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The Nexus of Financial Development and Economic Growth

Impact on property prices

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Abstract

This study investigates the negative effects generated from the nexus of financial development and economic growth. Through recent years have the financial sector escalated in 'speed' due to the high levels of financial integration which have in turn caused an effect of 'too much finance'. The effect has been notice in the constant increase of property prices and hence private debt. In order to analyze the link closer and test if the increase in private debts and property prices is a main cause to low economic growth, this study has conducted a sample of 17 developed economies from 1985-2015. Furthermore, two different estimation methods have been applied. Method one have used a panel data model including country and time specific fixed effects in order to account for unobserved heterogeneity and cross-sectional dependence. For the second estimation, the method of Common Correlated Effects (CCE) as suggested by Pesaran (2006), have been used. The results imply that higher levels of debt (private and public) have a negative impact on economic growth, but the study could not tie the 'too much finance'-effect with the increase in household debt and the low economic growth rates.

Keywords: Economic growth, financial development, debt, panel data analysis, common correlated effects (CCE)

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1. Introduction

The deepening of the financial sector has for long been considered the main component for economic growth as it has encouraged higher rates of consumption and investment (Schumpeter, 1911). Its rapid progression has mainly been rooted in the loss of economic independence as countries around the world have sought stability to ensure credibility in long-term objectives (Rey, 2013). However, due to the constant deepening of the financial sector, economic difficulties have emerged. Today many economists are hence questioning if further financial development is beneficial for the world economy.

According to Arcand et al. (2012), the financial sector has grown "too large" in relation to countries' economic system, which has caused a non-linear relationship between financial development and economic growth. The non-linear relationship is argued to impose economic and financial instabilities due to effects of "too much finance", which in turn has initiated lower levels of economic growth. To address Acemoglu et al. (2005), can the effects from "too much finance" be seen in the record high levels of debt.

From basic economic theory is it known that a certain degree of debt is essential for further economic growth, but if the pace in debt escalates (in relation to economies GDP ratio), problematic situations will emerge (Pescatori et al. 2014). The two major debts which have grown parallel with the higher pace of financial deepening in the recent years are private- and public debt. However, one of these two debts are more damaging to the economy than the other (Vague, 2016).

The debt that has been discussed more in recent time is public debt (also known as government debt). The high public debt level has been very concerning to the economy, but its overall effects have been manageable. According to Barro (1991) and Checherita and Rother (2010) do the impact from a higher public debt differ between economies as the relationship between the financial development and economic growth varies. For instance, economies with a more linear relationship will be better protected, especially when it comes to public debt, since imposed government regulations will be more efficient then (Checherita & Rother, 2010; Woodford, 1996).

According to Vague (2016) private debt is the key component to the low economic growth

trends. Private debt is larger in relation to public debt, mainly because the debt is a combination of a number of different debts (Vague, 2016). One particular debt, which is part of the private debt nexus, is household debt which preserves mortgage debt. Therefore, private debt generates a more direct and damaging effect on the economy. The increase in private debt has mainly been due to the constant rise of property prices. For this reason, strong parallels can be drawn between the "too much finance" effect and the low economic growth trends. By following this assumption, the main focus of this study will be to analyze the possible macroeconomic effects, which can emerge from the interaction between high private debt and house prices.

Hence, the research question for this study is: *what possible macroeconomic effects do house prices have on economic growth when private (and public) debt continue to increase?*

In order to examine the possible effects generated from the nexus of financial development and economic growth, the study will conduct two different econometric methods on a sample of 17 developed economies from 1985 to 2015. The first estimation method will be with a panel data model including country and time specific fixed effects in order to account for unobserved heterogeneity and cross-sectional dependence. For the second estimation, the method of Common Correlated Effects (CCE) as suggested by Pesaran (2006), will be used.

The results imply that "speed" between developed countries' financial sector and economic system is unsynchronized and hence causes the effect of "too much finance", which has a negative effect on economic growth. The negative effects towards economic growth are specifically captured from the high level of debt, as the variables for private- and public debt are statistically significant and negative in almost all regressions. However, from the constructed variable 'house price x private debt' the results are low and non-significant. For this reason, the hypothesis of this study is incorrect, since the result cannot tie the "too much finance"-effect to the increase in household debt and the low economic growth rates.

The rest of this study is organized as follows: section two present a detailed background review of the nexus of financial development and economic growth. Section three outlines the empirical approach of the study, and in section four the data collection is explained. In section five and six the results are presented and discussed. Section seven follows with a conclusion.

2. Background review

Throughout the history, the nexus between financial development and economic growth have been highly analyzed. Today there is no question whether a correlation exists or not, it is rather a question about the effects. Previous literature in the area has found that the relationship is both important as well as intriguing, as the effects between economies vary (Sahay et al. 2015). It is therefore necessary to understand the characteristics that drive the (argued) invented u-shaped relationship and evaluate if it possibly can have a connection to the record high (household) debts, which exists in the world economy.

The research question for this study is hence the following: what possible macroeconomic effects do house prices have on economic growth when private (and public) debt continue to increase?

2.1 The nexus of financial development and economic growth

When referring to early literature in the area, the financial development is understood to be important for economic growth as it fosters innovation and investment (Schumpeter, 1911). Still today, and throughout the twentieth century, a large number of economists support the fact that the financial sector is essential for economic growth (Bekaert et al. 2001; Levine et al. 2000). To address Lucas (1988), King and Levine (1993), Beck and Levine (2002) and many others, the financial sector boost growth specifically by transacting and monitoring costs, mobilizing savings, facilitating the exchange of goods and services, diversifying risks and allocating capital into the most profitable investments. In other words, financial intermediation efficiency is the backbone in the promotion of growth. This can be understood in the study by Greenwood and Jovanovic (1990), as they argue that a functioning two-way connection (between financial intermediation and economic growth) can result in a higher rate of return earned on capital, which can result in an expansion of the financial institutions. However, due to the progression of the two-way connection, studies have shown that governments may take advantage of the situation. According to Roubini and Sala-I-Martin (1992) governments could, due to the expansion of the financial institution (equals more authority), dampen productivity and growth by imposing financial repression in order to raise the inflation tax to finance public expenditures. However, these imposed monetary policy changes have proven not to be as efficient as hoped for and instead been seen as a factor

which halters economic growth (Borio, 2014). Therefore, many have questioned the finance-growth relationship and a number of studies have shown that the relationship may only be beneficial at certain stages (Arcand et al. 2012).

The questioning of the finance-growth relationship has grown considerably throughout the recent decade(s) due to the prolonged unstable financial situation. Consequently, the support for new as well as old negative theories has grown. According to Shen et al. (2011) and Patrick (1966) does the relationship between financial development and economic growth only remain linear at certain levels. This goes along with Arestis and Demetriades (1997) who stated that the financial system must include certain institutional frameworks in order to incur any positive effect. For instance, economies with weaker economic systems, poor institutions or double-digit inflations will most likely not generate any effects from the nexus between finance and growth (Demetriades & Law, 2006; Rousseau & Wachtel, 2002). These characteristics may in particularly describe the conditions for developing economies, but advanced economies may struggle as well to incur any positive effects. For instance, according to Arcand et al. (2012) certain economies have reached a financial depth, or a specific level of financial development, where the connection between financial development and economic growth no longer generate any effects and the relationship is seen as non-monotonic. To address Arcand et al. (2012, pp. 3) explicitly: "the relationship between economic growth and the size of the financial sector is consistent with the hypothesis that there can be 'too much' finance and this can explain the recent finding of a vanishing effect of financial depth on economic growth". The assertion goes along with the findings of De Gregorio and Guidotti (1995), who suggest that more advanced economies (with a certain financial depth) have a negative relationship with growth, as the investment efficiency is upheld.

When reading between the lines, the relationship of financial development and economic growth can be understood as very complex. According to Sahay et al. (2015), positive effect (such as financial intermediation efficiency) from institutional characteristics (of an economic system) can only appear when they are in line with the speed of the financial development (a linear relationship). Hence, when they are not in line the financial sector can appear to be "too large" in relation to the size of the domestic economy. In other words, the "speed" of the two systems is unsynchronized. This can result in an abnormal economic situation as it can signal an inaccurate picture of the economic situation and may influence economic actions, which

cannot be supported in the long run. According to Wolf (2009), the explained un-synchronicity in speed has been the case for U.S. in the last decade. For example, the financial sector of U.S. has grown almost six times quicker in relation to the nominal GDP. Furthermore, Sahay et al. (2015, pp. 5) mean that "the effect of the financial development on economic growth is bell-shaped: it weakens at higher levels of financial development".

The inaccurate picture of the financial system describes many economies today. The situation is therefore known as the inverted U-shaped relationship between finance and growth. The (U-shaped) relationship highlights Arcand et al. (2012) hypothesis that there exists a potential "too much finance"-effect, which can put an economy in danger. For instance, when the financial development is too deep (or the pace too fast) in relation to the economic system, the economy as a whole is exposed to certain risks, such as economic and financial instabilities, which through the recent years have caused lowered economic growth rates.

2.2 Debt levels

The economic and financial instabilities are often rooted in the economic behavior of risk-taking, which rise with the incentives generated from a higher pace of financial development (Acemoglu et al. 2005). The extent of risk-taking is seen in the levels of debt, as of recent times have never been any higher (Vague, 2016). According to the economic theory, higher levels of debt have a close connection to the lower levels of economic growth (Pescatori et al. 2014).

There are a number of different types of debts and all of them are said to affect an economy differently (Borio et al. 2015). For example, the effects and the difficulties it may cause an economy depend on the level of the institutional framework, hence some economies handle (higher) debts better. Due to the financial integration have the regulation of debt become harder and hence record high debt levels around the world have been estimated. Even though record high levels of debt have been reached, does this not mean that economies are at any specific risk. For instance, the risk of debt is estimated by its ratio to GDP growth and if the growth trends follow a similar pace, an economy is considered prosperous (Pescatori et al. 2014). Yet, if the pace is quicker in relation to the growth rate of the GDP, problematic situations can emerge. First, if the debt pace accelerates quickly, the outcome has most often been a type of a financial crisis. The evidence could be the recent financial crisis (2007-2008),

the Japan crisis, the Asian crisis and many others (Bernardini & Forni, 2017). Second, if the pace is not as rapid but still increases faster relative to a country's GDP growth, the problems that emerge are more insidious and subtle. In these scenarios the overall economic growth trend is impeded and often remains at a depressed level during a longer period (Vague, 2016). Both scenarios with different speed in debt growth is something the global economy has experienced through the last decades, and is highly related to the idea that a financial system may be "too large" in relation to the size of a domestic economy.

There are specifically two types of debts, which have grown remarkably in recent decades, due to the "too much finance"-effect. Both cause different types of effects to an economy, but one is said to be the specific key component to the inadequate low economic growth. These two debts are public- and private debt.

The global public debt, or government debt, has been on a constant rise since the 1980's but have escalated in pace in recent time in relation to the ratio of the global GDP (IMF). Its constant growth and high levels have enforced economic difficulties, but the effect may differ depending on the timeframe and pace in growth. According to Barro (1991) and Checherita and Rother (2010) and many others, does a higher public debt pace in the short run often stimulate aggregate demand and output. In the long run, on the other hand, the public debt is said to crowd out capital, lower the overall output and make an economy less resilient to shocks. However, the extent of these effects may vary between economies as the relationship between the financial development and economic growth is different. Economies with a synchronized pace will be better protected; especially when it comes to public debt since imposed government regulations will then be more efficient (Checherita & Rother, 2010; Woodford, 1996).

Public debt may be discussed and analyzed more than private debt, but private debt is greater and has a more direct impact on the economy as a whole. The private debt is therefore said to be the key component to the low economic growth trends (Vague, 2016). Private debt is a combination of household debt (include mortgage) and business debt[1], hence affect the consumption and investment patterns to a larger extent. Its rapid increase throughout the recent decades is mainly due to two reasons: one is the spread of the financial integration,

[1] Business debt is generated from smaller business and self-employed workers (Ambrose et al., 2015). Household debt is defined as the sum of debt for people in a household (Barba & Pivetti, 2009).

which has caused a “decrease in the prevalence of credit rationing” (Debelle, 2004, pp. 1). Two is a heavy decline in real and nominal interest rates and the introduction of monetary policies (Debelle, 2004). Both factors have contributed to a smoother consumption pattern for households since it led to a larger easing of liquidity constraints (Bhattacharya & Patnaiky, 2013). Why the level of household debt may vary between economies is due to the level of the financial development, as some economies may contribute to a higher loan-to-valuation ratio (LVR) and debt-servicing ceilings (Debelle, 2004; Ortalo-Magne & Rady, 1998). From the explained scenarios, strong parallels can again be drawn to the financial development and economic growth nexus.

2.3 Debt and house prices

One trend that has followed the same pace as the private- and public debts, the real GDP growth and the financial integration, is the trend of house prices (Sutton et al. 2017). Due to the economic behavior of risk-taking, the demand for houses boomed (rise in demand equals higher prices). Since a house is often classified as the most valuable asset to many households, a change in the rate pattern often generates a large effect on the entire economy. For instance, an increase in house prices will lead to (a higher) inflation and vice versa. However, due to the level of financial integration, the up-going trend has been seen in a great number of economies around the world. According to Dimitri et al. (2006), house-price increases normally follow a four to five- year cycle and thereafter either decrease or flatten for a period of time. Following the “global real house price index”-trend, posted by the International Monetary Fund (IMF)(2017), the theory seems to be correct as well as it still follows the same pattern today. Again, to address Dimitri et al. (2006), we have reached the end of the four to five- year cycle and a possible larger upset to the “global real house price index”-trend is upon us.

Due to the high levels of debt, especially private debt, a possible fall in property prices can be extremely harmful to the world economy. According to Borio et al. (2015), the interaction between high private debt and a property price deflation is the most damaging interaction from a historical perspective. This is mostly because private debt maintains household debt, which in turn preserves mortgage debt. For this reason, household debt can affect a much larger population and cause a greater and more direct impact on the economy, in comparison to public debt (Alter et al. 2018; Barba & Pivetti, 2009). For example, a certain degree of debt

is always essential for a continued economic growth, but if the purchases made by the economy do not generate any return[2] (such as house purchases, which equals an increase in mortgage), the pace in economic growth will change. Therefore, a potential decrease (or increase) of property prices, due to the level of debt, could have a negative effect on economic growth.

From the high levels of debts and constant changes of interest rates and other policies, have the non-linear relationship between financial development and economic growth continued to grow in different 'speeds'. Due to the financial integration have the unsynchronized relationship generated an effect of 'too much finance' which seems to be deep-rooted in the housing market and hence the cause of low economic growth.

In order to see it the stated hypothesis is correct, the study will run a number of different regressions including twelve explanatory variables and one dependent variable - real GDP growth. A further and more detailed description will follow in the next chapter of 'Empirical approach'.

[2] Return is essential for the growth trend to continue upwards.

3. Empirical approach

This section aims to present a clear methodology discussion, explain the choice of model and estimations technique in order to empirically examine the nexus between economic growth, debt and house prices.

3.1 Methodology

In order to analyze the macroeconomic effects, which can occur from changes in the nexus of financial development and economic growth, the data set used in the estimation must be large in terms of both numbers of countries and in time period. The study will therefore use panel data. Similar to previous studies in the area, this study will include a larger number of different variables since possible changes to the nexus can be generated from all sections of the economy (Arcand et al. 2012; King & Levine, 1993; Beck et al. 2000; Rajan & Zingales, 1998). According to Tsatsarnis and Zhu (2004), house prices depend on a number of components and they tend to differ between countries. Consequently, the choice of explanatory variables in this study will carefully be selected in order to capture the effects stemming from country specifics, which can occur from differences in the institutional framework or human capital (population and tertiary education). However, unlike previous literature (with a similar focus) annual data will be used in this study instead of quarterly[3]. The choice of annual data is made due to data limitations, as the data for some of the variables were not available at a quarterly frequency. According to Demetriades and Law (2006) and Rousseau and Wachtel (2002), it is harder to assess the effects from the nexus (finance-growth) in developing economies. Hence, the data collection for this study will come from developed economies.

As understood from previous literature, different econometric techniques are necessary in order to estimate the links of causality between economic growth, house prices and private debt (Goodhart & Hofmann, 2008; Gavin & Theodorou, 2005). The study will therefore run different regression models using a modeling framework based on panel data. Using the panel data approach in macroeconomics estimations models have been highly recommended as it reduces the sampling error (Gavin & Theodorou, 2005). The approach is often seen in studies

[3] See for example Borio and McGuire (2004) and Habibullah and Eng (2007).

where macroeconomic indicators of economic growth are measured (Dewan & Hussein, 2001; Bassanini & Scarpetta, 2001; Romano, 2015). Furthermore, the study will use a panel data model with country and time specific fixed effects in order to account for unobserved heterogeneity and cross-sectional dependence. To capture the unobserved factors, the study will use the common method of Common Correlated Effects (CCE) as suggested by Pesaran (2006).

3.2 Model

For this study, a number of 17 developed countries have been chosen and the data collection is between a time period of 30 years (1985-2015). Despite the fact that they are all classified as developed there is significant heterogeneity across countries to account for, since a possible increase or decrease in house prices will not cause a similar economic stimulation for all. Hence, some regressions will maintain twelve explanatory variables along with the dependent variable (real GDP growth) in order to capture the differences in effects. The determination of variables has been made from previous literature in the same area (Barbra & Pivetti, 2009; Raja & Zingales, 1998; Borio et al. 2015). The variables have then been selected from the assumption where the strongest effects towards economic growth are generated following a change in debt and house prices. Additionally, in order to better evaluate the nexus between the financial development and economic growth, the study has constructed the variable: '*house-price*private-debt'*. Further, each regression (1-6) will include three main explanatory variables, disregarding the statistical significance. By including the three main variables, the model examines which institutional characteristics generate the largest effect towards economic growth. These three main variables are: '*house price*', '*private debt*' and the '*house-price*private-debt'*. However, the estimated model, maintaining all variables, will appear as follows:

$$gdp_{it} = \alpha + \beta_1 houseprice_{it} + \beta_2 privatedebt_{it} + \beta_3 (houseprice * privatedebt)_{it} + \beta_4 investment_{it} + \beta_5 exchangerate_{it} + \beta_6 population_{it} + \beta_7 education + \beta_8 publicdebt_{it} + \beta_9 KOF_{it} + \beta_{10} Institutional_{it} + \beta_{11} publicexpenditures_{it} + \beta_{12} interestrate_{it} + F_t + \lambda_i + \varepsilon_{it}$$

Model (3)

gdp_{it} is real GDP growth and the dependent variable for country *i* in time period *t.* The study uses time period *t* in order to capture the contemporaneous effect on economic growth. The α

is a constant. The β- parameters (1-12) signify the elasticity and are measured differently between the explanatory variables. For example, the variables 'private debt', 'public debt' and 'public expenditure' all represents a share of GDP. Hence the β – parameters will generate a result in percentage point. The percentage points will in turn generate a percentage change in economic growth. Similarly, the β – parameters for the variables of 'exchange rate', 'KOF', and 'institutional' are all log-transformed and will be measured in percentage points. The remaining β – parameters will generate a percentage change towards the dependent variable when an increase in the explanatory variables occurs.

A common problem with a basic panel regression is that it imposes restrictions when pooling. This means that the panel model will not account for cross-country differences in the estimated relationship (Fischer, 2010). In order to specify the regression and capture the unobserved heterogeneity, the model for this study will add the factor of F_t and factor loadings λ_i. The factor F_t captures time specific shared effects, which can occur from an up-going trend in the business cycle or a possible increase in house price. The factor is necessary to include in order to estimate if there exists a correlation between house prices and the economic growth. To capture the strongest possible effect, the study has especially included the 'KOF' and 'intuitional' variables due to their close connection to house purchases[4]. The λ_i captures no time specific country effects, such as population total and education (human capital variables). For instance, in developed economies, human capital rates often remain constant over time, which means that the effect is often foreseen, but the effect has an essential role to the economic growth trends. Hence, the λ_i is important to include in order of capturing the overall effects. Lastly, the factor ε_{it} is an error term.

Between the six regressions the study will apply different estimation techniques. In model (1) and (2), only λ_i will be included. In model (3) and (4), factors F_t and factor loadings λ_i will enter additively. Finally, in model (5) and (6) we will have $\lambda_i F_t$. The study uses the following variation in order to see if the factors cause any noticeable differences. For instance, if the results vary we will know better when and from where larger effects from the nexus of financial development and economic growth are generated.

For model (2), the non-significant control variables from model (1) will be excluded. This is

[4] Variable description will follow in the Data section.

done in order to avoid over-specification and to possibly capture stronger effects from the three main explanatory variables on economic growth. Hence, the second regressed model (2) will only maintain significant variables along with the three primary explanatory variables.

In addition to the common problem of unobserved heterogeneity in panel data models, another problem can arise in form of cross-sectional dependence (CSD). It is therefore understood that the results from panel data estimations may generate inaccurate effects due to possible interdependence between units (Sarafidis & Wansbeek, 2010). According to Baltagi and Pesaran (2007), the results can (due to CDS) become inadequate and lead to significant size distortions. Therefore, in order to cancel out the possible effects which may arise from interdependent unit(s), model (3) will be constructed differently. In model (3) the study will add the factor F_t times the factor loadings λ_i to capture the error cross-sectional dependence.

Similar to model (2), model (4) will only maintain the statistically significant control variables from model (3). This is done in order to avoid over-specification and to possibly achieve higher statistical significance of the main variables.

Models (1-4) have all been constructed differently in order to examine the nexus financial development and economic growth efficiently, but each model has been estimated through the fixed effect (FE) method. Therefore, the problem of unobserved heterogeneity still exists even though the added factors have specified the regressions. However, due to the existing problem of unobserved heterogeneity, misinterpretation between specific country effects and global effects may occur. For this reason, model (5) and (6) will be estimated by the highlighted method of common correlated effect (CCE)[5]. The CCE method is especially used to capture the factor structure in the error term in order to avoid possible effects from unobserved heterogeneity as well as to avoid any effects from CSD (Pesaran, 2006)[6]. Additionally, in model (5) and (6) we have $\lambda_i F_t$.

Furthermore, the (6)th and final regression in this study will maintain the same construction as in model (5), but will only contain significant variables along with the three main explanatory variables.

[5] The common correlated effect (CCE) equation for this study can be found in Appendix.
[6] A further and more detailed discussion of CCE can be read in: Pesaran, 2006.

4. Data

A number of different sources have been used in order to estimate if the "too much finance"-effect could possibly be the cause of the record high private debts and lowered economic growth. Below we will explain the data collection process, data sources and highlight specific matrices and trends of the data. The section will also clarify why the models above were used instead of others.

As we mentioned before, in this study data for 17 countries[7] have been collected. The first approach of the study was larger in terms of countries and in time period, but due to data limitations the study got the above outline[8]. As the focus of the study is to examine the nexus between economic growth, debt and house prices, a large number of variables (12) had to be chosen. In comparison with previous literature with a parallel focus, a number of similar variables have been selected. However, as one objective of the study is to capture the effects that may come from specific country characteristic (can generate different effects), additional variables have been chosen. The table below (Table 1) will maintain all variables for the study and include a general description of each. The additional variables, marked with (*), will follow with a more detailed description.

Table 1

Function	*Variable*	*Transformed*	*Frequency*	*Data source*
Dependent variable	**Real GDP growth** (current US dollar)	Growth rate	Yearly	The World Bank
Explanatory variables:	**Public credit debt**	Ratio to GDP	Yearly	IMF
	Private credit debt (household debt, loans and debt securities)	Ratio to GDP	Yearly	BIS
	Property prices	Growth rate	Yearly	OECD
	Real effective exchange rate index	Logarithm	Yearly	The World Bank
	Real interest rate (percentage)	Percentage	Yearly	The World Bank
	Public expenditure (final consumption expenditure (percentage) of GDP	Ratio to GDP	Yearly	The World Bank
	KOF Index*	Logarithm	Yearly	KOF Swiss Economic Institute

[7] The 17 countries of the study: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, United Kingdom and The United States.
[8] The limitations are discussed in Appendix.

Institutional Index*	Logarithm	Yearly	ICEG
Real Investment*	Growth rate	Yearly	OECD
Population total (human capital)	Growth rate	Yearly	The World Bank
Education* (tertiary gross – human capital)	Percentage	Yearly	The World Bank

The additional variables are: the 'KOF index', 'institutional index', 'real investment' and 'education'. The 'KOF index' can be explained as an evaluation of the most globalized countries based upon three areas: economic, social and political (KOF Swiss Economic Institute). The variable 'institutional index' is an estimate of the 'investment climate' in a country. For instance, it measures if a potential investment could be beneficial or not (ICEG). The 'real investment' variable belongs to the same category, as it is an estimate of countries' gross fixed investment (OECD). Lastly, the variable 'education' is an estimate of tertiary enrollment (higher education) (The World Bank). The variable goes in the category of human capital along with 'population total' for this study. The variables that do not go under the term 'additional' follows with a description familiar to us all and will not be further discussed or explained.

The collection of all variables has come from secondary sources. However, what must be mentioned are the constant updates of these sources, which occur on a regular basis. For this reason, and due to the time period of this study, certain observation may have improved. Moreover, the collection of data for the variables of 'real interest rate', 'the institutional index' and 'education', have taken additional time. In the case of the 'real interest rate', the data between the years of 1985 to 2005 is gathered from the same source, but the data from 2005 to 2015 only existed for a small number of countries. Therefore, all data from 2005 to 2015, for the variable of 'real interest rate', is made from own calculations[9]. For the variable 'institutional index' the data source for all countries and years is the same except for Germany between the years of 1985 to 1990, where the data is collected from OECD. Lastly, the data for Germany between the years of 1980 to 1990 and Canada between the years of 2000 to 2017 is gathered from OECD, while the rest of the data is collected from The World Bank.

The data for the variables of 'real GDP growth', 'real investment', 'real effective exchange rate', 'property prices', and 'population total' has been converted in order to make the data

[9] Calculation: 'short term nominal interest rate' data (OECD) subtracted with 'inflation GDP deflator' data (The World Bank).

stationary. The data for the remaining variables were shown to be stationary and hence not converted. Furthermore, for all variables real data have been collected which means that the data is adjusted for inflation. Moreover, in Table 2 and in Table 3 the study will report the descriptive statistics and the pairwise correlation coefficients for all variables, respectively.

Table 2

Summary Statistics			Annual data			
Variable	*Variable*	*Obs*	*Mean*	*Std. dev*	*Min*	*Max*
Re_grow	Real GDP Growth	527	0.062	0.1137	-0.316	0.481
Real_hus_pr	Real house price index	527	0.0258	0.066	-0.178	0.334
Pri_debt	Private debt (debt to GDP ratio)	527	152.08	48.021	54.1	337.4
Pop_tot	Population Total growth	527	0.006	0.005	-0.018	0.029
Edu	Education (tertiary)	527	55.36	18.866	19.133	97.020
Institu	Institutional Index	527	2.2002	0.268	1.386	2.485
Re_interest	Real Interest rate (%)	527	3.702	3.8147	-20.357	16.751
Invest	Real Investment	527	-0.107	21.549	-374.93	228.24
Kof	KOF index	527	4.37	0.21	0.0004	4.507
Pub_debt	Public (Debt to GDP ratio)	527	66.47	36.425	9.682	249.11
Pub_exp	Public expenditures	527	19.69	3.676	10.66	27.93
Ex_rate	Real Exchange rate index	527	4.595	0.117	4.197	4.995

In the descriptive statistics we can see that the average rate of economic growth is approximately 6.2% (real GDP – current U.S. dollar) for all the 17 countries (1985-2015). Studies which only maintain European countries or have a shorter time period have often averages which are larger (see for example Sassi and Gasmi, (2014)). The minimum and maximum real GDP growth rates were -31.6% for Canada in 1994 and 48.1% for Japan in 1986. This mainly shows how developed Canada was in relation to other economies during the year 1994. The highest estimated real house price ratio occurred in Spain in 1986 of 33.4% (in ratio to GDP). The minimum growth rate was of -17.8% and was measured in Ireland 2010 (further evidence of the housing crisis which took place during this time). Lastly,

the lowest private debt (in ratio to GDP) was estimated in Italy 1986 of 54.1%, while the highest occurred in Ireland in 2015 of 337.4%.

Table 3

Pairwise Correlation Matrix	Re_grow	Real_hus_pr	Pri_debt	Edu	Pop_tot	Institu	Invest	KOF	Ex_rate	Pub_debt	Pub_exp	Re_interest
Re_grow	1											
Real_hus_pr	0.1688	1										
Pri_debt	-0.2015	-0.1937	1									
Edu	-0.2596	-0.0265	0.3809	1								
Pop_tot	0.0355	-0.0661	0.2407	0.2487	1							
Institu	0.5226	0.1868	0.3510	0.4167	0.1807	1						
Invest	-0.0253	-0.0075	-0.0116	-0.016	-0.1729	-0.075	1					
KOF	-0.2044	0.0157	0.4232	0.4148	0.0107	0.4344	-0.031	1				
Ex_rate	0.1151	0.1674	-0.0306	-0.079	0.0622	0.0875	-0.080	-0.0253	1			
Pub_debt	-0.1739	-0.1289	-0.0664	0.0072	-0.393	-0.029	0.079	-0.075	-0.0901	1		
Pub_exp	-0.1216	-0.04454	0.0910	0.2110	-0.2100	-0.053	0.004	0.3528	-0.1236	0.0462	1	
Re_interest	0.0901	-0.0949	-0.4255	-0.420	-0.4204	-0.513	0.055	-0.3829	-0.0873	-0.0449	0.0273	1

In Table 3 (above) the study outlines the pairwise correlation coefficients for all variables. The results in the matrix are coherent with economic theory as, for instance, there is a positive correlation between the real house prices index and economic growth rate. Also, a negative relation is perceived between economic growth and private debt. These results indicate that the market will incur less spending when the level of private debt increases.

In Figure 1 below (including three graphs) we can see the overall averages for each country in every year, following the time frame of this study. The values are collected from the three variables of 'real house price index', 'private debt' and 'real GDP growth'.

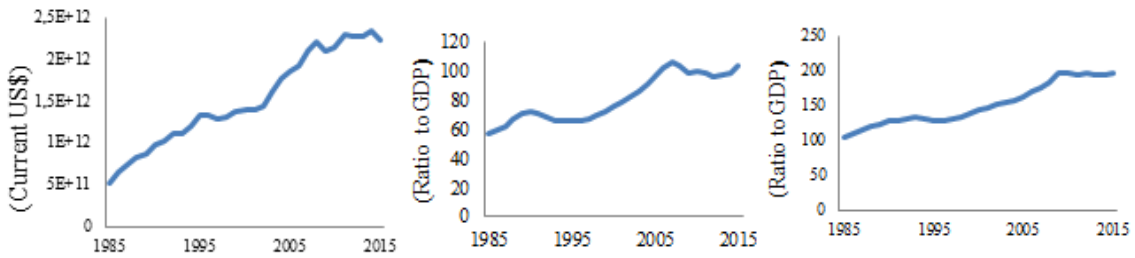

Figure 1: *Graph on the 'left' represent the average real GDP growth rate in the current US dollar. The graph in the 'middle' represents the average real house price rate in percentage to GDP. The graph on the 'right' represents the average private debt growth in rate in percentage to GDP. The data is from the 17 countries of this study between 1985-2015.*

5. Results

In this section the study will present the results from the six estimated models. The study will also try to highlight the main differences in results from the regressions in order to better understand which techniques are more efficient when empirically examine the nexus between economic growth, debt and house prices. The result will be available in Table 4, where columns 1-4 are computed by OLS while the method of CCE by Pesaran (2006) is estimated in columns five and six. Further, columns with even numbers (2, 4, 6) will only maintain the results from significant variables, while odd columns (1, 3, 5) will maintain the full sample of twelve explanatory variables with data from all 17 countries.

Table 4 Annual data

Regressions

Explanatory Variables:	**OLS** (1)	**OLS** (2)	**OLS** (3)	**OLS** (4)	**CCE** (5)	**CCE** (6)
C	0.862*** (0.296)	0.8962*** (0.2713)	1.1145*** (0.2045)	1.1994*** (0.1705)	0.00169 (0.9413)	0.6675*** (0.1949)
Real house price	0.260 (0.202)	0.2464 (0.2003)	0.1291 (0.135)	0.1366 (0.1323)	0.1272 (0.1281)	0.1322 (0.1226)
Private debt	-0.055*** (0.0183)	-0.055*** (0.0002)	-0.02 (0.0147)	-0.026* (0.0137)	-0.022 (0.014)	-0.0263** (0.0133)
Real house price x Private debt	-0.1831 (0.1243)	-0.15 (0.121)	-0.016 (0.083)	-0.0151 (0.0816)	-0.015 (0.078)	-0.0115 (0.0747)
Population total	0.0876 (1.499)		0.1311 (0.9678)		0.1305 (0.9496)	
Education (tertiary)	-0.0015*** (0.0004)	-0.00152*** (0.0004)	-0.00016 (0.00033)		-0.00014 (0.000328)	
Institutional Index	0.0785*** (0.0219)	0.0867*** (0.0210)	0.01316 (0.0281)		0.0132 (0.0283)	
Real interest rate	-0.001336 (0.0016)		-0.00115 (0.001146)		-0.0012 (0.001124)	
Real investment	4.22E-05 (0.000215)		-5.70E-05 (0.00014)		-5.68E-05 (0.000137)	
KOF index	0.0205 (0.02393)		0.0076 (0.0155)		0.00759 (0.0152)	
Public debt	-0.095*** (0.027)	-0.11*** (0.02)	-0.034*** (0.019)	-0.0405** (0.00018)	-0.034* (0.000194)	-0.397** (0.00017)

Public expenditure	-0.6725 (0.44)		-1.61*** (0.331)	-1.6645*** (0.30)	-1.61088*** (0.320)	-1.676*** (0.2959)
Exchange rate	-0.1512*** (0.0580)	-0.1715*** (0.0568)	-0.1594*** (0.0373)	-0.1625*** (0.0369)	-0.1595*** (0.0366)	-0.1519*** (0.0349)
R-squared	0.21505	0.20908	0.71303	0.71183	0.71303	0.698517
Cross-section fixed	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed	No	No	Yes	Yes	No	No
Wald test (p-value)	0.0062	0.0042	0.0541	0.0129	0.0475	0.01
Observations	527	527	527	527	527	527

Notes: * indicate significance level at 10%, **indicate significance level at 5%, ***indicate significance level at 1%.

The result for each variable in Table 4 seems to follow a similar pattern despite the fact that different techniques have been used between the columns. When analyzing the result for a number of variables in detail, the results appear to be relatively weak as they do not seem to generate any larger effects on GDP growth. Additionally, when comparing the overall results between the columns, no specific pattern seem to follow and the number of statistically significant variables seems to differ.

In model (1) and (2) the number of statistically significant variables is larger and the results appear to be stronger in relation to the remaining models, but the R-squared is much lower. In regression (1), which maintain the full sample and cross-section fixed effects, five statistically significant variables at the 1% level are estimated. From the five significant variables, stronger results (following the value in the coefficients) are generated from the ‘exchange rate’ and ‘institutional’. For instance, a possible decrease in the exchange rate by one percent will correspond with a negative effect on the growth rate ratio of -0.1512 percentage points. However, the relatively weak effects show that the exchange rate in developed economies will not affect the economic growth rate or its variability to a higher extent. However, due to the low R-squared, the effects between economies can differ to a large extent and the results shall be interpreted carefully. Further, in comparison with the results in model (1), the values in model (2) for the significant variables of ‘institutional’, ‘public debt’ and ‘exchange rate’, generate a larger effect. The two remaining variables, ‘private debt’ and ‘education’ maintain the same value. However, the R-squared did not improve.

In model (3) and (4) are cross-section fixed effects and period-specific fixed effects are

included in order to account for possible unobserved heterogeneity and cross-sectional dependence. However, the result in model (3) is weaker in comparison to the results in model (1). For instance, both the number of statistically significant variables and the actual significance value is lower. This can especially be seen in the values of 'institutional' and 'education' where they appear to be non-significant in model (3), while they are statistically significant at 1% level in model (1). Additionally, in the comparison of model (1) and (3), most coefficient values are lower. However, despite the values, a few numbers should be highlighted. Firstly, the variable 'public expenditure', becomes statistically significant at 1% level. Secondly, the value for 'public debt' decreases. Lastly, the R-squared is significantly higher. When comparing the result in model (4) with (3), some changes have occurred. For instance, 'private debt' became statistically significant at the 10% level, 'public debt' decreased both in coefficient value and in the significance level while the R-square increased slightly. However, by applying the time-specific fixed effect along with the cross-section fixed effects, the regression becomes better specified as dependence across countries is taken into account. It can be seen in the 'public expenditure' which generates a larger effect. However, from model (3) and (4) no large effect on GDP growth is captured.

In model (5) and (6) the CCE method is used along with the cross-section fixed effect model. In comparison to model (1) and (3), does (5) generate lower values. Similar to model (3), model (5) only maintains 3 statistically significant variables, but the significance level is higher for 'public debt'. Two other similarities are seen: one in the coefficients which appear to generate almost the same value for all variables, and another one in the value of the R-squared, which remain 'high' in relation to (1). However, in model (6) the results improve, especially for the variables of 'private debt' and 'public debt' (both become statistically significant at the 5% level). Hence, in model (6) and with the CCE method applied, it becomes clear where the strongest correlations to economic growth exist.

In all six regressions the variable 'house price x private debt' remains non-significant and do not appear to generate any conspicuous effects towards economic growth. However, the coefficient does remain negative in all regression which means that my intuition is correct – the "too much finance" effect has a connection to household debt which in turn causes a lowered economic growth. In order to see if a dynamic panel data model specification is more

appropriate, the study estimated the six regressions using a dynamic model. Nonetheless, the result did not improve[10].

In order to estimate if any structural breaks existed while following the time frame selected for the study, three models were estimated using different sample sizes for models (1, 3, 5)[11]. Further, due to the uncertainty of the estimated results, the study proceeded with robustness checks for each model. From the results of the robustness checks, it was found that some changes had appeared[12]. Therefore, the result for this study should be interpreted carefully.

6. Discussion and analysis

Seen from the values of the R-squared and the robustness checks, the results for this study must be interpreted wisely. However, in comparison with the existing literature, the results demonstrate a similar trend. For instance, similar to Sassi and Gasmi (2014) and Beck et al. (2012), who show that a household credit decrease in European countries weakens economic growth, this study can proceed with a parallel conclusion. This can especially be seen in the results for 'private debt'[13], 'public debt' and 'public expenditure', as they all produce a negative effect on economic growth.

Following the negative results of public- and private debt, the theory of the inverted u-shaped relationship between financial development and economic growth, seems to be correct. In other words, the "speeds" between developed countries' financial sector and economic system is unsynchronized. This causes an effect of "too much finance", which imposes certain risks to the economy and furthermore affect the economic growth negatively.

The negative effects from "too much finance" on economic growth seem to follow the idea that a higher "speed" of the financial sector causes the economic behavior of risk-taking. This can be understood from the results of 'private debt', as they are statistically significant and negative. However, the rise in private debt does not seem to have a correlation with the increase in house prices, which makes the hypothesis of this study incorrect (following the

[10] The tables for the dynamic model can be found in Appendix.
[11] The structural breaks models can be found in Appendix.
[12] The robustness checks table can be found in Appendix.
[13] The variable 'private debt' is statistically insignificant in model (3) and (5).

results generated). For instance, similar trends in private debt and house prices have imposed the assumption that there exists a strong correlation, which in turn produce a negative effect towards economic growth. This is assumed since house prices do not generate any return and therefore affects the consumption and investments rates negatively. For this reason, the hypothesis of this study is incorrect due to the results.

Despite the low result from 'houseprice*privatedebt' (insignificant), private debt by itself generates a negative effect towards economic growth. For this reason, as private debt is a combination of household debt and business debt, may the actual business debts have a larger effect than predicted (only a theory). However, these negative effects (even though the values are low) follow the idea of economic theory – an increase in private debt and public debt (statistically significant in all six regressions) is a central cause of lowered economic growth.

The relative low and negative private debt effects can be due to an unsynchronized domestic household debt cycle. According to Mian et al. (2016) economies with a household debt cycle, which is synchronized with the global household debt cycle, could generate a much more substantial decrease in growth after a rise in domestic household debt. This could explain the surprisingly low effect and indicate the level of financial integration and its force.

Due to the force and the level of the financial integration, it is highly realistic that the difference in size (between the financial sector and economic system) will maintain. For this reason, a new theory emerges. For instance, due to the unsynchronized "speeds" (between the finance-growth nexus) will the effects from further changes of monetary policies and interest rates continue to generate prolonged effects. Hence, changes to the economic system will only occur in the long run and in unpredicted times. In other words, a shock will emerge when the economy appears to be relatively stable. When an unpredicted shock(s) occur, devastating effects can emerge since the economic debts (private and public) are expected to rise even further (Alter et al. 2018; Mian et al. 2016). Therefore, a future shock can affect the economic growth trend to a much large extent (seen from a negative perspective).

In summation, similar to previous studies in the area of financial development and economic growth, can the results for this study be perceived as ambiguous (Pagano, 1993; Levine, 1997; 2003). The overall result correlates highly to the stated expression of complexity and proves the forces of the financial integration, as certain economic effects appear to be prolonged. In

other words, the strongest and clearest effects from the nexus will only be noticeable when certain institutional characteristics of the economic system are in line with the "speed" of the financial development (Sahay et al. 2015; Arestis & Demetriades, 1997). Further, even though the result of the study could not prove the correlation between house prices and private debt, the debt (public and private) is the basis of lowered economic growth.

7. Conclusion

Due to the financial integration, the relationship between financial development and economic growth has become non-linear. This non-linear relationship has caused the effect of "too much finance", which is closely related to the economic behavior of risk-taking. The result has been noticed in the rapid increase of private- and public debt, which have reached record heights. Private debt, in particular, has been said to be the key component to the low economic growth trends due to its combination of debts. Household debt, which belongs in the nexus of private debts, has been said to be the most damaging due to its volume and direct impact on the economy. Its steady increase has followed the constant rise of property prices, which is assumed to be highly correlated to the "too much finance"-effect. For this reason, the focus of this study has been to analyze the possible macroeconomic effect house prices have on economic growth, when private (and public) debts in developed economies are high.

In order to examine the nexus between private debt, house prices and economic growth, the study has used panel data concentrated on the time period of 1985-2015 and on 17 developed economies. Further, twelve variables have been collected and a number of six regressions have been made. The results generated follows economic theory – higher levels of debt (public and private) have a negative impact on economic growth. However, no larger effect was captured from the constructed variable 'real house prices x private debt' towards economic growth. Hence, the result from this study could not tie the "too much finance"-effect to the increase in household debt and the low economic growth rates.

Due to the constant rise of debt and further deepening of financial sectors, the focus on this area should continue. The prolong effects only seem to become stronger for each decade and hence more harmful to the economy. There exist a larger number of different approaches that can be used in order to analyze the nexus between financial development and economic growth closer. This study hopes to guide future researches in the right direction.

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Appendix

Estimation results obtained using robust standard errors:

Regressions	Annual data					
Robustness Check model	OLS (1)	OLS (2)	OLS (3)	OLS (4)	CCE (5)	CCE (6)
C	0.862** (0.2603)	1.2212*** (0.3334)	1.1145*** (0.2982)	1.1994*** (0.221)	0.00169 (0.0119)	-0.002 (0.0.011)
Real house price	0.260 (0.252)	0.42039 (0.2751)	0.1291 (0.1181)	0.1366 (0.116)	0.1272 (0.1090)	0.134 (0.103)
Private debt	-0.05** (0.0259)	-0.036 (0.02)	-0.02 (0.0121)	-0.026* (0.0121)	-0.022 (0.0119)	-0.0257** (0.011)
Real house price x Private debt	-0.0018 (0.00161)	-0.002026 (0.00164)	-0.00016 (0.00068)	-0.000151 (0.000816)	-0.00015 (0.000617)	-0.000132 (0.00058)
Population total	0.0876 (1.4967)		0.1311 (0.8531)		0.1305 (0.8373)	
Education (tertiary)	-0.0015* (0.00083)	-0.001029 (0.00079)	-0.00016 (0.00063)		-0.00014 (0.00062)	
Institutional Index	0.0785 (0.053)	-	0.01316 (0.0359)		0.0132 (0.0353)	
Real interest rate	-0.001336 (0.00196)		-0.00115 (0.001146)		-0.0012 (0.0010)	
Real investment	4.22E-05 (0.00023)		-5.70E-05 (0.00010)		-5.68E-05 (9.87E-05)	
KOF index	0.0205 (0.0315)		0.0076 (0.0317)		0.00759 (0.00311)	
Public debt	-0.095*** (0.029)	-0.122*** (0.03)	-0.034* (0.0206)	-0.0405** (0.018)	-0.034* (0.0202)	-0.0405** (0.00017)
Public expenditure	-0.67 (0.75)		-1.61*** (0.028)	-1.66*** (0.30)	-1.61*** (0.0027)	-1.68*** (0.0319)
Exchange rate	-0.1512** (0.0677)	-0.2109** (0.0716)	-0.1594*** (0.0498)	-0.1625*** (0.0497)	-0.159*** (0.0489)	-0.1625*** (0.04858)
R-squared	0.21505	0.18235	0.71303	0.71183	0.71303	0.7118
Cross-section fixed	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed	No	No	Yes	Yes	No	No
Wald test (p-value)	-	-	-	-	-	-
Observations	527	527	527	527	527	527

* indicate significance level at 10%
**indicate significance level at 5%
***indicate significance level at 1%

Estimation results obtained using dynamic model specification:

Regressions	Annual data					
Robustness Check model	OLS (1)	OLS (2)	OLS (3)	OLS (4)	CCE (5)	CCE (6)
C	1.089*** (0.3135)	1.1321* (0.2895)	1.2689 (0.21656)	1.2931 (0.1805)	0.3941 (1.0348)	0.3898 (0.6742)
Real GDP growth (-1)	0.11466** (0.04641)	0.11361** (0.04623)	0.06154 (0.0724)	0.0781* (0.04645)	0.03382 (0.03382)	0.03756 (0.03167)
Real house price	0.1615 (0.204)	0.1578 (0.202)	0.1246 (0.1386)	0.1515 (0.1356)	0.1128 (0.1324)	0.13772 (0.12537)
Private debt	-0.054*** (0.0186)	-0.053*** (0.0175)	-0.0179 (0.0151)	-8.38E-03 (0.0129)	-0.0195 0.0147	-0.0103 (0.0125)
Real house price x Private debt	-0.1387 (0.124)	-0.119 (0.1213)	-0.022 (0.0847)	-0.0246 (0.0832)	-0.0134 (0.080)	-0.0134 (0.0756)
Population total	-0.592 (1.505)		0.1442 (0.9814)		0.16754 (0.96393)	
Education (tertiary)	-0.0017*** (0.00458)	-0.00175*** (0.00043)	-0.00013 (0.00034)		-0.000146 (0.00033)	
Institutional Index	0.0855*** (0.0226)	0.09171*** (0.0216)	0.01184 (0.02852)		0.01335 (0.02797)	
Real interest rate	-0.0012 (0.0016)		-0.001272 (0.0012)		-0.00127 (0.00114)	
Real investment	4.97E-05 (0.00022)		-5.02E-05 (0.000141)		-5.12E-05 (0.000139)	
KOF index	0.020 (0.0237)		0.00701 (0.01557)		0.00684 (0.0153)	
Public debt	-0.10*** (0.0284)	-0.1074*** (0.0236)	-0.0312 (0.0204)		-0.0324 (0.020)	
Public expenditure	-0.43 (0.0451)		-1.656*** (0.3463)	-1.899*** (0.310)	-1.692*** (0.3375)	-1.970*** (0.02968)
Exchange rate	-0.210*** (0.062)	-0.2234*** (0.061)	-0.1923*** (0.0405)	-0.185337*** (0.0399)	-0.18644*** (0.03934)	-0.1764*** (0.0383)
R-squared	0.2536	0.2498	0.71918	0.71541	0.718669	0.71449
Cross-section fixed	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed	No	No	Yes	Yes	No	No
Wald test (p-value)	-	-	-	-	-	-
Observations	527	527	527	527	527	527

* indicate significance level at 10%
**indicate significance level at 5%
***indicate significance level at 1%

Estimation results obtained using different sample sizes:

Regressions	Annual data					
Robustness Check model	OLS (1)	OLS (1)	OLS (3)	OLS (3)	CCE (5)	CCE (5)
Years:	Y:1985-2000	Y:2001-2015	Y:1985-2000	Y:2001-2015	Y:1985-2000	Y:2001-2015
C	5.6564*** (1.1866)	0.8982** (0.4143)	1.07819 (1.30890)	1.209547*** (0.2778)	0.39756 (10.76763)	0.15806 (2.6690)
Real house price	0.38625 (0.3250)	-0.5867 (0.3787)	0.26091 (0.23644)	-0.4001* (0.2245)	0.2602** (0.23441)	-0.400947* (0.2235)
Private debt	-0.2108*** (0.0639)	-0.0938*** (0.0290)	-0.1383** (0.0550)	-0.0374** (0.0175)	-0.138 (0.0547)	-0.0374** (0.0174)
Real house price x Private debt	-0.2943 (0.2582)	0.1231 (0.1836)	-0.1082 (0.1881)	0.1718 (0.106)	-0.107 (0.1864)	0.1717 (0.1051)
Population total	-1.21150 (3.35019)	-1.5515 (1.846)	-1.308453 (2.52475)	0.63636 (1.11944)	-1.3083 (2.5083)	0.63636 (1.1141197)
Education (tertiary)	-0.000813 (0.000852)	0.001832 (0.00117)	-0.000322 (0.000741)	0.000684 (0.000746)	-0.000323 (0.000736)	0.000684 (0.000742)
Institutional Index	-0.002619 (0.03993)	0.195911*** (0.06248)	-0.00048 (0.04211)	0.097336** (0.04252)	-0.000471 (0.04183)	0.09733** (0.0423)
Real interest rate	-0.003123 (0.00233)	-0.00103 (0.002724)	-0.001713 (0.001716)	0.001975 (0.001955)	-0.00171 (0.001705)	0.00197 (0.00194)
Real investment	7.32E-05 (0.00544)	8.54E-05 (0.00020)	-0.000187 (0.000396)	-7.01E-06 (0.00116)	-0.000187 (0.000393)	-7.01E-06 (0.000115)
KOF index	-0.785074*** (0.255832)	0.034597 (0.019469)	0.161995 (0.285717)	0.00950 (0.0112)	0.16193 (0.2838)	0.00950 (0.01115)
Public debt	-0.0278 (0.0883)	-0.0577 (0.0499)	-0.0743 (0.0659)	2.69E-03 (0.0315)	-0.0743 (0.0655)	2.69E-03 (0.0314)
Public expenditure	-0.4495 (0.8224)	-2.925*** (0.59819	-0.7525 (0.6556)	-2.863*** 0.4393	-0.7523 (0.00651)	-2.863*** (0.4372
Exchange rate	-0.3785*** (0.09446)	-0.1691** (0.08271)	-0.285026*** (0.06909)	-0.1838*** (0.04884)	-0.2850*** (0.06864)	-018386*** (0.04861)
R-squared	0.3537	0.38469	0.69404	0.8192	0.6940	0.8193
Cross-section fixed	Yes	Yes	Yes	Yes	Yes	Yes
Period fixed	No	No	Yes	Yes	No	No
Wald test (p-value)	-	-	-	-	-	-
Observations	527	527	527	527	527	527

* indicate significance level at 10%
**indicate significance level at 5%
***indicate significance level at 1%

The common correlated effect (CCE) estimator equation:

$$\Upsilon_{it} = \alpha_i + \mu_i + \beta X_{it} + \lambda_{1i} \mathrm{F}_{1t} + \lambda_{2i} \mathrm{F}_{2t} + \ldots + \lambda_{ki} \mathrm{F}_{kt} + \varepsilon_{it}$$

which is the same as:

$$\Upsilon_{it} = \alpha_i + \mu_i + \beta X_{it} + \sum_{m=1}^{k} \lambda_{mi} \mathrm{F}_{mt} + \varepsilon_{it}$$

In order to create factor structure in the error term, λ_i is added and represent factor loading (in this equation), F_{it}, is a factor and, *k*, is a finite positive constant (a number of factors). The above equation is created following the method of CCE by Pesaran (2006). The CCE method is applied since F_{mt} is not observed. Hence we used the following technique in order to get the above equation:

Step (1): Estimate F_{mt} by cross-sectional averages.
Step (2): Estimate β:

$$\Upsilon_{it} = \mu_i + \beta X_{it} + \lambda_{1i} \hat{\mathrm{F}}_{1t} + \lambda_{2i} \hat{\mathrm{F}}_{2t} + \cdots + \lambda_{ki} \hat{\mathrm{F}}_{kt} + \varepsilon_{it}$$

$$\approx$$

$$\Upsilon_{it} = \mu_i + \beta X_{it} + \lambda_{1i} \overline{Y_t} + \lambda_{2i} \overline{X_t} + \lambda_{3i} \overline{X_{2t}} + .. + + \lambda_{12i} \overline{X_{11t}} + \varepsilon_{it}$$

Research limitations:

The original idea was to include a number of 20+ countries for a period of 40 years. However, data for smaller developed countries were not found from any secondary data source. Hence the research got smaller in terms of number of countries and time period.