



The Impact of Loan to Value Ratio on Saving and Growth – Cross Country Evidence

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Dedication

I dedicate this study to my husband, Bernas Syafri, and my two beloved daughters Alya Putri Berta Syafri and Mikhayla Aldiha Syafri, who had offered unwavering support and encouragement during my master journey. They have cheered me on and wiped my tears away when I was discouraged.

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List of Acronyms

LTV	Loan to Value
OECD	The Organisation for Economic Co-operation and Development
GDP	Gross Domestic Product
SUR	Seemingly Unrelated Regression
IMF	International Monetary Fund
HOFINET	Housing Finance Investment Network
US	United States
UK	United Kingdom

Abstract

The present study investigates the impact of LTV (loan-to-value) as well as supervisory LTV on net national saving and real GDP per capita growth in 56 countries from 2000 to 2014. The empirical result from global sample shows that LTV has significant impact on real GDP per capita growth through net national saving in pre- financial crisis. Global sample also provides evidence that in pre-financial crisis supervisory LTV and non-supervisory LTV produce different impact on net national saving. The significant impact LTV and supervisory LTV on net national saving and real GDP per capita growth are absence in post- financial crisis. However, supervisory LTV plays important role in OECD and non-high-income countries both in pre- and post- financial crisis in determining net national savings.

Relevance to Development Studies

Following the global financial crisis of 2007-8, supervisory LTV ratio has been adopted in housing sector in many countries as a part of macro-prudential policy. Many studies provide evidence that supervisory LTV has a significant impact on the stabilisation of the financial system. It helps financial institutions become more resilient to adverse conditions in the housing market. While housing sector plays a major role in the economy, proper understanding of LTV which impacts housing sector is necessary to ensure economic performance does not suffer adverse effects. This paper provides the analysis of complementary role of LTV as well as supervisory LTV on saving and economic growth. The results of this research will expand the current literature on macro-prudential policy.

Keywords

Loan to Value ratio, Net National Saving, GDP per Capita growth, Supervisory Loan to Value

Chapter 1 - Introduction

This chapter provides a description of the research topic and problem statement, as well as research questions. This chapter also provides an overview of relevance of this study on development studies, the limitations of such studies and study design.

1.1 – Background

For most households, housing is the most principal investment over their lifetime. Generally, households own a house by acquire it either in cash or through securing a mortgage loan. However, most household utilise a mortgage loan to finance its spending to purchase housing. Banks, financial institutions and mortgage lenders can all be actively involved in the process of house financing.

Typically, a lender will offer the borrower a loan equal to a certain percentage of the value of the house. From lender perspective this percentage is called the LTV (loan-to-value) ratio which is a ratio of the loan amount to the value of the house (Suh 2011:14). The principal reason that lenders will restrict the loan amount offered to the borrower up to LTV ratio, is to reduce lender's risk against of borrower's default. With a mortgage loan, the house is used as collateral for securing the loan against default. If the borrower fails to repay the loan, the lender is then legally entitled to sell the house and retain a sufficient portion of the proceeds to cover the remaining loan balance. An LTV in this case protects the lender against various factors that could reduce the value of the collateral, as well as the loss that occurs as a result of a reduction in the value of the collateral between the most recent loan payment and the time when the collateral is sold.

The LTV places a restriction on the amount of money the household may borrow. In order to purchase a house, the household should cover that portion of the value of the house which is not covered by the lender. From the perspective of the borrower, this portion should serve as the required down payment. To elucidate this with an example, assume that the lender has restricted the mortgage loan extended to the borrower to 70% LTV. With this restriction, the borrower can only borrow a mortgage loan which comprises 70% of the value of property, and therefore is required to provide a down payment of 30% of the value of property. If the lender increases the LTV ratio, the down payment required will subsequently be less, and vice versa. Put simply, LTV is the inverse of the down payment requirement.

The presence of credit constraints such as LTV will affect the decision of a household concerning the savings, timings and consumptions involved in

home buying. In the case of LTV, Hayashi et al. (1988:215-216) investigated the behaviour of households with regard to house buying in the United States and Japan. They found that Japanese typically purchase housing later in life, and save more in the interim period in order to meet the high down payment requirements due to a low LTV compared to Americans. Aron et al. (2012:397) studied the behaviour of households in the US, Japan and the United Kingdom. They found that consumption increases as down payments decrease. These studies provide evidence of the existence of interaction between credit constraint and saving-consumption decisions. Households facing constraints, such as the LTV ratio requirement, in acquiring mortgage loans are thus prevented from increasing their consumption, as they are forced to save more in order to meet the down payment requirements for a mortgage.

The maximum LTV varies considerably between countries. Between 2000 and 2014, the lowest maximum LTV was in Armenia, at 45%, while the highest was in the Netherlands, at 103.4%.¹ This discrepancy can be explained by various factors which include: (1) The availability of information concerning loan applicants to lenders, (2) The country's legal system, and (3) The country's regulations.

The availability of information on loan applicants to lenders contributes greatly to the substantial variance in maximum LTV rates between countries. In Canada and the UK, lenders do share information about borrowers. Specialized credit reference agencies provide lenders with reliable and easily attainable information about the credit records of mortgage applicants, but in other countries such information sharing does not take place (Jappelli and Pagano 1994:94).

Differences in legal systems and judicial efficiency between countries determine the differences in costs and length of time for foreclosure processes in the case of borrower default to repay mortgage. In Sweden in 2011, a duration of four months was necessary for a lender to possess a property in the case of mortgage foreclosure (Swedish National Housing Credit Guarantee Board as cited in HOFINET 2015), whilst in Spain this same process took 18 to 24 months (The Spanish Mortgage Association as cited in HOFINET 2015). In Sweden, the foreclosure process incurred a cost of 3% of the loan value, whilst in Australia it incurred a cost of 4.5% (HOFINET 2015).

In some countries, central banks or financial regulators impose restrictions on the limits of LTV (hereafter called the supervisory LTV), whilst in others these institutions impose no supervisory LTV. In the absence of supervisory LTV,

¹ The value of maximum LTV refers to the average maximum LTV value in each respective country. The value is based on the author's calculation based on source data describe in the appendix 1 and 2.

the limits placed on LTV can be regarded as credit rationing of lenders. The lender chooses the relevant LTV that it plans to extend to borrowers after assessing their risk profile. The maximum LTV are dependent on the borrower's capacity for repayment. In such cases, changes in LTV will reflect changes in the composition of the borrower rather than the condition of the housing market (Chiuri and Jappelli 2003:861).

In countries where the supervisory LTV limit is in practice, central banks and financial regulators restrict the upper limit of LTV on mortgage loans that can be provided by either a bank or a mortgage lender over a given time period. Banks and mortgage lenders are required to restrict mortgage lending to no more than the strict upper limit of LTV. The supervisory LTV is widely used by many central banks and financial regulators to avoid risks such as those that occur from excessive mortgage credit and credit-driven asset price inflation (Lim et al. 2013:8). Massive mortgage loans result in house price appreciation, which in turn renders housing prices overvalued. A significant correction in housing prices may erode a household's equity, and furthermore the lender may lose their mortgage portfolio, resulting in stress within the financial system (Reserve Bank of New Zealand 2013). This in turn has a long-lasting, adverse effect on the economy. Generally, central banks and financial regulators will tighten the supervisory LTV in real estate boom conditions, and ease the supervisory LTV in bust conditions. Supervisory LTV during the 2000 - 2014 period varied considerably; the lowest supervisory LTV was found in Bulgaria at 54%, whilst a supervisory LTV exceeding 100% (103.4%) existed in the Netherlands.²

Following the global financial crisis of 2007-8, supervisory LTV have been introduced in many countries, particularly non-OECD (non - The Organisation for Economic Co-operation and Development) countries as a part of macro-prudential policy (Lim et al. 2013:8). The broad agreement concerning the global financial crisis of 2007-8 concludes that inadequate prudential regulation of financial systems may be regarded as the key contributing factor to the worldwide financial meltdown. The crisis is commonly believed to have been triggered by the bursting of "house bubbles" in the US in 2006. Bad lending practice by financial institutions such as low down payment requirements, particularly within the housing sector, was suggested to be responsible for the massive lending which subsequently fuelled the creation of house bubbles (Igan and Kang 2011:3). As a result, there is currently a growing recognition among policy makers that supervisory LTV

² The value of maximum LTV refers to the average maximum LTV value in each respective country. The value is based on the author's calculation, based on source data described in the appendix 1 and 2.

should be adopted to safeguard financial systems, and particularly to help financial institutions become more resilient to adverse conditions in the housing market.

Supervisory LTV is believed to have had a significant impact on financial system stability. Supervisory LTV could help to avoid further instances of financial crisis similar to the 2007-8 crash. According to Wong et al. (2011:1), LTV operates in pursuit of financial stability through altering demand and supply within the mortgage loan mechanism. Tightening (or loosening) of the supervisory LTV may reduce (or increase) demand for mortgage loans because of liquidity hurdles for the potential homebuyer. They may be forced out of (or alternatively welcomed into) the property market, therefore reducing (or increasing) demand for housing, resulting in falling (or rising) house prices. One of the principal, and far-reaching, implications of this mechanism is that limiting LTV could improve banks' resilience. LTV restrains household leverage, which in turn reduces incidents of default in residential mortgage loans (Igan and Kang 2011:3). LTV limits can also improve banks' resilience in the sense that due to the tightening of LTV limits, lenders hold more of an equity buffer at the loan origination than they would otherwise do. Consequently, the possibility of negative equity is lower and thus so is the risk of default (Wong et al. 2014:1).

1.2 – Problem Statement

The housing sector plays a major role in the economy. For most households, housing is the largest component of their consumption bundle. Purchasing a house is generally the most important financial transaction for a household. On the other hand, in many countries, a mortgage loan is the main mechanism for most households to finance ownership of housing. Any constraints on acquiring a mortgage, such as LTV requirements, will have significant effects on the household. A decline (or rise) in the LTV ratio affects the saving rate of households, since they are forced to accumulate savings merely in order to meet rising (or declining) down payment requirements for acquiring mortgage loans. At an aggregate level, LTV limits therefore affect national saving.

Saving and economic growth are intrinsically related to one another. According to economic theory particularly the Solow growth model (1956:85), accumulated saving is an important source of capital stock which is absolutely crucial for creating investment, and eventually promotes economic growth. With this in mind, if the LTV affects national saving then the implications will be far-reaching. In short, by affecting accumulated saving, LTV limits will affect economic growth.

1.3 - Research Objective and Research Question

Research Objective

This research paper aims to investigate whether LTV affect saving and economic growth.

This paper will explore LTV, both supervisory and non-supervisory, in relation to their impact on saving and economic growth. As outlined in the introduction sub-chapter, the increasing tendencies of the introduction supervisory LTV has occurred following global financial crisis 2007-8, therefore this research paper will also explore the effects of LTV pre- and post- before financial crisis of 2007-8.

Research Question

In order to achieve the research objective, the main questions of this research paper is:

- Does the limit of LTV affect saving as measured by net national saving, and growth as measured by real GDP per capita growth?

This research paper also aims to answer the following sub-research question:

- Do supervisory and non-supervisory LTV produce different effects on net national saving and real GDP per capita growth?
- Do LTV have different effects on net national saving and real GDP per capita growth pre- versus post- financial crisis?

1.4 – Relevance to Development Studies

To the best of our knowledge, studies that investigate the impact of LTV on aggregate saving and economic growth are still limited. Previous papers that have investigated the effect of LTV have been produced in a small number of individual countries such as the UK, the US and Japan, whilst cross-country analysis has only been undertaken in OECD countries and Europe. The expansion of such studies to include non-OECD countries is a distinctive feature of this research paper. This research paper is therefore contributing to current literature concerning the impact of LTV on aggregate saving and economic growth in both OECD and non-OECD countries.

Another distinctive feature of this research paper is its inclusion of an investigation into the effect of the presence of supervisory LTV on saving and growth. Despite the fact that supervisory LTV have become standard policy in recent years, empirical evidence of the impact of these supervisory LTV is still incomplete. Major research has been carried out to discover the impact of supervisory LTV on mortgage credit growth, housing prices and financial stability. While supervisory LTV are mostly determined by policy makers in

order to manage mortgage credit growth, house price appreciation or financial instability, it is important to investigate whether LTV has complementary effect on the economy, particularly on saving and economic growth. Therefore, this paper is relevant for all countries that are considering employing supervisory LTV limit.

Given that the housing sector plays such an important role in the economy, the supervisory LTV that impacts housing market should be carefully designed to ensure economic performance does not suffer adverse effects. This paper provides the analysis of complementary role of supervisory LTV which currently a part of macro-prudential policy on economic growth. Therefore, the results of this research will expand the current literature on macro-prudential policy.

1.5 – Limitation and Scope

1.5.1 Limitation

The findings in this study are resulted from limited data of LTV both for supervisory and non-supervisory LTV. The dataset available for LTV value is limited to OECD countries. Gathering data of LTV value particularly for non-OECD countries was more difficult than expected. Introduction supervisory LTV in non-OECD countries are too recent and very little study has been written about it. A lack of data will likely under powering the overall findings and conclusion of this study. Inclusion more data of LTV value might address the research problem more accurately in any future study.

1.5.2 Scope

In order to maintain relevance and focus, this study will bypass two interesting discussions. First, this study will ignore the discussion concerning the dynamism value of LTV. This will be true for both supervisory and non-supervisory LTV across groups of countries in pre- and post- financial crisis. To be specific, this study will not elaborate on these points when explaining the descriptive statistics of LTV in Chapter Four. The analysis of this issue requires an in-depth discussion of the mortgage market in the respective groups of countries, which is beyond the focus of this study. Second, this study also ignores the discussion about transmission channel impact LTV on real GDP per capita growth besides saving channel, which also beyond the focus of this study.

1.6 - Study Design

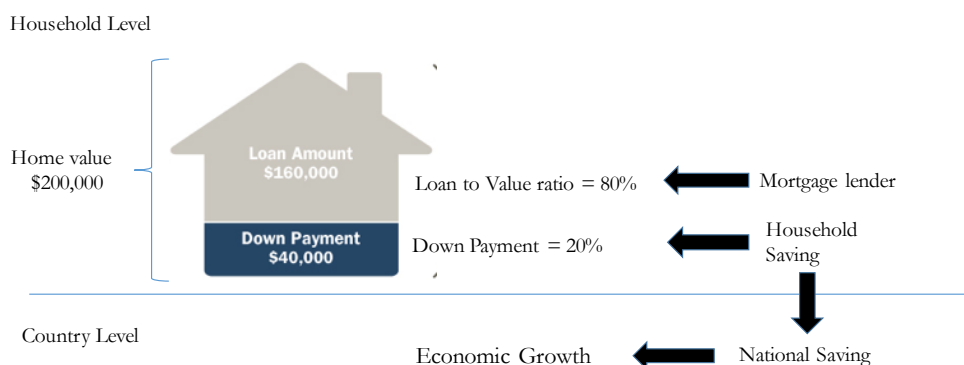
This research paper will proceed as follows: Chapter Two will describe theoretical frameworks. Chapter Three will provide a literature review

regarding saving and growth. Chapter Four will explain the methodological approaches, data gathering of the research and descriptions of the selected key data. Chapter Five will explicate the results and analysis of this paper. Chapter Six comprises of the summary and concluding remarks.

Chapter 2 – Conceptual Framework

This chapter provides a conceptual framework and presents empirical studies, as well as using models to demonstrate the links between LTV, saving and growth. The link between LTV saving and growth is illustrated in the figure below.

Figure 1 Illustration the Link Loan-to-Value, Saving and Growth



2.1 – Loan-to-Value and Saving

LTV can be regarded as a credit constraint on borrowers attempting to obtain mortgage loans, irrespective of their future capacity to repay those loans. According to Teppa et al. (2014:5), credit constraints have a direct correlation with saving, thus we can expect that LTV does affect saving. Households facing credit constraints are prevented from ordinary consumption, as they consume less compared with their normal maximum level of consumption, therefore constraints are enforcing saving on the household. In order to become a home owner using a mortgage loan, the household must save more money and consume fewer non-housing goods in the early stages of their life cycle, in order to meet the required down payment. The consequence of this constraint is that households are required to change their pattern of saving over their life cycle, forced to save from very early life cycle unless they choose to postpone or forgo the purchase of housing (Jappelli and Pagano 1994:91).

The potential first-time home buyer must accumulate sufficient savings before being able to afford a house through mortgage loans. According to DeNederlandse Bank (2015), the majority of potential first-time home buyers in the Netherlands must accumulate savings for an average of three years before being able to afford a home, if LTV were lower from more than 100% to 90%. The lower LTV ratio is associated with higher down payment requirements and higher savings. The higher LTV ratio has the opposite effect.

Low down payment requirement for mortgage is not necessary translate into less saving. The effect of LTV on saving may be ambiguous due to interaction factors which involving (1) household's saving motive, (2) household's characteristic and (3) intergenerational transfer.

According to Teppa et al. (2014:4), household saving motives can be categorized as either saving to finance the purchase of a house, saving for provision in old age, saving as a precautionary motive or a bequest motive. Saving motives render the effect LTV has on savings ambiguous. Lower LTV implies higher down payment requirements and more saving. This correlation may be accurate for a young individual who has typically high credit constraints, and has a saving motive of financing a house purchase. On the contrary, higher LTV, which implies lower down payment requirements, does not necessary translate into less saving. Lower down payments are not necessary to make a household increase its consumption and save less. The household may maintain a certain level of saving in order to save for provision in old age, as a precautionary motive, or bequest motive.

In other papers, Jappelli and Pagano (1988), provide evidence that the LTV may not always be negatively correlated with saving. They studied the gap between consumption and credit constraint, and found that the characteristics of the household determine the gap between consumption and credit constraint. This gap is large for households headed by an individual who is less than 30, an unemployed individual or a non-home owner, and smaller in households headed by an individual who is over 50. While Blanc et al (2015:2) surveyed expenses of households in 15 Euro-Zone countries in 2010-11. The survey showed that mainly household whose headed by female, young or divorced reported to have expenses exceeding income. By contrast, wealthier household reported to less likely to have expenses exceeding income. Given that differences on characteristic of household, therefore, higher LTV does not necessary translate into less saving, depending on the composition of the household in a country that is dominated by constraints types of household.

The family network can also play a role in determining the rate of saving for buying a house. Intergenerational transfer can interact with the household's desire to save for down payments. For example, transfers from older generations can help young generations meet the down payment requirements faster. Chiuri and Jappelli (2003:861) investigated the importance of this transference and the ways it is affecting household saving for down payments. Their study highlighted that intergenerational transfers reduced the time it took to complete home purchases in Italy and the US. Furthermore, the study notes that younger generations expecting to receive an inheritance or bequest tend to avoid saving for down payments. In these cases, LTV constraints may not be binding in terms of saving trends.

2.2 – Saving and Growth

The Solow Growth Model is an economic model that conveniently explains the relation between saving and growth. The model, named after Robert Solow in 1956, works within a neoclassical framework and argue the post-Keynesian Harrod-Domar model (Solow 1956:66). The Solow model extends the Harrod Domar model by adding labour as a factor in production and assuming that capital-labour ratios are not fixed, unlike in the Harrod-Domar model (Solow 1956:65). These extensions enable the Solow model to predict that economic growth is driven by three principal factors: capital accumulation, labour or population growth, and an increase in productivity which it commonly refers to as technological progress (Solow 1956:66). To narrow down the broad discussion this model invites, the remaining section of this paper will focus on capital accumulation.

The Solow model predicts that changes in capital investment will drive changes in economic growth. The neoclassical framework assumes that saving is equal to investment. With this assumption, the model predicts that changes in capital investment is driven by changes in the saving rate (Solow 1956:66). An increase in the saving rate will induce higher capital investment, which in turn will increase the growth rate of output per worker (Solow 1956:85). However, the model also predicts that the saving rate will only lead to higher growth until the economy achieves a steady state due to the assumption of diminishing returns on capital (Solow 1956:72). When the steady state is achieved and the country's resources are used up, economic growth in the long term can be attained only through technological improvement.

The Solow model suffers from two main shortcomings. First, the model assumes that the saving rate is exogenous (Solow 1956:87). The model does not foresee any household optimization of saving and consumption decisions. The saving rate is determined by external factors. This assumption is lacking a micro-foundation. Households will generally optimally determine their own consumption and saving, therefore the saving rate is the result of endogenous and not external factors. Another shortcoming of the Solow model is that the model provides no mechanism in which saving influences growth in the steady state.

An endogenous growth model could overcome the shortcomings of the Solow model. The Romer model is the most popular and spawned a large body of literature on endogenous growth theory. The main principle of the Romer endogenous growth model is an assumption of the elimination of diminishing return on capital accumulation (Romer 1986:1004) and saving rate is assumed to be a product of utility maximization. Romer developed this model by considering the model with increasing return to scale. This led to a radical shift in the implications of the model, compared to the Solow Model. The Romer model implies that saving rates have a growth effect. Changes in the

saving rate thus result in permanent changes in the growth rate. Since saving is an endogenous factor, any disturbance in saving patterns will therefore change growth rates.

2.3 - Relation between LTV, Savings and Growth

Jappelli and Pagano (1994:85) developed a growth model which explained the relation between credit constraints, saving and growth. They built two growth models which are modifications of the standard Solow exogenous model and the Romer endogenous model respectively. The Solow exogenous model was modified by modelling technical progress, using Hicks-neutral technical progress, making total productivity an increasing function of time (Jappelli and Pagano 1994:86). The Romer endogenous model was modified by assuming that the state of technology evolves as a function of the aggregate level of capital (Jappelli and Pagano 1994:86). These two models yield the following predictions: (1) Credit constraint raises saving, (2) The effect of growth on saving is stronger in presence of credit constraint, and (3) Higher levels of saving triggered by credit constraint will translate into higher levels of growth. Using this model, they found that easing households' credit constraints, which proxy by LTV, had negative consequences for saving rate and economic growth. They demonstrated that in a sample of 25 middle- and high-income countries the practice of raising LTV for mortgages was associated with a reduction in the savings rate and lower GDP per capita growth.

The model developed by Japelli and Pagano (1994) does, however, overlook the fact that credit constraints affect housing supply and demand. The macro-economic effect of low LTV is ambiguous. According to DeNederlandse Bank (2015), low LTV carries a macro-economic cost to the economy. Low LTV restrict potential first-time buyers in being able to afford a home. The demand for housing will subsequently decrease, lowering house prices, reducing property investment and possibly limiting economic growth.

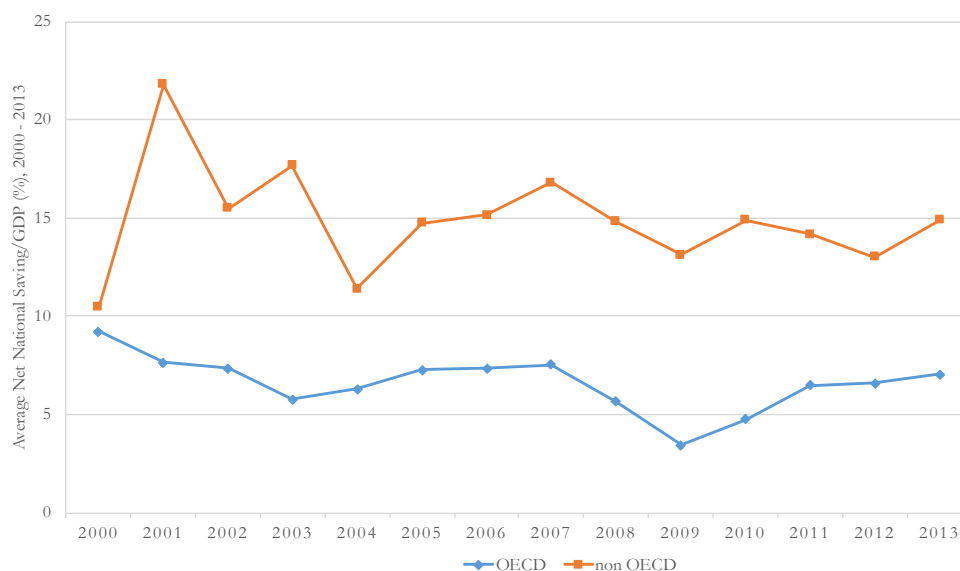
Chapter 3 - Literature Review

This chapter will briefly explain theory related to saving and growth as well as selected economic variables that determine saving and economic growth.

3.1 Saving

Saving rates, particularly national saving, differ vastly across countries and time periods. Figure 1 shows saving patterns as measured by the ratio of Net National Saving to GDP for OECD and non-OECD countries, from 2000 to 2013. During this period, national saving rates for non-OECD countries were higher compared to OECD countries, and national saving rates for both groups of countries fluctuated over the year. The differences and fluctuation in net national saving rates can be determined by various factors. These factors can be classified into four major factors: a demographic factor, an income and growth factor, an economic policy factor, and an international factor (Hussain and Brookins 2001: 151-159). Broad sets of economic variables that are included in each of these categories have been important for saving. However, the rest of this chapter will focus on selective variables that are mostly used in the literature on savings regression.

Figure 2 Average Net National Saving (% of GDP), 2000 - 2013



Sources: Author calculation based on data net national saving and GDP from World Development Indicator accessed 6 July, 2015

OECD and non-OECD countries refer to OECD and non-OECD countries used in this study.

Dependent population is considered as important variable in the class of demographic factors. The dependent population profile should be important

only insofar as it differs across countries and therefore will determine cross-country differences in saving. The changes in dependent population will change savings pattern due to changes in expenditure for consumption, health, schooling, and retirement (Hussain and Brookins 2001:152).

A number of empirical studies have found that the dependent population is an important contributory factor in saving. The empirical evidence provides mixed result. For example, Li et al. (2007:138) study the relation between dependent population (as measured by the dependency ratio) and saving in 200 countries from a period of 1960 to 2004, using the World Bank's World Development Indicator 2005. Their study reveals that the dependency ratio has had a negative effect on saving rates. In contrast, study from Kraay (2000:18) is not resembling to those by Li et al (2007). Kraay's study provides evidence that the dependency ratio has actually had a positive impact on saving in China. The explanation of this correlation is that high dependency ratio in China reflect a large young-age population and households in China have a strong bequest motive. With this in mind, higher dependency ratio will force higher saving. Baharumsah et al. (2003:829) also provide evidence that dependency ratio positively associated with saving in Malaysia, Thailand, the Philippines and Korea. They suggested that bequest motive strongly contribute to this correlation. The increase number of children increases household's motivation to leave a large bequest.

Many researchers have focused on income and the growth factor besides demographic factors as determinants of saving rates. Economic growth and structural changes in the economy as well as the uncertainty of future income streams are two major variables which fall into the income and growth factors category (Hussain and Brookins 2001:155).

Modigliani's lifecycle theory of saving and consumption hypothesizes that the saving rate is positively affected by increases in the economic growth rate (Deaton and Paxson 2000:212). As economic growth increases, the life-time resources of the younger generation increase relative to the older generation. The young generation can save more compared to the old, therefore aggregate saving increases. However, the results of recent studies have not been favourable to lifecycle theory. Recent studies have found the effect of economic growth on saving to be ambiguous. Deaton and Paxson (2000:213) studied the effect of economic growth on saving in Taiwan and Thailand. The study revealed that economic growth had a significant impact on saving but showed conflicting results between the two countries. For Taiwan, an increase in economic growth resulted in an increase in saving. By contrast, for Thailand, the results indicated that higher growth could trigger higher consumption and therefore reduce saving.

The uncertainty of future income streams is another important factor that influences saving. Carroll (1996:1) developed a model called the buffer-stock

model, which explains the relation between income uncertainty and saving. According to this model, if a household is facing uncertainty in its future income, that household may engage in buffer-stock saving behaviour. Households will opt to practice a fraction of their current consumption potential in order to cushion potential future income losses and secure future consumption. This behaviour results in an increase of precautionary saving. The recent financial crisis of 2007-8 is an example of an event which resulted in an increase of uncertainty in future income. Households faced adverse shocks to their income during the financial crisis, whilst the economic condition post-financial crisis was then unclear. This triggered household to reduce consumption and increase saving as a precautionary motive (Lee et al. 2010:7; Gerlach et al.2013). In 2009, the Federal Reserve Board conducted a survey of families to discover the effect of financial crisis on all types of household in United States. The study found that most families experienced a drop in wealth between 2007 and 2009, and the families also reported a greater desire for buffer saving (Bricker et al. 2011:1).

Economic policy factors, covering various financial and fiscal aspects of the economy, play an important role in determining national saving. Budget balance is an economic variable which is widely considered to be the most significant variable within this class. Empirical studies indicate a strong correlation between budget balance and national saving. A decrease (or increase) in budget surplus will contribute to an increase (or decrease) in national saving. Domenech et al. (2000:383) studied the effect of budget deficit on national saving in 18 OECD countries. They found that long lasting budget deficit is important factor which explain lower national saving rates. Similarly, Gale and Orszag (2004:103) studied the relation between budget balance and national saving in United States in 1962 to 2002, and found out that an increased in budget deficit by 1% of GDP could reduce national saving by 0.5% to 0.8% of GDP. This result suggests that budget balance as proxy for budget surplus/deficit plays a major role in determining national saving.

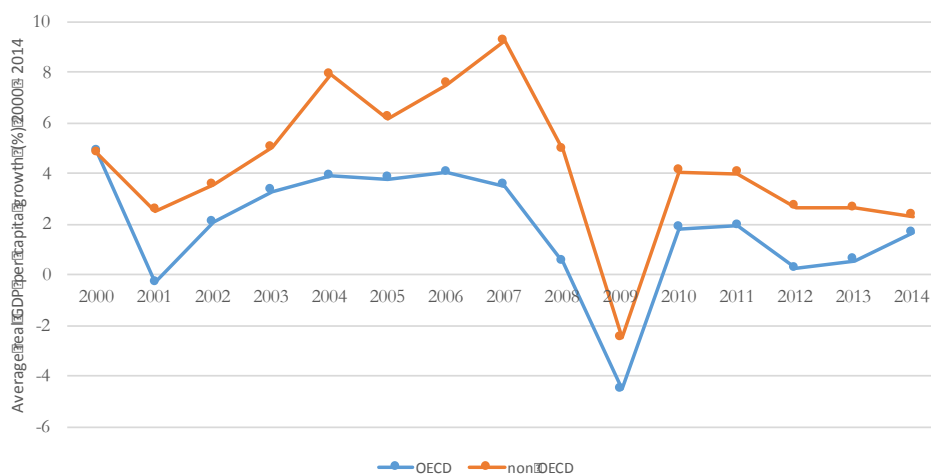
3.2 Growth

Growth rates, particularly real GDP per capita growth across countries, vary greatly and this discrepancy is influenced by many factors. According to Barro (1996:5), a country's growth rate is sensitive to its initial level of real GDP per capita. For a given value of all variables which affect growth rate, the initial level of real per capita GDP is negatively related to growth (Barro 1996:2). This implies that the higher the initial level of real GDP per capita, the lower the growth. The poorer countries will have higher growth rates compared to the richer countries. The stylized facts in Figure 3 support this claim. Figure 3 compares the average growth rate as measured by real GDP per capita growth between two group countries: the richer (OECD) and the poorer (non-OECD)

countries, from 2000 to 2014. During this period, the growth rate of non-OECD countries was higher compare to OECD countries.

As in the Solow growth model, the rate of growth is determined by the saving habits of households and firms in country, and labour force growth (Solow 1956:65). Solow model predicts that for a given level of capital accumulation, as measured by real GDP per capita, higher saving and labour force is expected to produce a higher income per capita. Mankiw et al. (1992:407) examined cross-country variation in income per capita and found that more than half of such variation can be explained by these two variables alone. They also found that saving and labour force do influence income per capita in the direction predicted by the Solow Model.

Figure 3 Average Real GDP per Capita Growth (%), 2000 - 2014



Sources: Author calculation based on data real GDP per capita from World Development Indicator accessed September 26, 2015

OECD and non OECD countries refer to OECD and non OECD countries used in this study.

For a given starting level of real per capita GDP, growth of human capital level will enhance the growth rate in economy. Mankiw et al. (1992:408) developed a growth model which could explain the link between human capital and growth. They augmented the Solow Model by including a human capital variable. According to this new model, human capital accumulation is associated with saving rates and labour force growth. For a given level of human capital accumulation, higher saving and labour force growth leads to higher income, which in turn leads to a higher level of human capital; therefore, saving rates and labour force have a greater impact on real GDP per capita growth when human capital accumulation is taken into account.

Chapter 4 – Data and Methodology

This chapter explains about data sources, variables and methodology used to investigate correlation between LTV, saving and growth. Descriptive statistics were calculated for the key variables of LTV, savings, and growth also will be provided in this chapter. These data will be presented for the global sample and also grouping into two type of country groups: OECD and non-OECD and high-income³ and non-high-income.

4.1 Data

This research uses secondary sources for economic and financial data covering 56 countries from 2000 to 2014. The countries comprise 25 OECD countries and 31 non-OECD countries. Within this selection, there are 25 countries which do adopt supervisory LTV and 31 countries which do not adopt supervisory LTV. The time period for this research has been chosen to encompass both pre-financial crisis and post-financial crisis years.

The dataset available for main variable LTV is limited. The available dataset for this variable is taken from the Helgi Library and covers only 21 countries, the majority of which are OECD countries. This dataset therefore acts as the base dataset for this study. To increase observation numbers, the dataset has been expanded by the inclusion of LTV data for other countries, taken from various sources such as IMF working papers, existing literature on the subject, the European Central Bank Report, the United Nations Report, the Banking Association Report, mortgage lender institution reports and The Housing Finance Information Network (HOFINET). To ensure that the information relating to LTV is of suitable a quality and reliability for this study, cross-referencing has been conducted for the sources cited in HOFINET. Only LTV data sourced in HOFINET that has been provided by reputable institutions such as central banks, mortgage lenders, banking associations and real estate associations was used for this study. Full details of data sources can be found in the Appendix.

³ Certain country in non OECD group in this study such as Singapore, Hong Kong and United Arab Emirates show very large real GDP per capita compare to other countries in this group. Similarly, certain country in OECD group also points out that Turkey and Mexico shows low real GDP per capita compare other countries in this group. To maintain homogeneity on income across two group countries, the analysis also covers analysis for high-income countries and non-high-income. According to World Bank, high-income countries are those countries with a Gross National Income per capita of minimum \$12,736 or more.

The dataset for supervisory limit LTV was constructed by the author. The information for this dataset is taken mainly from Lim et al. (2013) with additional information from Crowe et al. (2011), Hassler (2011), Wong et al. (2011), the United Nations (2011) and HOFINET. Data on supervisory limit LTV taken from HOFINET was prepared following the same process as the LTV data mentioned in the previous paragraph.

Data for net national saving, GDP, Cash Surplus/deficit, and dependency ratio have been taken from the World Development Indicator, accessed July 6, 2015. Data for GDP per capita, labour force and primary school enrolment were taken from the World Development Indicator, accessed July 7, 2015, whilst data for GDP growth was sourced from the World Development Indicator, accessed September 25, 2015.

4.2 Variables

The analysis effect LTV on savings and growth takes the form of two estimations, which are represented by two dependent variables: Net National Savings, and Real GDP Per Capita Growth. Five key variables are used both in savings and growth estimation: 1) maximum limit LTV, 2) dummy supervisory limit LTV, 3) time dummy financial crisis, 4) the interaction term between limit LTV and time dummy financial crisis, and 5) the interaction term between supervisory limit LTV and time dummy financial crisis.

The other variables, besides the five key variables outlined above, that significantly affect saving and growth should all be controlled. The control variables for saving estimation are real GDP growth, cash surplus/deficit and dependency ratios. The control variables for growth estimation are initial real GDP per capita, labour force growth and primary school enrolment. These variables are frequently used as control variables to estimate saving and growth, and are also regarded as variables which have significant impact in explaining growth.

Net National Saving

According to Jappeli and Pagano (1994:96), national saving is a better representation of saving than private or public saving, because national saving is more resistant to the inflation induced transfers that occur between the private and public sectors. On the other hand, net national savings is commonly used to measure the capacity of the country to produce goods and services in the future (US GAO 2001:47). As such, this variable can provide better explanations of the relation between saving and growth.

The net national saving is defined as gross national saving less the amount of fixed capital consumption. It is expressed as a percentage of GDP for the following reasons:

- The amount of net national saving is not a meaningful measurement of share of income or economic output when the primary measure of a country's economic output is GDP.
- This study deals not only with national saving but also with other measures such as cash surplus/deficit which is expressed as a share of GDP. Therefore, expressing net national saving as a share of GDP will provide a consistent frame of reference.

GDP per capita growth

Growth as predicted by the Solow growth model and the Romer model refers to income per capita growth. Therefore, GDP per capita growth is used as a proxy for growth. GDP per capita growth is defined as the annual percentage growth rate of GDP per capita based on a constant of US dollars in 2005.

Maximum LTV

The maximum LTV is defined as the average maximum LTV for one year at loan origination when that loan is given to a first-time home buyer, both for supervisory LTV and non-supervisory LTV. Supervisory LTV refers to the maximum limit LTV which is determined by a central bank or financial regulator, whilst non-supervisory LTV refers to the maximum limit LTV which is determined by a lender for each homebuyer. This variable has an ambiguous relation with net national saving. A lower LTV will increase saving, but on the other hand, a higher LTV does not necessarily translate into less saving.

Dummy variable supervisory LTV

Dummy variable supervisory LTV is used to find out whether supervisory LTV and non-supervisory produce different effect on net national saving and real GDP per capita growth. Country-year combination determines the value of this variable. Supervisory LTV is valued as 1 if the country in respective year implement supervisory LTV. Supervisory LTV is valued as 0 if the supervisory LTV was not used in the country in respective year.

Time dummy variable Financial crisis

Unexpected variation or particular events, such as the 2007-8 financial crisis, may affect the outcome of the national saving variable. Therefore, a time dummy variable of a financial crisis is used in this study as a control variable.

Refer to Figure 3 in Chapter 3 above, which shows the sharp decline in real GDP per capita growth in 2009 both in OECD and non-OECD countries. This indicates that both of these groups of countries began experiencing negative consequences of the crisis from 2009. Therefore, pre-financial crisis is defined as the period 2000 to 2008, while the post-financial crisis period is

defined as the years 2009 to 2014. Post-financial crisis is valued as 1 while pre-financial is valued as 0.

Interaction term LTV and time dummy financial crisis

As mentioned in Chapter 1, bad lending practices by financial institutions, such as high LTV ratio particularly in housing sector, was suggested to be responsible for massive lending which fuelled a house bubble that triggered the financial crisis 2007-08 (Igan and Kang 2011:3). Furthermore, following the global financial crisis of 2007-8, supervisory LTV were introduced in many countries, particularly non-OECD countries (Lim et al. 2013:8). The countries did this to safeguard financial systems, and more particularly to help financial institutions become more resilient in the face of adverse shock in the housing market. With this in mind, it is highly conceivable that the value of LTV was directly affected by the financial crisis. The value of LTV in one country could be significantly different pre- and post-financial crisis, and this could influence the effect that LTV had on net national saving and real GDP per capita growth pre- and post- the financial crisis. The interaction term between LTV and a time dummy financial crisis is included in this study to capture and analyse this effect.

Interaction term supervisory LTV and time dummies financial crisis

Similar motivation for inclusion interaction term LTV and time dummies financial crisis also applies for inclusion interaction term supervisory LTV and time dummies financial crisis in the analysis. Increasing tendencies of introduction supervisory LTV following global financial crisis 2007-8 in many countries country could influence the effect that supervisory LTV had on saving and growth pre- and post- financial crisis.

GDP growth

GDP growth is used as a proxy for economic growth. Real GDP growth rate is defined as annual percentage growth rate of GDP measured at market prices based on constant local currency while the aggregates are based on 2005 US constant dollar. GDP growth is expected to have ambiguous effect on net national saving.

Cash surplus/deficit

Cash surplus/deficit is used as a proxy for budget balance. Cash surplus/deficit is represented as percentage of GDP. This variable is defined as revenue (including grant) minus expenditure and net acquisition of nonfinancial assets (World Bank 2015). Cash surplus (or deficit) is expected to have a positive (or negative) effect on national saving.

Total Dependency ratio

The total dependency ratio is used as a proxy for the dependent population. The dependency ratio is defined as the ratio of the population of dependent to population of working age (World Bank 2015). 'Dependent' refers to people younger than 15 or older than 64, and 'working age' refers to people aged between 15 and 64. This variable is expected to have an ambiguous impact on saving.

Log initial GDP per capita

Initial GDP per capita is used as a proxy for initial levels of capital stock. This variable is expressed in constant 2005 U.S. dollars. According to Barro (2001:12) there is virtually no simple relation between the rate of growth and the initial level of capital stock as measured by GDP per capita. However, this variable showed significant negative effects when it was included in the growth estimation, implying that there is a partial relation between growth rate and the level of capital stock.

Labour force growth

Labour force is defined as the percentage of the population aged 15-64 that is economically active in terms of the total population (World Bank 2015). The number refers to International Labour Organization (ILO) estimations. Labour force growth rate is defined as the rate of change that a nation's labour force participation experiences from year to year. This variable is used as a proxy for population and also frequently used to estimate growth. Li et al. (2007:150) used this variable to estimate growth, and found that higher labour force participation growth increases income per capita. Consequently, this variable is predicted to have a significant and positive association real GDP per capita growth.

Primary school enrolment

Primary school enrolment refers to the gross primary school enrolment ratio. This variable is defined as the total enrolment in primary education, irrespective of age, expressed as a percentage of the official primary education age population (World Bank 2015). Primary school enrolment numbers can exceed 100% due to inclusion of over-aged and under-aged students, grade repetition and early or late school entrance. This variable is used as a proxy for initial levels of human capital stock and is frequently used to estimate growth. Barro (1996:16) investigated the relation between GDP per capita and primary schooling, and found that the GDP per capita growth rate is positively determined by primary schooling. Therefore, this variable is expected to have a positive effect on growth.

4.3 Methodology

The method used in this study is quantitative analysis with a regression model. In order to determine the effect of LTV on saving and growth, this paper will use two regression models. The saving regression and growth regression models from Jappelli and Pagano (1994) are used as references.

In order to analyse the impact of LTV pre- and post- financial crisis, and the impact of supervisory LTV on saving and growth, these models have been modified with the addition of a dummy variable of supervisory LTV, time dummy variable of financial crisis, an interaction term LTV and time dummy variable of financial crisis and interaction term supervisory LTV and time dummy variable of financial crisis. The models after modification are formulated as follows:

Saving model

$$\begin{aligned} \text{Net National Saving} = & \alpha_0 + \alpha_1 \text{GDP Growth}_{i,t} + \alpha_2 \text{cash surplus/deficit}_{i,t} + \\ & \alpha_3 \text{dependency ratio}_{i,t} + \alpha_4 \text{LTV}_{i,t} + \alpha_5 \text{Supervisory LTV}_{i,t} + \\ & \alpha_6 \text{FinCris}_{i,t} + \alpha_7 (\text{LTV}_{i,t} \times \text{Fincris}_{i,t}) + \\ & \alpha_8 (\text{Supervisory LTV}_{i,t} \times \text{Fincris}_{i,t}) + \mu_{i,t} + \varepsilon_{i,t} \end{aligned}$$

Growth model

$$\begin{aligned} \text{Real GDP per capita growth} = & \alpha_0 + \alpha_1 \text{Log initial GDP per capita}_{i,t} + \alpha_2 \text{Labor force growth}_{i,t} + \\ & \alpha_3 \text{primary school enrolment}_{i,t} + \alpha_4 \text{Net National Saving}_{i,t} + \\ & \alpha_5 \text{LTV}_{i,t} + \alpha_6 \text{Supervisory LTV}_{i,t} + \alpha_7 \text{FinCris}_{i,t} + \\ & \alpha_8 (\text{LTV}_{i,t} \times \text{Fincris}_{i,t}) + \alpha_9 (\text{Supervisory LTV}_{i,t} \times \text{Fincris}_{i,t}) + \\ & \mu_{i,t} + \varepsilon_{i,t} \end{aligned}$$

The study of the impact LTV on saving and growth will be performed into two stages, starting with cross-sectional study and proceed with panel study.

Cross-sectional study

In the cross-sectional study, the impact of LTV on net national saving and real GDP per capita growth are observed in many countries over a single period of time using cross-sectional regression. Such studies provide a snapshot of any links or associations between LTV and net national saving and real GDP per capita growth without regarding the time differences. A cross-sectional regression would have as each data point an observation on a particular country's variables at a single period in time, and different data points would reflect different countries at the same period of time.

Panel study

As outlined in Chapter 1, this study also aims to investigate whether LTV, as well as supervisory LTV, has a different impact on saving and growth pre- and post- financial crisis. A cross-sectional study may not provide the information needed to achieve this objective. By contrast, a panel study allows us to study dynamic relationships over time (Wooldridge 2002:169). The key difference is that panel study extend beyond a single period in time and therefore can facilitate an analysis of the impact LTV on saving and growth in many different countries and how this may change over the course of time. A panel study involves the analysis of panel data. Two techniques are selected for use in this paper to estimate panel data; these are Random Effect and Seemingly Unrelated Regression (SUR).

Random Effect

Random effect has been selected for this study to estimate panel data. Random effect was chosen over other methods of estimating panel data, such as Fixed Effect, because this study is interested in investigating the impact of variables that change very little or not at all over time. One of the goals of this study is to investigate the impact of supervisory LTV on saving and growth in pre- and post- financial crisis. The adoption of supervisory LTV in many of the countries used in this study mainly occurred post- financial crisis. On the other hand, this paper also aims to investigate the impact LTV on saving and growth across groups of countries. In certain groups, supervisory LTV also changes very little. Referring to the nature of the data used in this study, therefore, supervisory LTV is expected to be a time-constant variable in pre-financial crisis periods and certain groups of countries. Random effect provides a means to deal with time-constant explanatory variables, which cannot be solved by Fixed Effect technique (Wooldridge 2002:266).

Seemingly Unrelated Regression

Seemingly Unrelated Regression (SUR) is a linear regression model that consists of several regression equations linked by the fact that the error terms are correlated (Moon and Perron 2006:2). Each equation has its own dependent variable, and possibly contains the same number of explanatory variables. Each equation in the system can be estimated independently and the estimations are consistent, however, it is inefficient if the error terms display no correlation across the equations. SUR combines information from different equations and estimates all the equations jointly within one system, resulting in an efficient estimator as long as the error terms across the equations are correlated (Moon and Perron 2006:2).

This paper will also use SUR besides random effect in panel study. Given that the impact LTV on savings and growth are investigated using two equations, the use of SUR on this study is attractive. The main motive to use SUR is to gain efficient estimator by jointly estimate these two equations as one system.

The key to gaining efficiency from using SUR is the correlation of error terms across the equations. SUR become inefficient when the error terms between equations are uncorrelated, or when each equation is comprised of exactly the same explanatory variables (Moon and Perron 2006: 5). With this in mind, correlation of error terms between equations should be tested. If the error terms between equations are uncorrelated, then efficiency gain from using SUR disappear and Random Effect should be selected over SUR.

The Breusch-Pagan test could be used to check the correlation of error terms between equations. It tests whether the residuals from the two equations are independent. In other words, the test examines the presence of heteroscedasticity. The null hypothesis is that homoscedasticity is present. If the value of Chi Squared is insignificant and p-value is larger than that threshold (e.g. $p > 0.05$) then we fail to reject the null hypothesis of homoscedasticity. Thus we could interpret the error terms between equations as uncorrelated.

4.4 Descriptive Statistics - Selected Key Variables

4.4.1 LTV

LTV between countries which are used in this study varies considerably. Table 1 provides descriptive statistics for LTV variable for global sample and the restricted sample, which are categorize as OECD, non-OECD, high-income and non-high-income countries. From 2000 to 2014, LTV in global sample ranged from 37.2% to 104% with average 75.00%. Table 1 points out that LTV in OECD countries is generally higher than in non-OECD countries and global sample. The average LTV, as well as minimum and maximum, in OECD are higher compare to non-OECD countries. If the sample is restricted to high-income countries and non-high-income countries, the pattern of LTV also similar. The average, minimum and maximum LTV in high-income countries are higher compare to non-high income countries.

Table 1 Descriptive Statistics for LTV Variable

Variable	No. Observations	Mean	Std. deviation	Min	Max
Global Sample	363	75.00	13.81	37.2	104
OECD countries	185	76.18	13.15	42.6	104
non-OECD countries	178	73.77	14.39	37.2	100
High- income countries	214	75.96	13.63	40	104
Non-high-income countries	149	73.66	13.97	37.2	100

Descriptive statistics for dummy variable Supervisory LTV as depicted in Table 2 shows that non-OECD or non-high income countries are more active in introducing supervisory limit LTV in their economies. Supervisory LTV in

non-OECD or non-high income countries represent more than 60% of the number of observation in these group. On the other hand, supervisory LTV in OECD and high-income countries is only at a maximum of 22% and 30% respectively of the total by comparison.

Table 2 Descriptive Statistics for Supervisory LTV Variable

Variable	No. Observations	Mean	Std. deviation	Min	Max
Global Sample	363	0.44	0.50	0	1
OECD countries	185	0.22	0.41	0	1
non-OECD countries	178	0.66	0.47	0	1
High- income countries	214	0.30	0.46	0	1
Non-high-income countries	149	0.62	0.48	0	1

The average value of Supervisory LTV and non-supervisory LTV are illustrated in Table 3. The average value of supervisory limit LTV for global sample is higher than non-supervisory LTV. However, within the group of countries the pattern shows variation. In OECD and high-income countries, the average value of Supervisory LTV is significantly higher compared to value of non-supervisory LTV. Contrastingly, in non-OECD and non-high income countries supervisory LTV is lower than non-supervisory limit LTV, though the difference is marginal.

Table 3 Average Value LTV Pre- and Post Financial Crisis, 2000-2014

Sample	Type of LTV	Pre-financial crisis	Post-financial crisis
Global Sample	Supervisory LTV	75.402	77.476
	Non Supervisory LTV	72.301	74.74
OECD	Supervisory LTV	97	89
	Non Supervisory LTV	71.71	73.14
Non-OECD	Supervisory LTV	73.32	71.456
	Non Supervisory LTV	76.13	76.98
High-income	Supervisory LTV	81.25	82.37
	Non Supervisory LTV	72.14	73.56
Non-high-income	Supervisory LTV	72.24	73.76
	Non Supervisory LTV	73.03	77.06

Scanlon et al. (2010: 7), investigated the mortgage market after the financial crisis. They found that many OECD countries tightened lending standards, including LTV value, as a response to the financial crisis. Table 3 supports their findings; supervisory limit LTV dropped in post financial crisis in OECD countries. On the other hand, supervisory limit LTV slightly decreased in non-OECD in post-financial crisis. However, this relation is reversed if the analysis is examined using country classifications based on income. In post- financial crisis, supervisory LTV increases in both high-income and non-high-income countries.

4.2.2 Net National Saving

The net national saving variable, as depicted in Table 4, shows that non-OECD and non-high-income countries save more compare to OECD and high-income countries. In average net national saving account for 14.52% of GDP in non-OECD countries and 12.76% of GDP in non-high-income countries. Conversely, net national saving in OECD countries only represent 6.28% of GDP, and in high-income countries only represent 8.43% of GDP.

Table 4 Descriptive Statistics for Net National Saving (% of GDP)

Variable	No. Observations	Mean	Std. deviation	Min	Max
Global Sample	363	10.158	10.377	-11.88	46.843
OECD countries	179	6.28	5.00	-10.23	24.86
non-OECD countries	159	14.52	12.86	-11.88	46.84
High- income countries	203	8.43	8.42	-10.23	39.83
Non-high-income countries	135	12.76	12.35	-11.88	46.84

4.2.3 Real GDP per Capita Growth

Real GDP per capita growth variable, as depicted in Table 5, shows that growth in non-OECD or non-high-income countries is higher compared to OECD or high-income countries. The average real GDP per capita growth in non-OECD and non-high-income countries are 3.83% and 4.06% respectively. However, the average real GDP per capita growth in OECD and high-income countries is 1.46% and 1.62% respectively. These figures support hypothesis from Barro (1996) that the growth of the poorer (non-OECD and non-high-income countries) is higher compare to the richer (OECD and high-income countries)

Table 5 Descriptive Statistics for Real GDP per Capita Growth (%)

Variable	No. Observations	Mean	Std. deviation	Min	Max
Global Sample	363	2.61	4.25	-15.14	23.63
OECD countries	185	1.46	3.24	-8.70	10.65
non-OECD countries	178	3.83	4.81	-15.14	23.63
High- income countries	214	1.62	3.82	-15.14	13.22
Non-high-income countries	149	4.06	4.43	-13.89	23.64

4.2.4 Correlation between LTV, Net National Saving and Real GDP per capita growth

Table 6 displays the average value of the key variables between 2000 to 2014 for the 25 OECD countries used in the data set in this paper. The countries are ordered by the type of LTV and the value of real GDP per capita. Columns 1 and 4 indicate that in OECD countries, there is not necessarily correlation between LTV and Net National Saving. This could imply that LTV may not be

a constraint on obtaining mortgage for households in OECD countries, and thus may not affect net national saving. Columns 2, 3 and 4 indicate that LTV neither does LTV have an association with real GDP per capita growth, but there is an indication that LTV has positive correlation with real GDP per capita in OECD countries.

The correlation matrix for OECD countries support the prediction mentioned in previous paragraph.⁴ Correlation Coefficient shows moderate correlation 0.27 between LTV and net national saving and -0.106 between LTV and real GDP per capita growth. However, the correlation coefficient shows a moderate correlation 0.291 between LTV and real GDP per capita.

⁴ see appendix

Table 6 Average value of key variables for OECD countries, 2000-2014

OECD Country	Net National Saving as % of GDP	Real GDP per capita	Real GDP per capita growth	Maximum LTV	supervisory LTV
	(1)	(2)	(3)	(4)	(5)
Mexico	9.75	8,379.32	1.73	49.76	No
Poland	6.26	9,939.31	4.23	69.6	No
Slovakia	1.35	13,089.73	4.82	77.2	No
Czech Republic	4.27	14,527.82	2.13	51.35	No
Slovenia	5.56	19,683.71	-0.13	59.3	No
Greece	-0.86	22,408.61	2.23	63.25	No
Spain	4.16	26,308.08	-1.07	80	No
New Zealand	1.97	28,319.36	0.23	92.5	No
France	5.00	35,819.26	0.36	86.01	No
Australia	7.65	36,623.90	1.16	66.9	No
Belgium	9.77	36,686.53	1.68	80	No
Germany	7.72	36,955.36	1.12	74.14	No
United Kingdom	1.94	39,260.98	1.21	71.8	No
United States	1.74	43,596.59	1.00	73.5	No
Denmark	6.78	47,608.31	-1.12	80	No
Ireland	12.29	48,253.01	1.45	77.9	No
Turkey	8.86	7,240.14	3.04	75	Yes
Chile	9.89	9,062.06	3.09	100	Yes
Hungary	2.32	11,257.43	1.23	63.8	Yes
Israel	8.60	24,180.64	1.22	75	Yes
Canada	6.10	36,810.97	0.95	95.9	Yes
Finland	6.43	40,206.59	0.36	78.3	Yes
Netherlands	11.20	43,593.65	0.55	103.4	Yes
Sweden	12.76	45,329.66	1.59	85	Yes
Norway	22.80	66,337.76	-0.01	86.25	Yes

Sources: Author calculation based on data from various sources.
Information about the data can be found in the appendix.

Supervisory LTV in OECD countries also shows an interesting relation. Table 6 Column 1 and 5 indicate that irrespective of value of LTV ratio, countries which impose supervisory LTV have relatively higher saving compare to non-supervisory LTV. Correlation matrix shows that these two variables have a moderate correlation of 0.30.⁵ Table 6 Column 2, 3 and 5 indicate that supervisory LTV and non-supervisory LTV are not correlated with real GDP per capita growth.

Table 7 Column 1 and 4 indicate that in non-OECD countries, LTV and net national saving are uncorrelated. This suggests that in non-OECD countries,

⁵ see appendix

LTV also may not be a constraint for household in obtaining a mortgage, and may not affect saving. Column 2, 3 and 4 indicate that LTV is not necessary associated with real GDP per capita growth and real GDP per capita. On the other hand, supervisory LTV and non-supervisory LTV indicate no correlation with net national saving and real GDP per capita growth. These prediction are supported by the correlation matrix for non-OECD which report weak correlations between these variables.⁶

Table 7 Average Value of Key Variables for non-OECD Countries, 2000-2014

non-OECD Country	Net National Saving as % of GDP	Real GDP per capita	Real GDP per capita growth	Maximum LTV	Supervisory LTV
	(1)	(2)	(3)	(4)	(5)
Ghana	19.18	735.08	5.72	80	No
Mongolia	21.33	1,302.15	6.15	75	No
Georgia	6.03	2,073.10	5.29	78.3	No
Armenia	11.82	2,083.23	2.91	45	No
Morocco	10.67	2,513.10	2.02	100	No
Jordan	6.36	2,847.23	0.49	90	No
Iran	-	2,959.08	-1.5	70	No
Peru	14.71	3,912.16	4.66	90	No
Tunisia	-1.57	3,950.12	2.57	80	No
Belarus	19.51	4,577.76	4.58	90	No
Brazil	4.24	5,522.29	2.81	61.7	No
Russia	23.3	6,396.61	2.96	76	No
Uruguay	7.91	7,595.58	3.86	90	No
Lithuania	3.36	9,249.14	3.94	79.16	No
Pakistan	13.83	775.73	1.24	68.77	Yes
India	23.49	1,085.18	5.82	90	Yes
Egypt	10.05	1,470.88	0.71	90	Yes
Indonesia	23.53	1,605.38	4.32	81.4	Yes
China	32.55	2,270.79	9.4	75.3	Yes
Algeria	38.41	2,706.87	1.44	75	Yes
Azerbaijan	41.42	2,928.94	8.33	85.01	Yes
Thailand	14.01	3,297.21	2.76	93.3	Yes
Colombia	6.11	3,713.67	3.1	70	Yes
Serbia	-3.77	3,955.53	3.56	80	Yes
Bulgaria	3.07	4,379.66	3.85	54	Yes
Romania	4.7	5,466.43	4.26	73.17	Yes
Lebanon	-6.53	6,957.85	3.75	60	Yes
Latvia	3.72	9,417.06	4.27	90	Yes
United Arab Emirates	-	25,153.84	-2.95	77	Yes
Hong Kong	16.77	27,848.84	3.55	62.02	Yes
Singapore	35.08	33,531.81	3.22	73.99	Yes

Sources: Author calculation based on data from various sources. Information about the data can be found in the appendix.

Table 8 reports the average value of the key variables from period 2000 to 2014 for high-income countries. This table indicates that LTV has no correlation with net national saving and real GDP per capita growth. Similarly, supervisory LTV seems to have no clear difference when compared to non-supervisory LTV in explaining net national saving and real GDP per capita

⁶ see appendix

growth. The correlation matrix for high-income countries in the appendix supports this prediction that these variables show weak correlations.

Table 8 Average Value of Key Variables for High-Income Countries, 2000-2014

High-income Country	Net National Saving as % of GDP	Real GDP per capita	Real GDP per capita growth	Maximum LTV	supervisory LTV
	(1)	(2)	(3)	(4)	(5)
Lithuania	3.36	9,249.14	3.94	79.16	No
Poland	6.26	9,939.31	4.23	69.6	No
Slovakia	1.35	13,089.73	4.82	77.2	No
Czech Republic	4.27	14,527.82	2.13	51.35	No
Slovenia	5.56	19,683.71	-0.13	59.3	No
Greece	-0.86	22,408.61	2.23	63.25	No
Spain	4.16	26,308.08	-1.07	80	No
New Zealand	1.97	28,319.36	0.23	92.5	No
France	5	35,819.26	0.36	86.01	No
Australia	7.65	36,623.90	1.16	66.9	No
Belgium	9.77	36,686.53	1.68	80	No
Germany	7.72	36,955.36	1.12	74.14	No
United Kingdom	1.94	39,260.98	1.21	71.8	No
United States	1.74	43,596.59	1	73.5	No
Denmark	6.78	47,608.31	-1.12	80	No
Ireland	12.29	48,253.01	1.45	77.9	No
Latvia	3.72	9,417.06	4.27	90	Yes
Chile	9.89	9,062.06	3.09	100	Yes
Israel	8.6	24,180.64	1.22	75	Yes
United Arab Emirates	-	25,153.84	-2.95	77	Yes
Hong Kong	16.77	27,848.84	3.55	62.02	Yes
Singapore	35.08	33,531.81	3.22	73.99	Yes
Canada	6.1	36,810.97	0.95	95.9	Yes
Finland	6.43	40,206.59	0.36	78.3	Yes
Netherlands	11.2	43,593.65	0.55	103.4	Yes
Sweden	12.76	45,329.66	1.59	85	Yes
Norway	22.8	66,337.76	-0.01	86.25	Yes
Hungary	2.32	11,257.43	1.23	63.8	Yes

Sources: Author calculation based on data taken from various sources.
Information about the data can be found in the appendix.

Non-high-income countries shows similar pattern with non-OECD countries. Table 9 Column 1, 3 and 4 indicate that in non-high-income countries LTV has no correlation with net national saving and real GDP per capita growth. Furthermore, there is no apparent difference in the effects that supervisory and non-supervisory LTV have on net national saving and real GDP per capita growth. However, LTV and net national saving has moderate correlation 0.350.⁷

⁷ see appendix

Table 9 Average value of key variables for non-high income countries, 2000-2014

Non-high-income country	Net National Saving as % of GDP	Real GDP per capita	Real GDP per capita growth	Maximum LTV	supervisory LTV
	(1)	(2)	(3)	(4)	(5)
Ghana	19.18	735.08	5.72	80	No
Mongolia	21.33	1,302.15	6.15	75	No
Georgia	6.03	2,073.10	5.29	78.3	No
Armenia	11.82	2,083.23	2.91	45	No
Morocco	10.67	2,513.10	2.02	100	No
Jordan	6.36	2,847.23	0.49	90	No
Iran	-	2,959.08	-1.5	70	No
Peru	14.71	3,912.16	4.66	90	No
Tunisia	-1.57	3,950.12	2.57	80	No
Belarus	19.51	4,577.76	4.58	90	No
Brazil	4.24	5,522.29	2.81	61.7	No
Mexico	9.75	8,379.32	1.73	49.76	No
Pakistan	13.83	775.73	1.24	68.77	Yes
India	23.49	1,085.18	5.82	90	Yes
Egypt	10.05	1,470.88	0.71	90	Yes
Indonesia	23.53	1,605.38	4.32	81.4	Yes
China	32.55	2,270.79	9.4	75.3	Yes
Algeria	38.41	2,706.87	1.44	75	Yes
Azerbaijan	41.42	2,928.94	8.33	85.01	Yes
Thailand	14.01	3,297.21	2.76	93.3	Yes
Colombia	6.11	3,713.67	3.1	70	Yes
Serbia	-3.77	3,955.53	3.56	80	Yes
Bulgaria	3.07	4,379.66	3.85	54	Yes
Romania	4.7	5,466.43	4.26	73.17	Yes
Lebanon	-6.53	6,957.85	3.75	60	Yes
Turkey	8.86	7,240.14	3.04	75	Yes

Sources: Author calculation based on data from various sources.

Information about the data can be found in the appendix.

Chapter 5 – Findings and Interpretation

This chapter focusses on findings and interpretation of the study. The findings on the impact of main variable LTV on saving and growth are first reported and then compared with theories from Jappelli and Pagano (1994), and growth model from Solow and Romer. On the other hand, the findings of the impact of control variables on saving and growth will be correlated with theories and empirical evidences provided in Chapter 3 Literature Review.

In order to better understand on the impact LTV on saving and growth, the analysis will be identified in the global sample, two type group countries which is based on membership in OECD (OECD or non-OECD) and type of income (high-income and non-high-income countries). The impact of LTV on saving and growth also observed in pre- and post- financial crisis.

5.1 Results

5.1.1 Impact LTV on Savings and Growth, evidence from cross-sectional study

This section describes the impact LTV on net national saving and real GDP per capita growth from cross-sectional regression. Due to data availability, certain cross-sectional unit may not represent the average value of the whole period (2000 to 2014). Cross-section regression in this study is therefore derived from average value for each data point for each cross-section unit, over a time period determined by the availability of data. ⁸

The cross-sectional regression for global sample for savings equation is presented in Table 10. The regression starts with very simple model which uses only LTV and supervisory LTV as explanatory variable in Column (1). The regression model is then gradually enriched by the addition of a control variable real GDP growth in Column (2), then cash surplus/deficit in Column (3) and finally reaches full regression model with the addition of the dependency ratio in Column (4). As regression progresses from simpler model to full regression model the coefficient for LTV remains statistically and economically insignificant. The result shows that LTV is positively associated with net national saving.

⁸ The details of the average period for each respective country is fully explained in the appendix.

The positive correlation between LTV and savings is in contrast with a study by Jappelli and Pagano (1994: 98) which found that LTV has a negative correlation with net national savings in OECD countries. Cross-sectional regression points out that higher LTV increases net national saving. This indicates that high LTV, which create low down payment requirements in the mortgage acquisition process, does not necessarily decrease household saving. This finding also points out that household is not subject to credit constraint such as LTV. Two possible explanations may contribute the result of the study is not resembled to those by Jappelli and Pagano (1994). The study is based on different time period and on different countries.

Macroeconomics condition changes after study from Jappelli and Pagano (1994) and shaped different saving pattern of household in OECD countries use in their study. Financial Crisis 2007-8 has shifted saving pattern of households in OECD. As a result of the crisis, unemployment level increases in majority countries in OECD countries, rising uncertainties and force households to increase precautionary saving (Bouyon 2014:13). As mentioned in Chapter 2, saving motives can be categorized as either financing a house purchase, precaution, old age provision, or bequests (Teppa et al 2013:4). Given that households maintain the same level of consumption with high LTV (and low down payment requirements), they might well use the excess money left after a down payment as savings under a different motivation categorisation, therefore increasing aggregate saving anyway, as measured by net national saving. This argument is supported by study from Creedy et al. (2015:20) who found that changes an LTV policy in New Zealand did not affect overall level of household saving. The major effect of the changes was reallocation savings portion toward down payment savings and reduction in financial savings leaving the same level of savings.

Inclusion non-OECD countries particularly Asian countries in this study possibly contribute to positive association between LTV and net national saving. Saving behaviour of Asian countries is characterized by high precautionary savings motive (Jha et al. 2009:23). Weak public health and education system, underdeveloped pension system, low unemployment compensation funds are among other factors that trigger high precautionary saving in this countries (Jha et al. 2009:17). Therefore, with high LTV (or low down payment requirement), household could translate excess money after down payment into savings for other saving motives, which in turn increases net national saving

Table 10 shows that the coefficient supervisory LTV becomes smaller and even negative when regression moves from the simple regression model in Column (1) to the full regression model in Column (4). This indicates that supervisory LTV contributes more to reductions in saving than non-supervisory LTV. However, this contribution is economically and statistically

insignificant, and the overall impact of supervisory and non-supervisory LTV on net national saving here is irrelevant.

Table 10 Cross-Sectional Regression for Savings, Global sample

Variables	Dependent Variable : Net National Saving			
	(1)	(2)	(3)	(4)
Real GDP growth rate	-	2.446*	1.686*	1.729*
		(0.521)	(0.445)	(0.45)
Cash surplus/deficit	-	-	1.085*	1.12*
			(0.199)	(0.208)
Dependency ratio	-	-		0.091
				(0.144)
LTV	0.101	0.1	0.075	0.064
	(0.108)	(0.09)	(0.071)	(0.074)
Supervisory LTV	3.7	0.99	-0.094	-0.169
	(2.88)	(2.498)	(1.89)	(1.91)
Number of observations	54	54	49	49
R-squared	0.057	0.345	0.606	0.609

a. Standard deviation showed in parentheses

b. * significant at 5%.

The cross-sectional regression in Table 10 also shows that the control variables of real GDP growth and cash surplus/deficit have positive and significant impact on net national savings. These findings support the prediction of these variables on savings found in literatures mentioned in Chapter 3. On the other hand, the coefficient for dependency ratio is positively associated with net national savings. This result similar with study from Kraay (2000: 18) who found positive association between dependency ratio and saving in China. However, the positive impact of dependency ratio on net national saving is statistically insignificant.

Cross-sectional regression for global sample for growth equation is presented in Table 11. The regression starts with very simple model which has only LTV and supervisory LTV as explanatory variable in Column (1). The regression model is then gradually enriched by adding net national saving in Column (2) and the control variables initial real GDP per capita, labour force growth and primary school enrolment in Column (3) to (5). As regression progresses from simpler model in Column 1 to full regression model in Column 5 the sign of coefficient net national savings, LTV and supervisory LTV remain unaffected.

Table 11 points out to the presence of a negative correlation between real GDP per capita growth and LTV. This result is similar with study by Jappelli and Pagano (1994:98) which shows that LTV has negative correlation with GDP per capita growth. A negative coefficient for LTV indicates that LTV

promote real GDP per capita growth. A reduction of LTV, which implies high down payment requirement promotes real GDP per capita growth. On the other hand, supervisory LTV consistently has a positive coefficient. The positive coefficient indicates that supervisory LTV promotes higher growth compare to non-supervisory LTV. As regression moves from simpler model to full regression model, coefficients for both LTV and supervisory LTV remain statistically insignificant. Both of these coefficient has no explanatory power with regards to real GDP per capita growth.

Table 11 Cross-Sectional Regression for Growth, Global Sample

Variables	Dependent Variable : real GDP per capita growth				
	(1)	(2)	(3)	(4)	(5)
Log initial Real GDP per capita			-2.130*	-2.132*	-2.110*
			(0.421)	(0.428)	(0.485)
Labor force growth				0.132	0.011
				(0.287)	(0.298)
Primary school enrolment					0.003
					(0.040)
Net National Saving		0.085*	0.051*	0.051*	0.051*
		(0.027)	(0.023)	(0.024)	(0.027)
LTV	-0.007	-0.017	-0.010	-0.010	-0.013
	(0.024)	(0.021)	(0.017)	(0.017)	(0.019)
Supervisory LTV	1.194	0.629	0.477	0.472	0.534
	(0.646)	(0.576)	(0.472)	(0.490)	(0.523)
Number of observations	56	54	54	54	51
R-squared	0.06	0.199	0.473	0.473	0.480

a. Standard deviation showed in parentheses

b. * significant at 5%.

Net national savings is statistically significant affects growth. Net national savings is positively associated with real GDP per capita growth. Higher net national savings will increase real GDP per capita growth. This result supports the prediction of Solow and Romer growth model which report that savings is significantly affects growth.

Control variables in growth equation are observed and the result show that all variables show expected sign as suggested by much of the literatures. Initial real GDP per capita shows negative association with real GDP per capita growth while labour force growth and primary school enrolment show positive association. However, among of these variables, only initial real GDP per capita which statistically significant.

Cross-section regression result for saving equation for two group countries OECD versus non-OECD and high-income versus non-high-income countries

are shown in Table 12. This table reports that LTV has no significant impact on net national saving in the four groups. However, in non-OECD and non-high income countries the correlation between LTV and net national savings resemble to those in the global sample. Higher LTV results in higher net national savings. On contrary, in OECD and high-income countries higher LTV result in lower net national savings. This indicates that across group, LTV has different impact on net national savings.

Turning into supervisory LTV, this variable contributes to higher saving compare to non-supervisory LTV in both OECD and high-income countries. On the other hand, supervisory LTV contribute to less net national savings compare to non-supervisory LTV in non-OECD and non-high-income countries. However, neither of these variables are statistically significant, indicating that supervisory LTV and non-supervisory LTV do not differ in explaining net national savings across groups.

Table 12 Cross-Sectional Regression for Saving, OECD, non-OECD, High-Income and non-High-Income Countries

Variables	Dependent variable : Net National Saving			
	OECD	non-OECD	high-income	non-high-income
Real GDP growth rate	0.538 (0.460)	1.802 (1.181)	1.122 (0.724)	1.761 (1.179)
Cash surplus/deficit	0.860* (0.185)	1.136* (0.447)	1.022* (0.238)	1.318* (0.510)
Dependency ratio	0.197 (0.130)	0.019 (0.250)	-0.138 (0.189)	0.406 (0.263)
LTV	-0.027 (0.064)	0.104 (0.135)	-0.014 (0.095)	0.169 (0.129)
Supervisory LTV	2.953 (1.98)	-1.103 (3.346)	2.486 (2.701)	-0.334 (3.250)
Number of observations	24	25	29	20
R-squared	0.716	0.592	0.64	0.682

a. Standard deviation showed in parentheses

b. * significant at 5%.

Cross-section regression result for growth equation for the groups OECD and non-OECD and high-income and non-high-income countries are shown in Table 13. This table reports that LTV and supervisory LTV are not statistically significant affect real GDP per capita growth. Surprisingly, net national saving also does not significant affect real GDP per capita growth in the four groups countries. Furthermore, net national saving negatively correlated with real GDP per capita growth in OECD and high-income groups. These findings are contradictory with Solow and Romer growth model which asserts that saving does significantly affect growth. However, the results may not reliable enough to draw conclusions about the associations between these variables due to small number of observations undertaken in this study.

Table 13 Cross-Sectional Regression for Growth, OECD, non-OECD, High-Income and non-High-Income Countries

Variables	Dependent Variable : real GDP per capita growth			
	OECD	non-OECD	high-income	non-high-income
Log initial Real GDP per capita	-3.456*	-0.22	-4.405*	-0.580
	(0.913)	(1.388)	(0.929)	(1.805)
Labor force growth	-0.020	0.042	-0.202	-0.695
	(0.289)	(0.817)	(0.273)	(1.149)
Primary school enrolment	0.02	0.024	0.058	0.021
	(0.091)	(0.055)	(0.940)	(0.058)
Net National Saving	-0.0007	0.074	-0.005	0.078
	(0.063)	(0.038)	(0.043)	(0.042)
LTV	0.008	-0.0067	-0.013	-0.0145
	(0.025)	(0.033)	(0.021)	(0.035)
Supervisory LTV	0.197	0.840	1.052	0.845
	(0.975)	(0.860)	(0.704)	(0.936)
Number of observations	25	26	27	24
R-squared	0.4753	0.232	0.594	0.303

a. Standard deviation showed in parentheses

b. * significant at 5%.

Overall, the result of cross-sectional regression provides a picture of the association between LTV, supervisory LTV, net national saving and real GDP per capita growth. However, these result may not reliable due to small number of observations. To summarise, the cross-sectional study offers two conclusions. First, LTV is economically and statistically insignificant affects net national saving and real GDP per capita growth. Second, supervisory LTV and non-supervisory LTV is indifferent affect net national saving and real GDP per capita growth.

5.1.2 Impact of LTV on Savings and Growth, global sample evidence

Panel regression shows a pattern similar to cross-sectional regression. The sign of the coefficient of LTV and supervisory LTV are consistent and remain unchanged as the regression moves from simpler model to full model in both Random Effect and SUR.⁹ Full model regression for two selected techniques in panel study are presented in Table 14.

⁹ See appendix 4 to appendix 6

Random effect for saving equation in Table 14 column 1 shows that LTV does not affect net national saving with any statistical significance. By contrast, supervisory LTV statistically significant affects net national saving indicating that supervisory LTV and non-supervisory LTV produce different impact on net national saving. However, the coefficient of supervisory LTV becomes significant after the regression includes interaction term between supervisory LTV and time dummy financial crisis. This indicates that the impact of supervisory LTV is altered by the financial crisis. In pre- financial crisis, supervisory LTV contributed to less net national saving by 2.997% when compared to non supervisory LTV while in post- financial crisis supervisory LTV contributes higher net national saving by 0.022% (increasing it to 3.019%) as compared to non-supervisory LTV.

Table 14 Panel Regression for Saving and Growth, Global Sample

variables	Random Effect (1)	Seemingly Unrelated Regression (2)
Dependent Variable : Net National Saving		
Real GDP growth rate	0.184* (0.058)	0.790* (0.112)
cash surplus/deficit	0.253* (0.062)	0.763* (0.086)
dependency ratio	-0.264* (0.117)	0.026 (0.074)
LTV	0.030 (0.026)	0.078* (0.036)
supervisory LTV	-2.997* (1.368)	-5.304* (1.797)
Financial crisis	0.032 (0.750)	5.084* (1.131)
LTV X Fin. Crisis	-0.011 (0.009)	0.001 (0.016)
Supervisory LTV X Fin. Crisis	3.019* (0.966)	4.057 (2.103)
Dependent Variable : Real GDP per capita growth		
Log initial real GDP per capita	-1.913* (0.449)	-2.550* (0.506)
Labor force growth	0.049 (0.162)	0.120 (0.176)
primary school enrolment	0.053 (0.031)	0.062 (0.043)
Net National Saving	0.104* (0.024)	0.154* (0.028)
LTV	-0.025 (0.017)	0.0002 (0.019)
supervisory LTV	0.594 (0.825)	1.633 (0.974)
Financial crisis	-5.246* (0.689)	-3.849* (0.569)
LTV X Fin. Crisis	0.030 (0.010)	-0.002 (0.008)
Supervisory LTV X Fin. Crisis	0.126 (0.956)	-1.829 (1.108)
Number observations		
- saving equation	265	237
- growth equation	297	237
R-squared :		
- saving equation	0.292	0.351
- growth equation	0.281	0.255

a. Standard deviation showed in parentheses

b. * significant at 5%.

Random effect for growth equation in Table 14 Column 1 shows that the coefficients for LTV and supervisory LTV do not statistically significant affect real GDP per capita growth. LTV shows no existence of important impact on real GDP per capita growth both in pre- and post- financial crisis. While supervisory LTV and non-supervisory LTV produce no different impact on real GDP per capita growth in pre- and post- financial crisis.

In contrast to Random Effect, SUR result in Table 14 Column 2 shows the presence of important of LTV and supervisory LTV affect net national saving. Both of these variables are statistically significant affect net national saving in pre-financial crisis.

The coefficient LTV and interaction term between LTV and time dummy financial crisis in the saving equation show that in pre-financial crisis an increase of 1% in LTV resulted in increasing the net national savings by 0.078% while in post-financial crisis, an increase of 1% in LTV resulted in increasing net national saving by 0.079% (0.001% higher compare to pre-financial crisis). The positive correlation between these variables is similar to those in cross-sectional study that report higher LTV increases net national saving. This result indicates that LTV is not binding for household.

On the other hand, SUR shows that supervisory LTV contributes to less net national saving by 5.304% as compared to non-supervisory LTV in pre-financial crisis. While in post-financial crisis supervisory LTV increases net national saving by 4.057%. However, the net effect supervisory LTV as compared to non-supervisory LTV is contributed to less net national saving by 1.247% as compared to non supervisory LTV in post-financial crisis.

Turn into SUR result for growth equation in Table 14 Column 2, LTV has positive correlation with real GDP per capita growth in pre- financial crisis. This result is contradicting with study Jappelli and Pagano (1994:101). They found negative correlation between LTV and growth. A positive coefficient indicates that LTV reduce real GDP per capita growth in pre-financial crisis. While LTV has negative coefficient in post-financial crisis indicating LTV promotes real GDP per capita growth in post- financial crisis. On the other hand, supervisory LTV contributes higher real GDP per capita growth when compared to non- supervisory LTV in pre- financial crisis while contribute to lower real GDP per capita growth in post- financial crisis. However, LTV and supervisory LTV are not statistically significant affect real GDP per capita growth both in pre- and post- financial crisis.

In panel regression, SUR is selected over Random Effect to estimate the impact LTV on net national saving and real GDP per capita growth for global sample over Random Effect. The Breusch-Pagan test resulted in rejection of null hypothesis that homoscedasticity is presence. This indicates that the error term between saving and growth equations is correlated and SUR resulted in more efficient estimator when compared to Random Effect.¹⁰

SUR shows that the control variables of real GDP growth and cash surplus/deficit had positive and significant impacts on net national saving.

¹⁰ The Breusch-Pagan test provided in appendix 6.

These findings support the prediction of these variables on saving in literature mentioned in Chapter 3. On the other hand, the coefficient of the dependency ratio is positively associated with net national saving, supporting a result from Kraay (2005:5) who found positive associations between those two variables. However, this variable is statistically insignificant and equal to zero in terms of its impact on saving.

Turn into growth equation, all control variables show positive correlation with real GDP per capita growth except initial real GDP per capita which negatively correlated with real GDP per capita growth. These findings support the prediction of these variable on growth in literature review. However, among initial real GDP per capita, labour force growth, and primary school enrolment, only initial real GDP per capita which statistically significant.

SUR result shows that net national saving positively and significantly affect real GDP per capita growth. This result supports prediction from Solow and Romer growth model which mention that higher saving will translate into higher growth. Given that, LTV and supervisory LTV significant affect net national saving but not significant affect real GDP per capita growth, these findings suggest that LTV and supervisory LTV have indirect effect on real GDP per capita growth. Both of these variables affect real GDP per capita growth only through net national saving channel.

Direction of interaction LTV, supervisory LTV and saving and growth are more easy to interpret compare to direction of interaction between saving and growth. LTV affects net national saving which subsequently net national saving affect real GDP per capita growth. Interaction between net national saving and GDP growth is difficult to interpret. In saving equation, real GDP growth is statistically significant affects net national saving. On the other hand, on growth equation, net national saving is statistically significant affects real GDP per capita growth. There is feedback mechanism between these two variables which make direction causality between saving and growth is complicated to be interpret.

As mentioned earlier, coefficient supervisory LTV in Random effect regression becomes statistically significant after inclusion interaction term between supervisory LTV and time dummy financial crisis in the regression. These finding provide an indication that the impact of LTV on net national saving and real GDP per capita growth is determined by the presence of unexpected event such as financial crisis. To elaborate further this hypothesis, the regression for panel data is restricted, based on the time period pre- versus post- financial crisis.

SUR¹¹ results in Table 15 provide restricted time period regression for global sample. The result supports the result unrestricted SUR in Table 14 Column 2. Savings equation in Table 15 reports that LTV and supervisory LTV only significant affect net national savings in pre- financial crisis but not significant impact net national savings in post- financial crisis. On the other hand, growth equation in the same table report that both of these variables are not significant affect real GDP per capita growth both in pre- and post- financial crisis.

The coefficient net national saving in growth equation is observed to have positively and statistically significant impact on real GDP per capita growth in pre- and post- financial crisis. This finding supports the prediction of Solow and Romer model. Given that LTV and supervisory LTV only significant in pre- financial crisis affects net national saving while these variable are not significant affect real GDP per capita growth. These associations suggest that LTV and supervisory LTV affect real GDP per capita growth only through saving channel in pre- financial crisis.

The absence significant relation between LTV, supervisory LTV and net national saving in post financial crisis emphasizing the role of mortgage in affecting net national saving. In general, mortgage market post- financial crisis was depressed particularly in OECD countries where the mortgage market is largest compared to the other counties used in this study (see Figure 4). Furthermore, in post- financial crisis households tended to increase saving for precautionary motives (Lee et al. 2010:7; Gerlach et al.2013).¹² Household chose to postpone or forego purchasing of a house and as a result, mortgage markets declined and new lending was down.¹³ The mortgage market is then no longer a principal contributor in determining net national saving, as it would have been pre- financial crisis.

Panel study on global sample provides five important findings.¹⁴ First, LTV significantly affects positively net national saving only in pre- financial crisis. An increase of 1% LTV will increase 0.078% net national saving in pre-financial crisis. Second, the LTV has no significant impact on net national saving in post- financial crisis. Third, supervisory LTV contribute less net national savings by 5.304% compare to non-supervisory in pre- financial crisis. In post-financial crisis supervisory LTV and non-supervisory LTV produce indifferent effect on net national savings. Fourth, LTV has no direct effect on real GDP per capita growth in pre- and post- financial crisis. Fifth, real GDP

¹¹ SUR is selected over random effect. The Breusch-Pagan test resulted in rejection of null hypothesis that homoscedascity is presence. This indicates that error term saving and growth equation correlated.

¹² SUR result in Table 14 also provide evidence that in post financial crisis net national saving is higher 5.084% compare in pre financial crisis.

¹³ Further explanation can be found in the analysis of OECD groups.

¹⁴ Refer to findings on unrestricted SUR regression in Table 14 Column 2.

per capita growth is significantly affected by net national savings which significantly induce by LTV and supervisory LTV only in pre- financial crisis. An increase of 1% of net national savings will promotes real GDP per capita growth by 0.154% in pre- financial crisis.

Table 15 Restricted SUR Pre- and Post- Financial Crisis, Global Sample

variables	Pre-financial crisis	Post-financial crisis
Dependent variable: Net National Saving		
Real GDP growth rate	0.996* (0.211)	0.757* (0.137)
Cash surplus/deficit	0.957* (0.177)	0.719* (0.102)
Dependency ratio	0.204 (0.109)	-0.012 (0.094)
LTV	0.110* (0.040)	0.075 (0.044)
Supervisory LTV	-6.813* (1.305)	-0.828 (1.258)
Dependent variable: Real GDP per capita growth		
Log initial real GDP per capita	-4.561* (0.763)	-1.936* (0.636)
Labor force growth	0.272 (0.250)	0.120 (0.222)
Primary school enrolment	0.052 (0.062)	0.075 (0.054)
Net National Saving	0.125* (0.048)	0.162* (0.035)
LTV	-0.042 (0.022)	0.020 (0.023)
Supervisory LTV	0.055 (0.863)	0.148 (0.680)
Number observations	76	161
R-squared :		
- saving equation	0.476	0.338
- growth equation	0.432	0.115
Correlation residual	-0.270	-0.274
Breusch-Pagan test of independence		
- chi2	5.566	12.111
- p-value	0.018	0.0005

a. Standard deviation showed in parentheses

b. * significant at 5%.

5.1.3 Impact of LTV on Savings and Growth Across Group Countries

LTV value which is heterogeneous across countries while in the same time supervisory LTV which not homogenously implemented across countries are expected contribute to variation impact of these variables on net national saving and real GDP per capita growth across countries. This study also investigates the variation of impact LTV and supervisory LTV on net national savings and real GDP per capita growth across countries which classified into OECD versus non-OECD and high-income versus non-high-income.

The result of the study using random effect ¹⁵ in a restricted sample of two group of countries OECD versus non-OECD and high-income versus non-high-income countries are displayed in Table 16. The result indicates that LTV has no significant impact on net national saving in any groups but supervisory LTV does significantly affect net national savings in OECD and non-high-income countries both in pre- and post- financial crisis.

Table 16 Random Effect for saving, OECD, non-OECD, High-Income and non-High-Income Countries

Variables	Dependent Variables: Net National Saving			
	OECD	non-OECD	high-income	non-high-income
Real GDP growth rate	0.293* (0.061)	0.166 (0.106)	0.291* (0.054)	0.067 (0.123)
Cash surplus/deficit	0.315* (0.051)	0.298* (0.128)	0.202* (0.047)	0.843* (0.209)
Dependency ratio	-0.064 (0.115)	-0.169 (0.184)	-0.523* (0.125)	0.202 (0.203)
LTV	0.026 (0.028)	0.055 (0.044)	-0.034 (0.024)	0.077 (0.055)
Supervisory LTV	2.809* (1.457)	-1.982 (3.613)	2.064 (1.291)	-6.330* (3.091)
Financial crisis	-0.670* (0.500)	2.307 (1.292)	-0.630 (0.460)	3.710* (1.660)
LTV X Fin. Crisis	-0.001 (0.006)	-0.010 (0.021)	-0.003 (0.006)	-0.021 (0.025)
Supervisory LTV X Fin. Crisis	-3.599* (1.312)	3.419 (2.005)	-1.659 (0.969)	5.863* (2.316)
Number observations	153	112	178	87
R-squared	0.619	0.18	0.575	0.221

a. Standard deviation showed in parentheses

b. * significant at 5%.

¹⁵ Restricted regression using Random Effect. The Breusch-Pagan test failed to reject null hypothesis that homoscedasticity is presence in non-OECD and non-high-income countries. For uniformity therefore, Random Effect was selected to analyze the impact of LTV in all group countries. SUR results are presented in the appendix.

Variables of supervisory LTV and interaction term between supervisory LTV and time dummy financial crisis point out that supervisory LTV contribute to 2.809% higher net national saving in OECD countries but contribute to 6.330% lower saving in non-high-income as compare to non-supervisory LTV in pre- financial crisis. After financial crisis, the impact is change, supervisory LTV contribute to 0.790% less saving in OECD group (decline by 3.599% from pre- financial crisis) but contribute to less saving by 0.467% (increase by 5.863% compare to pre financial crisis) in non-high-income group as compare to non supervisory LTV. In non-high-income countries, despite that the net effect impact supervisory LTV is still negative as compare to non-supervisory LTV but in post- financial crisis supervisory LTV contribute to higher net national savings.

Random effect for growth equation across group countries is provided in Table 17. This table reports that LTV is not significantly affect real GDP per capita growth across group countries. Interestingly, coefficient interaction term LTV and time dummy financial crisis is statistically significant in non-OECD, high-income and non-high-income countries. LTV statistically significant reduces real GDP per capita growth in post- financial crisis in these 3 group countries. However, the magnitude negative impact LTV on real GDP per capita growth (after taking into account coefficient LTV and interaction term LTV and time dummy financial crisis) was economically insignificant. The net negative effect of LTV on real GDP per capita growth for non-OECD, high-income and non-high- income was 0.03%, 0.009% and 0.03% respectively.

Turn into supervisory LTV, this variable is statistically insignificant and produce indifferent impact on real GDP per capita growth in OECD, non-OECD, and non-high-income countries. By contrast, coefficient interaction term supervisory LTV and time dummy financial crisis in high-income countries is statistically significant. In high-income countries supervisory LTV contribute to 0.924% (increase 3.272% from pre-financial crisis) higher real GDP per capita growth compare to non-supervisory LTV in post- financial crisis.

Net national saving statistically significant affects real GDP per capita growth in all group countries. Net national saving is positively associated with real GDP per capita growth. Higher net national saving will increase real GDP per capita growth as predicted by Solow and Romer model.

Table 17 Random Effect for Growth, OECD, non-OECD, High-Income and non-High-Income Countries

variables	Dependent variable: Real GDP per capita growth			
	OECD	non-OECD	high-income	non-high-income
Log initial real GDP per capita	-3.144*	0.784	-3.133*	1.586
	(0.809)	(1.139)	(0.914)	(1.579)
Labor force growth	0.171	-0.067	0.071	-0.004
	(0.177)	(0.308)	(0.212)	(0.286)
Primary school enrolment	-0.131*	0.096*	-0.126	0.083
	(0.067)	(0.041)	(0.074)	(0.044)
Net National Saving	0.131*	0.106*	0.100*	0.124*
	(0.047)	(0.032)	(0.041)	(0.037)
LTV	-0.015	-0.0129	-0.011	-0.022
	(0.022)	(0.036)	(0.020)	(0.037)
Supervisory LTV	-0.991	-0.323	-2.348	1.920
	(1.595)	(1.695)	(1.392)	(1.526)
Financial crisis	-3.588*	-7.585*	-4.539*	-6.396*
	(0.731)	(1.302)	(0.745)	(1.377)
LTV X Fin. Crisis	0.015	0.047*	0.020*	0.0546*
	(0.010)	(0.024)	(0.010)	(0.023)
Supervisory LTV X Fin. Crisis	1.502	0.701	3.272*	-1.541
	(1.644)	(1.887)	(1.492)	(1.749)
Number observations	117	120	181	116
R-squared	0.309	0.401	0.349	0.33

a. Standard deviation showed in parentheses

b. * significant at 5%.

The result from global sample in Table 14 column 2 outlined in the previous sub section, shows that LTV and supervisory LTV only had indirect effect on real GDP per capita growth. LTV and supervisory LTV affects real GDP per capita growth only through net national savings. However, the coefficient interaction term between LTV and the time dummy variable, which does significantly affect real GDP per capita growth in restricted regression (see Table 17), suggest that LTV also has a direct impact on real GDP per capita growth in post-financial crisis in non-OECD, high-income and non-high-income countries.

According to Jappelli and Pagano (1994:99), LTV which stimulates saving will have explanatory power to explain growth when LTV is used in reduce form regression for growth. Their regression model excluded net national savings and use LTV as a proxy for net national savings. They found that LTV significantly affected real GDP per capita growth. It suggests that LTV which promotes saving will also have direct effect on real GDP per capita growth. In this study, in growth equation, a net national saving variable is included. This variable is statistically significant. Given that LTV in saving equation in Table 16 does not statistically significant affect net national saving while in growth

equation LTV statistically significant affects real GDP per capita growth. Consequently, it is reasonable to believe that LTV may affect real GDP per capita growth through other channels besides saving.

According to DeNederlandse Bank (2015) LTV could affect demand of houses. On the other hand, demand on housing will affect property construction, which plays a significant role to affect growth. There is possibility that in post- financial crisis LTV would affect real GDP per capita growth through property investment channel in non-OECD, high-income and non-high-income countries. Nier et al. (2012:22) provided evidence that LTV affect growth through impact on investment in construction. They study that in Emerging Market, low LTV is correlated with lower investment in construction which affect growth. Similarly, China Banking Regulatory Commission reported that low LTV slowing sales of property, discouraging property construction, impacting demand on upstream and downstream industries from building material, home appliances to transport and deteriorating economic growth (as cited in Shao and Subler 2015).

The direction of the interaction of LTV and supervisory LTV and saving and growth in OECD and high-income country is similar with the interaction these variables in global sample. Real GDP growth is statistically significant affect net national saving while net national saving significantly affects real GDP per capita growth. There is feedback mechanism between saving and growth in these two groups countries. In contrast, in non-OECD and non-high-income country direction causality is more clear, real GDP growth does not statistically significant affect net national saving, while net national saving statistically significant affects real GDP per capita. In non-OECD and non-high-income countries saving determine growth.

Further analysis on variation within group of countries will focus on exploring the impact supervisory LTV on net national savings in OECD and non-high-income countries. The rationale for selecting these two groups of countries for discussion of supervisory LTV is that random effect for saving equation highlights the important statistically and economically effects of supervisory LTV on net national savings in these two group countries.

OECD countries

In pre-financial crisis supervisory LTV significantly contribute to higher net national saving by 2.809% as compared to non supervisory LTV. In post-financial crisis supervisory LTV together with the coefficient interaction term between supervisory LTV and time dummy financial crisis contribute to less net national saving by only 0.671% (less 3.599%) compared to non-supervisory LTV. Despite contribute to less saving but the negative impact supervisory LTV is not economically significant different with non-supervisory LTV.

Supervisory LTV plays important role in OECD countries, as it affects net national savings significantly. In pre financial crisis, the value of supervisory LTV was significantly higher compare to non-supervisory LTV (see Table 3). Given that from the result of this study LTV is not binding on households in this group countries, but with low down payment requirement, households in OECD countries could transform excess income after down payment to savings. This process contributes more to higher net national saving, compared to non-supervisory LTV.

In post-financial crisis periods, supervisory LTV contributes more to decreases in net national saving compared to non-supervisory LTV. The explanation for this cannot simply be uncovered in the values of supervisory LTV; it is a complex issue surrounding the mortgage market in these groups of countries, and how that is affected following a financial crisis.

After financial crisis, many lenders tightened lending term and conditions, including LTV value for new borrower (Scanlon et al. 2010:5). The evidence shows that supervisory LTV declined significantly in OECD countries (see table 3). Low LTV rendered mortgages more expensive. Bouyon (2015:4) provide evidence that significant tightening LTV in UK and Ireland in 2008-10 have lead to reduction of access of first-time buyer to home ownership resulted in contraction in mortgage market in this country.

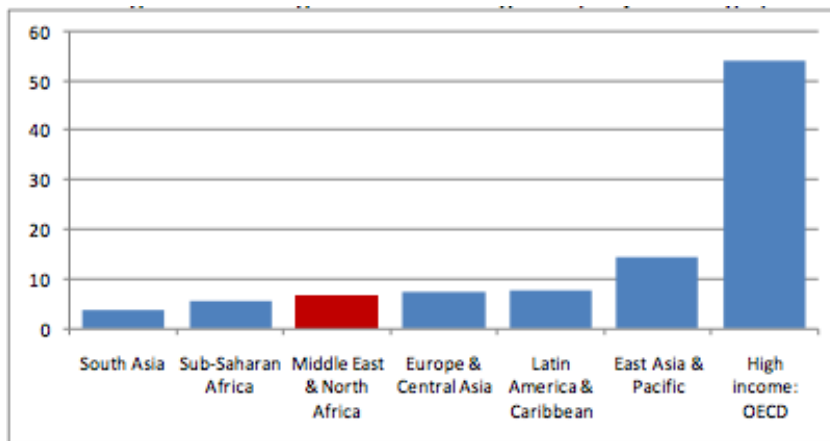
On the other hand, financial crisis that hit this group of countries also contributed to less net national saving from mortgage channel. During the financial crisis, households faced two types uncertainty. First, new borrowers faced uncertainty in housing prices post- financial crisis (Scanlon et al. 2010:5). After the financial crisis housing prices fell and house become more affordable. However, potential borrower facing uncertainty that house's price will continue to decline in the future. This made purchasing a house is a risky action. Second, there is some evidence that during the financial crisis income of household's decline (Lee et al. 2010:5; Huang et al.2011; Gerlach et al. 2013). In post-financial crisis, household income was not likely to return to pre-crisis state (Lee et al. 2010:5). This made mortgages even more expensive, and forced households to relax their constraints by delaying or foregoing the purchase of a house.

According to Li (2001:3) mortgage availability is important in determining savings and economic growth. He conducted a simulation to investigate the effects of mortgage credit availability on savings and growth. The simulation focused on Middle East, due to the fact that mortgage market is less developed, but demand on housing is high. The simulation suggested that expansion of mortgage markets in the Middle East enforce household to use mortgage and in turn affects savings and growth

Mortgage availability can be measured by the size of mortgage credits as a percentage of GDP in the economy. High mortgage credit size indicates easier

access to mortgages. Widespread availability of mortgage loans will result in low down payment requirements (or high LTV) due to increased competition among lenders. Figure 4 shows the average size of mortgage loans across the observed regions. The size of the mortgage market in high income OECD countries is by far the largest amongst them. Therefore, compared to other groups of countries, households in OECD countries have relatively easy access to the mortgage market. The data in Table 3 provides further evidence that LTV is higher in OECD countries. Easy access to the mortgage market encourages households to use a mortgage loan, therefore it is not surprising that supervisory LTV plays a significant role in OECD countries in explaining net national saving.

Figure 4 Average Size of Mortgage Loan (as % of GDP) by Region, 2008



Sources: Hassler (2011:4)

Non high income countries

Though the size of mortgage market is smaller compare to OECD, the result of this study indicate that supervisory LTV in non-high-income country also plays important role in determining net national savings. The coefficient for supervisory LTV in non-high-income country in Table 16 is statistically significant. This shows that supervisory LTV and non-supervisory LTV is significantly different in determining net national savings. Interestingly, the signs displayed by the coefficient here are in contrast to the OECD countries. In non-high-income country supervisory LTV in pre- financial crisis contribute to 6.330% less net national saving as compare to non-supervisory LTV while in post- financial crisis supervisory LTV contribute to less saving by 0.467% compare to non-supervisory LTV (increase saving by 5.863% higher net national saving compare to in pre- financial crisis).

Countries that comprise the group of non-high-income countries in this paper are found throughout Latin America, East Asia, South Asia, Sub Saharan

Africa, Europe and Central Asia. Looking more closely at each region, all countries in East Asia, except for Mongolia, have introduced supervisory LTV into their economies (see Table 9). The East Asia region represents the largest mortgage market within the low income countries group in this study (see Figure 4). Therefore, it is reasonable to deduce that the impact of supervisory LTV on net national saving is mainly attributed to East Asia. On the other hand, the impact of supervisory LTV and non-supervisory LTV on net national saving is statistically significant, emphasizing the importance of mortgage market size with regard to the extent of the impact LTV can have on net national saving.

Given that rates of supervisory LTV introduction are so high in East Asia compared to other regions in this group, and due to their large mortgage market, an explanation of supervisory LTV in low income countries is effectively a reflection on the nature of supervisory LTV in the East Asia region. The remaining analysis will therefore be conducted from this regional perspective.

In post-financial crisis, average value of supervisory LTV in non-high-income countries increased. The increase of supervisory LTV in East Asia in post-financial crisis periods is the net result of several factors: (1) The mortgage market in East Asia is relatively shielded from the impact of financial crises as mortgage lenders in the region adopted relatively conservative financial practices following the Asian financial crisis of 1997-98, offering plain vanilla¹⁶ home loan (Hale and Kennedy 2012: Karnad 2008:27); (2) The existence of a growing middle-class population which augments demand for housing; (3) Government intervention aiming to promote home ownership as one means of the poverty alleviation program (Kobayashi 2012:20). These factors lead to expansion of the mortgage market in East Asia region as the largest mortgage market within this group. Table 9 shows that countries in East Asia which introduced supervisory LTV are considered to have lower real GDP per capita in comparison to other countries within the low income group. For countries predominately occupied by relatively low income households, but where the size of the mortgage market is greater, such as in the East Asia region, the relaxation of supervisory LTV will contribute to higher net national saving. For low income households, a 1% relaxation on the value of LTV will significantly affect the country's saving pattern. In this economic situation households can transfer excess money left after down payments to finance other saving motives.

Study on impact of LTV on savings and growth across group country provides several main findings. First, LTV has no significant impact on net national saving in pre- and post- financial crisis across groups. Second, LTV has

¹⁶ Plain vanilla refers to the most basic feature of a loan.

significant impact on real GDP per capita growth in high-income country in post- financial crisis. Third, supervisory LTV and non-supervisory LTV is significantly produce different impact on net national saving in OECD and non-high-income countries. Fourth, supervisory LTV in OECD and non-high-income work in different direction suggesting that supervisory LTV significant affect net national saving both when mortgage market was depressed and expand. Fifth, LTV and supervisory LTV is suggested to have direct effect on real GDP per capita growth though other mechanism beside saving.

5.2 Main Findings, Policy implication and Future Research

5.2.1 Main Finding

This study demonstrated several main findings. First, the global sample shows that LTV does not constrain household saving pattern, both in pre- and post-financial crisis. LTV is positively associated with net national saving. Higher LTV increases net national saving. This shows that High LTV does not necessary increase consumption; household could translate excess income after down payment expenditure into savings. Second, global sample shows that LTV and supervisory LTV have significant impact on net national saving only in pre- financial crisis. Third, global sample shows that LTV and supervisory LTV do not significant impact real GDP per capita growth. The impact LTV on real GDP per capita growth is through net national saving channel. Fourth, supervisory LTV plays important role in OECD and non-high-income country both in pre- and post- financial crisis, in opposite direction of each other. Supervisory LTV and non-supervisory LTV produce different impact on net national saving. Fifth, there is an indication that the size of mortgage market determines the impact of supervisory LTV on net national savings. Sixth, though the impact is economically insignificant, there are indications that LTV reduces real GDP per capita growth in post- financial crisis through another channel besides net national savings.

5.2.2 Policy Implication

Macroeconomic implication of policy which introduce in housing sector can be a major of importance. The study arises significant findings which provide two salient implications for regulator. First, this study suggests that supervisory LTV plays major role in OECD and non-high-income country in determining net national saving in pre- and post- financial crisis. Supervisory LTV which nowadays introduces actively in many countries as part of macro prudential policy that goal to safeguard financial stability could be a valuable additional tool for regulator to manage net national saving and real GDP per capita growth. The analysis indicates that mortgage market size contributes to effectiveness of supervisory LTV affect net national savings. Therefore, to gain

benefit from supervisory LTV on net national saving and real GDP per capita growth, mortgage market should be enlarged. Expanding mortgage markets may make it possibility to manage net national saving and real GDP per capita growth.

Second, the result also suggests that there is an indication that LTV potentially reduce real GDP per capita growth in post- financial crisis. LTV particularly supervisory LTV (which has the goal of dampening credit growth and house price appreciation) will also potentially reduce real GDP per capita growth. Careful design of optimal value of supervisory LTV is important to limiting potential negative spill over which may occur. Poor design the value of supervisory LTV could deteriorate real GDP per capita growth. Low supervisory LTV which is claimed effective to dampen credit growth and house price appreciation (Wong et al. 2011:1) but it potentially reduces real GDP per capita growth through negative impact on property construction. A value for supervisory LTV should be designed to balance the goal of safeguarding the financial system with other important macroeconomic indicators.

5.2.3 Future Research

The groups of countries used in this study are divided based on income and membership of the OECD. A closer look at each country included in this study group reveals diverse variation in terms of mortgage market size. Due to this, there is an indication that mortgage market size contributes to the extent of LTV's – specifically supervisory LTV's – impact on net national saving and real GDP per capita. To investigate this hypothesis future research can therefore be conducted to analyse the impact of LTV in countries that are divided based on the size of their mortgage markets.

The dynamism in the changes in value for LTV also make for an interesting potential investigation. This study has suggested that changes in the value of LTV across countries will contribute further to explanations of the impact of LTV on net national saving and real GDP per capita growth across specified groups of countries.

A final investigation which could be undertaken to expand on the analysis provided by this paper is the potential impact of LTV on economic growth through property investment. Low LTV rates carry a macro-economic cost to the economy. Low LTV restricts affordability of housing for potential first time buyers. The demand for homes in turn will decrease, lowering housing prices, reducing property investment and potentially limiting economic growth and causing further consequences.

Chapter 6 – Summary and Concluding Remarks

In many countries, mortgage loans are the main mechanism for a majority of households to finance ownership of housing. Many lenders place LTV as a restriction on the amount of money the household may borrow. The implication of this restriction is that potential first time home buyers have to accumulate sufficient savings to cover the portion of the value of the house which is not covered by the lender. They must force themselves to save unless they choose to postpone or forgo the purchase of housing. A decline (rise) in LTV ratio affects household saving. At an aggregate level, LTV limits will affect national savings. While growth theory suggest saving will affect growth, therefore the LTV which stimulates saving will affect growth.

This study demonstrated that in 56 OECD and non-OECD countries from period 2000 to 2014, LTV does not constrain household saving pattern. Cross-sectional study and panel study show that LTV is positively associated with net national saving both in pre- and post- financial crisis 2007-08. Higher LTV increases net national saving. This shows that LTV does not affect level of household consumption. Household maintains the same level of saving, therefore excess income after down payment expenses could be translate into other savings motive.

At country level, cross-sectional study reports that LTV has no economical or statistical significant effects on net national savings and real GDP per capita growth. On the other hand, supervisory LTV and non-supervisory LTV do not produce different effect on net national savings and real GDP per capita growth. However, the result may not be reliable for drawing conclusions due to small number of observations.

In panel study, SUR technique is selected to estimate the impact of LTV on net national savings and real GDP per capita growth in global sample. SUR demonstrates that LTV significantly impact net national saving only in pre-financial crisis in global sample. An increase of 1% LTV increases 0.078% net national saving in pre-financial crisis. Supervisory LTV and non-supervisory LTV produce different impact on net national saving in pre- financial crisis. SUR observes that supervisory LTV contribute less net national savings by 5.304% compare to non-supervisory in pre- financial crisis. The significant impact of LTV on net national saving is absence in post-financial crisis. Supervisory LTV and non-supervisory LTV are also observed produce indifferent effect on net national savings in post- financial crisis.

SUR also observes that LTV and supervisory LTV has no significant effect on real GDP per capita growth both in pre- and post- financial crisis in global sample. Real GDP per capita growth is significantly affected by net national

savings while in the same time LTV and supervisory LTV significantly impact net national savings despite only in pre- financial crisis. These findings suggest that LTV and supervisory LTV have indirect impact on real GDP per capita growth. These two variable only impact real GDP per capita growth through net national savings in pre- financial crisis.

LTV value which is heterogeneous across countries while in the same time supervisory LTV which not homogenously implemented across countries are expected contribute to variation impact of these variables on net national savings and real GDP per capita growth across countries. Random Effect is selected to investigate the impact of LTV on net national savings and real GDP per capita growth across countries which grouped into two types of group country, OECD versus non-OECD country and high-income versus non-high-income country.

Random effect indicates that LTV has no significant impact on net national savings in all groups. However, supervisory LTV significantly affects net national savings in both OECD countries and non-high-income countries both in pre- and post- financial crisis. Supervisory LTV contribute to 2.809% higher net national saving in OECD countries but contribute to 6.330% lower saving in non-high-income as compare to non-supervisory LTV in pre- financial crisis. After financial crisis, the impact is change, supervisory LTV contribute to 0.790% less saving in OECD group (decline by 3.599% from pre- financial crisis) but contribute to less saving by 0.467% (increase by 5.863% compare to pre financial crisis) in non-high-income group as compare to non-supervisory LTV.

Random effect reports that LTV statistically insignificant affect real GDP per capita in pre-financial crisis in all group countries. Surprisingly, in post-financial crisis LTV statistically significant reduce real GDP per capita growth in non-OECD, high-income and non-high-income countries. These result is contrast with the result provided by global sample which report that LTV only has indirect effect on real GDP per capita growth. The LTV which has explanatory power to explain real GDP per capita growth in post- financial crisis suggest that LTV also has direct effect on real GDP per capita growth in post-financial crisis in non-OECD, high-income and non-high-income countries. Consequently, it is reasonable to believe that LTV reduce real GDP per capita growth through other channels besides saving in post-financial crisis.

The study arises significant findings which provide two salient implications for regulator. First, this study suggests that supervisory LTV plays major role in OECD and non-high-income country in determining net national saving in pre- and post- financial crisis. Supervisory LTV which nowadays introduces actively in many countries as part of macro-prudential policy that goal to safeguard financial stability could be a valuable additional tool for regulator to manage net national saving and real GDP per capita growth. Second, the

result also suggests that there is an indication that LTV potentially reduce real GDP per capita growth in post- financial crisis. LTV particularly supervisory LTV (which has the goal of dampening credit growth and house price appreciation) will also potentially reduce real GDP per capita growth. Careful design of optimal value of supervisory LTV is important to limiting potential negative spill over which may occur. A value for supervisory LTV should be designed to balance the goal of safeguarding the financial system with other important macroeconomic indicators.

There are two issues that have remained unexplored in this study and would be interesting to pursue in future research. First, providing study impact LTV and supervisory LTV on saving and growth across countries which grouped based on mortgage market size. The analysis indicates that mortgage market size contributes to effectiveness of supervisory LTV affect net national savings. Second, providing the analysis of impact LTV on economic growth through channel of property construction. Group country study suggest that LTV also have direct effect on real GDP per capita growth in post-financial crisis in non-OECD, high-income and non-high-income countries. This direct effect of LTV on growth indicating that LTV potentially affect real GDP per capita growth through other channel beside from saving channel.

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Appendices

Appendix 1 Data Sources

Country	Year	Maximum LTV	Supervisory LTV
Algeria	2013-2014	Bank of Algeria *	Bank of Algeria *
Armenia	2007-2011	Central Bank of Armenia*	Central Bank of Armenia*
Australia	2007-2014	Australian Finance Group (2008-2015)	Lim et al. (2013:18)
Azerbaijan	2007-2011	Azerbaijan Mortgage Fund*	Azerbaijan Mortgage Fund*
Belarus	2008-2013	The United Nations Economic Commission for Europe *	The United Nations Economic Commission for Europe *
Belgium	2002-2006	Helgi Library	Crowe et al. (2011:36)
	2007	European Central Bank (2009:77)	
Bulgaria	2004-2013	Helgi Library	Lim et al. (2013:19)
Brazil	2007-2011	The Brazilian Association of Real Estate Loans and Savings Companies (Associação Brasileira das Entidades de Crédito Imobiliário e Poupança - Abecip)* Caixa Econômica Federal*	Lim et al. (2013:19)
	2012-2013	Brazil Central Bank*	
Canada	2004-2007	Canadian Mortgage and Housing Corporation*	Lim et al. (2013:20)
	2008 – 2014	Canadian Bankers Association (2015)	
Chile	2009-2013	IMF (2013:31)	Lim et al. (2013:20)
China	2001-2013	Lim et al. (2013:21)	Lim et al. (2013:21)
Colombia	2000-2014	Ley 546 de 1999 and decreto 145 de 2000*	Lim et al. (2013:21)
Czech Republic	2005-2012	Helgi Library	Crowe et al. (2011:38)
Denmark	2009-2013	DanskeBank*	DanskeBank*
Egypt	2010-2013	Mortgage Finance Fund*	Mortgage Finance Fund*
Finland	2005-2009	Helgi Library	Lim et al. (2013:22)
	2010-2013	Lim et al. (2013:22)	
France	2007	European Central Bank (2009:77)	HFIN (2015)
	2011-2013	Helgi Library	
Georgia	2011-2013	Bank of Georgia*	Bank of Georgia*
Ghana	2013-2014	United Nation (2011:103)	United Nation (2011:103)
Germany	2002, 2006	Helgi Library	Crowe et al. (2011:38)
	2007	European Central Bank (2009:77)	
	2009	Helgi Library	
	2010,2013	European Mortgage Federation (2014:38)	

Country	Year	Maximum LTV	Supervisory LTV
	2012	Richolt and Linsin (2014:1)	
Greece	2003, 2004,2007, 2010	Helgi Library	Crowe et al. (2011:38)
Hong Kong	2000-2013	Wong et al. (2011)	Wong et al. (2011)
Hungary	2005-2009	Helgi Library	Lim et al. (2013:23)
	2010-2013	Lim et al. (2013:23)	
India	2010-2013	Lim et al. (2013:24)	Lim et al. (2013:24)
Indonesia	2007-2009	Bank Tabungan Negara*	Bank Indonesia (2012)
	2010	Kompas	
	2012-2014	Bank Indonesia (2012)	
Iran	2013-2014	Parsian Bank*	HFIN (2015)
Ireland	2000-2011	Helgi Library	Lim et al. (2013:25)
Israel	2012-2013	Lim et al. (2013:25)	Lim et al. (2013:25)
Jordan	2013-2014	Bank of Jordan*	HFIN (2015)
Latvia	2007-2008	Lim et al. (2013:27)	Lim et al. (2013:27)
Lebanon	2008-2013	Lim et al. (2013:27)	Lim et al. (2013:27)
Lithuania	2006-2011	Helgy Analysis	Crowe et al. (2011:38)
	2012-2013	European Mortgage Federation (2014:48)	
Mexico	2011-2013	Helgi Library	Lim et al. (2013:28)
Mongolia	2008-2011	Bank of Mongolia*	Lim et al. (2013:28)
Morocco	2013-2014	CIH Bank*	
Netherlands	2007-2014	Lim et al. (2013:29)	Lim et al. (2013:29)
	2014	NVB (2014:12)	
New Zealand	2008-2012	Reserve Bank of New Zealand*	Lim et al. (2013:29)
	2013	Rogers (2014:3)	
Norway	2010-2013	Lim et al. (2013:30)	Lim et al. (2013:30)
Pakistan	2007-2014	State Bank of Pakistan*	State Bank of Pakistan*
Peru	2011-2013	BCP and BBVA*	Lim et al. (2013:30)
Poland	2006-2007	Helgy Analysis	Lim et al. (2013:31)
	2008-2014	Polis Bank Association*	
Romania	2004	Lim et al. (2013:31)	Lim et al. (2013:31)
	2005-2013	Helgi Library	
Russia	2008-2011	HOFINET(2015)	Lim et al. (2013:32)
Serbia	2004-2013	Lim et al. (2013:33)	Lim et al. (2013:33)
Singapore	2005-2009	Lim et al. (2013:34)	Lim et al. (2013:34)
	2010-2013	Helgi Library	
Slovakia	2003-2011	Helgi Library	Lim et al. (2013:34)
Slovenia	2007-2009, 2011-2012	Helgi Library	HOFINET (2015)
	2010	IMF (2012:10)	
Spain	2007-2010	HOFINET (2015)	Lim et al. (2013:35)
	2011-2013	Bover et al. (2013:55)	
Sweden	2010-2013	Lim et al. (2013:35)	Lim et al. (2013:35)
Thailand	2011-2013	Lim et al. (2013:35)	Lim et al. (2013:35)
Tunisia	2012-2013	Hassler (2011:26)	Hassler (2011:26)
Turkey	2000-2010	HOFINET (2015)	Lim et al. (2013:36)
	2011-2013	Lim et al. (2013:36)	
UAE	2009-2011	Emirates NBD *	Crowe et al. (2011:38)
	2012-2013	UAE Central Bank*	
United	2000 - 2011	Helgi Library	Lim et al. (2013:36)

Country	Year	Maximum LTV	Supervisory LTV
Kingdom	2012 - 2014	Council of Mortgage Lender (2012-2014)	
United Stated	2007-2013	Federal Housing Finance Agency*	Lim et al. (2013:37)
Uruguay	2012-2013	BHU (National Housing Bank of Uruguay)*	Lim et al. (2013:37)

Note : * refer to as cited in Housing Finance Investment Network (2015)

Appendix 2 Data Calculation

Figure in Table 6, 7, 8 and 9 for Net National saving, real GDP per capita, real GDP per capita growth, maximum LTV and Supervisory LTV for the following country refer to the following average year

Countries	Year
The Netherlands ¹⁾ , Australia, Indonesia ²⁾ , Pakistan	2007-2014
Belgium	2002-2007
Canada	2004-2014
Chile, Denmark, United Arab Emirates ¹⁾	2009-2013
Czech Republic	2005-2012
Finland ³⁾ , Singapore	2005-2013
France, Spain, Brazil	2007-2013
Germany	2002-2013
Greece	2003-2010
Hungary ³⁾	2004-2012
Ireland	2000-2011
Israel, Ghana, Jordan, Uruguay, Tunisia	2012-2013
Mexico, Peru, Georgia, Thailand	2011-2013
New Zealand, Lebanon, Belarus	2008-2013
Norway, Sweden, Egypt	2010-2013
Poland	2006-2014
Slovakia	2003-2011
Slovenia	2007-2012
Turkey ¹⁾ , United States, Hong Kong	2000-2013
United Kingdom, Colombia	2000-2014
Russia, Algeria ⁴⁾ , Iran, Morocco	2013-2014
Armenia, Azerbaijan	2007-2011
Romania, Serbia, Bulgaria	2004-2013
China	2001-2013
Latvia	2007-2008
Lithuania	2006-2011
Mongolia	2008-2011

Notes:

- 1). Supervisory LTV has been implemented in these countries since 2011
- 2). Supervisory LTV has been implemented in this country since 2012
- 3). Supervisory LTV has been implemented in these countries since 2010
- 4). Supervisory LTV has been implemented in this country since 2014

Appendix 3 Descriptive Statistics

Descriptive statistic cross-sectional data

variable	Descriptive Statistics			
	Mean	Std. deviation	Min	Max
LTV (%)	77.15	12.767	45	103.4
LTV supervisory policy = 1	0.357	0.483	0	1
NNS / GDP (%)	10.739	10.154	-6.533	41.415
Real GDP growth (%)	3.383	2.309	-0.69	10.03
cash surplus/deficit (% of GDP)	-2.054	4.654	-14.374	13.859
dependency ratio (%)	48.102	8.402	17.237	72.478
Real GDP per capita growth (%)	2.508	2.3	-2.958	9.399
Log initial real GDP per capita (US\$)	3.9199	0.551	2.856	4.82
Labour force growth rate (%)	0.384	0.801	-1.0325	4.96
Primary school enrolment (%)	104.385	6.657	91.397	121.454

Descriptive Statistics Panel Data

variable	Observations	Mean	Std. deviation	Min	Max
LTV (%)	363	75.000	13.808	37.200	104
Net National Saving (% of GDP)	338	10.158	10.377	-11.880	46.843
Real GDP growth (%)	363	3.408	4.182	-14.814	25.049
cash surplus/deficit (% of GDP)	269	-2.193	5.521	-30.726	19.566
dependency ratio (%)	352	47.103	7.691	16.542	72.728
LTV supervisory policy = 1	363	0.438	0.496	0	1
Financial crisis ₂₀₀₉ = 1	363	0.680	0.466	0	1
Real GDP per capita growth (%)	363	2.619	4.250	-15.145	23.639
Log initial real GDP per capita (US\$)	363	4.032	0.526	2.856	4.824
Labor force growth (%)	353	0.250	1.210	-5.160	10.480
Primary school enrolment (%)	311	103.631	6.950	87.090	129.456

Appendix 4 Random Effect for Saving Equation, Global Sample

variables	Dependent variable: Net National Saving						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Real GDP growth rate	-	0.252*	0.162*	0.172*	0.171*	0.170*	0.184*
		(0.057)	(0.059)	(0.059)	(0.060)	(0.059)	(0.058)
cash surplus/deficit	-		0.332*	0.306*	0.305*	0.261*	0.253*
			(0.060)	(0.061)	(0.061)	(0.062)	(0.062)
dependency ratio	-			-0.289*	-0.289*	-0.263*	-0.264*
				(0.117)	(0.118)	(0.117)	(0.117)
LTV	0.01	0.017	0.004	0.014	0.013	0.019	0.030
	(0.024)	(0.024)	(0.025)	(0.025)	(0.026)	(0.025)	(0.026)
supervisory LTV	-0.102	-.547	-0.672	-0.561	-0.561	-2.508*	-2.997*
	(1.100)	(1.08)	(1.154)	(1.144)	(1.115)	(1.313)	(1.368)
Financial crisis	-1.667*	-0.673	0.107	0.205	-0.039	-0.850	0.032
	(0.435)	(0.487)	(0.537)	(0.530)	(0.763)	(0.601)	(0.750)
LTV X Fin. Crisis	-				0.0009		-0.011
					(0.009)		(0.009)
Supervisory LTV X Fin. Crisis	-					2.535*	3.019*
						(0.885)	(0.966)
Number observations	338	338	265	265	265	265	265
R-squared	0.058	0.109	0.216	0.237	0.237	0.275	0.281

Appendix 5 Random Effect for Growth Equation, Global Sample

variables	Dependent variable: Real GDP per capita						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Log initial real GDP per capita		-2.284*	-2.287*	-1.944*	-1.903*	-2.024*	-1.913*
		(0.387)	(0.388)	(0.449)	(0.442)	(0.453)	(0.449)
Labor force growth			0.031	0.069	0.049	0.065	0.049
			(0.156)	(0.164)	(0.162)	(0.164)	(0.162)
primary school enrolment				0.051	0.052	0.057	0.053
				(0.031)	(0.030)	(0.031)	(0.031)
Net National Saving	0.134*	0.105*	0.106*	0.107*	0.105*	0.102*	0.104*
	-0.024	(0.019)	(0.019)	(0.024)	(0.023)	(0.024)	(0.024)
LTV	-0.015	-0.006	-0.006	-0.0009	-0.026	-0.0006	-0.025
	(0.016)	(0.014)	(0.014)	(0.015)	(0.017)	(0.015)	(0.017)
supervisory LTV	0.868	0.411	0.407	0.640	0.686*	-0.177	0.594
	(0.507)	(0.411)	(0.413)	(0.640)	(0.449)	(0.791)	(0.825)
Financial crisis	-3.083*	-3.176*	-3.181*	-3.504*	-5.238*	-3.829*	-5.246*
	(0.406)	(0.390)	(0.391)	(0.423)	(0.685)	(0.495)	(0.689)
LTV X Fin. Crisis					0.030		0.030
					(0.009)		(0.010)
Supervisory LTV X Fin. Crisis						1.141	0.126
						(0.902)	(0.956)
Number observations	338	338	338	297	297	297	297
R-squared	0.233	0.213	0.213	0.257	0.292	0.264	0.292

Appendix 6 SUR Result for Global Sample

variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent variable: Net National Saving							
Real GDP growth rate			1.692*	0.860*	0.769*	0.770*	0.790*
			(0.117)	(0.119)	(0.112)	(0.112)	(0.112)
cash surplus/deficit				0.843*	0.765*	0.777*	0.763*
				(0.089)	(0.086)	(0.087)	(0.086)
dependency ratio					0.043	0.041	0.026
					(0.074)	(0.074)	(0.074)
LTV	0.085*	0.088*	0.079*	0.070*	0.085*	0.068*	0.078*
	(0.039)	(0.039)	(0.035)	(0.033)	(0.033)	(0.035)	(0.036)
supervisory LTV	5.687*	5.774*	2.710*	0.003	-2.299*	2.396*	-5.304*
	(1.092)	-1.094	(1.017)	(1.000)	(0.987)	(0.988)	(1.797)
Financial crisis		-1.094	4.402*	4.371*	5.550*	4.990*	5.084*
		(1.148)	(1.110)	(1.061)	(1.054)	(1.137)	(1.131)
LTV X Fin. Crisis						0.017	0.001
						(0.014)	(0.016)
Supervisory LTV X Fin. Crisis							4.057
							(2.103)
Dependent variable: Real GDP per capita growth							
Log initial real GDP per capita			-1.851*	2.531*	-2.576*	-2.607*	-2.550*
			(0.354)	(0.449)	(0.508)	(0.507)	(0.506)
Labor force growth				0.106	0.114	0.117	0.120
				(0.169)	(0.178)	(0.117)	(0.176)
primary school enrolment					0.065	0.067	0.062
					(0.044)	(0.044)	(0.043)
Net National Saving	0.142*	0.134*	0.218*	0.152*	0.150*	0.148*	0.154*
	(-0.024)	(0.020)	(0.018)	(0.023)	(0.028)	(0.028)	(0.028)
LTV	-0.024	-0.016	-0.017	-0.008	-0.003	0.005	0.0002
	(0.015)	(0.014)	(0.013)	(0.016)	(0.018)	(0.019)	(0.019)
supervisory LTV	0.530	0.825*	-0.159	-0.148	0.276	0.306	1.633
	(0.449)	(0.418)	(0.401)	(0.481)	(0.552)	(0.550)	(0.974)
Financial crisis		-3.130*	-3.296*	-3.739*	4.142*	3.826*	-3.849*
		(0.422)	(0.403)	(0.483)	(0.519)	(0.570)	(0.569)
LTV X Fin. Crisis						-0.009	-0.002
						(0.007)	(0.008)
Supervisory LTV X Fin. Crisis							-1.829
							(1.108)
Number observations							
- saving equation							
- growth equation							
R-squared :							
- saving equation	0.094	0.096	0.196	0.359	0.342	0.345	0.351
- growth equation	0.136	0.256	0.270	0.226	0.244	0.250	0.255
Correlation residual	0.000	0.000	-0.383	-0.283	-0.275	0.273	-0.280
Breusch-Pagan test of independence							
- chi2	0.000	0.000	49.67	21.236	17.965	17.776	18.651
- p-value	1.000	1.000	1.000	0.000	0.000	0.000	0.000

Appendix 7 Restricted Random Effect Result Pre- and Post- Financial Crisis

variables	Dependent variable : Net National Saving	
	Pre-financial crisis	Post-financial crisis
Real GDP growth rate	0.341* (0.09)	0.106 (0.058)
cash surplus/deficit	0.268* (0.091)	0.345* (0.086)
dependency ratio	-0.373* (0.155)	-0.211 (0.150)
LTV	0.083* (0.027)	0.004 (0.031)
supervisory LTV	-0.432 (2.770)	0.567 (1.324)
Number observations	117	148
R-squared	0.362	0.135

Variable	Dependent variable : Real GDP per capita Growth	
	Pre-financial crisis	Post- financial crisis
Log initial real GDP per capita	-2.289* (1.136)	-1.152 (0.767)
Labor force growth	0.008 (0.230)	0.14 (0.238)
primary school enrolment	-0.056 (0.062)	0.087 (0.053)
Net National Saving	0.188* (0.062)	0.092* (0.042)
LTV	-0.062* (0.029)	0.042 (0.025)
supervisory LTV	0.930 (1.188)	1.042 (0.758)
Number observations	127	170
R-squared	0.134	0.029

Appendix 8 Restricted SUR Result For OECD, non-OECD, High-Income and non-High-Income Countries

variables	OECD	non OECD	High Income	Non High income
Dependent variable: Net National Saving				
Real GDP growth rate	0.596*	0.167	0.404*	0.363
	(0.109)	(0.199)	(0.123)	(0.192)
cash surplus/deficit	0.503*	1.196*	0.509*	1.725*
	(0.076)	(0.152)	(0.076)	(0.186)
dependency ratio	0.180*	0.238	-0.096	0.467*
	(0.074)	(0.124)	(0.085)	(0.121)
LTV	0.030	0.083	0.036	0.109
	(0.030)	(0.070)	(0.036)	(0.071)
supervisory LTV	1.762	-10.420*	1.667	-12.217*
	(2.167)	(3.517)	(2.251)	(3.680)
Financial crisis	0.825	8.160*	1.211	6.291*
	(0.867)	(2.525)	(1.022)	(2.650)
LTV X Fin. Crisis	0.005	0.0070	0.006	-0.030*
	(0.011)	(0.042)	(0.013)	(0.045)
Supervisory LTV X Fin. Crisis	-1.295	4.567	-1.649	10.215*
	(2.306)	(3.958)	(2.456)	(4.081)
Dependent variable: Real GDP per capita growth				
Log initial real GDP per capita	-4.084*	0.558	-3.819*	1.871
	(0.948)	(1.476)	(0.958)	(1.664)
Labor force growth	0.084	-0.048	0.153	-0.136
	(0.193)	(0.353)	(0.215)	(0.330)
primary school enrolment	-0.087	0.133*	-0.118	0.142*
	(0.076)	(0.063)	(0.086)	(0.059)
Net National Saving	0.241*	0.104*	0.174*	0.118*
	(0.048)	(0.043)	(0.042)	(0.045)
LTV	-0.007	0.062	0.019	0.040
	(0.021)	(0.037)	(0.022)	(0.039)
supervisory LTV	-1.326	-0.260	-2.157*	1.403
	(1.504)	(1.925)	(1.408)	(2.117)
Financial crisis	-3.117*	-5.818*	-3.707*	-4.031*
	(0.545)	(1.268)	(0.574)	(1.418)
LTV X Fin. Crisis	0.0008	-0.034	-0.0003	-0.025
	(0.007)	(0.022)	(0.008)	(0.025)
Supervisory LTV X Fin. Crisis	1.434	0.0267	2.236	-1.509
	(1.565)	(2.168)	(1.515)	(2.305)
Number observations	152	85	161	76
R-squared :				
- saving equation	0.422	0.541	0.338	0.641
- growth equation	0.369	0.294	0.369	0.283
Correlation residual	-0.208	-0.143	-0.164	-0.148
Breusch-Pagan test of independence				
- chi2	6.608	1.76	4.336	1.685
- p-value	0.0102	0.284	0.037	0.194

Appendix 9 Correlation Matrix for Global Sample

	LTV	Supervisory LTV	Net National Saving	Real GDP growth	Cash surplus / deficit	Dependency ratio	Real GDP per capita growth	Log initial GDP per capita	Labor force growth	Primary school enrolment
LTV	1									
Supervisory LTV	0.2018	1								
Net National Saving	0.262	0.086	1							
Real GDP growth	0.0416	0.0671	0.261	1						
Cash surplus/deficit	0.1809	0.1722	0.5369	0.3167	1					
Dependency ratio	0.147	0.0964	0.0076	-0.056	-0.1277	1				
Real GDP per capita growth	-0.0038	0.0511	0.1922	0.9738	0.2784	-0.152	1			
Log initial GDP per capita	0.053	-0.369	-0.2842	-0.259	0.0545	-0.0625	-0.2563	1		
Labor force growth	0.0148	0.0895	0.0252	0.0643	-0.0013	0.0822	0.0527	0.0086	1	
Primary school enrolment	-0.0052	-0.1491	-0.0048	0.1141	-0.1484	0.0526	0.0792	-0.0821	0.067	1

Appendix 10 Correlation Matric for OECD Countries

	LTV	Supervisory LTV	Net National Saving	Real GDP growth	Cash surplus / deficit	Dependency ratio	Real GDP per capita growth	Log initial GDP per capita	Labor force growth	Primary school enrolment
LTV	1									
Supervisory LTV	0.5351	1								
Net National Saving	0.2706	0.304	1							
Real GDP growth	-0.0466	0.0191	0.3198	1						
Cash surplus/deficit	0.2497	0.3385	0.6128	0.2711	1					
Dependency ratio	0.2318	0.0693	0.161	-0.2154	0.0955	1				
Real GDP per capita growth	-0.1063	-0.0129	0.2345	0.9779	0.2208	-0.252	1			
Log initial GDP per capita	0.2913	-0.0076	0.268	-0.158	0.1787	0.5804	-0.2318	1		
Labor force growth	0.0509	0.1951	0.2254	0.1874	0.1167	0.1825	0.1607	-0.2202	1	
Primary school enrolment	0.0566	-0.179	-0.0048	-0.1516	-0.2461	0.212	-0.1976	0.1479	0.1384	1

Appendix 11 Correlation Matrix for non-OECD Countries

	LTV	Supervisory LTV	Net National Saving	Real GDP growth	Cash surplus / deficit	Dependency ratio	Real GDP per capita growth	Log initial GDP per capita	Labor force growth	Primary school enrolment
LTV	1									
Supervisory LTV	-0.1755	1								
Net National Saving	0.3024	-0.2526	1							
Real GDP growth	0.1344	-0.0783	0.1724	1						
Cash surplus/deficit	0.1086	0.0627	0.5613	0.3755	1					
Dependency ratio	0.0781	0.1715	-0.0451	0.0579	-0.2876	1				
Real GDP per capita growth	0.1017	-0.1126	0.0921	0.9689	0.3504	-0.0807	1			
Log initial GDP per capita	-0.1379	-0.0185	-0.337	-0.1437	-0.0365	-0.7151	0.0075	1		
Labor force growth	-0.0359	0.0304	-0.0806	-0.0358	-0.135	-0.0079	-0.0303	0.1346	1	
Primary school enrolment	-0.0435	-0.2331	-0.0298	0.2208	-0.1076	-0.0063	0.1876	-0.1483	0.0378	1

Appendix 12 Correlation Matrix for High-Income Countries

	LTV	Supervisory LTV	Net National Saving	Real GDP growth	Cash surplus / deficit	Dependency ratio	Real GDP per capita growth	Log initial GDP per capita	Labor force growth	Primary school enrolment
LTV	1									
Supervisory LTV	0.5066	1								
Net National Saving	0.2138	0.2493	1							
Real GDP growth	0.0205	-0.0173	0.2784	1						
Cash surplus/deficit	0.2054	0.3064	0.564	0.3468	1					
Dependency ratio	0.2246	0.0113	-0.074	-0.1532	0.0562	1				
Real GDP per capita growth	-0.0179	-0.0421	0.2153	0.9762	0.2665	-0.1955	1			
Log initial GDP per capita	0.2108	0.0435	0.1053	-0.1265	0.2074	0.6551	-0.2472	1		
Labor force growth	0.0816	0.1979	0.15	0.1283	0.0127	0.1379	0.128	-0.2005	1	
Primary school enrolment	0.0328	-0.1847	-0.1235	-0.1796	-0.2357	0.2816	-0.2303	0.237	0.1144	1

Appendix 13 Correlation Matrix for non-High-Income Countries

	LTV	Supervisory LTV	Net National Saving	Real GDP growth	Cash surplus / deficit	Dependency ratio	Real GDP per capita growth	Log initial GDP per capita	Labor force growth	Primary school enrolment
LTV	1									
Supervisory LTV	-0.1654	1								
Net National Saving	0.3507	-0.2699	1							
Real GDP growth	0.0917	-0.1094	0.1808	1						
Cash surplus/deficit	0.1402	-0.089	0.6104	0.2694	1					
Dependency ratio	0.0721	0.0884	0.015	-0.0195	-0.4187	1				
Real GDP per capita growth	0.0323	-0.0925	0.1035	0.9678	0.3008	-0.1744	1			
Log initial GDP per capita	-0.1952	0.0829	-0.4499	-0.0805	0.0859	-0.6259	0.0417	1		
Labor force growth	-0.0919	0.024	-0.0573	0.0092	-0.0221	0.036	-0.0263	0.1548	1	
Primary school enrolment	-0.0255	-0.318	-0.0027	0.2637	-0.1265	-0.0841	0.2445	-0.065	0.0574	1