading to an innovation this is assumingly not affecting the growth rate in the first time period, since it takes time to implement the innovation process (Aghion and Howitt, 2009). It may also be the case that the credit channelled to enterprises is not used for investments, or the projects are not feasible, and thereby does not promote economic growth.

Another possible explanation why this study finds a negative relationship compared to previous studies is the composition of the credit variable and the type of countries included in the studies. Beck et al. (2000), for example, investigated empirically the relationship between financial intermediary development and economic growth. As variables they have measured financial intermediary as "private credit as a percentage of GDP" and economic growth as "real per capita GDP growth rate", which is the same variables chosen in this study, except that private credit has been decomposed into household and enterprise credit. Beck et al. (2000) find

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a positive linkage running from private credit to economic growth both for developing and developed countries, using the same method as in this study. The two reasons why the findings of these study differ from their study may be explained by the composition of the credit variable and also by the fact that they included both developed and developing countries. This is supported by Calderón and Liu (2003) which find that the positive effect of private credit on economic growth is larger for developing countries, compared to developed countries. Furthermore, Demetriades and Hussein (1996) highlight in their study the importance of not treating developing and developed countries as homogenous when evaluating the relationship between financial development and economic growth, which can lead to misleading conclusions.

Table 5. The effect on economic growth

	Dependent variable: Growth rate per capita GDP (GC)		
	Difference GMM (all years included)	System GMM (all years included)	Difference GMM (crisis years excluded)
GC_{t-1}	7.845 (0.057)	26.596*** (0.024)	-19.782** (0.079)
CE_{t-1}	-7.025** (2.574)	-10.764*** (1.319)	-10.587*** (3.598)
CH_{t-1}	0.903 (5.322)	10.349*** (3.959)	0.611 (8.619)
INF_{t-1}	-0.0902* (0.053)	-0.0378 (0.030)	-0.116** (0.058)
$TRADE_{t-1}$	0.0305*** (0.007)	0.0025 (0.004)	0.0673*** (0.013)
GEX_{t-1}	0.4364*** (0.149)	-0.0303 (0.042)	0.922*** (0.226)

*, ** and *** indicate significant level at 10%, 5% and 1%, respectively. The standard errors are given in the parenthesis.

The effect of household credit (CH) on economic growth (GC) is positive (0.903) and (10.349), and significant for the system GMM. The positive relationship between household credit and economic growth is expected. If household borrow money and the consumption level increases this has a positive effect on the economy. The problem occurs when i) the proportion of credit is too large compared to the income of household, ii) credit is mainly used for housing, iii) asset prices are affected. The first problem affects economic growth negatively if household

are not able to repay the loans, either because the large amount of the debt or due to increased interest rates. This lead to a drop in consumption level, affecting economic growth negatively and in worst case leads to a financial crisis in the economy. The second problem arise if a larger part of the credit is used for housing, which does not contribute to the production in the same way as consumption does. If household credit is not transformed into a new value in the economy, for example into the production sector, the problem of excess credit occurs. As credit works in the same way as real money this can lead to monetary inflation. The third problem is related to the second problem, where household credit is not used for consumption. If households borrow money for housing the prices on the house market are likely to increase, where a too rapid rise in prices creates the risk of a bubble and financial crisis. Therefore, a not so realistic interpretation of this finding is that if household continue to borrow more, economic growth can continue to grow, especially if it used for wrong things.

As a robustness check, the third and final column reports the results when the VAR model has been re-estimated excluding the crisis years of the financial crises (US and Euro crisis). The time period estimated is 1995-2006. Credit to enterprises remains negative (-10.587) and significant. This strengthen the previous findings, including the entire sample period.

Household credit remains positive (0.611), but insignificant excluding the crisis years. The insignificant estimates are expected since the model has been re-estimated using the difference GMM, which also gave insignificant result including the whole time period. The system GMM may be preferred prior to the difference GMM, since it has proven to perform better due to stronger instruments compared to the difference GMM (for further details see Roodman (2009)). If the problem of weak instruments is the case here, the results of system GMM may be more reliable and explain why the household credit variable is insignificant. Comparing the first results from the difference and system GMM including the whole sample period gives indications that weak instruments is a problem in this model. This is supported by performing a Sargan-Hansen test on both models, which give indications of weak instruments for the difference GMM, but appropriate instruments for the system GMM.

The sign and significance of the control variable are not of importance and the analysis of these coefficients are therefore excluded in the analysis.

4.3 The effect on enterprise credit

Table 6 reports the estimated parameters when enterprise credit (CE) is set as dependent variable. The GDP per capita growth rate (GC) is the coefficient of interest in this table, which is positive and significant (0.72) for both estimators. The interpretation of this finding is that

the demand of credit increases due to higher growth rate and higher aggregate demand (Patrick, 1966). If the growth rate continues to be high and the economy booms, central banks can use monetary policy to dampen the economy, to prevent it from over-heating. This should then decrease the demand of credit due to higher interest rates. If the real interest rate is kept at a low level during a longer time period, promoting the economy to grow, the credit level is likely to increase. Credit is today seen as necessary to promote economic growth, and many central banks have lowered the real interest rate in order to stimulate the economy. But if economic growth itself increases the credit level and this level is allowed to continue to grow as a percentage of GDP this may once again lead to financial problems.

Table 6. The effect on enterprise credit

	Dependent variable: Enterprise credit to GDP (CE)		
	Difference GMM (all years included)	System GMM (all years included)	Difference GMM (crisis years excluded)
GC_{t-1}	0.718*** (0.001)	0.715*** (0.000)	0.817*** (0.002)
CE_{t-1}	0.325*** (0.059)	0.472*** (0.0361)	0.395*** (0.073)
CH_{t-1}	-0.171 (0.122)	-0.052 (0.069)	-0.033 (0.175)
INF_{t-1}	0.0000 (0.001)	0.0010 (0.0007)	-0.000 (0.001)
$TRADE_{t-1}$	-0.0002 (0.0001)	0.0001** (0.0007)	-0.000 (0.000)
GEX_{t-1}	-0.0116 (0.003)	-0.0034 (0.002)	-0.009* (0.005)

*, ** and *** indicate significant level at 10%, 5% and 1%, respectively. The standard errors are given in the parenthesis.

According to the findings in this study there is no bi-directional causal relationship between enterprise credit and economic growth, as theory predicts. The strongest causal linkage is running from economic growth to enterprise credit, and not the opposite way, which theory predicts. That is, lowering the interest rates in order to stimulate enterprise investments do not seem to promote economic growth in developed countries.

Excluding the crisis years does not change the previous finding. The GDP per capita growth rate (GC) coefficient remains positive and significant (0.82).

4.4 The effect on household credit

The result of the Granger causality test indicate that economic growth both increases the level of enterprise credit and household credit. Even if enterprise credit has increased in similar rate as household credit (see Figure 3), the discussion among politicians and scholars have focused on the increasing household debt. It is therefore important to evaluate, not only how household credit affects economic growth, but what impact the growth rate has on household debt as well. Table 7 reports the estimated parameters when household credit (CH) is set as dependent variable. The coefficient of interest in this table is the growth rate coefficient (GC), which is positive and significant (0.231 and 0.265) for both estimators.

Table 7. The effect on household credit

	Dependent variable: Household credit to GDP (CH)		
	Difference GMM (all years included)	System GMM (all years included)	Difference GMM (crisis years excluded)
GC_{t-1}	0.231*** (0.001)	0.265*** (0.000)	0.225*** (0.001)
CE_{t-1}	-0.026 (0.025)	0.015 (0.025)	-0.036 (0.031)
CH_{t-1}	0.349*** (0.052)	0.529*** (0.107)	0.167** (0.074)
INF_{t-1}	-0.0002 (0.0005)	0.0007 (0.0006)	-0.0001 (0.0001)
$TRADE_{t-1}$	-0.0003*** (0.000)	0.000 (0.000)	-0.0001*** (0.0001)
GEX_{t-1}	-0.0116*** (0.001)	0.0006 (0.0006)	-0.007*** (0.002)

*, ** and *** indicate significant level at 10%, 5% and 1%, respectively. The standard errors are given in the parenthesis.

The theoretical and empirical literature evaluating the causal linkage running from household credit to economic growth is extensive (see for example Galor and Zeira (1993); Jappelli and Pagano (1994); De Gregorio (1996); Dos Santos (2011)). Unfortunately, there is not much empirical literature evaluating how the growth rate of the economy may affect household credit. One possible explanation for this may be that economic growth should not theoretical have a direct effect on household credit. However, as interest rates are kept at low levels to increase the growth rate of the economy, household debt is likely to increase at the same time. The causal

relationship running from economic growth to household credit is only existing due to the combination of low interest rates.

4.5 Long-run effect

The Granger causality test only reports the short-term effects, which is highly interesting since monetary policy mainly affect the short-term factors in the economy. Nevertheless, aiming for economic growth is an important objective for many countries and hence it is interesting to evaluate the long-run effect between credit and economic growth.

Table 8 presents the long-run effects calculated on 1 to 3 lags. In this model the difference GMM estimator is more reliable than the system GMM when including 3 lags. This is because we reject the null hypothesis in the Sargan-Hansen test. Based on this, the analysis of the system GMM will be excluded here, but the results are still presented in Table 8.

One result stands out compared to the short-term effect. When calculating the long-term effect between credit to enterprises and economic growth it remains negative for one and two lags, which is the same conclusion stated in the results from the short-term Granger causality test (for the difference GMM). However, when including three lags, credit to enterprises suddenly has a positive effect on economic growth. This is supported by studies from McKinnon (1973), Shaw (1973), King and Levine (1993), Demirguc-Kunt & Levine (2008) and Johannes et al. (2011). The theory predicts that if the interest rate decreases, firms are more willing to borrow money for investments. Since investments take time, finding a long-term relationship between enterprise credit and economic growth is more accurate than finding a short-term relationship. The results indicate that enterprise credit is affected by economic growth as well. This may be explained by the expectations of enterprises. If enterprises expect the economy to be in a boom for a time period, they may be more willing to borrow money for investments. Still, including 1 and 2 lags do not give indication of a long-term relationship.

Table 8. Long-run effect between household credit, enterprise credit and economic growth

Difference GMM	1 lag	2 lags	3 lags
$CE \rightarrow GC$	-7.624	-6.165	8.8078
$GC \rightarrow CE$	0.011	0.012	0.021
$CH \rightarrow GC$	0.980	18.015	9.316
$GC \rightarrow CH$	0.0004	0.0003	0.0000

Continue Table 8. Long-run effect between household credit, enterprise credit and economic growth

System GMM	1 lag	2 lags	3 lags
CE → GC	-14.664	-4.556	-24.204*
GC → CE	0.014	0.007	0.019
CH → GC	14.098	2.431	-8.222*
GC → CH	0.0006	0.0004	-0.0003

Crisis years excluded	1 lag	2 lags	3 lags
CE → GC	-8.838	-12.363	10.947
GC → CE	0.014	0.014	0.014
CH → GC	0.510	26.625	29.670
GC → CH	0.836	0.000	-0.0001

* These results should be taken with cautiousness, since the estimates do not pass the Sargan-Hansen test.

Further, calculating the long-term relationship between household credit and economic growth, the bi-directional causal relationship remains. The findings are somewhat surprising, since household credit that is used for consumption should mainly have a short-run effect on the growth rate (Dutt, 2006). Assuming that household credit is not used for consumption, but for housing this may still have a long-term effect on the economy. According to Gan (2010) households' wealth mainly come from houses, meaning that if house prices increase the wealth of the household increases. Increasing wealth may lead to higher consumption and affect economic growth positively. This means that households do not borrow money to consume, but for housing, which lead to higher consumption level, if house prices increases. There are other explanations how household credit can have a long-term effect on economic growth. According to Durkin et al. (2010) a large amount of household debt come from student loans, where education is assumed to have a positive effect on economic growth in the long-run.

It is important to notice that not all economies are characterised by consumption markets, meaning that for some countries an increase in credit does not affect the consumption level and do not have a significant impact on productivity and output, or economic growth (Hung and Cothren, 2002). Nevertheless, the countries included in this study seems to be characterised by

strong consumption markets, due to the positive causal link between household credit and economic growth. Excluding the crises years do not change the estimates noticeably.

Even if the results of this study show indications of a positive relationship between household credit and economic growth, this should be a warning sign and not a positive finding. The importance of consumption is nothing new, but how household finance consumption has changed. Today households do not decide the consumption level upon the wage income, but the obtainability of credit and increasing house prices. The problem is that if household credit today is the main driving force of the economy, increasing the interest rate and hence force the consumption level to drop may have severe consequences on the economies.

The overall conclusion is that credit can be both positive and negative for the economy and economic growth depending on what it is used for. There are two possible actions preventing the household debt to continue to grow i) increase the interest rate, ii) regulate the credit market. Nevertheless, no matter what action taken, there are likely to be negative consequences on the economies, in one way or the other.

5. CONCLUDING REMARKS

In the beginning of the 20th century Schumpeter (1912) stated that financial development is an important factor considering economic growth. He argued that a well-functional financial system can enhance economic growth, since a better financial system promotes innovation and technological improvement, which affect growth positively. Today private credit as a percentage of GDP has reached the highest level of all time in many developed countries, and the attitude towards credit has changed. Years of financial crises partly caused by credit has taught us that credit can have severe consequences on an economy.

Previous studies investigating the relationship between credit and economic growth, has used credit to private sector as a variable. This credit composition include both household and enterprise credit. In this study these two credit variable has been decomposed to evaluate the separate effect on the economy. The main findings of the Granger causality test is that there is a bi-directional causal relationship between household credit and economic growth. This is an important finding since household consumption is today the main driving force of the business cycle, where credit can be used to increase the consumption level. On the other hand, the last financial crisis in the US provided evidence on what happens if household debt increases too much. The other main finding of the Granger causality test is that economic growth has a positive impact on enterprise credit, but there is a negative causal linkage running from enterprise credit to economic growth. This strengthen the conclusion that household credit has a greater effect on economic growth than enterprise credit.

In the long-run the bi-directional relationship between household credit and economic growth remains. The effect of enterprise credit on economic growth become positive in the long-run, including three lags. However, when including 1 and 2 lags the relationship running from enterprise credit to economic growth is still negative. The results show that the growth rate of the economy positively affect enterprise credit in the long-run.

Does this mean that all we have to do is borrow money, consume, live the life we want and by that, we help the economy to grow? It sounds too good to be true, and it probably is. A huge problem by letting the household being the driving force of the economy is that they are sensitive. They are sensitive to price changes, to changes in interest rates and just because households consume a lot today does not mean that they will consume a lot next year, or even tomorrow. Speculations on the house market can rapidly change the behaviour of households, which in worst case can lead to financial crises. It does not have to be this way, but there is a possibility, and most important, there are historical events pointing towards this scenario.

This thesis shows that it is important to decompose enterprise and household credit, and that the relationship on how these two variables separately affects economic growth has to be further investigated. The last crises in the US and Europe indicate that more research are needed on how credit affects the economy in developed countries and what credit is used for. I believe that the length of the time period is not as important as including more countries into the study. Even if history can teach us about the consequences of finance, the availability of credit we have today is not something we have seen in the past and therefore the consequences of regulations should be investigated.

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APPENDIX A

Definition of variables

    GC   **GDP per capita growth (annual %)**

Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2005 U.S. dollars. Data obtained from World Data Indicators of the World Bank.

    CE   **Credit to enterprises**

Loans and debt securities of non-financial corporations (both private and public owned) in domestic currency. From BIS quarterly data has been obtained and recalculated as yearly average. To obtain enterprise credit to GDP, credit has been divided by nominal GDP in domestic currency. The nominal GDP in domestic currency has been obtained by OECD Statistics besides for Hong Kong and Singapore, which has been obtained from Census and Statistics Department of Hong Kong, respectively Department of Statistics of Singapore.

    CH   **Credit to households**

Loans and debt securities of households in domestic currency. From BIS quarterly data has been obtained and recalculated as yearly average. To obtain household credit to GDP, credit has been divided by nominal GDP in domestic currency. The nominal GDP in domestic currency has been obtained by OECD Statistics besides for Hong Kong and Singapore, which has been obtained from Census and Statistics Department of Hong Kong, respectively Department of Statistics of Singapore.

TC   **Total credit**

Total credit of enterprises and households to GDP. The sum of enterprise credit and household credit divided by nominal GDP.

INF   **Inflation, consumer prices (annual %)**

Annual percentage change in consumer price index. Data obtained from World Data Indicators of World Bank.

TRADE   **Trade openness**

Trade openness is the sum of exports and imports as a percentage of GDP. Both the variables imports (imports of goods and service) and exports (exports of goods and services) have been obtained from the World Data Indicators of the World Bank.

GEX   **Government final consumption expenditure**

Includes all government expenditures for purchases of goods and services as a percentage of GDP. Data obtained from World Data Indicators of the World Bank.