HOUSING WEALTH, STOCK WEALTH AND CONSUMPTION

A Master's Thesis

by
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Department of
Economics
İhsan Doğramacı Bilkent University
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To my family

HOUSING WEALTH, STOCK WEALTH AND CONSUMPTION

The Graduate School of Economics and Social Sciences
of
Bilkent University

by

EMRE KARABULUTOĞLU

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ANKARA

January, 2017

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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ABSTRACT

HOUSING WEALTH, STOCK WEALTH AND CONSUMPTION

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The growth of the stock market in 1990s and the enormous increase in house market during the last decades have reawakened the wealth impacts on the consumption. The main goal of this study is to determine the differential impact of two wealth categories on consumption expenditures. Here we also attempt to compare two alternative housing wealth and stock wealth measures used in the previous literature. The sample period used in the analysis is 2000-2014, which also allows us to identify the effect of the great recession on the consumption parameters for 31 OECD countries. We find strong evidence which housing wealth has important effects on consumption than stock wealth.

Keywords: Consumption, Housing Wealth, Stock Wealth

ÖZET

KONUT VARLIĞI, MENKUL KIYMET VARLIĞI VE TÜKETİM

Karabulutoğlu, Emre
Yüksek Lisans, İktisat Bölümü
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Menkul değerler piyasasında gerçekleşen 1990'lardaki büyüme ve son yıllarda konut piyasasındaki hızlı büyüme, varlıkların tüketim üzerindeki etkisini tekrar gündeme getirdi. Bu çalışmanın amacı iki varlık grubunun tüketim üzerindeki etkisini incelemektir. Aynı zamanda, hem menkul varlıklar hem de konut varlığı iki farklı yöntemle hesaplanmaktadır. 2000 ve 2014 yılları arasında 31 OECD ülkesinin incelendiği bu çalışma, 2008 finansal krizinin tüketim üzerindeki etkilerini görme imkanı da sağlıyor. Biz konut varlıklarının tüketime olan etkisinin menkul varlıkların etkisine göre daha büyük ve önemli olduğunu buluyoruz.

Anahtar Kelimeler: Konut Piyasası, Menkul Değerler Piyasası, Tüketim

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TABLE OF CONTENTS

ABSTRACT vi

ÖZET vii

ACKNOWLEDGEMENTS viii

TABLE OF CONTENTS ix

LIST OF TABLES x

LIST OF FIGURES xi

CHAPTER I: INTRODUCTION 1

CHAPTER II: LITERATURE REVIEW 6

CHAPTER III: THE THEORY 14

CHAPTER IV: DESCRIPTIVE DATA ANALYSIS 17

CHAPTER V: THE MODEL 22

CHAPTER VI: ECONOMETRIC RESULTS 24

REFERENCES 41

APPENDICES 42

Appendix A 42

Appendix B 45

Appendix C 47

Appendix D 50

LIST OF TABLES

1.	Empirical studies on stock wealth which use macro and micro data	9
2.	Empirical studies on housing wealth which use macro and micro data	11
3.	Results for the fixed-effects estimator under the both measures of wealth	27
4.	Consumption fixed-effects models with serially correlated errors	31
5.	Consumption in first differences fixed-effects model	33
6.	*a.* Pre vs post crisis consumption fixed effects model 1	36
	b. Pre vs post crisis consumption fixed effects model 2	37
7.	Consumption fixed-effects models in error correction form	39

LIST OF FIGURES

1. Variation in consumption in log vs. variation in stock wealth in log 19

2. Variation in consumption in log vs. variation in housing wealth in log 19

3. Stock Price Index (2010=100) by Country 34

4. Housing Price Index (2010=100) by Country 34

CHAPTER I

INTRODUCTION

The increase in financial wealth and housing booms in the 1990s and 2000s, and following economic crisis drew attention to the impact of financial and housing wealth on consumption has expenditures. It is crucial for the policymakers to understand the process of how variations in different wealth categories affect consumption. For development of correct policy response, the response of consumption is critical. When the magnitude of consumption in overall demand is considered, it is essential to understand the determinants of demand if we are to measure the effect on total output of fiscal and monetary policy changes and/or possible technology shocks. The growth of the stock market in 1990s and the enormous increase in house market during the last decades have reawakened the wealth impacts on the consumption.

Consumer' consumption preferences are essential for growth and cyclical fluctuations. With regard to growth, the allocation of resources between consumption and human and physical capital investment forms the base for long run variations in standards of living of economies. The growth of stock wealth was very influential in the 1995s that is following a positive period in the 1985s. By many, this acceleration is attributed to the development and wide use of the internet technology (De Bonis et al., 2013). According to the studies on wealth effects, the increase in U.S. private consumption relied on the increase in households wealth that became greater with of the stock market expansion until 2000s and the house-pricing rise

thereafter. The rise in household wealth contributed to the support of consumer spending and to the decrease of the saving rate, especially in the US.

At the beginning of the 2000, the end of the stock market bubble began and cause to a decrease in share prices until 2003. Then rapid increase consumption was primarily carried by the rise in the value of houses, which started in the late 1990s but intensified after 2000 (De Bonis et al., 2013). For instance, Feldstein (2008) and Chandrasekhar and Ghosh (2005) suggested that a rise in savings may depend on housing market performance, where lower prices may induce to a rise in rates of saving. The logic here is that rise in wealth leads a decline in savings and a rise in consumption since variations in wealth directly have impact on households contemporaneous budget sets (Salotti (2010)).

According to the De Bonis et al. (2013) the US have seen the most important gains in wealth and the rise in stock market wealth for European countries was also significant. On the other hand, in Japan, stock prices had decreased during 1990s. The growth of financial assets was rapid in the 1990s and it increased its speed late 1990s, followed by a collapse in the stock values in 2000s. Most western countries experienced a decrease in the stock market, except Japan in this recent crisis. The decline in the value of stock in 2008 crisis and years following was significant in United States, United Kingdom and Canada. In countries like Spain and Germany, where historically banks have an important effect the rise of stock market was weaker prior to the crisis. (De Bonis et al, 2013).

Due to the housing bubble and rapid and overall increase in housing prices, most countries experienced an increase in housing wealth, up until 2006. With this, changes in wealth were dominated by the changes in the housing market and changes in total wealth have been raised above changes in stock market wealth. An important part of the increase in the housing prices can be attributed to the deregulations of housing markets, but whatever the reason there is enough evidence to suggest that housing wealth has an undeniable impact on the economy. Actually, it was Greenspan (2001), Chairman of the Federal Reserve of the United States,

who suggested that when one compared the marginal propensity to consume out of stock wealth and out of housing wealth, the former might be lower than the latter.

The main goal of this study to the differential impact of two wealth categories on consumption expenditures. Here we also attempt to compare two alternative housing wealth and stock wealth measures used in the previous literature. Our focus is to empirically test the equality of the elasticity of consumption with respect to stock wealth and housing wealth. The sample period used in the analysis is 2000-2014, which also allows us to identify the effect of the great recession on the consumption parameters. We analyze the impact of housing wealth and stock wealth on consumption expenditures. In measuring housing and stock wealth, we first adopt the approach recommended by the ECB (2009). This is the method used in several recent studies, in which housing and stock prices indices are employed as a proxy for housing wealth and stock wealth, respectively.

As a second measurement approach, which is suggested by Case et al. (2005), estimations of housing market wealth is done by employing homeownership rate, number of households and house price index. The second method of computing the aggregate stock market wealth is by measuring the domestic stock market capitalizations. Taking into account the criticisms about the use of market capitalization as stock wealth, we use domestic market capitalization data. The latter method also requires broader data, which is not available for many countries, but it allows us to measure wealth in terms that are more precise.

Our analysis is based on panel data assembled for a period ranging from 2000 to 2015, for 31 OECD countries and China. For these countries, we have collected annual data on household disposable income, stock wealth, housing wealth, consumer price index, stock and housing price indices, population, number of households, household final consumption expenditure, real interest rate, household debt and home ownership rates. All values are measured in US dollars terms and price indices have 2010 as the base year. Variables are defined in logarithmic forms. By

choosing a panel, we extend the size of sample relative to aggregate estimations; hence, country-level panel data should give us more precise estimations of the housing and stock market wealth impacts. We employ a structural break test to assess pre-crisis and post crises periods. All regressions include robustness checks. Therefore, our data has various strengths and weaknesses. We could not compare the countries by whether they are low income or high-income level. This is, due to the absence of home owner ship, house price index data for most of the low-income countries, and the fact that the assumptions of our model such as liquidity constraint issue are not appropriate for these countries. However, the countries we cover provide a wider spectrum of geographic variation to exploit.

After the introduction, this study is divided into four chapter. Section II gives theoretical reasons for the distinction between housing and stock wealth and reviews limited evidence. Section III provides consumption theory of permanent income hypothesis. Section IV includes data properties and section V indicates the model. Section VI, lastly, discusses the empirical results and draws conclusions.

When we consider the magnitude of consumption in the aggregate demand, the factors that affect consumption become crucial for policymakers. To determine correct policy responses, the mechanism between consumption and its determinants must be shed light on. In addition, with the recent increases in the housing wealth and stock wealth in the last decades, now it became more crucial to understand the effects of wealth on consumption. Thus, in this study, we investigate the evolution of the effects of stock wealth and housing wealth on consumption. Since the period we covered included the financial crisis period in 2008, it enable us to assess the effect of crisis and makes the study more comprehensive.

Our data includes many countries that have different characteristics and with this study, we expect to capture common traits in the consumption behavior. We found significant and stronger effect of housing wealth on consumption. However, most of time we found insignificant and smaller in magnitude effect of stock wealth on consumption. According to our findings, housing wealth may provide efficient policy

implications through financial markets channels.

CHAPTER II

LITERATURE REVIEW

The theoretical literature on consumption is established over three important theories; namely the relative income theory of consumption by Duesenberry et al. (1949), the life cycle theory of consumption by Modigliani and Brumberg (1954), and the theory permanent income by Friedman (1957). In this section, we briefly present these theories, how these theories are estimated empirically.

Keynes introduced income as the only determinant of consumption with a marginal propensity to consume with less than one, since he claimed when income increases consumption rises but not by as much as the rise in income. Duesenberry et al. (1949) proposed that consumption depends on relative income of an individual rather than only his own individual income. That is why his theory is called relative theory of consumption. In addition, the consumption of an individual also depends on the previously attained income levels in the past, which is another deviation of Duesenberry from Keynes's theory of consumption.

The theory that focused on wealth as the determinant of consumption was proposed by Ando and Modigliani (1963), which known as life cycle theory of consumption. According to Ando and Modigliani (1963), expected income of an indi-

vidual's working years is an important factor that determines consumption. The same study also emphasized the stock market wealth. According to estimations of this study, which used time-series data for the US, the relation between consumption and income is not proportional; rise in labor income creates increase in consumption, but not by as much as the rise in the income.

Friedman (1957) has developed another important theory of consumption, which is called the permanent income theory. While permanent income hypothesis and life cycle consumption theory is different in details, they have essential common points. Similar to the life cycle theory, consumption is governed by long-term expected average income rather than current income. The long-term expected average income is provided from both human and non-human wealth. The income provided from human wealth, indicates the return on income derived from selling individual's labor services, it implies the abilities and efforts of the labor. This is defined as labor income.

According to Friedman (1957), consumption is proportional to permanent income, defned as the long-term expected average income. The proportion of permanent income allocated to consumption depends on the rate of interest, non-human wealth and labor income. Therefore, changes in rate of interest and the wealth or assets held by the people are emphasized as other essential determinants of consumption. However, Dejuan et al. (2006) analysis whether time-series data from 11 German states support evidence in accord with the implication of the permanent income hypothesis. The empirical results do not support this hypothesis, in which the reaction of consumption to income variations is much smaller than is indicates by the permanent income hypothesis. Additionally, for each state as well as for Germany as a whole, the response was found to be asymmetric, being weaker for positive than negative income changes.

The empirical literature on the wealth effects is broad and dates back to 1960s. On the one hand, the literature on wealth effects conducts estimations using variety of sample periods and various estimation techniques. Furthermore, the studies have

employed different housing and stock wealth measurements. On the other hand, one of the issue, which is common to most of contributions, is a consensus on the need to distinguish between stock and housing wealth when calculating the wealth effect on consumption. However, until the last decades, the wealth is generally defined as a total wealth and is not distinguished as stock wealth or housing wealth. Moreover, there must be considerable variation in the consumer behavior, due to the deviations in the economic structure of the developed and developing countries.

There are various reasons why consumption could be affected separately by the form of wealth. Firstly, individual may consider rises in measured wealth of different kinds as temporary. Secondly, consumer can see the accumulation of wealth as an end goal in itself. In addition, consumer may have a bequest goal. This is in some cases encouraged by the tax structure, which provides incentive to hold wealth for the purpose of appreciation over time. In addition, people could may not be able to evaluate the exact value of their wealth at every instant, or how it changes over time. However most of the studies used aggregate household wealth as a determinant of consumption (Case et al., 2005).

Other consumption studies examined the impact of different wealth forms on consumption expenditures. Imbens et al. (1999), points out the effect of unexpected wealth such as lottery winnings causes positive impact on consumption. In some cases, some of the asset gains may be unrealized and might be transitory. In addition, consumer may separate different wealth types into different psychological groups, which are then considered separately in the consumption decisions. For example, the prices of some asset types can be calculated with more accurately in markets in which there are lots of active traders. Shefrin and Thaler (1988) states that the methods with which an asset is formed may have an impact on how it is used. Some wealth groups are more suitable for the use on ongoing expenditures while some other assets are reserved for savings. For example, the accumulation of housing property wealth can be considered as hedging against uncertainties. Moreover, Sinai and Souleles (2003) found that homeownership rates becomes higher where more uncertain rental rates are observed.

The above arguments indicate a requirement that differentiates between the stock wealth and housing wealth in the analysis of consumption. Consumer could have distinct psychology about giving his stock wealth and giving their houses to his children (Shefrin and Thaler, 1988). It is possible that households are probably not aware of the variations in housing wealth because they do not obtain daily news about its value. On the other hand, stock market provides daily information online, on media and in newspaper (Case et al., 2005).

Table 1: Empirical studies on stock wealth which use macro and micro data.

	OECD	US	UK	CAN	IT	FR
Macro Data						
Marginal Propensity to Consume						
Davis et al. (2001)		0.06				
Carroll (2004)		0.04				
Bassanetti and Zollino (2008)					0.04-0.06	
De Bonis and Silvestrini (2012)	0.009					
Elasticity						
Ludvig and Sløk (2004)	0.02-0.05					
Case et al. (2005)	0.01					
Our results	0.07-0.13					
Micro Data						
Marginal Propensity to Consume						
Paiella (2004)					0.09	
Guiso et al. (2005)					0.02	
Grant and Peltonen (2008)					0.005	

The empirical influence of housing wealth on consumption has not been broadly explored. Below, we survey recent contributions on wealth effects on consumption, particularly focusing on papers that exploit aggregate data. Davis et al. (2001) by using time series estimated and found that long-run marginal propensity to consume (MPC) out of housing wealth as 0.08, and the marginal propensity out of stock wealth is 0.06 for the US. Pichette et al. (2003) estimated a long-run marginal propensity to consume for housing wealth for Canada is 0.06, and an insignificant effect of stock wealth. Another study Carroll (2004) estimated the long-run MPC out of different types of wealth and assessed that long-run MPC out of housing wealth as 0.09 and stock wealth as 0.04 in the US. By concentrating on long-run elasticity instead MPC, Ludwig and Slok (2004) found a consumption elasticity

relative to stock wealth, which ranges between 0.023 and 0.052, and a consumption elasticity relative to housing wealth about zero for 16 OECD countries, in a panel data study. These results were challenged by Case et al. (2005) who found a consumption out of housing wealth ranges between 0.11 and 0.17, and they found insignificant elasticity results with respect to stock wealth in panel of 14 developed countries.

The table 1 and 2 indicate the findings of empirical studies on stock wealth and housing wealth, which use macro and micro data. Firstly, the period we cover is recent and quiet different compared to the sample period of earlier studies. In table 2, the study with the most recent data includes up to year 2007, and only half of our sample period overlaps with this period. The increase in financial and housing wealth in last decades may be one of the reason of why our findings is large as compared to the findings of the earlier studies. Secondly, most of the studies in the above table employ quarterly data, their marginal propensity to consume and elasticity values are for quarters, hence it is expected to be lower than annual parameters. We collected data annually and our elasticities stand for annual values. Our sample includes 31 country for most of regressions under the method in which price indices are used as wealth measure. The study that includes the broadest number of country is Case et al. (2005) and they only rely upon for 14 countries. These might be the reason why we obtain larger elasticities as compared to the findings of the earlier studies.

Table 2: Empirical studies on housing wealth which use macro and micro data.

	OECD	US	UK	CAN	IT	FR
Macro Data						
Marginal Propensity to Consume						
Skinner (1993)		0.03				
Davis et al. (2001)		0.08				
Bertaut (2002)		0.10	0.04	0.09		
Slacelek (2006)	0.01	0.05	0.05	0.05		
Bassanetti and Zollino (2008)					0.01-0.02	
De Bonis and Silvestrini (2012)	0.001					
Elasticity						
Boone and Girouard (2002)		0.03	0.04	0.19	-0.06	0.05
Ludvig and Sløk (2004)	0.04					
Case et al. (2005)	0.09-0.17					
Our results	0.22-0.33					
Micro Data						
Marginal Propensity to Consume						
Lehnert (2004)		0.02				
Paiella (2004)					0.02	
Guiso et al. (2005)					0.02	
Campell and Cocco (2007)			0.08			
Elasticity						
Bostic et al. (2006)		0.06				
Sierminska and Takhtamanova (2007)				0.12	0.13	
Grant and Peltonen (2008)					0.8	

From studies focusing on national cases, Blake (2004) indicates that wealth directly affects consumption, with a marginal propensity of 0.01 in the UK. Later, Tang (2006) found that whilst one-dollar rise in housing wealth causes to 6 cent increase in consumption, one-dollar increase in stock wealth leads to 2 cent increase in consumption in Australia. In addition, Hamburg et al. (2008), studying Germany, claim that one-euro rise in asset wealth increase in consumption by 4-5 cents. On the other hand, Bassanetti and Zollino (2008), by analyzing the Italian case, assessed the magnitude of marginal propensity to consume of stock wealth is about 4-6 cents, against of 1.5-2 cents for one-euro rise in housing wealth.

In recent years, there are also various studies that employ micro data. The objective in these are to measure the impact of housing versus stock wealth on consumption. Disney et al. (2003) indicated that marginal propensity to consume

(MPC) of housing wealth varies from 0.09 to 0.14 for the United Kingdom. In addition, Bover et al. (2005) found MPC to be around 0.015 out of housing wealth for Spain. On the other hand, also other studies use micro data, but use elasticity as their parameters instead of MPC. While Lehnert (2004) found a consumption elasticity of housing wealth of 0.05 in the US, Campbell and Cocco (2007) found elasticity of consumption for housing wealth about 0.017 in the UK. Focusing on other national cases by using micro data, Grant and Peltonen (2008) studied the impact on consumption of various component of wealth in Italy and found that while housing wealth has MPC about 0.014, stock wealth has MPC about 0.005.

The effect of stock market prices on total consumption was also investigated through studies such as Romer (1988) and Poterba et al. (1995). Using the flow of funds for the US case, the position of house prices on consumption also received attention in more recently by Girouard and Blondal (2001) and Case et al. (2005).

Another strand of literature has an important debate about the differential impacts of variations in housing wealth on rental and non-rentals. Sheiner (1995) stated that house prices increases might lead to an increase in the savings of renters who have to meet higher future payment to be used in the future date to buy house. On the other hand, Engelhardt (1994) and Yoshikawa and Ohtaka (1989) found similar results which the probability that renters saved for future payments considerably decreases due to the higher housing prices. Therefore, the overall impact of higher prices is to raise consumption of renters as homeowners. In addition, higher housing prices increase the resources available for inter-generational transfers. This may also decrease the savings of those renters who look for becoming homeowners Case et al. (2005).

Ludwig and Slok (2004) concluded variation in the stock prices have an impact on consumption but this effect is larger in countries with a market-based environment than for countries with a bank-based environment. Case et al. (2005) indicated that a significant and greater impact of housing wealth than impact of stock wealth on household consumption. De Bonis and Silvestrini (2012) reached a dif-

ferent result that stock, house wealth have a positive impact on consumption, and the impact of stock wealth is greater than that of housing wealth.

Muradolu et al. (1996) points out differences within the set of countries included in this study. We have some developing countries with lower per capita income such as Turkey, China, and Romania. However, the majority of the countries are high-income countries and the sample is not balanced in terms of high income and upper middle-income countries. We do not expect to be able to differentiate the behavior of high-income countries from the upper middle-income countries with our sample. Some country specific differences such as financial structure, tax regulations, culture and demography can be captured by fixed effect model. We choose the fixed effect model to control these unobserved country effects.

CHAPTER III

THE THEORY

The literature on consumption function describes consumption through wealth and income. This paper concentrates on the relative importance of two wealth ingredients, housing wealth and stock wealth, across various countries. An aggregate consumption function with disposable income and wealth as the only explonatory variables of consumption is developed by various theories which are consisting of the permanent income theory by Friedman (1957).

The representative consumer's problem in Friedman (1957) is

$$\max_{\{c_t, a_{t+1}\}_{t=0}^{\infty}} E_0[\sum_{t=0}^{T} \beta^t u(c_t)] \quad s.t. \tag{1}$$

$$c_t + a_{t+1} = y_t + (1+r)a_t \quad with \ \ a_0 \ \ is \ given \tag{2}$$

$$E_0\{\lim_{T\to\infty} \big(\frac{1}{1+r}\big)^t a_{t+1}\} = 0 \tag{3}$$

where c_t is consumption, a_t is an asset holding at t which yields the net interest rate of r, and y_t is a stochastic income process. The instantaneous utility function $u(:)$ is assumed to satisfy the Inada conditions.

In equation (1), consider a household who maximizes its expected lifetime utility from the consumption of goods c between periods 0 and T, as determined by one-period utility function. In every period t, it receives an income y_t, which it can be either spent on a consumption good c_t or saved in the form of an asset a_t which pays a constant real interest rate r in the succeeding period. The utility of consumption in next periods is discounted at the rate $\beta \in (0, 1)$. Let $\mathbb{E}_t[\cdot]$ stand for expectation conditional on the information available at t. Equation (2) is budget constraint and equation (3) is for the transversality condition which avoids the household from permanently borrowing and rolling over its debt to next periods.

The period budget consraint is given by

$$c_t + a_{t+1} = y_t + (1 + r)a_t$$

We arrange this equation

$$a_t = \frac{1}{1+r}(c_t - y_t + a_{t+1}) \tag{4}$$

Forwarding this expression one period yields

$$a_{t+1} = \frac{1}{1+r}(c_{t+1} - y_{t+1} + a_{t+2}) \tag{5}$$

We now plug this equation into (4)

$$a_t = \frac{1}{1+r}[c_t - y_t + \frac{1}{1+r}(c_{t+1} - y_{t+1} + a_{t+2})] \tag{6}$$

Rewriting this gives

$$a_t = \frac{1}{1+r}(c_t - y_t) + \left(\frac{1}{1+r}\right)^2 (c_{t+1} - y_{t+1} + a_{t+2}) \tag{7}$$

We could then forward (4) one more period to substitute a_{t+2}. However, we could already see how the equation evolves when we repeat this procedure an infinite

number of times, the result is

$$a_t = \sum_{s=0}^{\infty} \left(\frac{1}{1+r} \right)^{s+1} (c_{t+s} - y_{t+s}) + \underbrace{\lim_{s \to \infty} \left(\frac{1}{1+r} \right)^{s+1} a_{t+s+1}}_{=0 \text{ (by assumption)}} \tag{8}$$

Iacoviello (2011) numerically shows that when we divide total asset (a_t) into housing wealth and stock wealth, then equation (8) evolves households' income, real interest rate and two types of wealth determine consumption expenditure.

The purpose in this thesis is to empirically test the relative importance of the two types of wealth following the debate in the literature. To reach the empirical model we estimate, we need to use the assumptions of zero wealth at the end of the last period of consumer. Because, households make their consumption according to its whole life, and end of the last period their wealth becomes zero. This corresponds to no bequest motive. We are aware that of our explanations on consumption may be biased upwards due to the assumptions.

CHAPTER IV

DESCRIPTIVE DATA ANALYSIS

Our analysis is based on data collected for a period ranging from 2000 to 2014, for most of OECD countries and China.[1] We would like to examine this issue in the OECD countries and we wanted to include as many as the developed and emerging market countries, which has relatively developed financial markets. Because these countries have a developed financial markets and consumers have the option of using either their stock or housing wealth. However, the data availability constraints our final results. For these countries, we have collected data on household disposable income, stock wealth, housing wealth, stock and housing price indices, household final consumption expenditure and homeownership rates. Below, we give a brief description of data set.

We wanted to increase the country and time coverage of our empirical work. However we are running to the problem of data availability especially with the housing wealth measure. Hence we are using two alternative types of housing wealth definition. Firstly, we have adopted house price index as a proxy to measure housing wealth. Residential Property Prices Indices also named house price indices, are index numbers that measure the price of residential properties over time.

[1] Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Greece, Ireland, Iceland, Israel, Italy, Japan, Hungary, Latvia, Luxembourg, Netherland, Norway, Poland, Portugal, Spain, the United Kingdom, the United States, Slovakia, Slovenia, Sweden, Switzerland, the Republic of Korea, Turkey and China.

The second one is adopted from Case et al. (2005). According to the model, consumption, stock wealth and housing wealth are computed yearly for every country.

Computations of housing market wealth were constructed by using:

$$W_h = R_{it} N_{it} p_{it}$$

where
W_h : total value of owner occupied housing,
R_{it} : homeownership rate[2],
N_{it} : number of households, and
p_{it} : housing price index.

Take account of our measure W_h of housing wealth knowingly does not evaluate the size and quality of new houses or of deviations in existing homes. This measure may be described as wealth of homeowners supposing that they own a uniform, standart home. We define housing wealth in such a way, since we want to concenrate on effects of variations in the market price of housing on consumption.[3]

We employed again the two types of approaches to measure stock wealth. The first measure is again stock price index as a proxy to evaluate stock wealth. Stock price index are presented as an index where the year 2010 is the base year. As a second approach, market capitalization is used to measure stock wealth. Computations of aggregate stock market wealth for each country were gathered from the GFD. Domestic market capitalization can be found annually for all countries. Market capitalization is the share price times the number of shares outstanding for listed domestic companies.

[2]The definitions of all variables are in the appendix C.

[3]Instead of, if we used the total value of homes as our measure of wealth, we would likely find a relation between consumption and housing wealth obviously because housing consumption is a component of aggregate consumption. For any rises in consumption, it is possible to think that, there could be a feedback into housing wealth through improvements in home size and quality which implies part of the rise might be attributable to developments in houses.

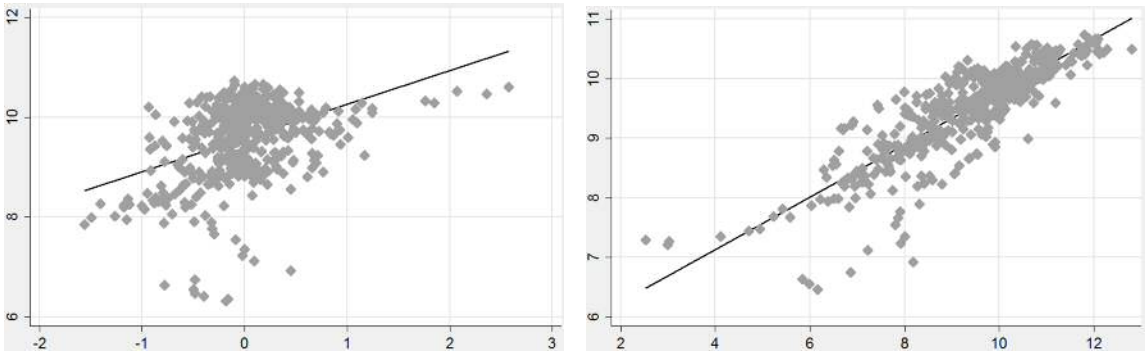

Figure 1: *Variation in Consumption in Log vs. Variation in Stock Wealth in Log*

The diagrams of log changes in consumption versus log variations in stock wealth and housing wealth are provided in Figures 1 and 2. The vertical axis is consumption in log and the horizantal axis stands for stock and housing wealth, respectively. With our statistical results, it suggests long-run relationship between housing wealth and consumption. Importantly, as can be seen table 1 and 2, which approach we use to measure wealth does not affect the results.

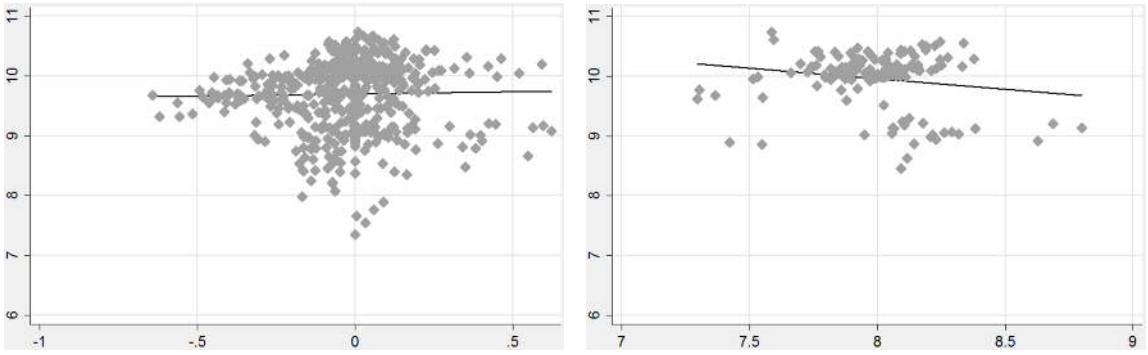

Figure 2: *Variation in Consumption in Log vs. Variation in Housing Wealth in Log*

The source for the data on household disposable income, home ownership rates, stock price and housing price indices is OECD's database. Household and NPISH (non-profit institutions serving households) final consumption expenditure, and

yearly data on home ownership rates are obtained from Eurostat's database. Another source for data on population and consumer price index is WorldBank database. Definitions of variables are relegated to appendix C.

All variables are defined as real per capita values in logarithmic forms. There is a number of data limitations. Availability of data also restraints us to employ disposable income rahter than only labor income as proposed by the permanent income hypothesis. However, the usage of total income instead of labor income is also proposed by various theories such as the life cycle theory (Attanasio (1999)). Data on population and consumer price index is World Bank database. OECDs database, World Bank database and Eurostats database was employed for all the variables for each country.

Under the measure in which we use price indices as a proxy for wealth, our data is not balanced, but we have 402 observation of 450 data points. As we mentioned before under this method, the number of countries is 31 and average observation per group is 13. Under the second measure in which value of housing stock is used as wealth measure, the data is also not balanced, and its number of observation is limited, since its computation needs several variables such as number of households and homeowner ship rate, and such a broad data does not exist for most of the countries. Unbalanced nature of data was taken into consideration during the testing stage.

Unobserved country effects, such as differences in financial structure, culture, tax regulations and demography is important factors that determine the behavior of consumer. These factors inherently changes from one country to another and for this reason, we choose the fixed effect model to control this effects. On the other hand, all countries in our sample is high-income level country except Turkey, China and Romania. However, these exceptional countries form very small part of our sample and even they not included under the second method.

With the first method in which we used price indices as wealth proxy, we use the same data source for China as OECD countries. Moreover, under this method, the observation number is 402, number of countries is 31, and average number of observation per group is 13. China is not included under the method in which value of housing stock is used as wealth measure. The source for the data on household disposable income, home ownership rates, stock price and housing price indices is OECD's database. Household and NPISH (non-profit institutions serving households) final consumption expenditure, and yearly data on home ownership rates are obtained from Eurostat's database. Another source for data on population and consumer price index is World Bank database. Definitions of variables are relegated to appendix C.

CHAPTER V

THE MODEL

A consumption function with consumer income and wealth as the only explonatory variables of interest is developed by various theories which are consisting of the permanent income theory by Friedman (1957) and life cycle theory by Modigliani and Brumberg (1954). Most of the empirical studies of the wealth impact of consumption assumed and tested trends among the these variables Ludwig and Sløk (2004).

In the consumption function, the standard determing factors of consumption are permanent income Y and wealth W. The consumption function can be written as:

$$C = f(Y, W) \tag{9}$$

As in the model presented by Iacoviello (2011), when total wealth is divided stock (W_s) and housing (W_h) wealth, the consumption fuction takes the form below

$$C = f(Y, W_s, W_h) \tag{10}$$

De Bonis and Silvestrini (2012) mentions that macroeconomic theories of wealth effects are defined according to a reduced-form consumption equation of the type,

$$C_{i,t} = \alpha Y_{i,t} + \beta W_{i,t} + \varepsilon_{i,t} \tag{11}$$

where α and β stands for the marginal propensity to consume out of permanent income and wealth, and subscripts i and t stand for country and time. $\varepsilon_{i,t}$ is the error term which is controlling the impacts of unexpected shocks to consumption. An equation such that (11) goes in the history of economic thought. It was given eminence in the seminal study of Milton Friedman and Franco Modigliani (Iacoviello (2011)). A generalization of the consumption function which provides different marginal propensities to consume out of stock and housing wealth can be shown as:

$$C_{i,t} = \gamma_i + \tau_t + \alpha Y_{i,t} + \beta_s (W_s)_{i,t} + \beta_h (W_h)_{i,t} + \varepsilon_{i,t} \tag{12}$$

We incorporate country fixed effects (γ_i) in all identifications. Also, we add time fixed effects τ_t, to measure common shocks for all countries. Our econometric specification allows for different measures across countries.

The coefficient β_h in above equation stands for the housing wealth effect. At the basic level, the equation shows that if housing wealth was to increase by 1 dollar, consumption should increase by β_h dollars. This equation indicates the relation between housing wealth and consumption. Life-cycle and bequest motivations, non-separability between housing and consumption, endogenous labor supply, and housing tenure preference are not considered here.

An aggregate consumption function with disposable income and wealth as the only explanatory variables of consumption is developed by various theories, which are consisting of the permanent income theory by Friedman (1957). To reach the empiric model we estimate, we need assumptions to solve the permanent income theory of Friedman (1957) as not considering bequest motive. Because, household makes his consumption according to its whole life, and end of the last period his wealth become zero so we have not to consider the bequest. On the other hand, Carroll (1998) find out that whether household sees the accumulation of wealth as an end in itself, or unspent wealth gives way a flow of services like social status or power that have the same impact on consumer as if wealth were intrinsically desirable.

CHAPTER VI

ECONOMETRIC RESULTS

This section provides the empirical results of the statistical equation. Inaccuracies in consumption function such as relating consumption to solely income, can seriously affect the predictive power of models. Following the failures, the search for additional explanatory variables was intensified. Wealth is perceived to play a significant role in consumption, hence were used to add the existing consumption estimations. Consumption and saving rely on disposable income, wealth, and real interest rates.

The variables we include in the model are disposable income, stock wealth and housing wealth. Since the primary determinant of consumption is disposable income, the expected sign of the coefficent is positive. Secondly, the greater the volume of wealth in the economy, the greater will be the consumption expenditure, hence the expected sign of the wealth is also positive.

Much of the literature employs aggregate data, that are obtainable for longer terms, more often than household-level data. Results are generally presented in terms of elasticities with respect to wealth. Some work approximates the marginal propensity to consume out of housing wealth, which shows how much consumption changes for a one-dollar change in wealth rather than the elasticities. The two measures are closely related, in which the marginal propensity to consume multiplied by the

ratio of housing wealth to annual consumer expenditure equals the consumption elasticity to housing wealth.

Tables 3 reports the results of the basic estimation in which consumption is related with disposable income and two measures of wealth. Each table presents results for 31 countries. Variables of interest are real and calculated per capita in logarithmic form. The basic specification is model 1 and presents relationship between per capita consumption, per capita and disposable income. Through model 2, we add stock wealth as another explanatory variable. Model 3 includes additionaly housing wealth and model 4 is presented with year-specific fixed effetcs. All specifications include fixed effects.

By choosing fixed effects model, we wanted to control for unobserved country effects, such as differences in financial structure, culture, tax regulations and demography. We also present the results for equality test of coefficient on stock wealth and housing wealth at the bottom of each table. All models are documented with robust standart errors for panel specific auto-correlation and heteroskedasticity. Unlike the literature, we also present estimations, which include real interest rate in the appendix. Interest rate is statistically significant when both of housing wealth and stock wealth included in model 3. It is also significant in model 4 in which time fixed effect is included and consumption elasticity of real interest rate takes the value of 0.08.[4]

All coefficents of the model except stock wealth are significant and the model is good fitted. According to the all models, disposable income and housing wealth are significant variable to explain consumption. The coefficient of stock wealth is significant when it is included as the only wealth ingredient. However it became insignificant if housing wealth is added to regression. Moreover, while the coefficient of the housing wealth decreases in model 4, it is still significant. Wealth measure is defined as price index at the upside, and as value of housing stock at the down side in the tables. The consumption elasticity of housing wealth ranges

[4]The estimation includes real interest rates are reported in Appendix D.

between 0.34 and 0.22. On the other hand, the elasticity of stock wealth varies between 0.00 and 0.07. In addition, we reject the equality of the coefficient on housing wealth and the coefficient of stock wealth for all models, except error-correction one.

To check whether we should include time-fixed effect in the specifications, we applied F-test for all specifications. We present the results on tables. Under the both methods, time fixed-effect is jointly significant at 1% level for all specifications, except only for one model, which uses value of housing stock as wealth measure. We also present results by adding time-fixed effect in model 4, in all tables.

Table 3: Results for the fixed-effects estimator under the both measure of wealth.[5]

Dependent variable: Consumption per capita Variables		(1)	(2)	(3)	(4)
	Coef.	0.9400***	0.1081***	0.8122**	0.7767***
Disposable Income	Robust Std. Err.	(0.0592)	(0.0847)	(0.0691)	(0.1425)
	t	15.85	12.01	11.75	5.45
	Coef.		0.1324***	0.0529	0.0536
Stock Wealth	Robust Std. Err.		(0.0312)	(0.0478)	(0.0556)
	t		4.24	1.11	0.96
	Coef.			0.3440***	0.2294*
Housing Wealth	Robust Std. Err.			(0.0675)	(0.0873)
	t			5.09	2.63
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		535	465	402	402
R-squared		0.88	0.89	0.87	0.86
F-test				$F^0 = 9.35$	$F_{critical} = 1.54$
F(1,30)				7.76	2.06
(Prob>F)				(0.009)	(0.164)
	Coef.	0.9400***	0.8909***	0.4423**	0.3526
Disposable Income	Robust Std. Err.	(0.0592)	(0.0648)	(0.1241)	(0.2033)
	t	15.85	13.73	3.56	1.73
	Coef.		0.0270	-0.0008	0.0778*
Stock Wealth	Robust Std. Err.		(0.0235)	(0.0207)	(0.0369)
	t		1.15	-0.04	2.11
	Coef.			0.3350***	0.2772***
Housing Wealth	Robust Std. Err.			(0.0474)	(0.0366)
	t			7.07	7.56
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		535	415	102	102
R-squared		0.88	0.89	0.74	0.86
F-test				$F^0 = 0.95$	$F_{critical} = 1.48$
F(1,26)				61.74	65.34
(Prob>F)				(0.000)	(0.000)

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

[5]Variables of interest are real and calculated per capita in logarithmic form. All tables report fixed-effects coefficients estimated over the period 2000-2015. The dependent variable is consumption per capita. We documented robust standart errors for panel specific auto-correlation and heteroskedasticity and correlated t-statistics. *** stands for significance at the 99% level, ** stands for significance at the 95% confidence level, * stands for significance at the 90% confidence level.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Studies which estimate jointly the impact of variations in housing wealth and stock wealth often show that one of the coefficients of two wealth is insignificant. Case et al. (2001) propose that the multicollinearity between the stock and housing wealth could be allayed using country-level data. Because each countries' housing market is geographically different, each would affected by regional shocks, in addition to national macroeconomic shocks. Hence, the characteristic of housing wealth over time should be different from country to country. To analyze the coefficients deeply, we also need to decide to use fixed or random effects for estimation. Thus, we employed Hausman test in which the null hypothesis is that the preferred model is random effect versus the alternative fixed effects. Under the both methods, we significantly reject null hypothesis, and use fixed effect estimation.[6]

In the fourth table we present, stock wealth was approximated using stock market price data and housing wealth was approximated using house price index data. As can be seen, the impact of disposable income is significant in all specifications. While the consumption elasticity of housing wealth varies from 0.34 to 0.23 and significant, the elasticity for stock wealth is between 0.13 and 0.05, and it is only significant in model 2. To interpret the estimation, our coefficient estimates must be statistically significant. As the table reports, the estimated impact of housing wealth is significant and high. In contrast, the estimated effect of stock wealth on consumption are much smaller. Furthermore, the consumption elasticity of housing wealth is statistically significant when time-fixed effects included, although its value decrease to 0.23.

Table 3 reports results for the fixed-effects estimator in which estimates of aggregate stock market wealth is obtained from domestic stock market capitalization

[6]The results are presented on table D2 in appendix D.

annually and estimates of housing market wealth is constructed by using home-owner ship rate, number of households and house price index.

As can be seen in table 3 above, we reached the results that while the impact of housing wealth on consumption is significant, stock wealth impact on consumption is insignificant when holding all other independent variables constant. The estimate is 0.08 in model 4. The elasticity of consumption of disposable income gradually decreases and became insignificant in specification 4. Although our estimates are consistent with results of Case et al. (2005) in the ways that both reports housing wealth has greater effects effects than stock wealth on consumption and coefficents of stock wealth is insignificance in some specifications, the magnidutes and interpretations of coefficients differs in detail.

According to the our study, the impact of housing wealth is much greater than the results reached by Case et al. (2005). The reason may arise from that, we exploit more observations, and includes more country. More importantly, whereas Case et al. (2005) and other papers which exploit data until 2000, we started the data from 2000 to 2015, in which period housing market gained importance particularly with the 2008 crisis across the world. Baker (2008) states the burst of the stock prices in the early 2000s helped to feed the housing prices, hence housing wealth. The failure of faith in the stock market leaded household to turn to investments in housing as a protected alternative to the stock market. In appendix, we provide cross-country housing price index to show variations and trends by country, and the results are striking.

Table 2 indicates the results as the impacts of first order serial correlation are added to regression. The coefficient of serial correlation is highly significant. The coefficient of housing wealth and stock wealth change significantly. While the value of parameter on housing wealth is higher that of stock wealth in model 3, they became the same in model 4. The consumption elasticity with respect to housing wealth ranges between 0.08 and 0.25. Where significant, the consumption elasticity of stock wealth varies between 0.07 and 0.05. Prais-Winsten method was used in

the model.

Table 4: Consumption fixed-effects models with serially correlated errors.

Dependent variable: Consumption per capita Variables		(1)	(2)	(3)	(4)
	Coef.	0.2676***	0.2312**	0.1786**	0.2702***
Disposable Income	Robust Std. Err.	(0.0491)	(0.0662)	(0.0490)	(0.0669)
	t	5.45	3.49	3.64	4.03
	Coef.		0.0960***	0.0635**	0.0529**
Stock Wealth	Robust Std. Err.		(0.0129)	(0.0186)	(0.0160)
	t		7.43	3.40	3.30
	Coef.			0.1675***	0.0829**
Housing Wealth	Robust Std. Err.			(0.0393)	(0.0247)
	t			4.26	3.36
	Coef.	0.6467***	0.6283***	0.5943***	0.6166***
Serial Correlation Coefficient	Robust Std. Err.	(0.0365)	(0.0482)	(0.0345)	(0.0415)
	t	17.71	13.03	17.20	14.83
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		500	435	381	381
R-squared		0.99	0.99	0.99	0.99
F-test				$F^0 = 33.33$	$F_{critical} = 1.52$
F(1,30)				4.84	0.87
(Prob>F)				(0.036)	(0.359)
	Coef.	0.2676***	0.2307**	0.2570**	0.4949**
Disposable Income	Robust Std. Err.	(0.0491)	(0.0695)	(0.0694)	(0.1456)
	t	5.45	3.32	3.70	3.40
	Coef.		0.0421**	0.0169	0.0748***
Stock Wealth	Robust Std. Err.		(0.0140)	(0.0203)	(0.0180)
	t		3.01	0.83	4.15
	Coef.			0.2535***	0.1047***
Housing Wealth	Robust Std. Err.			(0.0342)	(0.0258)
	t			7.40	4.05
	Coef.	0.6467***	0.6422***	0.3171***	0.5137***
Serial Correlation Coefficient	Robust Std. Err.	(0.0365)	(0.0526)	(0.0752)	(0.0523)
	t	17.71	12.21	4.22	9.81
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		500	387	101	101
R-squared		0.99	0.99	0.96	0.98
F-test				$F^0 = 14$	$F_{critical} = 1.47$
F(1,26)				33.36	0.74
(Prob>F)				(0.000)	(0.397)

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Table 5 indicates estimations with all variables of interest defined as first differences. Again, the coefficient of the consumption elasticity of housing wealth is significant, and larger than that of stock wealth. This implies, changes in consumption is highly associated with the changes in housing wealth. The coefficient of housing wealth and disposable income is significant in all identifications, while the parameter on stock wealth is small and insignificant in specifications which country-specific effetcs is included. In comparison, while the consumption elasticity of stock wealth to is at most 0.03 for stock wealth, the elasticity for housing wealth is between 0.31 and 0.21 for housing wealth. Meaning that consumption changes mainly depends on variations in disposable income and housing wealth, but not stock wealth.

Table 5: Consumption in first differences fixed-effects model.

Dependent variable: Change in Consumption per capita					
Variables		(1)	(2)	(3)	(4)
	Coef.	0.5074***	0.6884***	0.6517***	0.5370***
Change in Disposable Income	Robust Std. Err.	(0.0806)	(0.1276)	(0.1542)	(0.1146)
	t	6.29	5.39	4.22	4.18
	Coef.		0.1151***	0.0610*	0.0442
Change Stock Wealth	Robust Std. Err.		(0.0215)	(0.0262)	(0.0390)
	t		5.35	2.32	1.13
	Coef.			0.3122***	0.2122**
Change in Housing Wealth	Robust Std. Err.			(0.0820)	(0.0638)
	t			3.80	3.32
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		499	434	371	371
R-squared		0.68	0.61	0.47	0.62
F-test				$F^0 = 37$	$F_{critical} = 1.44$
F(1,30)				6.30	3.64
(Prob>F)				(0.018)	(0.066)
	Coef.	0.5074***	0.4602***	0.7547**	0.2204
Change in Disposable Income	Robust Std. Err.	(0.0806)	(0.0602)	(0.1932)	(0.1211)
	t	6.29	7.64	3.90	1.82
	Coef.		0.0035	-0.0413**	0.0180
Change in Stock Wealth	Robust Std. Err.		(0.0077)	(0.0122)	(0.0317)
	t		0.45	-3.37	0.57
	Coef.			0.3360*	0.3059*
Change in Housing Wealth	Robust Std. Err.			(0.1159)	(0.1194)
	t			2.90	2.56
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		499	283	72	72
R-squared		0.68	0.54	0.12	0.78
F-test				$F^0 = 9.13$	$F_{critical} = 1.60$
F(1,12)				12.05	8.24
(Prob>F)				(0.005)	(0.014)

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Figure 3 and 4 indicate the evolution of housing price and stock price indices for almost 40 countries relative to their prices in 2010. While the general level of stock

prices is clearly stable over 15 years, housing prices show a steadily increase over the same period. It is also possible to conclude that housing prices still tend to increase for most of countries after 2008.[7]

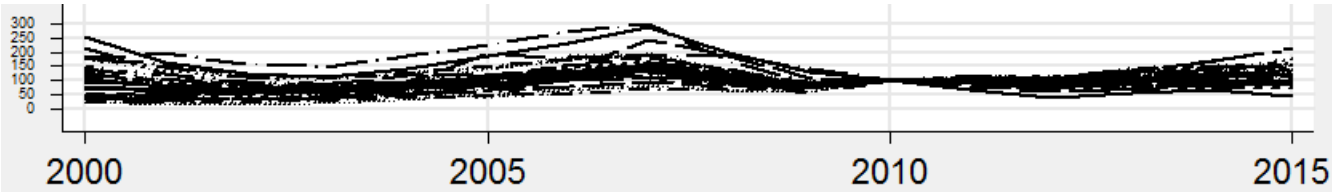

Figure 3: Stock Price Index (2010=100) by country.

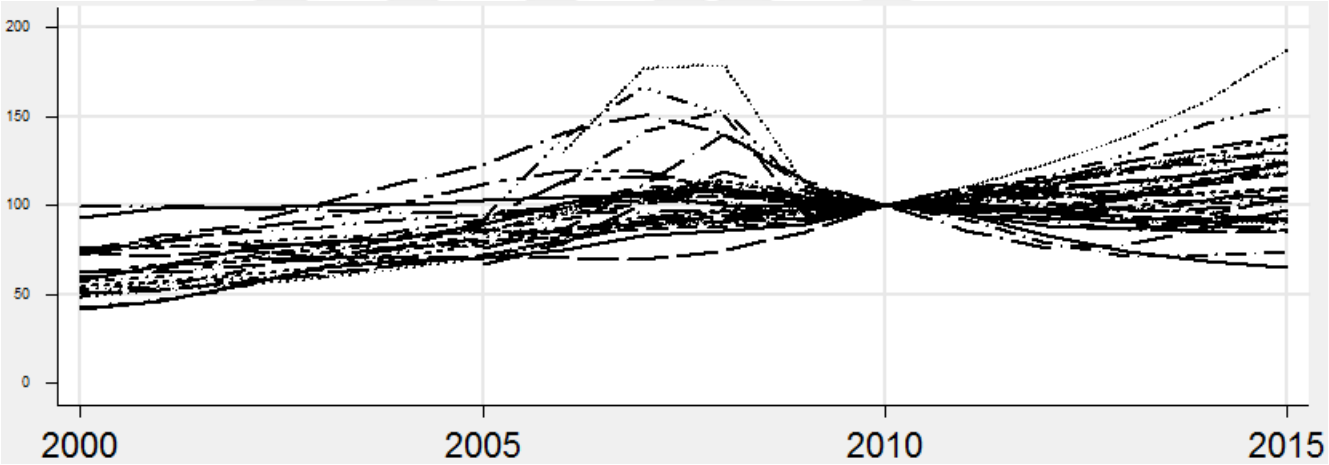

Figure 4: House Price Index (2010=100) by country.

Because of fluctuations in stock and housing market, we concern that the effect of variables could change through time. Then, we create a dummy variable for years between 2007 and 2012. Under both the first and second method, the estimated effects of variables of interest do not change statistically. While the first method uses the price indicies as proxy for wealth, it includes more number of observation

[7]We changed and set the base year as 2000 and put the tables in appendix. When the base year was changed, the effect of crisis on the stock price is seen more precisely.

than those of the latter one. The second method could more precise measure than the former one, but its weakness is the scarcity of observations.

Table 6a: Pre vs post crisis consumption fixed effects model in which wealth measure defined as price index.

Dependent variable: Consumption per capita Variables		(1)	(2)	(3)
Disposable Income	Coef.	0.7578***	0.7607***	0.7584***
	Robust Std. Err.	(0.0668)	(0.0668)	(0.0672)
	t	11.33	11.37	11.28
Stock Wealth	Coef.	0.0550	0.0546	0.0408
	Robust Std. Err.	(0.0479)	(0.0483)	(0.0582)
	t	1.15	1.13	0.70
Housing Wealth	Coef.	0.3065***	0.3063***	0.3194***
	Robust Std. Err.	(0.0479)	(0.0674)	(0.0730)
	t	1.15	4.54	4.37
Dummy for Crisis Period	Coef.	0.0641***	0.2064	0.3323
	Robust Std. Err.	(0.0673)	(0.3671)	(0.3875)
	t	4.55	0.56	0.86
Interaction of Disposable Income	Coef.		-0.0141	-0.0269
	Robust Std. Err.		(0.0363)	(0.0384)
	t		-0.39	-0.70
Interaction of Stock Wealth	Coef.			0.0463
	Robust Std. Err.			(0.0429)
	t			1.08
Interaction of Housing Wealth	Coef.			-0.0947
	Robust Std. Err.			(0.0842
	t			-1.12
Country Fixed		Yes	Yes	Yes
Number of Obs.		402	402	402
R-squared		0.86	0.86	0.86

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Table 6a and 6b indicates the results in which pre-crises and post-crises period is evaluated under the two measure of wealth. The break is statistically insignificant. The interactive dummies is also statistically insignificant. It tells us something the differences in two groups of data whether the data differs because of changes in slope, or it differs because of change in constant. The notable point in the table 4, whilst stock wealth is insignificant for affecting consumption under two methods, consumption becomes sensitive to stock wealth under crisis period. This may suggest that households have higher propensity to consume from stock wealth when the crisis hit the world. While the consumption elasticity of housing wealth is

about 0.30, consumption elasticity with respect to stock wealth ranges between 0.02 and 0.05

Table 6b: Pre vs post crisis consumption fixed effects model in which wealth measure is defined as value of housing and stock.

Dependent variable: Consumption per capita Variables		(1)	(2)	(3)
Disposable Income	Coef.	0.2944*	0.3307**	0.3487**
	Robust Std. Err.	(0.1074)	(0.1042)	(0.1077)
	t	2.74	3.17	3.24
Stock Wealth	Coef.	0.0229	0.0262	0.0102
	Robust Std. Err.	(0.0208)	(0.0212)	(0.0278)
	t	1.10	1.24	0.37
Housing Wealth	Coef.	0.3095***	0.3053***	0.3031***
	Robust Std. Err.	(0.0391)	(0.0385)	(0.0569)
	t	7.90	7.91	5.32
Dummy for Crisis Period	Coef.	0.0617***	0.9321	0.8203
	Robust Std. Err.	(0.0091)	(0.4986)	(0.4593)
	t	6.76	1.87	1.79
Interaction of Disposable Income	Coef.		-0.0848	-0.0748
	Robust Std. Err.		(0.0486)	(0.0447)
	t		-1.74	-1.67
Interaction of Stock Wealth	Coef.			0.0616*
	Robust Std. Err.			(0.0234)
	t			2.63
Interaction of Housing Wealth	Coef.			-0.0667
	Robust Std. Err.			(0.0847)
	t			-0.79
Country Fixed		Yes	Yes	Yes
Number of Obs.		102	98	98
R-squared		0.74	0.68	0.43

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

We also investigate test for the existence of unit roots in variables of interest. The test developed by Im, Pesaran and Shin (2003) is generally used unit root test that links individual unit root test applied on each time series in the panel. Since our data is not balanced we employed the Fisher-type unit-root test, the null hypothesis is that all panels contain a unit root. We reject the null hypothesis of this test

under the given test conditions (included one lag and no trend, no means). In the literature, it is acknowledged that panel unit root test has greater power than unit root test based on individual time series. For all series, we could reject the presence of unit roots in data. The results also point to accept of the null hypothesis of no cointegration. The results are robust and available in appendix.

Although the presence of unit root is not accepted, table 7 indicates the model in error correction form. The model includes the lagged change in consumption and lagged ratio of consumption to income. This model is frequently used in the existence of unit roots. The coefficient of the lagged ratio of consumption to income is significant and negative. It implies that the error term or variations in other variables will have an instantaneous impact on consumption. The consumption elasticity of housing wealth is significant and varies between 0.18 and 0.20. On the other hand, the consumption elasticity of stock wealth ranges between 0.10 and 0.03.

Table 7: Consumption fixed-effects models in error correction form in which wealth measure defined as price index.

Dependent variable: Change in Consumption per capita

Variables		(1)	(2)	(3)	(4)
	Coef.	0.4196***	0.5749**	0.5837**	0.5955***
Change in Disposable Income	Robust Std. Err.	(0.0949)	(0.0868)	(0.1630)	(0.1258)
	t	4.42	6.62	3.58	4.73
	Coef.		0.0991***	0.0678**	0.0287
Change in Stock Wealth	Robust Std. Err.		(0.0230)	(0.0238)	(0.0442)
	t		4.31	2.85	0.65
	Coef.			0.2020*	0.1813**
Change in Housing Wealth	Robust Std. Err.			(0.0792)	(0.0617)
	t			2.55	2.94
	Coef.	-0.0716**	-0.0760*	-.1271***	-0.0609
Lagged Change in Consumption	Robust Std. Err.	(0.0213)	(0.0362)	(0.0316)	(0.0600)
	t	-3.36	-2.10	-4.01	-1.01
	Coef.	-2.3231***	-1.4132*	-0.8330*	-1.7819*
Lagged Ratio of Consumption to Income	Robust Std. Err.	(0.3961)	(0.6346)	(0.3829)	(0.7417)
	t	-5.86	-2.23	-2.18	-2.40
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		499	434	371	371
R-squared		0.60	0.63	0.35	0.73
F-test				$F^0 = 30.29$	$F_{critical} = 1.42$
F(1,30)				1.97	2.81
(Prob>F)				(0.170)	(0.104)

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Our results could be decribed as follows. First of all, in general, stock wealth and housing wealth are positively correlated household consumption. Second, while estimation results show variations with different econometric estimations, we find strong evidence which housing wealth has important effects on consumption than stock wealth. The results of estimation is consistent the fact that effects of housing wealth is highly significant and the effects of stock wealth is not significant for most cases. Third, it is clear that the consumption elasticity of housing wealth is different from that of stock wealth. Finally, our estimates of consumption elasticity of housing prices is not much different for pre-crises and post-crises periods. However, due to data limitations and other consraints such as measuring wealth with

indicies, conclusions from the study are tentative at best as other study results in this topic.

The financial openness and financial deepening indicators might be important contributors to the consumption. These indicators is correlated with the liquidity, and the liquidity differs from one wealth group to another, such as from housing wealth to stock wealth. For these channels, they affect consumption. The financial integration and the associated cheap credit under the EU anchor are important for countries such as Spain, Greece, Turkey, Portugal and Ireland. To further extensions, we are going to interest in these aspects.

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APPENDICES

Appendix A

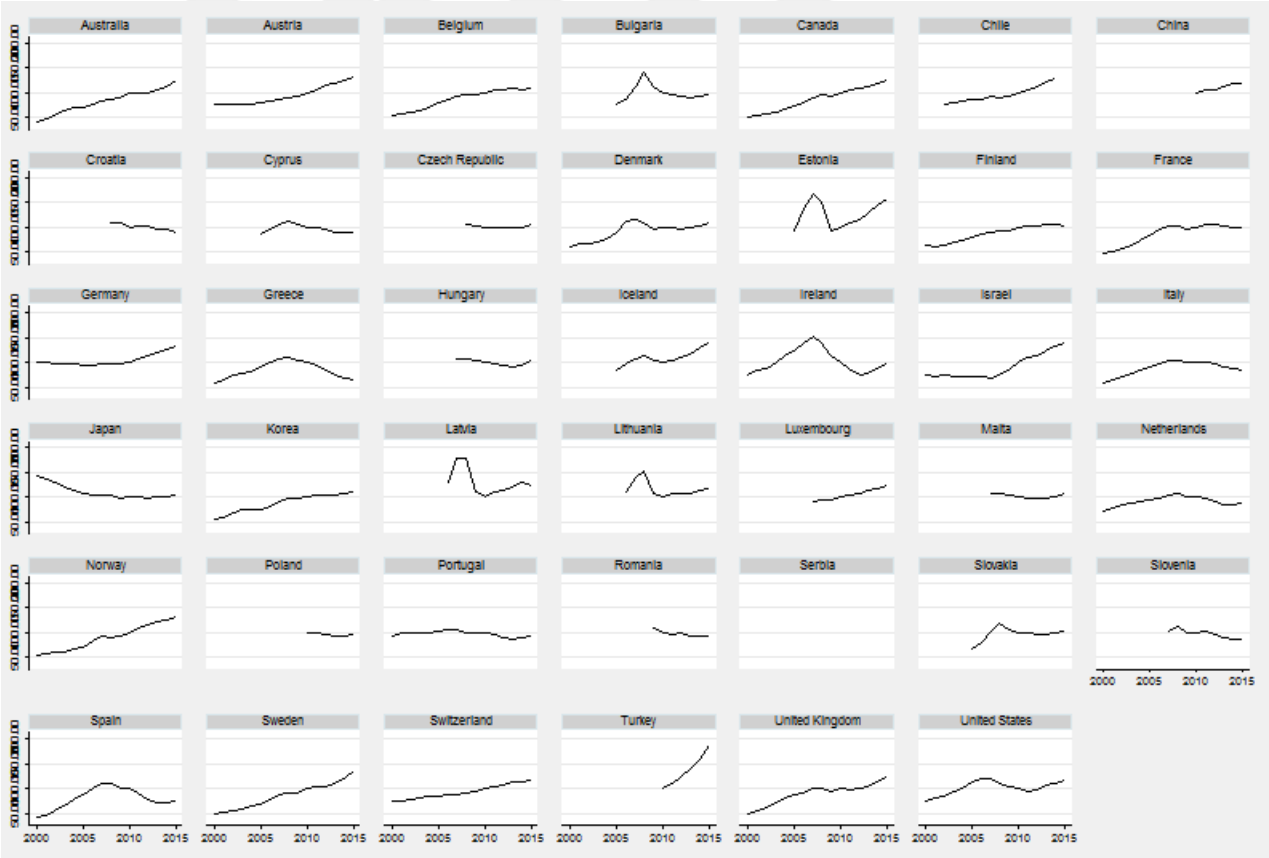

Figure 1A: Cross-Country Housing Price Index (2010=100).

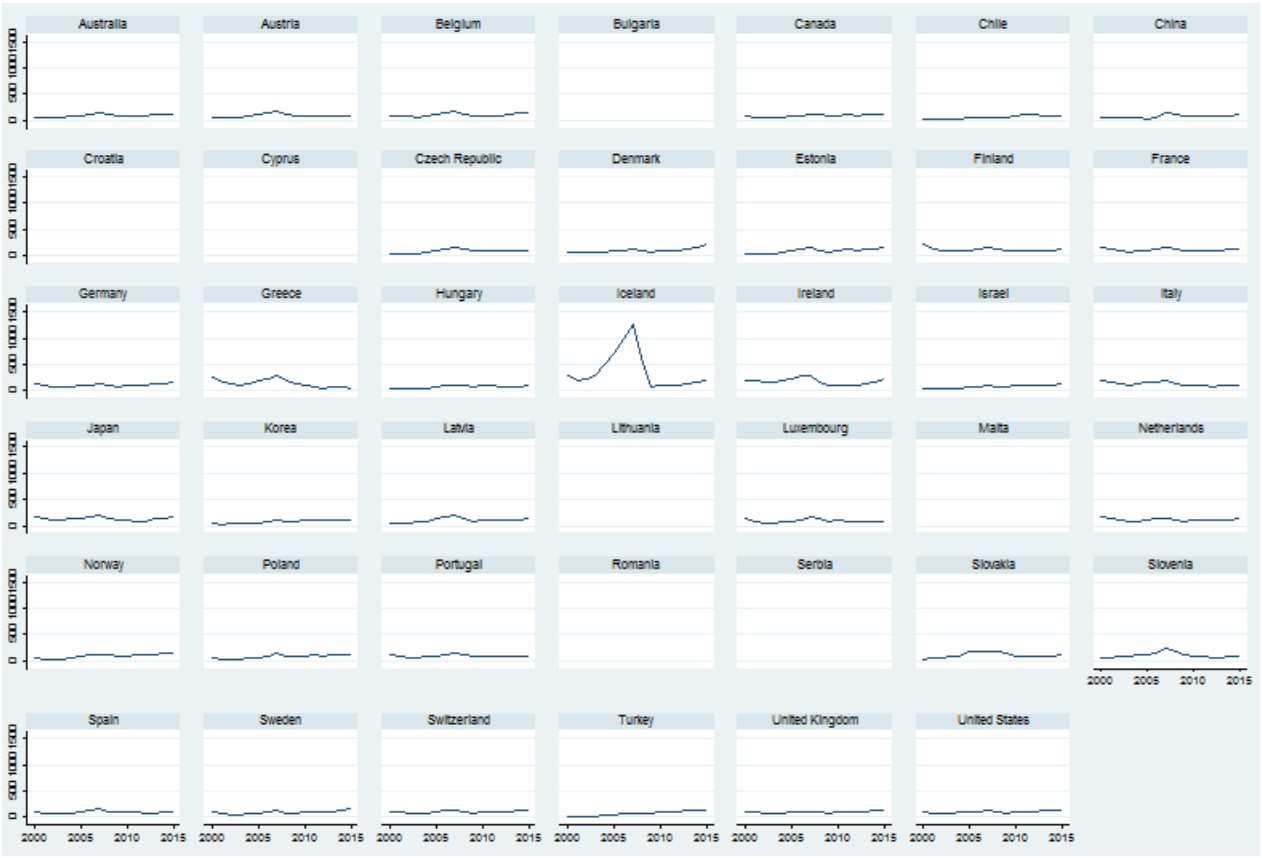

Figure 1B: Cross-Country Stock Price Index (2010=100).

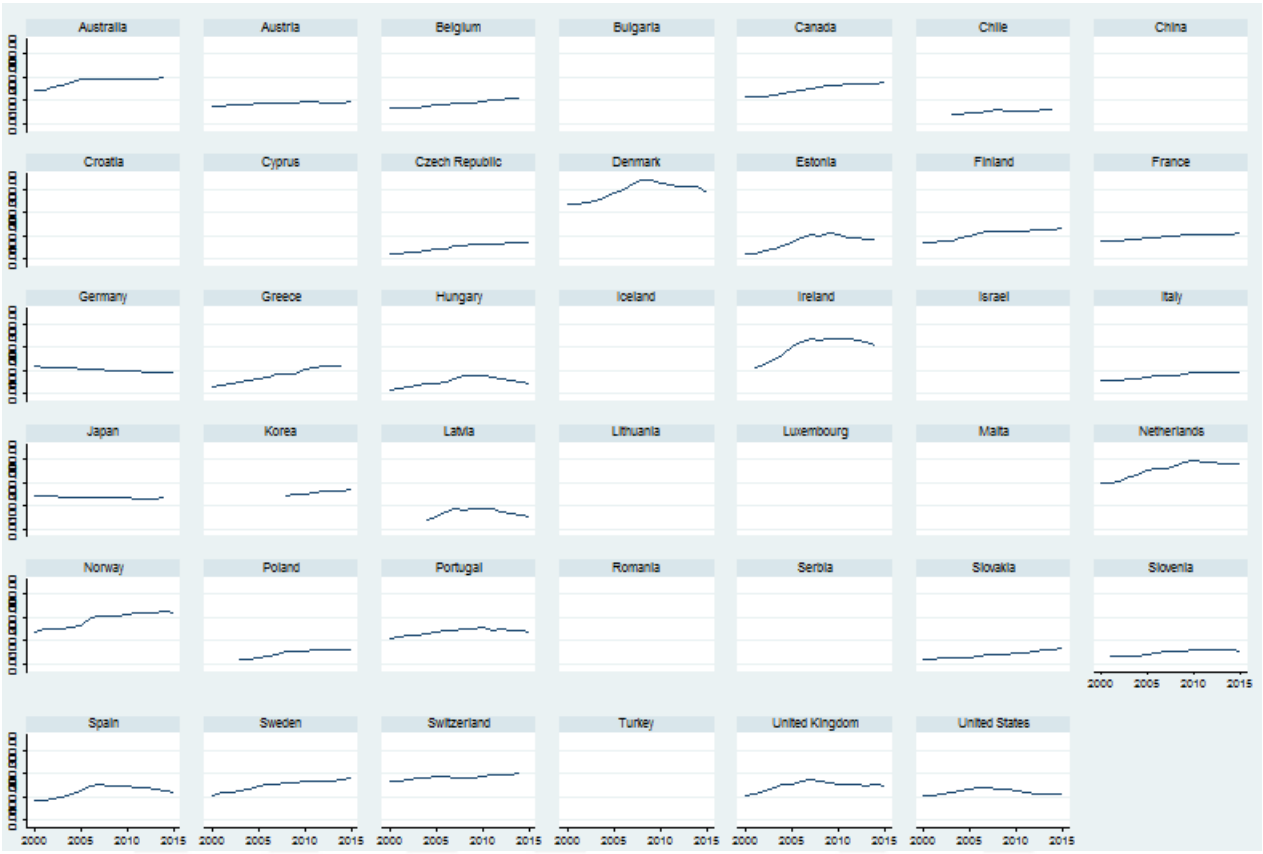

Figure 1C: Cross-Country Household Debt. This indicator is measured as a percentage of national disposable income.

Appendix B

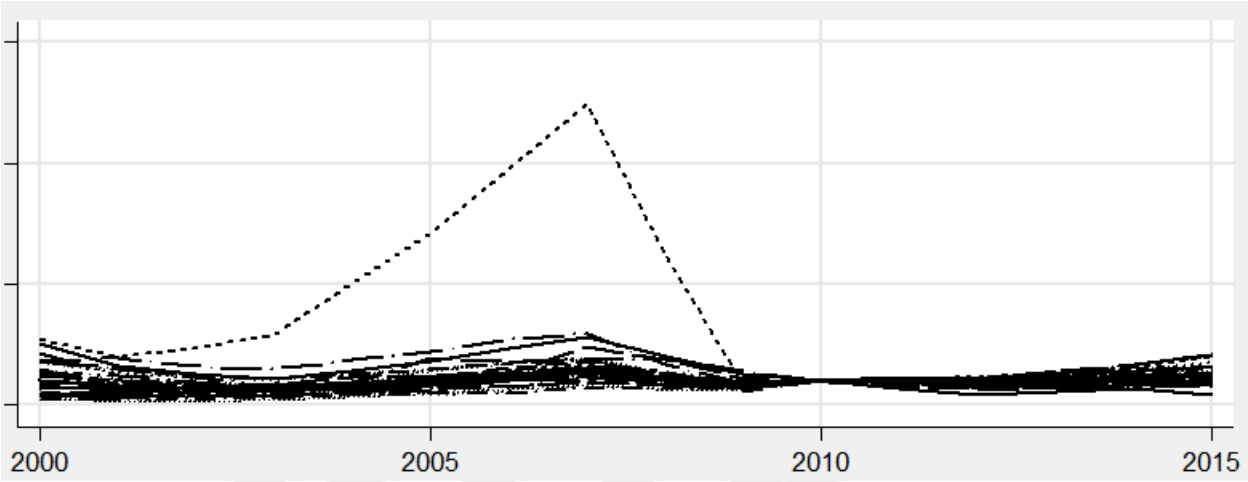

Figure 3A: Stock Price Index (2010=100) by country.[5]

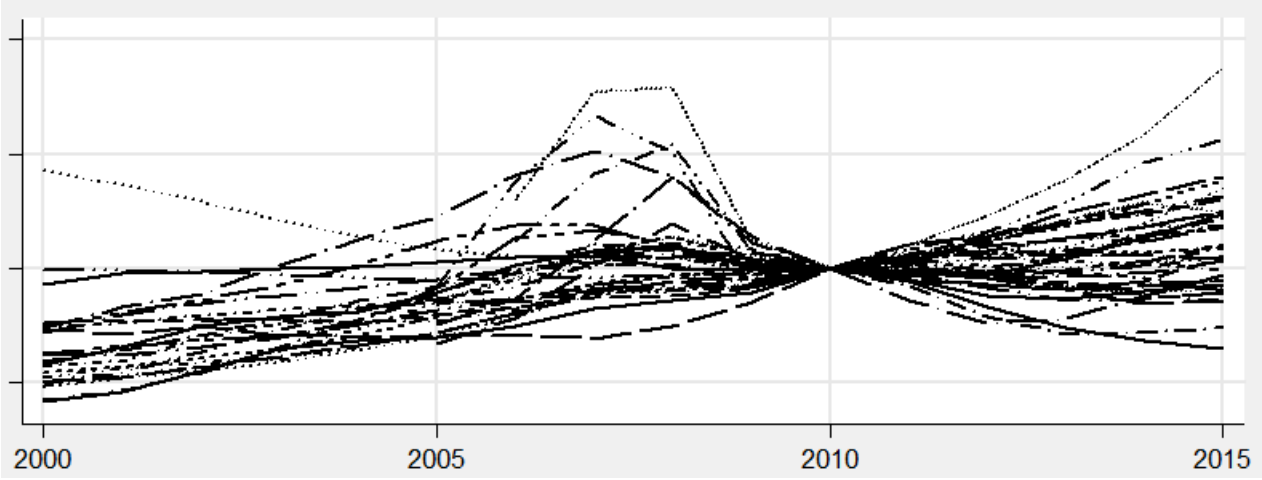

Figure 3B: House Price Index (2010=100) by country.[6]

[5]The outlier in stock price index is Iceland.
[6]The outlier in stock price index is Japan.

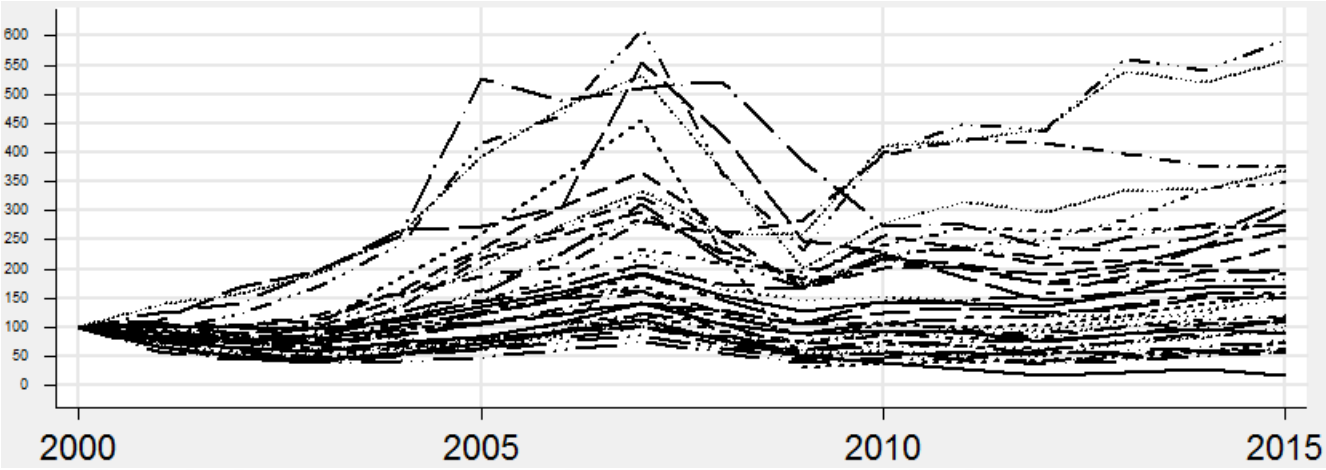

Figure 4A: Stock Price Index (2000=100) by country.

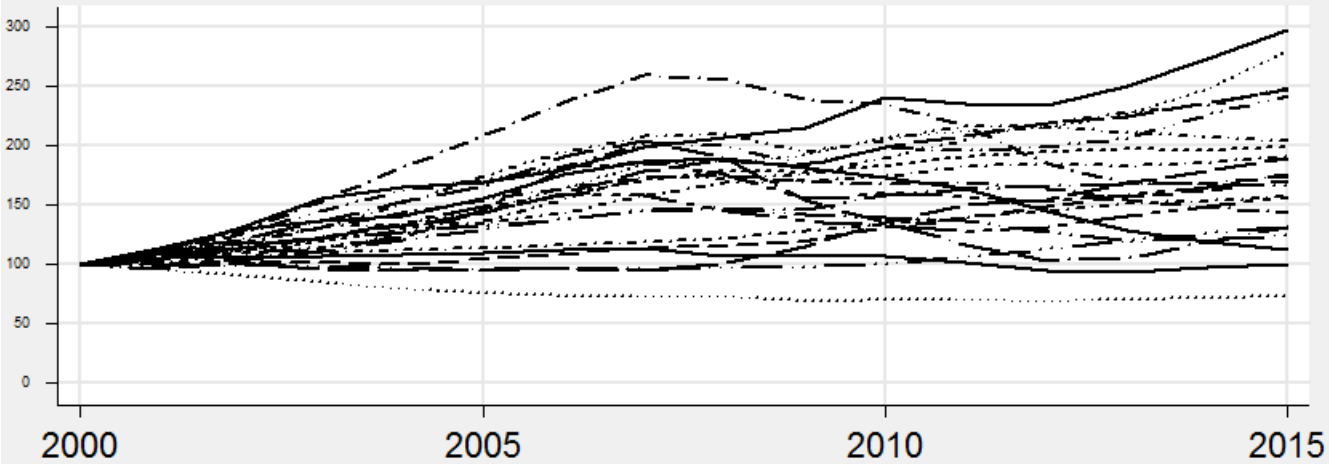

Figure 4B: House Price Index (2000=100) by country.

Appendix C

C1-Population: "Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship. The values shown are midyear."

C2-Home owner ship rate: "It is the ratio of owner-occupied units to total residential units in a specified area. "

C3-Market Capitalization: "Market capitalization (also known as market value) is the share price times the number of shares outstanding (including their several classes) for listed domestic companies. Investment funds, unit trusts, and companies whose only business goal is to hold shares of other listed companies are excluded. Data are end of year values converted to U.S. dollars using corresponding year-end foreign exchange rates."

C4-Housing Price Index: "The Housing indicator shows indices of residential property prices over time. Included are rent prices, real and nominal house prices, and ratios of price to rent and price to income; the main elements of housing costs. In most cases, the nominal house price covers the sale of newly-built and existing dwellings, following the recommendations from RPPI (Residential Property Prices Indices) manual. This indicator is an index with base year 2010. "

C5-Consumption Expenditure: "Private consumption expenditure consists of expenditure incurred for the direct satisfaction of individual or collective needs by private households or non-profit institutions serving households (such as religious societies, sports and other clubs, political parties, etc.)."

C6-Household Disposable Income: "Real household net disposable income is defined as the sum of household final consumption expenditure and savings, minus the change in net equity of households in pension funds. This indicator also corre-

sponds to the sum of wages and salaries, mixed income, net property income, net current transfers and social benefits other than social transfers in kind, less taxes on income and wealth and social security contributions paid by employees, the self-employed and the unemployed. Household gross adjusted disposable income additionally reallocates "income" from government and non-profit institutions serving households (NPISHs) to households to reflect social transfers in kind. These transfers reflect expenditures made by government or NPISHs on individual goods and services, such as health and education, on behalf of an individual household. The indicator includes the disposable income of non-profit institutions serving households. Disposable income, as a concept, is closer to the idea of income as generally understood in economics, than is either national income or gross domestic product (GDP). This indicator is measured in terms of net in annual growth rates and in terms of gross adjusted in USD per capita at current prices and PPPs. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey (SNA 1993)."

C7-Consumer price Index: "Consumer price index reflects changes in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Data are period averages."

C8-Stock Price Index: "The Financial Statistics dataset contains predominantly monthly statistics, and associated statistical methodological information, for the 34 OECD member countries and some selected other countries. The dataset itself contains financial statistics on 4 separate subjects: Monetary Aggregates, Interest Rates, Exchange Rates, and Share Prices. The data series presented within these subjects have been chosen as the most relevant financial statistics for which comparable data across countries is available. In all cases a lot of effort has been made to ensure that the data are internationally comparable across all countries presented and that all the subjects have good historical time-series data to aid with analysis. All data are available monthly, and are presented as either an index (where the year 2010 is the base year) or as a level depending on which measure is seen as the most appropriate and/or useful in the economic analysis context. "

C9-Real Interest Rate: "Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator."

C9-Household Debt: "Houshold debt is defined as all liabilities that require payment or payments of interest or principal by household to the creditor at a date or dates in the future. Consequently, all debt instruments are liabilities, but some liabilities such as shares, equity and financial derivatives are not considered as debt. According to the 1993 System of National Accounts, debt is thus obtained as the sum of the following liability categories, whenever available/applicable in the financial balance sheet of the households and non-profit institutions serving households sector, such as: currency and deposits; securities other than shares, except financial derivatives; loans; insurance technical reserves; and other accounts payable. For households, liabilities predominantly consist of loans, in particular mortgage loans for the purchase of houses. This indicator is measured as a percentage of NDI. Data are under 2008 System of National Accounts (SNA 2008) for all countries except for Chile, Japan and Turkey (SNA 1993). "

Appendix D

Table D1: The basic consumption fixed-effects model.

Dependent variable: Consumption per capita Variables		(1)	(2)	(3)	(4)
Disposable Income	Coef.	0.9450***	1.131***	0.7585***	0.8120***
	Robust Std. Err.	(0.0786)	(0.1108)	(0.0773)	(0.1427)
	t	12.01	10.21	9.80	5.69
Stock Wealth	Coef.		0.1711***	0.0755	0.0742
	Robust Std. Err.		(0.0263)	(0.0535)	(0.0720)
	t		6.49	1.41	1.03
Housing Wealth	Coef.			0.5110***	0.4284***
	Robust Std. Err.			(0.0682)	(0.0828)
	t			7.49	5.17
Interest Rate	Coef.	0.0018	0.0034	0.0074*	0.0087***
	Robust Std. Err.	(0.0033)	(0.0026)	(0.0026)	(0.0022)
	t	0.56	1.30	2.76	3.81
Time Fixed		No	No	No	Yes
Country Fixed		Yes	Yes	Yes	Yes
Number of Obs.		361	300	250	250
R-squared		0.86	0.91	0.67	0.71

H_0 is that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is that the coefficient on housing market wealth is not equal to that of stock market wealth.

Table D2: Hausman Test

Models	Price index as wealth measure		Value of stock as wealth measure	
	chi2 = 180.36	Prob>chi2 = 0.000	chi2 = 60.71	Prob>chi2 = 0.000

H_0 is that random effect model is appropriate.

H_1 is that fixed effect model is appropriate.

Table D3: Test of equality for consumption elasticity of housing wealth and stock wealth.

Models	(3)		(4)	
The Basic Model	F(1,30)=7.76	Prob>F = 0.0092	F(1,30)=2.06	Prob>F = 0.1640
The Model with Serrially Corr. Err.	F(1,30)=4.84	Prob>F = 0.0357	F(1,30)=0.87	Prob>F = 0.3588
The Model in First Differences	F(1,30)=6.30	Prob>F = 0.0177	F(1,30)=3.64	Prob>F = 0.0659
The Error-Correction Model	F(1,30)=1.97	Prob>F = 0.1702	F(1,30)=2.81	Prob>F = 0.1039

H_0 is a test of the hypothesis that the coefficient on housing market wealth is equal to that of stock market wealth.

H_1 is a test of the hypothesis that the coefficient on housing market wealth is not equal to that of stock market wealth.