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Estimating Wealth Effects on Consumption in Finland

A Cross-Sectional Household Level Data Study Focus on Housing and Forest Wealth

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Estimating Wealth Effects on Consumption in Finland[1]

A Cross-Sectional Household Level Data Study Focus on Housing and Forest Wealth

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Abstract

This paper studies the effects of household wealth on consumption using cross-sectional household level data obtained from the 1998 Household Wealth Survey compiled by Statistics Finland. The focus of the study is on the effects of physical wealth, namely housing and forest wealth, on consumption in Finland. The estimation is performed using OLS regression and taking into account survey design considerations. The results from the study provide evidence confirming the existence of a wealth effect on consumption regarding housing wealth, forest wealth as well as financial wealth. The housing wealth effect on consumption is found to be positive and much larger than the financial wealth effect for those households that are homeowners, although the magnitude and the sign of the wealth effect seems to somewhat differ by the amount of accumulated net housing wealth. Evidence of the existence of a life-cycle pattern in consumption is also confirmed for the subsample of homeowners by comparing differences in wealth effects between household age groups. It should however be emphasised, that actual life-cycle behaviour can only be traced with the use of panel data. The study also finds evidence that the effect of forest wealth on consumption may be negative for the subsample of forest owners. Further study reveals that the negative estimate for the effect of net forest wealth on consumption observed for the whole subsample seems to arise from the much stronger and significant negative estimate obtained for the subgroup of forest owning farmer households. In order to study the concavity of the consumption function in Finland, wealth and income effects are estimated separately for the net wealth quintiles of households using the whole sample of observations. The results indicate that the effect of a change in financial wealth or income on consumption is indeed larger for households with small total net wealth.

Keywords: wealth effect, household wealth survey, forest wealth, housing wealth, elasticity of consumption with respect to wealth

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Contents

1. Introduction

This working paper is based on my master's thesis titled *Estimating Wealth Effects on Consumption in Finland. A Cross-Sectional Household Level Data Study. Focus on Housing and Forest Wealth*. The thesis was written during my traineeship at Statistics Finland in 2014, under the Discipline of Economics at the University of Helsinki's Department of Political and Economic Studies.

1.1 Key Findings

The aim of this study is to analyse the effects of household wealth on consumption. The specific focus of the study is on the effects of households' physical wealth, namely housing and forest wealth, on consumption in Finland. Physical wealth makes up the great majority of both gross and net wealth of Finnish households, and housing wealth is by far the largest component of physical wealth. On the other hand, the effects of forest ownership and forest wealth on consumption is of particular interest in Finland where households own over 52% of productive forestland and forestry makes up approximately 2% of GDP (Forest resources, Finnish Statistical Yearbook of Forestry 2009). There is great variation in the total wealth of Finnish households, and wealth is less equally distributed than income. In the international context however, the distribution of wealth in Finland is remarkably even. The level of average net household wealth in Finland is relatively low when compared to other high income countries, a phenomenon that can in part be attributed to the fact that social security wealth, namely statutory pension insurance, is omitted from the estimates of total household wealth in Finland. However, an unexplained gap between the average household wealth level of Finland and the reference countries would persist even if all the wealth accumulated in the statutory pension funds was accounted for in private household wealth.

A look at some of the results obtained from previous studies on wealth effects, conducted both in Finland and other high income countries, is given in chapter two. The principles of consumption theory, which the study of wealth effects is based on, is then briefly presented in the fifth chapter of this paper. A general finding from the previous studies is that their results vary considerably both because of differences in data used as well as model specifications. There are also differences in the objectives of research between the studies, with some papers focusing solely on short- or long-run wealth effects. Hence, it is not possible to make direct comparison between the reviewed studies. Although numerous studies estimating wealth effects on consumption have been conducted in the larger OECD countries[3], not much research on the subject has focused on Finland in detail. A few preceding papers focusing on wealth effects in Finland have studied both the effects of financial wealth[4] and housing wealth on consumption. The results concerning the

3 Namely Australia, Canada, France, Germany, Italy, the United Kingdom and the United States.
4 See chapter 3 on wealth.

housing wealth effect have however been mixed. To the best of my knowledge, no previous studies on forest wealth effects on consumption have been performed.

In this study, the empirical estimation of wealth effects is conducted using cross-sectional household level data obtained from the 1998 Household Wealth Survey compiled by Statistics Finland. The estimation is performed using OLS regression and taking into account survey design considerations. The results obtained are well in line with the preceding literature on wealth effects on consumption. The housing wealth effect on consumption is found to be much larger than the financial wealth effect for those households that are homeowners. Evidence of the existence of a life-cycle pattern in consumption is also confirmed for the subsample of homeowners. For the whole sample (i.e. sample including households who are renting) the housing wealth effect is found to be slightly negative. A somewhat surprising discovery from the study is, that the effect of forest wealth on consumption is negative for the subsample of forest owners. Further study reveals that the significant and negative estimate for the effect of net forest wealth on consumption observed for the whole subsample of forest owners, seems to arise from the much stronger and significant negative elasticity estimate obtained for the subgroup of forest owning farmer households. This finding could in part be explained by the skewed age distribution of forest owning households, the fact that farmer households are likely to be engaging more in home production, which lowers *observed* consumption outside of the home, and that farmer owned forestland estates, and the logging income they generate, are often used for funding farm associated investments. In addition, estimating wealth and income effects on consumption separately for households by net wealth quintiles yields evidence that the consumption function is indeed concave in the Finnish case, meaning that the estimates of the marginal propensity to consume out of financial wealth and income are decreasing along the wealth distribution.

1.2 The Wealth Effect

The term wealth effect refers to a change in spending that accompanies a change in either actual wealth or perceived wealth. This means that consumers typically spend more when they are either actually wealthier or perceive themselves to be so. In addition, consumption is often tied to relative wealth (and income), meaning that a consumer's ability to obtain certain goods may depend on the amount of his wealth relative to that of other consumers in the economy (Sorensen and Whitta-Jacobsen, 2010). Wealth effects are often reported as elasticities of consumption with respect to different components of wealth[5]. Many studies also report marginal propensities to consume (MPC) out of wealth which can be obtained by multiplying the elasticities of consumption by the sample period's average consumption-to-wealth ratio (Dvornak and Kohler, 2003). The marginal propensity to consume out of wealth can be interpreted to report by how many cents consumption will rise given a one euro increase in wealth.

5 The elasticity of consumption with respect to wealth gives the percentage change in consumption implied by a 1 % change in wealth.

Wealth influences consumption mainly in three different ways: through the direct wealth effect (the increase in consumption due to an increase in wealth), by increasing the value of collateral on loans and through increased private sector confidence (Sousa, 2009). Distinguishing between a true wealth effect and the above mentioned indirect effects is often difficult, since consumers' expectations of the future are hard to observe and constantly changing. The observed wealth effects vary greatly in time and across countries and are also affected by the model specifications of studies. Many studies have found that wealth effects, particularly in the case of financial wealth, are generally larger in market-based economies than in bank-based economies (Ludwig and Slok, 2004). Slacalek (2009) writes in his paper that market-based economies can be defined as those countries in which the stock market plays a more important role in financial transmission than banks. The degree of development of the financial market can be seen as a proxy for the significance of the secondary mortgage market, which facilitates the funding of mortgages by banks (Slacalek, 2009). The group of market-based economies includes countries like the US, UK, Canada, Japan, Sweden, Australia, Ireland and the Netherlands. The group of bank-based countries includes for example Germany, Japan and Austria. Finland used to be classified as a bank-based economy up until the financial deregulation on the late 1980's and the recession of the early 1990's, but is nowadays thought to have a market-based financial system.

Quite a lot of scientific discussion has focused on the nature of housing wealth effects in the recent years and the results obtained from studies estimating housing wealth effects have been mixed. A common argument is that as a rise in housing prices increases the wealth of homeowners, it simultaneously increases the cost of housing services. Although consumers may feel wealthier as the value of their house increases, they will most likely still need to consume housing services in the future by living in their house, and thus won't be able to cash in on the rise in housing wealth. In addition, housing prices often change in reaction to future income expectations which also effect consumption, portraying a confidence effect rather than a true wealth effect. (Salo, 2009.) Housing wealth may also act as a proxy for permanent income (Sierminska and Takhtamanova, 2007). An important possible channel for the housing wealth effect is noted by Bover (2006) in her paper, where she writes that when housing equity values rise, households tend to engage less in precautionary saving, since they are more confident that they will be able to cash-in on their increased housing wealth should the need arise (Bover, 2006). Campbell and Cocco (2005) hypothesise in their paper that financial market deregulation may raise housing prices and simultaneously raise consumption by relaxing borrowing constraints on all consumers. This interpretation may have some value in regard to the developments observed in Finland in the mid 1980's. It is also noteworthy that rising housing prices may theoretically reduce consumption at the aggregate level, if it raises the saving rate of those households looking to buy a house because of tightening collateral constraints (Slacalek, 2009).

Some authors, like Buiter (2008), even assert that housing wealth should not be seen as a wealth component equal to financial wealth and other physical wealth, as it embodies several characteristics that makes it fundamentally different from other assets. In his paper, Buiter (2008) states that the value of a house is composed of its fundamental value (the present discounted value of its future rentals) and a possible

speculative bubble component. Buiter then argues that a pure wealth effect on consumption from a change in housing prices is possible only if it reflects a change in the bubble component of housing prices. His perception is that changes in the value of housing wealth affects consumption mainly through the use of housing wealth as collateral and redistribution effects in the case that the marginal propensity to consume out of wealth is different for those households who already own a house and those looking to buy one. Despite the well sustained arguments regarding the complications associated with measuring housing wealth effects, including housing wealth in the study of the effects of physical wealth on consumption is well justified because of its great significance on household wealth in virtually all countries.

It is worth noting that financial and physical assets have different features that are likely to affect the magnitude of the wealth effect on consumption. Assets differ for example by their liquidity, tractability, volatility and perceived appropriateness for financing consumption (Bostic et al., 2009). Portfolio riskiness may have a positive effect on consumption out of financial wealth, but on the other hand, households may be more willing to consume out of changes in housing wealth if such changes are perceived to be more permanent (Sierminska and Takhtamanova, 2007.) Agents' awareness of changes in financial and housing wealth may differ, and changes in housing wealth may well be more difficult to observe than changes in for example stock wealth (Dvornak and Kohler, 2003). Financial wealth is generally a lot more liquid than housing wealth. In addition, financial assets are acquired solely for the purpose of profiting from future dividends and increases in asset value. The wealth effects of financial wealth are hence more clear-cut than those of housing wealth. Although forest wealth is a component of households' physical wealth, it portrays many features characteristic of financial assets, mainly stocks. To the best of my knowledge, no previous studies on the effects of forest wealth on consumption in Finland have been conducted, but it is probable that forest wealth may have an effect on consumption.

The wealth effect on consumption has generally been found to be larger for older households and individuals. The intuition behind this finding is that individuals and households in different stages of their life-cycle have different propensities to consume current income and wealth because of their desire to smooth consumption over their entire life-cycle (Sorensen and Whitta-Jacobsen, 2010). This empirical finding is well in line with the life-cycle theory of consumption (see chapter 3).

2 Findings from Previous Studies

This section will provide a look into to the results from some of the previous studies examining wealth effects on consumption. Numerous studies on wealth effects have been conducted during the last few decades, mainly in the industrialised countries. These studies have been performed using both aggregate and household level time series, panel and cross-sectional data from the US, the OECD countries and also the Euro area. Although Finland has been included in various panel data studies, only a few papers (e.g. Halonen (2012), Sierminska and Takhtamanova (2007)) have focused on country-specific data and analysis of wealth effects on consumption in Finland. The studies performed using Finnish data have assessed both the effects of housing and financial wealth on consumption. To the best of my knowledge, no previous studies assessing forest wealth effects have been performed. Specific results from selected studies are summarised in tables 2.1 and 2.2 at the end of this section. The studies reviewed all provide evidence in support of the wealth effect, both in the case of housing and financial wealth. The results are mixed however, and because of differences in data as well as model specifications, direct comparisons between studies is not possible.

The majority of wealth effects studies have been performed using aggregate level panel data. Aggregate level data has traditionally been more easy to access and more widely documented in most countries, hence its popularity with researchers. Studies based on aggregate level data can provide information on how aggregate consumption in an economy will react to shocks to wealth, and could be of interest in for example forecasting and in the formulation of monetary policy. More recently research on wealth effects has also been performed using household level panel data and cross-sectional data. Although accurate household level data is often more difficult to acquire for the purpose of study than aggregate level data, it allows for more subtle analysis between households by characteristics such as age, region and amount of household wealth. Studies using household level data may also be more immune to endogeneity[6] and make it easier to take into account elements such as negative household net wealth and credit constraints (Heikkilä, 2011). In their paper Bostic et al. (2009) argue that studies based on aggregate level data lack the clear behavioural link between fluctuations in household wealth and spending, meaning that it is not possible to identify whether increases in consumption are incurred by those households that experienced an increase in wealth in the first place (Bostic et al., 2009). Bover (2006) also criticises the lack of relevant control variables in aggregate level data studies. Studies conducted using household level data (e.g. Mian et al., 2013) have found that the marginal propensity to consume (MPC) out of wealth and income varies quite significantly by household wealth and with age, with the MPCs being largest for households with lower net wealth. Since wealth is unevenly distributed in virtually all countries (also in Finland and even more so in other OECD countries), it seems evident that these household level differences in wealth effects may also have an effect on aggregate consumption.

6 Endogeneity is a common 'problem' in wealth effects studies since asset value development is affected by many factors that simultaneously affect consumption and future income expectations (e.g. Arrondel et al., 2014)

The magnitude of the wealth effects on consumption have been found to differ considerably depending on the observation period of the study. In general, wealth effects have been found to be larger in the long-run than in the short-run. Although the division into long- and short-run effects can be somewhat ambiguous, the short-run wealth effects on consumption can be thought to be the immediate effects of a shock to wealth observed in the current period. These short-run effects typically disappear during the following periods as consumption adjusts to its long-run equilibrium level (implied by the model employed). A method commonly adopted for studying the short-run effects and adjustment dynamics of consumption to wealth shocks is the use of (Vector) Error Correction Models (VECM) with panel data (Halonen, 2012). Sousa (2009) points out in his paper that the consumption behaviour of households exhibits sizeable persistence, which in part helps to explain the substantial difference in the magnitude between the immediate response of consumption to changes in wealth and the long-run impact of wealth effects.

The results from the reviewed aggregate level data studies appear to be mixed. Some authors including Case et al. (2006) and Carroll et al. (2011) have found that housing wealth effects on consumption are highly significant and large in the US and the OECD countries in general, whilst financial wealth effects are either weak or negligible. In contrast, studies by Sousa (2009) in the Euro area, Ludwig and Slok (2004) for the OECD countries and Halonen (2012) in Finland, report findings that wealth effects are significant in the case of financial wealth but housing wealth effects are insignificant. Halonen (2012) hypothesises that this unexpected insignificant housing wealth effect he obtained in his paper is due to the deficient quality of the data on housing wealth. By contrast, in her paper Salo (2009) estimates large and significant housing wealth effects both in the OECD countries and in Finland separately. Dvornak and Kohler (2003) in turn find both the housing and stock (i.e. financial) wealth effects to be significant in Australia, but that the housing wealth effect is only about half of that of the financial wealth effect. A common finding in the aggregate level data studies is that wealth effects tend to be larger in market-based economies than in bank-based economies (Slacalek, 2009). Also, the size of the wealth effect has been found to be increasing in time in studies with long observation periods (Ludwig and Slok, 2004).

Although less studies on wealth effects have been performed using household level data traditionally, increasing amounts of such studies have been published over the recent years. Household level data studies typically use time series, pseudo-panel or cross-sectional data and OLS regression to estimate wealth effects. The much quoted paper by Campbell and Cocco (2005) studies housing wealth effects in the UK and finds evidence well in line with life-cycle theory and consumption smoothing: the housing wealth effect is large for elderly house owners and insignificant for young households who rent, which indicates the existence of a pure housing wealth effect. Campbell and Cocco (2005) also find that households' credit constraints increase the housing wealth effect on consumption. In their paper Sierminska and Takhtamanova (2007) examine wealth effects at country level for Canada, Finland and Italy, using cross-sectional data from the Luxembourg Wealth Study. They find the housing wealth effect on consumption to be significant and larger than the financial wealth effect in all countries, and the housing wealth effect to be significantly lower for younger households. Bostic et al. (2009) find in their

study using both year-specific (cross-sectional) and pooled models, that the housing wealth effect on consumption in the US is notable and much larger than the corresponding financial wealth effect. The authors also note that reverse wealth effects in the US could be significant, and a decline in housing wealth could translate into a notable decline in GDP growth (Bostic et al., 2009). In his paper Lenhert (2004) studies the differences in housing wealth effects by age quintiles and finds two phenomena consistent with life-cycle behaviour. The first is that the elasticity of consumption for the youngest quintile (age 25-34 years) is higher than for the next two quintiles, since younger households are more likely to be liquidity constrained and use wealth purely as a buffer stock (i.e. precautionary savings in case of a fall in income), while older households use wealth for life-cycle reasons. Younger households are also more likely to move, potentially realizing some of their housing wealth gains. The second important finding in Lenhert's study is that the highest elasticity of consumption is among the second oldest quintile (age 52–62 years), which can be explained by the fact that this age group will most likely be downsizing their properties ahead of retirement, realising some of their housing wealth gains (Lenhert, 2004).

In their paper, Carroll et al. (2013) calibrate a buffer stock model to cohere with micro and macro level evidence on household income dynamics and also include heterogeneity in the time preference rates of households. They find evidence that the household level marginal propensities to consume out of one-time income shocks are much larger for households with lower net wealth. The findings of Carroll et al. (2013) are somewhat supported by those of Mian et al. (2013), who find based on their study in the US that there are great differences in wealth effects across the population, and that households with lower income and wealth and higher debt, cut spending notably more per lost dollar of housing net wealth than well-off households (Mian et al., 2013). Results from these two studies suggest that the distribution of wealth and debt in an economy is important in explaining how aggregate consumption reacts to sudden changes in wealth or income (e.g. a fiscal stimulus in the form of a tax break directed at households). Large mortgage debts (and thus small household net wealth) may also concentrate losses on housing wealth to those households with the highest marginal propensity to consume, making aggregate consumption fall more than predicted by traditional aggregate wealth models.

Table 2.1
Results from previous studies using aggregate level data

	Area and Time Period	Parameter	Housing Wealth	Financial Wealth
Aggregate level data				
Carroll et al. (2011)	US 1960–2007	MPC**, LR and SR	SR: 0.02 LR: 0.10	SR: 0.008 LR: 0.04
Case et al. (2006)	14 OECD countries panel data, and US state level panel data 1975–1999	Elasticity*, LR and SR	OECD: 0.11 US: 0.04	OECD: not significant US: 0.04
Dvornak and Kohler (2003)	Australia	MPC**, LR	0.03	0.06 –0.09
Halonen (2012)	Finland 1975–2008	MPC**, LR	Not significant	0.072
Ludwig and Slok (2004)	OECD 1960–2000	Elasticity*, LR	Not significant	0.025–0.053
Salo (2009)	OECD 1995–2006 and Finland	Elasticity*, LR	OECD: 0.09	–
Sousa (2009)	Euro area 1980–2007	MPC**, LR	Not significant	0.007–0.019

* Percentage increase in consumption associated with a 1 % increase in wealth.
** In dollars/euros for a one dollar/euro increase in wealth.

LR = long-run effect
SR = short-run (immediate) effect

Table 2.2
Results from previous studies using household level data

	Area and Time Period	Parameter	Housing Wealth	Financial Wealth
Aggregate level data				
Bostic et al. (2009)	US *(Survey of Consumer Finance)* 1989–2001 cross-sectional	Elasticity*	0.06	0.02
Campbell and Cocco (2005)	UK *(Family Expenditure Survey)* 1988–2000	Elasticity*, LR	0–1.7	–
Carroll et al. (2013)	US *(Household Finance and Consumption Survey)* 2004	MPC out of transitory income shock	MPC out of transitory income shock for households with different net wealth: 0.05–0.4	
Lehnert (2004)	US *(Panel Survey of Income Dynamics)* 1968–1993	Elasticity*, LR and SR	0.04–0.05	–
Mian et al. (2013)	US 2006–2009	MPC**, LR and SR	0.054–0.072	–
Sierminska and Takhtamanova (2007)	Canada 1999, Finland 1998, Italy 2002 *(Luxembourg Wealth Study)* cross-sectional	Elasticity*	Canada: 0.12 Finland: 0.10 Italy: 0.13	Canada: not significant Finland: 0.02 Italy: 0.04

* Percentage increase in consumption associated with a 1 % increase in wealth.
** In dollars/euros for a one dollar/euro increase in wealth.

LR = long-run effect
SR = short-run (immediate) effect

3. Consumption and Wealth

Private consumption is the single largest component of aggregate demand, and changes in the propensity to consume are often the main source of changes in total demand in an economy (Sorensen and Whitta-Jacobsen, 2010). Private consumption is mainly determined by the disposable income and wealth of households, although factors like consumer preferences and future expectations of wealth and income growth also influence consumers' spending decisions. Wealth typically influences the economy through various different channels: through the direct wealth effect (the increase in consumption due to an increase in wealth), by increasing the value of collateral on loans, the so-called Tobin's Q effect (increased investment demand due to increases in asset prices) and through increased private sector confidence (Sousa, 2009). Distinguishing between these different effects is not always straight forward and adds its own complications in to the interpretation of results obtained from studies on wealth effects. It is reasonable to assume that the effect of the wealth component on consumption decisions increases as the standard of living in an economy rises to a sufficiently high level.

Private consumption significantly affects both the cyclical development and the long-run growth prospects of an economy. It also serves as a basic determinant of economic welfare. (Sorensen and Whitta-Jacobsen, 2010). The state of private consumption and wealth has thus been a popular topic of research in economics throughout time. The financial crisis of 2008 and the sharp economic down turn that followed has provided plenty more incentive to study the effects of the recession on household wealth, income and private consumption.

3.1 What is Wealth?

Wealth is a somewhat ambiguous concept that varies with the context it is presented in. In economic theory, wealth can be thought to consist of *human wealth* and *initial wealth* (e.g. inherited wealth). Human wealth can be defined as the present value of a consumer's disposable life-time (labour) income. (Sorensen and Whitta-Jacobsen, 2010.) Savings from income are used to accumulate the stock of physical and financial assets in each period and the consumer may also borrow against his future income in any period to fund consumption and the accumulation of assets (e.g. buying a house). This is assuming that the consumer is not credit constrained and can borrow against his expected future income. A consumer with a sufficient amount of accumulated wealth may also engage in dissaving to boost his consumption in any period, typically toward the end of his life-cycle[7]. In practice, accurately estimating the value of a consumer's life-time labour income (i.e. human wealth) for empirical study is virtually impossible. Hence, the study of wealth effects is typically conducted by analysing the effects of income and household assets on consumption in a given period.

7 The foundations of this *life-cycle theory* were first laid out by Modigliani and Brumberg (1954), and the theory is further discussed in chapter 5.

From a statistical point of view, household[8] wealth is traditionally thought to comprise the value of a household's stock of resources at a given time (Törmälehto, 2012). This stock of resources is composed of *physical wealth*, which includes tangible assets such as dwellings, land and machinery, and *financial wealth* which includes bank deposits, private pension insurance policies and financial assets such as stocks and bonds. Added together, the physical wealth and the financial wealth components give the *gross wealth* of a household. The gross wealth of a household will change over time with savings (i.e. accumulation of wealth), capital transfers (e.g. inherited wealth) and with changes in the relative prices of the assets it holds (Törmälehto, 2012). To allow for comparison of the level of household wealth in different periods, the time series of the wealth components are deflated. Indebtedness is a concept closely tied to wealth and household indebtedness is usually included in the definition of wealth. *Household net wealth* is given by the difference between the *gross wealth* of a household and its *liabilities*[9]. In addition to accumulating wealth by saving from income, a household may also have accumulated dept. The amount of dept may be negative or positive, meaning that the household may be a net lender or a net borrower.

3.2 Housing Wealth

Housing wealth, including holiday and secondary homes as well as investment properties, is the single largest component of wealth in Finland and accounts for approximately two thirds of all household wealth (Säylä, 2012). In Finland, 68% of households own their primary residence (Törmälehto, 2012) and the absolute number of households living in owner-occupied housing has been steadily increasing since the 1970's (Halonen, 2012). As house ownership is common in Finland, this also means that a large proportion of households are predisposed to the risks associated with real estate markets (Säylä, 2012). For example, a large negative shock to housing prices could have serious effects on household wealth and the entire economy. Between the years 1994 and 2009 real housing prices rose by approximately 80% in Finland (Törmälehto, 2012).

Since housing wealth accounts for the great majority of physical wealth in Finland, estimating the effect of housing wealth on consumption is paramount in the empirical study part of this study. The fraction of housing wealth of aggregate physical wealth has remained fairly constant in Finland, at around 80%, since 1987. (Halonen, 2012). As a wealth component, housing has several distinguishing features when compared to other types of wealth. In addition, housing markets characterise many properties that render them different from other commodity and asset markets. The development of the housing market greatly affects the overall state of the economy through its effects on investment decisions, employment, consumption, future expectations and the financial market.

8 A group of people living in the same residence. Additional criteria often include that the household spends (at least a part of) its income together e.g. shared meals.
9 Mortgage loans and other debts (e.g. credit card debt, student loans).

Housing is a combined good: a house is often a commodity used for providing housing services and an asset at the same time. This is especially true for countries like Finland where house ownership is common amongst non-investors. Effectively, this means that most property owners live in the house they own. Housing is usually the largest single investment that households make in their life time. Housing is also necessary, expensive and indivisible, meaning that once a household lives in the house it owns, it cannot easily cash-in on a part of the assets tied to it. If a household does not own a house, it must consume housing services by renting. The rent it pays to a landlord is consumption to the renting household, but investment income to the owner of the property. Another distinguishing feature of the housing market is its highly local nature: housing in one region cannot be considered a substitute for housing in another region geographically far away (Oikkarinen, 2007). Imperfect information is also characteristic of the housing market as are long lags in the response of housing supply to changes in housing demand (Salo, 2009).

3.3 Forest Wealth

Forestland ownership is a distinctive, country-specific feature of Finnish households. In 2010 14% of the population in Finland owned at least two hectares of forestland (Leppänen and Sevola, 2012). The percentage of households that own forestland is smaller however, since many forest owners own forestland jointly with their spouse or through an inheritance estate or a tax syndicate[10]. The average size of a forestland estate[11] owned by private citizens was 30.1 hectares[12] (Leppänen and Sevola, 2012). The effects of forest ownership on consumption in Finland may be notable, since the forest industry sector produces around 18% of the value of annual industrial output (Statistics Finland, 2011) and requires considerable amounts of raw material for production. Households own over 52% of *productive forestland* [13] and forestry makes up approximately 2% of GDP in Finland. (Forest resources, Finnish Statistical Yearbook of Forestry 2009.) Of the domestic wood raw material used by the forest industry, 80% is logged from household owned forests (Hänninen et al., 2011). Forestland ownership will be referred to as *forest wealth* in this study. Forest wealth is a component of households' physical wealth, but it portrays many features characteristic of financial assets and commodity assets. Since forest wealth plays a role very different from that of primary housing wealth, it is justified to include it in the empirical study of wealth effects on consumption in Finland.

Forest wealth can be thought of in terms of the price of productive forestland. The price of forestland at a given time in a given area can be defined as the present value of the expected future logging income[14]. This definition of forestland price is very similar to that of stock price, where the present value of the stock is equal to the

10 A group of forest owners who manage their small forestland plots in co-operation, resulting in better economies of scale. As an incentive for co-operation, these syndicates are entitled to tax breaks.
11 All forestland, regardless of geographic location, owned by one person or the same group of people
12 Estates of at least 2 hectares.
13 Forestland suitable for the commercial production of wood i.e. forestland excluding conservation forests.
14 The payment the owner of the forestland will receive from selling the logged wood.

present value of expected future dividends (Brealey et al., 2008). Still, forest wealth has a few notable features that make it a very different asset from stocks, and it has traditionally been perceived as a fairly safe, long term asset, also suitable for balancing the portfolio risk of households (Säylä, 2000). Forest wealth is an investment with a very long horizon and it takes decades for a forest to reach a point of growth at which it is ready to be logged. Forestland estates are also not frequently traded on the open market, but rather inherited or sold within the extended family (Säylä, 2010). To be able to fully reap the payoffs from his forest wealth, an owner must also invest time and resources into tending to his forestland estate. In addition to active ownership, knowledge of forestry is needed in order to attend to a forestland estate properly. Economies of scale are prominent in forestry and increasing amounts of small scale forestland estates (less than 10 hectares) are co-managed together with other small forestland estates, very often by hired professional loggers. In recent years worries have been raised of the state of privately owned forest wealth, its inactive management and the fragmentation of forestland estates into ever smaller segments (mainly through inheritance). The large forest industry sector in Finland has particularly voiced its concern about securing stable access to its raw materials in the future. Incentives such as tax breaks for active forest wealth management have thus been introduced in Finland over the recent years.

When estimating the level of household forest wealth, numerous factors affecting forestland price need to be taken into account. These include, to mention some, different measurement methods used for determining forestland value, the regional distribution of forestland, the current market situation, the accessibility of the forestland (in regard to transportation of logged wood), the quality, age and rate of growth of the forest itself as well as the quality of the terrain. Productive forestland adds up to 86% of total land area in Finland. Of the 26,3 million hectares of productive forestland, 13.7 million hectares was owned by households in 2009. (Forest resources, Finnish Statistical Yearbook of Forestry 2009.) The average price of forestland in 2010 was 2 468 EUR per hectare for sales of over 10 hectares, but there is great variation in the price of forestland in Finland depending on geographic location and other factors listed above. (Forestland Estate Prices in Finland, 2010.) There is also much variation in forest wealth values between households, with some owning very large and valuable forestland estates whilst many households own none at all. Farmer households have traditionally been large scale forest owners, as many forestland estates are conjoined with farmland. Farmers make up around 21% of forest owners, but own a little over 30% of all forestland. The age distribution of forest owning households is also notably skewed, with 89% of private forestland owners aged 45 years or older. (Hänninen et al., 2011.)

3.4 Financial Wealth

In Finland financial wealth has traditionally been a much less significant component of wealth than housing wealth. In 2009 financial wealth amounted to 19% of total household wealth. The amount of average household financial wealth has been growing slowly but steadily since 1987, no doubt aided by the financial deregulation of the late 1980's. Financial wealth is more unevenly distributed than housing wealth. The Gini index for gross housing wealth was around 58% whilst its value

for (gross) financial wealth was 79%. Over 20% of households own stocks, but for the majority of households the value of these stock holdings is small. The wealthiest 5% of households own 71% of all stock wealth. (Säylä, 2012.) The remainder of total (gross) household wealth that is left unaccounted for by housing and financial wealth is mainly situated in investments in other financial assets, vehicles, land (including forestland) and machinery (Herrala, 2007).

The focus of this study is on the effects of changes in physical wealth on consumption. Financial wealth will however be included in the empirical analysis of wealth effects to serve as a control variable and to provide more insight into the consumption behaviour of households.

4. The 1998 Finnish Household Wealth Survey

In this study, the empirical estimation of wealth effects in Finland is conducted using cross-sectional household level data. The data has been obtained from the 1998 Household Wealth Survey compiled by Statistics Finland. The original sample size of the survey was 6 000 Finnish households and the resulting data set includes 3 893 households. Household wealth surveys have been conducted in Finland in the years 1987, 1988, 1994, 1998, 2004 and 2009. The wealth surveys compiled by Statistics Finland contain data on households' physical and financial wealth as well as household debt. Information on households' income and inheritance as well as several sociodemographic variables are also included in the survey data sets, although the data composition of the wealth surveys varies by year. The data in the surveys performed prior to 2009 has been collected by interviewing a sample of representative households. The most recent wealth survey (2009) was conducted using a register method of data collection. Because of differing data collection methods, the long collection intervals and the changing scope and sample of the wealth surveys, it is not possible to construct a panel data set suitable for the analysis of wealth effects on consumption from these wealth surveys. Empirical analysis in this study is thus conducted using cross-sectional data from the Household Wealth Survey of 1998. Although more recent Finnish wealth surveys are available, the 1998 Household Wealth Survey is the only one that contains information on households' expenditures as well as income and wealth. The data collected in the 1998 wealth survey is also available to some extent for study purposes at the Luxembourg Wealth Study Database[15], managed by the Cross-National Data Center in Luxembourg. The data set has thus been used in some previous studies comparing wealth effects between countries (e.g. Sierminska and Takhtamanova, 2007) as well as other household wealth related studies conducted in Finland (e.g. Kannas, 2007).

As discussed, the use of household level (i.e. micro) data allows for much more subtle analysis of household wealth effects on consumption than would be possible if aggregate level data were used. The use of micro data enables comparison between households by characteristics such as age, region, education and amount of household wealth and income. Household level data also makes it easier to confirm the behavioural link between changes in household wealth and expenditures. It is worth noting however, that since the data set at hand is cross-sectional (i.e. contains year-specific data only), it will not be possible to trace actual life-cycle behaviour by following the development of wealth and consumption of the same households through time. The analysis of life-cycle behaviour in wealth effects on consumption will hence be confined to comparing differences in wealth effects between age groups during the observation period.

15 The Luxembourg Wealth Study Database was launched in 2007 and contains household level data since 1994 (corresponding to different years) on assets and debt, market and government income, household characteristics, labour market outcomes, expenditures and behavioural indicators from 12 different countries. The purpose of the data base is to provide opportunities for scholarly research on wealth and the development of improved standardised wealth data collection practices. (LIS Cross-National Data Center in Luxembourg, 2014.)

The data obtained from the 1998 Household Wealth Survey includes information on housing wealth, forest wealth, financial wealth, household debts, household income, household expenditures and several control variables such as age, education, household size, employment status and geographic location (see appendix 1 for a full variable list). Funds paid by households in to statutory pension insurance funds, and households' future claims to these funds are not included in the definition of household financial wealth. The Household Wealth Survey data set also contains information on the value of vehicles owned by households, but these observations are not included in the analysis in this study.

Although the 1998 Household Wealth Survey does include data on forest wealth, it is based on the taxation value of forestland obtained from tax records[16], and is thought to significantly underestimate the actual value of forest wealth held by households (Kannas et al., 2011). The data set used in the empirical analysis is hence modified to include a more accurate estimate of household forest wealth, derived by multiplying the taxation values of household forest wealth by a constant factor of 2.0416. This weight coefficient was derived using data on the forestland area associated with farms (available for certain households only) to estimate the average taxation value of forestland wealth per hectare. The value used was the 5% truncated average taxation value of forestland wealth. This value was then compared to the average forestland sales price in 1998[17]. Although the method only gives a rough estimate of the relationship between forest wealth taxation values and actual forestland value, the estimate conforms reasonably well with that given by the Finnish Forest Research Institute (Metla) researcher Jussi Leppänen. According to Leppänen, the use of the weight coefficient may even give a more accurate estimate of household forest wealth than the use of other more complex methods (unfeasible in this case because of lacking data on forestland ownership). (Leppänen, e-mail 25.02.2014). Household forest sales income is added to the modified taxation values of forestland wealth to obtain gross forest wealth. The net forest wealth variable is constructed by subtracting household forest related debt from gross forest wealth. To enable comparison, the unmodified forest wealth variables (likewise computed by adding forest sales income and subtracting household forest related debt) are also included in the data set. The regression results obtained using the modified and unmodified forest wealth components are very similar, and hence the modified forest wealth components are used in the analysis. Average forest *taxation value* for the whole population was 2 920 EUR[18] whilst the average value for forest owning households was 24 255 EUR.

The net housing wealth variable used in the empirical analysis is defined as owner occupied housing and secondary homes as well as investment properties owned by households, net of mortgage debt. The value of holiday homes is omitted from

16 Forest taxation, in which the tax was collected according to forestland ownership instead of sales revenue, was enforced in Finland until 2005. The taxation value of forestland was calculated using a complex method of estimating the (potential) productivity of the forestland net of certain costs (Leppänen, e-mail 25.02.2014).

17 Similar methods for deducing the actual value of wealth components using taxation values have been used before, for example by Pekkarinen et al. (1988) in their paper on the wealth differences of households in Finland.

18 2009 euros.

the analysis, since there is no data available for the debt component of households associated with holiday homes only. Considering the effects of the primary and secondary residences on consumption is also in line with previous literature on housing wealth effects. Data on financial wealth is also included in the estimation, although the focus of this study is on the effects of physical wealth on consumption. Household financial wealth includes deposits, cash, stocks, bonds and private pension insurance. Financial wealth is considered in terms of asset value (i.e. gross financial wealth) in the analysis, since there is no separate financial investment debt component available. This hypothetical debt component is likely to be negligible in the case of Finnish households, and therefore should not affect the estimates obtained from the analysis.

The data on household income consists of total household labour income, investment income and income transfers (including pensions) net of taxes and statutory pension insurance payments. To avoid simultaneity, investment income is omitted from the definition of income in the empirical analysis. The dependent variable in the estimation is household expenditures, which comprises both durable and non-durable consumption, namely spending on food, clothes, housing, healthcare, travel, leisure, childcare and insurance.

The original 1998 Household Wealth Survey reports monetary variables in markkas[19]. In order to make the data comparable to the 2009 Household Wealth Survey data, all monetary variables are converted to 2009 euros using the consumer price index (Statistics Finland, 2010). For the empirical analysis, the data is adjusted for household size by dividing all monetary variables by the modified OECD equivalence scale variable included in the data set[20]. The fact that we are dealing with survey data means that the weights included in the data set should be taken into consideration when computing summary statistics and conducting statistical analysis[21]. The use of weights allows for statistical inference at population level, based on the sample at hand (see chapter 6 for details). The 1998 Household Wealth Survey data has been collected using stratified sampling, meaning that information on the strata should also be taken into account[22].

The time in which the 1998 Household Wealth Survey was conducted, was a period of strong economic growth in Finland. The notable decrease in household income and private consumption experienced during the recession of the early 1990's had subsided by 1994, and private consumption had been rising steadily for the preceding four years. Households grew wealthier during the late 1990's and increased both their financial and housing wealth. Households also invested an increasing proportion of their wealth in stocks and bonds (compared to the year

19 The currency of Finland from 1860 until 2002.
20 Due to economies of scale, the needs of a household do not grow proportionately with each additional member. EUROSTAT adopted the use of the OECD-modified equivalence scale in the late 1990's. The scale assigns a value of 1 to the household head (reference individual), a value of 0.5 to each additional adult member and a value of 0.3 to each child member. (OECD, 2013.)
21 The weights have been calculated using the probability of each household being included in the sample. The weights have then been calibrated to cohere with the population distribution of several other variables e.g. location, age, sex, household size. (Säylä, 2000.)
22 In stratified sampling the members of a population are divided into uniform groups i.e. strata before sampling. After grouping, sampling is conducted within each group. In general, stratification reduces sampling error and hence improves the representativeness of the sample.

1994). (Säylä, 2000). Housing prices began to recover after 1993, and by the year 1998 the housing market was experiencing a moderate boom (Schauman, 2012). In 1998, approximately 64% of Finnish households lived in owner occupied housing. However, a slightly greater proportion of households (68%) owned housing wealth in some form, with the remaining 4% owning investment properties and secondary or holiday homes only. For around 11% of households, total net wealth (excluding vehicles) was negative, meaning that the value of the households' debts exceeded the value of their assets[23]. In 1998, 12% of Finnish households owned forestland, but the distribution of forest wealth by age is skewed, with the majority of forestland owners aged 45 years or older.

Population summary statistics for income, expenditures, wealth and certain household characteristics are given in table 4.1. Since one of the objectives of this study is to assess the wealth effects on consumption of households in different stages of their life-cycle, the data set is divided into six subgroups by the age of the reference individual[24]. The age groups are at 10 year intervals, with the first group consisting of households under the age of 25 years, and the oldest group containing households aged 65 years or older. Both household income and household wealth typically increase with age. Income is at its highest for households aged 45–54 years, whilst net wealth is highest for the age group 55–64 years. Household consumption is closely associated with household size, which explains why the largest values of average consumption are observed for households with children i.e. for households with larger average household size.

Table 4.1
Household summary statistics by (reference individual) age group, 1998 Household Wealth Survey
Population size is 5 086 139 individuals. The number of households in the population is 2 355 000. Weighted averages for the population (at household level), 2009 euros

	All	< 25 years	25–34 years	35–44 years	45–54 years	55–64 years	> 64 years
Proportion of households in final sample	100%	5%	15%	24%	27%	16%	13%
Proportion of households in population	100%	7%	17%	20%	20%	14%	21%
Average household size	2,16	1,51	2,28	3,07	2,37	1,76	1,48
Presence of children (< 18 years)	27%	8%	37%	64%	31%	5%	< 1%
Employed (1 or more members)	60%	48%	83%	87%	86%	48%	4%
Education level min.							
Primary/None	38%	12%	13%	21%	34%	53 %	76 %
High School/Vocational School	50%	84%	69%	62%	51%	36 %	20 %
Bachelor's Degree	12%	4%	18%	17%	15%	11 %	4 %
Disposable Income	30 127	15 391	28 169	36 727	37 721	30 593	22 687
Expenditures	19 608	15 177	21 647	24 878	23 646	18 010	11 611
Total Gross Wealth	108 281	17 901	58 529	108 741	137 917	158 412	115 961
Total Net Wealth	94 702	10 632	34 949	82 675	124 437	152 037	115 044
Gross Housing Wealth (including holiday homes)	81 184	10 472	45 185	86 004	103 241	113 438	86 345
Gross Forest Wealth (modified)	6 502	2 455	3 052	6 465	8 346	10 374	6 291
Gross Financial Wealth	18 654	4 919	9 998	15 350	23 517	30 523	20 736
Total Debt (including forest debt)	13 579	7 269	23 580	26 066	13 480	6 375	917
Mortgage Debt	10 721	4 631	17 441	22 237	10 524	4 857	702

23 Net housing wealth was negative for a very small proportion of households, meaning that households with negative total net wealth had other large non mortgage debts.
24 Member of the household with largest annual personal income.

5. Theory and Methods

The empirical analysis of wealth effects is founded on consumption theory, namely life-cycle theory and the overlapping generations model as discussed below[25]. Consumption theory does not however present an unequivocal framework in which to analyse wealth effects separately for different types of wealth, and several different model specifications have been employed in previous studies on the subject. This chapter presents the methods used in the analysis of wealth effects on consumption in this study.

5.1 Consumption Theory

Early models of consumption modelled aggregate consumption in an economy as a function of real disposable income. This linear model of consumption however had serious limitations as it omitted the effects of wealth, expected future income and real interest rate on consumption. These limitations were first addressed and emended for by Modigliani and Brumberg (1954) with the presentation of the life-cycle theory and by Friedman (1957) with the introduction of his permanent income hypothesis. Life-cycle theory is based on microfoundations (compared to the aggregate approach of the linear model) and maintains that consumers plan their consumption and savings choices over the long-run and aim to smooth consumption over their life-time (Modigliani and Brumberg, 1954). The permanent income hypothesis presents the important finding that consumption choices made by consumers are mainly determined by changes in permanent income, rather than changes in transitory income, which again is mostly reflected in changes in the saving rate (Friedman, 1957). A similar pattern has been found to hold for wealth, for example Lettau and Ludvigson (2004) write in their paper that aggregate consumption is well described as a function of the trend components in wealth and income, and that permanent changes in wealth do affect consumer spending, although most changes in wealth are transitory and uncorrelated with consumption (Lettau and Ludvigson, 2004). Both the permanent income hypothesis and the life-cycle theory in their simplest form assume perfect capital markets, perfect certainty and that there is a welfare gain to be achieved from consumption smoothing through borrowing and saving. Changes in the wealth of households affects life-cycle wealth or permanent income and thus consumption (Herrala, 2007).

The concept of consumption theory can be summarised as follows. Savings from disposable (labour) income are used to accumulate the stock of physical and financial wealth when current disposable income is higher than permanent income. Given the assumption of perfect capital markets (i.e. no credit constraints) the consumer may also borrow against his future income in any period to fund consumption when his current disposable income is below his permanent income. A consumer with a sufficient amount of accumulated wealth may also engage in dissaving to boost his

25 Please see the original thesis for a more detailed discussion of consumption theory.

consumption in any period, typically toward the end of his life-cycle, when his current disposable income is below his permanent income. Consumers in different stages of their life-cycle have different propensities to consume current income and wealth because of their desire to smooth consumption over time (Sorensen and Whitta-Jacobsen, 2010). It is also probable that different wealth components have different marginal propensities to consume. It is important to note however, that the simple form of the consumption function only holds at a theoretical level. The assumption of perfect capital markets (i.e. no liquidity constraints) is highly unfeasible as is the omitting of the public sector and that of perfect information: expectations of future income are very uncertain and it is often impossible to for a consumer to distinguish between transitory and permanent changes in wealth.

Tools such as the 'buffer stock' extension to the life-cycle/permanent income hypothesis have been presented by for example Deaton (1991) and Carroll (1996), to improve modelling of consumption in an economy, both at the household and aggregate level. These models are able to provide more precise estimates in the case when households face income uncertainty and binding liquidity constraints, and are especially of great relevance when the focus of study is on the effects of income changes on consumption. The idea of a simple buffer stock extension is, that in the presence income uncertainty and borrowing constraints, there is an additional motive even for the impatient households to accumulate assets for smoothing consumption in case income falls in the future. Although not all households are liquidity constrained, these buffer stock models seem to be able to account for aspects of reality not explained by conventional life-cycle models. Such aspects include the empirical finding that consumption seems to track household income quite closely over the life-cycle (Deaton, 1991) and the fact that income uncertainty seems to make the consumption function concave and increase the level of the observed MPCs at all parts of the curve (Carroll et al., 1996). It should therefore be emphasised, that in the real world households are faced with constant uncertainty regarding their future income and wealth prospects, which is bound to affect consumption and savings decisions.

5.2 Data Selection

Prior to conducting the empirical analysis, the 1998 Household Wealth Survey data set is inspected for significant outliers and irregularities. To avoid simultaneity, investment income is subtracted from the disposable income variable, rendering 42 households with negative or very small (less than 2 400 EUR) annual income[26]. These observations are removed from the data set. Keeping in line with previous studies, and given the notable heterogeneity in the first age group, 193 households under

26 Investment income exceeds total income for certain households because imputed rent is included in the disposable income of households. Imputed net rent from housing is derived when the housing costs paid by the household for its dwelling (e.g. owner-occupiers' maintenance charges, insurance, maintenance costs) and interests on housing loans are deducted from the so-called imputed gross rent. Imputed gross rent describes the benefit gained by the household compared with a corresponding household living in a rental dwelling with market rent. The imputed net rent obtained as the result may be negative for households with housing loans because of interests on housing loans. (Metadata, Concepts and definitions, Statistics Finland 2014.)

the age of 25 years are also omitted from the analysis. Since a visual inspection of the income and wealth variables relative to expenditures reveals clear nonlinearity, a (natural) log transformation is performed on all the monetary variables. For this purpose, households with negative net housing wealth (70 observations) and households with negative net forest wealth (12 observations) are omitted. The resulting whole sample data set contains 3 576 households. The subsample of homeowners used in the analysis consists of 2 900 households with positive net housing wealth. For the sample of forest owners, households with forest wealth value of less than 2 000 EUR are omitted, resulting in a subsample of 795 households.

5.3 Nonlinearity in the Wealth Components

A visual inspection of the income and wealth components reveals clear nonlinearity in the variables of interest. Taking a (natural) log transformation of the monetary variables yields a linear relationship between the log dependent variable expenditures and log income, log gross financial wealth and log net forest wealth. For net housing wealth however, the correlation appears quadratic.

Hence, to accurately model expenditures as a function of income and the different wealth components, squared log net housing wealth is included in the model specification.

$$\log C = \beta_1 \log Y + \beta_2 \log NHW + \beta_3 \log NHW^2 + \beta_4 \log NFLW + \beta_5 \log GFIW + \sum_{i=2}^{N} \beta_{6i} A_i + \sum_{j=1}^{J} \beta_{7j} S_j \quad (1)$$

Function (1) models log expenditures *(C)* as a function of log income *(Y)*, log net housing wealth *(NHW)*, squared log net housing wealth *(NHW)*, log net forest wealth *(NFLW)*, log gross financial wealth (GFIW), four age group dummies A_i and other sociodemographic control variables S_j. A full variable list is given in appendix I. The estimates for income, net housing wealth, squared net housing wealth and gross financial wealth are all statistically significant at the 1% level.

The point estimate for net housing wealth is negative (–0.087), whilst the estimate for squared net housing wealth is positive (0.007). The intuitive explanation behind the result is, that households with positive but small net housing wealth are likely to have a large mortgage relative to the value of their house. Such households are typically amortizing their mortgages at a faster rate, which translates to a higher savings rate and consequently lower consumption. The effect of net housing wealth on consumption only seems to turn positive after a significant enough amount of wealth has been accumulated by the household. The complete results obtained from the regression model (1) are given in appendix 2.

To obtain a model with a more meaningful interpretation of the effects of housing wealth on consumption, a break point at the median value of net housing wealth (40 560 EUR) is identified, and linear models (model (1) with the squared net

housing wealth term omitted) are fitted separately for households with net housing wealth below the median value and for households with net housing wealth above the median value. This approach should result in different estimates of the elasticities of consumption with respect to wealth for the households for whom it appears to be negative or zero (i.e. below the median of net housing wealth), and for those households for whom it appears to be positive (i.e. above the median of net housing wealth). Although this approach seems to work in theory, the results obtained from the models are inconclusive: the estimate for households with more net housing wealth is positive and significant, but the estimate for households with less net housing wealth is not significant[27].

In the light of the above, it would seem that the log transformation of the income and wealth variables is not able to tackle all nonlinearity in the net housing wealth variable. However, since it is not possible to construct a model that results in interpretable and significant results for the whole sample, a linear model (2) with the squared net housing wealth term omitted is adopted as the most suitable approach for the estimation of wealth effects on consumption, given the data set at hand. The choice of the linear functional form of the model can be justified by the fact that although for a relatively small proportion of households with very little net housing wealth, the effect of housing wealth on consumption is likely to be negative or nonexistent, for the great majority of homeowner households, the elasticity of consumption with respect to housing wealth seems to be positive. The linear model specification is hence well suited for studying the consumption behaviour of households at the economy level. Underlying model assumptions such as residual normality and the absence of a trend in the residuals are also better met with model (2) compared to model (1).

5.4 The Linear Model

The basic reduced form model chosen for the empirical analysis is the linear model (2), with log transformations of the dependent variable expenditures *(C)* and the independent variables income *(Y)*, net housing wealth *(NHW)*, net forest wealth *(NFLW)* and gross financial wealth *(GFIW)*.

$$\log C = \beta_1 \log Y + \beta_2 \log NHW + \beta_3 \log NFLW + \beta_4 \log GFIW + \sum_{i=2}^{N} \beta_{5i} A_i + \sum_{j=1}^{J} \beta_{6j} S_j \quad (2)$$

Since all the monetary variables are in log form, the estimated coefficients of the income and wealth components can be interpreted as elasticities of consumption with respect to income/wealth[28].

27 Results not reported.
28 The elasticity of consumption with respect to wealth gives the percentage change in consumption implied by a 1 % change in wealth.

The estimation is conducted using the SAS *surveyreg* procedure which enables linear regression analysis for complex survey sample designs, accounting for stratification and unequal weighting of the sample. To asses wealth effects on consumption separately for the subsamples of homeowners and forest owners, the *domain* statement of the SAS *surveyreg* procedure is used. As the formation of the groups of homeowners and forest owners is unrelated to the sample design, the sample sizes for the domains are random variables. The *domain* statement incorporates this variability into the variance estimation, whilst analysing the subsamples directly may yield inappropriate estimates of variance. (SAS Institute, 2014.) The same approach is also used for analysing wealth effects for different net wealth quintile groups from the full sample. In previous studies on wealth effects on consumption, survey considerations have seemingly quite often been omitted from the model design. Since the use of survey methods in empirical analysis is a somewhat philosophical question, the subject is further explored in the robustness checks section in chapter 6.

As the *domain* statement of the SAS *surveyreg* procedure is used to extract the subsamples of homeowners and forest owners from the full sample, it cannot simultaneously be used to analyse the differences between age groups in the subsamples. Therefore, to obtain an understanding of how wealth effects on consumption differ by age group for the subsample of homeowners, a model with interaction terms of the age dummies and income and wealth components is constructed.

$$\begin{aligned}\log C = {} & \beta_{11}\log Y + \beta_{21}\log NHW + \beta_{31}\log NFLW + \beta_{41}\log GFIW \\ & + \sum_{i=2}^{N}(\beta_{1i}\log Y \times A_i + \beta_{2i}\log NHW \times A_i + \beta_{3i}\log NFLW \times A_i + \beta_{4i}\log GFIW \times A_i) \\ & + \sum_{i=2}^{N} \beta_{5i}A_i + \sum_{j=1}^{J} \beta_{6j}S_j \end{aligned} \tag{3}$$

Similarly, to study the effect of forest wealth on consumption for forest owning farmer households, a model with interaction terms of the dummy variable indicating whether the reference individual is a farmer or not, and the income and wealth components is compiled. The motivation for this approach lies in the fact that a great number of forestland estates are conjoined with farmland. In addition, the effects of forest wealth on consumption may be very different for these farmer households that live in the immediate vicinity of their forestland estate compared to the whole subsample of forest owners.

$$\begin{aligned}\log C = {} & \beta_1\log Y + \beta_2\log NHW + \beta_3\log NFLW + \beta_4\log GFIW + \beta_5\log Y \times Farmer \\ & + \beta_6\log NHW \times Farmer + \beta_7\log NFLW \times Farmer + \beta_8\log GFIW \times Farmer \\ & + \beta_9 Farmer + \sum_{i=2}^{N} \beta_{10i}A_i + \sum_{j=1}^{J} \beta_{11j}S_j \end{aligned} \tag{4}$$

6. Results

In this chapter, estimates of the effect of different wealth components on consumption are presented for the sample as a whole, the subsample of homeowners and for the subsamples of forest owners and farmer forest owners. To study the existence of a life-cycle pattern in consumption, estimates for households belonging to different age groups are presented. To further analyse the impact of household heterogeneity on wealth effects on consumption, estimates for households by net wealth quintile groups are also provided. The main results of interest are estimates for the elasticity of consumption with respect to wealth. All monetary variables are in logs and adjusted for household size[29].

6.1 Wealth Effects on Consumption and Housing Wealth

Table 6.1 presents the results of the regression for the whole sample[30] of Finnish households. The estimates for the income and wealth components are all statistically significant. The estimated elasticity of consumption with respect to income is 0.355%, and as expected, much higher than the elasticity of consumption with respect to wealth. The elasticity for net housing wealth is negative and small in absolute value at –0.005%. Although caution should be exercised in making any interpretations from this result, the negative effect of an increase in housing wealth on consumption may reflect the effect of rising housing prices on those households that are not homeowners, and those households with positive but small net housing wealth (see chapter 5). Because of tightening collateral constraints, an increase in housing prices is likely to increase the savings rate of households looking to buy a house (Slacalek, 2009). Rising interest rates on mortgages might also cause households with small positive net housing wealth to amortize their loans at a faster rate, increasing their saving rate and reducing consumption. The elasticity of consumption with respect to net forest wealth is also negative at –0.004%, but this result is hard to interpret for the whole sample, since relatively few households hold forest wealth. The effect of gross financial wealth is a 0.022% increase in consumption for a 1% increase in wealth, which is well in line with previous findings. Since most households own at least some financial wealth, which is a highly liquid wealth component, the elasticity of consumption with respect to financial wealth is almost always highly significant regardless of the sample selection of the analysis.

Regression results for the subsample of homeowners are given in table 6.2. The estimated elasticity of consumption with respect to net housing wealth is now highly significant, positive and large at 0.103%. This result is expected, as the subsample of homeowners consists mainly of households for whom the effect of housing wealth on consumption is positive (chapter 5). The elasticity of consumption with respect to income, 0.342%, is almost identical to the one obtained for the whole

29 Using the Modified OECD Equivalence Scale.
30 Renters and homeowners.

Table 6.1
Regression results for the whole sample. Model (2). Monetary variables in logs

Variable	Estimate	Standard Error	t-value	Pr > |t|
Intercept	6.747	0.312	21.600	0.000
Income	**0.355**	**0.029**	**12.200**	**0.000**
Net Housing Wealth	**−0.005**	**0.003**	**−1.880**	**0.060**
Net Forest Wealth	**−0.004**	**0.002**	**−1.880**	**0.060**
Gross Financial Wealth	0.022	0.003	6.620	0.000
Age 35–44 years	0.007	0.024	0.290	0.769
Age 45–54 years	−0.012	0.025	−0.490	0.624
Age 55–64 years	**−0.057**	**0.032**	**−1.770**	**0.077**
Age over 64 years	**−0.139**	**0.037**	**−3.760**	**0.000**
Metropolitan area	**0.051**	**0.023**	**2.190**	**0.029**
Eastern Finland	**−0.062**	**0.023**	**−2.720**	**0.007**
Central Finland	0.000	0.024	0.010	0.992
Northern Finland	−0.016	0.025	−0.650	0.516
Intermed. Level Ed.	**0.080**	**0.021**	**3.870**	**0.000**
Higher Level Ed.	**0.157**	**0.027**	**5.880**	**0.000**
Employed	**0.122**	**0.026**	**4.680**	**0.000**
Gender	0.015	0.017	0.850	0.394
Presence of Children	0.030	0.026	1.170	0.241
Inheritance	**0.076**	**0.020**	**3.690**	**0.000**
Married	**0.053**	**0.022**	**2.450**	**0.014**
Members	**−0.063**	**0.010**	**−6.190**	**0.000**
Liabilities	**0.130**	**0.019**	**6.820**	**0.000**
2nd Wealth Quintile	**−0.053**	**0.031**	**−1.700**	**0.090**
3rd Wealth Quintile	**−0.075**	**0.041**	**−1.810**	**0.070**
4th Wealth Quintile	−0.020	0.047	−0.430	0.667
5th Wealth Quintile	0.056	0.052	1.090	0.276
Adjusted R^2	0.425			
Sample Size	3576			

sample, whilst the estimate the elasticity of consumption with respect to financial wealth, 0.025%, is slightly larger for the subsample of homeowners. The estimate for net forest wealth is not statistically significant. None of the location dummies are significant for the subsample in question, but the estimates for all the net wealth quintile dummies are now significant, negative and large in absolute value. The interpretation of the estimates for the net wealth quintiles is somewhat challenging, since there are very few observations in the (1st) reference quintile in relation to the other quintiles for the subsample of homeowners[31].

31 The point estimates for the net wealth quintile dummies should be interpreted with caution, since including these dummies imposes some imperfect multicollinearity into to the model, although the net wealth quintiles are not formed solely based on the continuous wealth variables also included in the model. Running the regressions without the quintile dummies does not significantly alter the main results of interest from any of the models presented here.

Table 6.2
Regression results for the subsample of homeowners. Model (2).Monetary variables in logs

Variable	Estimate	Standard Error	t-value	Pr > |t|
Intercept	5.975	0.422	14.160	0.000
Income	**0.342**	**0.032**	**10.540**	**0.000**
Net Housing Wealth	**0.103**	**0.019**	**5.360**	**0.000**
Net Forest Wealth	−0.003	0.002	−1.410	0.160
Gross Financial Wealth	**0.025**	**0.004**	**5.890**	**0.000**
Age 35–44 years	−0.026	0.032	−0.820	0.414
Age 45–54 years	−0.052	0.032	−1.640	0.102
Age 55–64 years	**−0.095**	**0.040**	**−2.390**	**0.017**
Age over 64 years	**−0.165**	**0.048**	**−3.400**	**0.001**
Metropolitan area	−0.014	0.028	−0.510	0.609
Eastern Finland	−0.039	0.026	−1.510	0.130
Central Finland	0.037	0.029	1.270	0.206
Northern Finland	0.005	0.030	0.160	0.871
Intermed. Level Ed.	**0.090**	**0.024**	**3.700**	**0.000**
Higher Level Ed.	**0.158**	**0.030**	**5.200**	**0.000**
Employed	**0.120**	**0.035**	**3.410**	**0.001**
Gender	0.005	0.021	0.240	0.807
Presence of Children	0.027	0.030	0.920	0.360
Inheritance	**0.083**	**0.023**	**3.630**	**0.000**
Married	**0.092**	**0.025**	**3.640**	**0.000**
Members	**−0.057**	**0.011**	**−5.060**	**0.000**
Liabilities	**0.155**	**0.023**	**6.710**	**0.000**
2nd Wealth Quintile	**−0.418**	**0.113**	**−3.690**	**0.000**
3rd Wealth Quintile	**−0.511**	**0.116**	**−4.420**	**0.000**
4th Wealth Quintile	**−0.503**	**0.120**	**−4.210**	**0.000**
5th Wealth Quintile	**−0.475**	**0.125**	**−3.780**	**0.000**
Adjusted R^2	0.434			
Sample Size	2900			

6.2 *Wealth Effects on Consumption and Forest Wealth*

Results for the subsample of forest owners are summarised in table 6.3. When interpreting the estimates for the given subsample, it is worth noting that the age distribution of forest owners is highly skewed, with the great majority of forest owners aged 45 years or older. Forest wealth is mostly concentrated in the two oldest age groups, whose consumption and saving behaviour often differs significantly from that of younger households. This observation, along with the fact that the subsample of forest owners is quite small relative to the whole sample, are likely to effect the estimates of wealth and income effects obtained from the regressions.

A surprising result from the estimation is that the elasticity of consumption with respect to forest wealth is negative at –0.050%. The regression results seem to indicate, that on average, an increase in the value of net forest wealth causes the consumption of forest owning households to decrease. An increase in gross financial wealth increases the consumption of forest owning households by 0.032%, but the estimate for the housing wealth effect is not significant. The estimate for income,

0.218%, is lower than for the whole sample and the subsample of homeowners, and the estimates for the net wealth quintile dummies are now positive and larger in absolute value. These estimation results may in part reflect the unique consumption behaviour of older households: age seems to reduce observed consumption *per* se judging by the estimates for the whole sample. Another explanation may be, that forest wealth requires continuous investment in the form of maintenance and other costs for the owner to be able to profit from the forestland. If wood prices and the value of forestland are increasing, forest owners may be reducing their consumption and increasing investment spending on forestland in the hopes of better logging income or forestland sales price in the future. It is also likely that many forest owners do not perceive forest wealth as appropriate for financing consumption. Forestland estates are often passed on as inheritance and several forestland estates are also co-owned, which makes it more difficult for a single owner to cash in on an increase in forestland value. A report on Finnish forest owners, published by the Finnish Forest Research Institute (Metla), suggests that many forest owners value forest wealth as a means for providing financial security (Hänninen et al., 2011). If forest wealth is indeed a wealth component mainly used as a long term savings device (and often passed on as inheritance), it seems plausible that its effects on the consumption of households are nonexistent or even negative. Many forest

Table 6.3
Regression results for the subsample of forest owners. Model (2). Monetary variables in logs

Variable	Estimate	Standard Error	t-value	Pr > |t|
Intercept	7.755	0.630	12.310	0.000
Income	**0.218**	**0.064**	**3.400**	**0.001**
Net Housing Wealth	0.005	0.007	0.690	0.489
Net Forest Wealth	**–0.050**	**0.025**	**–1.980**	**0.048**
Gross Financial Wealth	**0.032**	**0.010**	**3.150**	**0.002**
Age 35–44 years	0.054	0.084	0.650	0.519
Age 45–54 years	0.040	0.087	0.460	0.649
Age 55–64 years	0.025	0.096	0.260	0.798
Age over 64 years	–0.103	0.114	–0.900	0.366
Metropolitan area	**–0.165**	**0.093**	**–1.780**	**0.076**
Eastern Finland	**–0.102**	**0.056**	**–1.800**	**0.072**
Central Finland	–0.034	0.059	–0.580	0.561
Northern Finland	0.048	0.066	0.730	0.463
Intermed. Level Ed.	**0.086**	**0.052**	**1.660**	**0.096**
Higher Level Ed.	**0.193**	**0.065**	**2.960**	**0.003**
Employed	**0.172**	**0.061**	**2.790**	**0.005**
Gender	–0.010	0.046	–0.220	0.828
Presence of Children	0.064	0.066	0.980	0.326
Inheritance	0.080	0.054	1.470	0.141
Married	0.017	0.054	0.320	0.749
Members	**–0.080**	**0.022**	**–3.680**	**0.000**
Liabilities	**0.197**	**0.045**	**4.360**	**0.000**
2nd Wealth Quintile	**0.808**	**0.125**	**6.440**	**0.000**
3rd Wealth Quintile	**0.674**	**0.090**	**7.470**	**0.000**
4th Wealth Quintile	**0.762**	**0.084**	**9.080**	**0.000**
5th Wealth Quintile	**0.926**	**0.092**	**10.080**	**0.000**
Adjusted R^2	0.341			
Sample Size	795			

Table 6.4
Summary of elasticity of consumption estimates from the farmer interactions model. Subsample of forest owners. Model (4)

Variable	Estimate	Standard Error	Pr > |t
Income	**0.199**	**0.080**	**0.013**
Net Housing Wealth	0.005	0.008	0.488
Net Forest Wealth	–0.032	0.028	0.267
Gross Financial Wealth	**0.031**	**0.011**	**0.006**
Income*Farmer	0.098	0.105	0.352
Net HW*Farmer	**0.110**	**0.051**	**0.031**
Net FLW*Farmer	**–0.116**	**0.049**	**0.019**
Gross FIW*Farmer	0.002	0.019	0.923
Farmer	–1.180	1.162	0.310

owners also place high value on the use of their forestland estate for recreational purposes[32], and may thus not primarily perceive their forest wealth as an investment akin to, for example, financial wealth.

A notable proportion of forestland estates are owned by farmer households, and several forestland estates are conjoined with farmland. It also seems possible, that forest wealth may play a role quite different in the balance sheets of farmer households than that observed for the entire subsample of forest owners. To obtain more insight into the consumption behaviour of these forest owning farmer households, model (4) with interaction terms of the dummy variable indicating whether the reference individual is a farmer or not, and the income and wealth components is run for the subsample of forest owners. Of the 795 forest owning households in the sample, 301 report farming as their primary livelihood. Main results of interest from the interaction model (4) are presented in table 6.4. The complete regression results are given in appendix 3.

The estimates from the interactions model place the results obtained from the basic linear model (2) in a new light: the significant and negative (–0.050%) estimate for the effect of net forest wealth on consumption observed for the whole subsample of forest owners, seems to results only from the much stronger and significant negative elasticity estimate (–0.116%) obtained for the farmer households. The estimate for the effect of housing wealth on consumption is also large and significant (0.110%) for the farmer forest owners. The main effects of net forest wealth and net housing wealth are insignificant, indicating that significant elasticities of consumption with respect to these wealth components are only observed for the farmer forest owners. The main effects of income (0.199%) and gross financial wealth (0.031%) on consumption are however significant, whilst the interaction terms are not, meaning that these elasticities appear to be identical for the whole sample of forest owners and the farmer forest owners subgroup. The estimate for the farmer dummy variable (the other main effect) is also included in the model and is insignificant, which suggests that the interaction effect of net forest wealth and the dummy is a robust finding.

32 For example the use of forestland for berry and mushroom picking, hunting or the building of a holiday home

One possible explanation for the negative and large estimate for forest owning farmer households is that these households who live in the immediate vicinity of their forestland estates are more likely to tend to the estate themselves, and may hence be more aware of the changes in the value of their forest wealth. Farmers also typically own more forest wealth on average and are more active in selling wood (hence realising their forest wealth gains), which may help explain the relatively large absolute value of the estimate and the insignificant estimate for the non-farmer households. Another intuitive interpretation for the results may be, that farmer households are likely to be engaging more in home production in general, which lowers *observed* consumption outside of the home (i.e. the dependent variable expenditures). Farmers may be consuming a proportion of their forest wealth directly in the form of for example heating, which would significantly lower the level of observed consumption for these households, especially around the time forest wealth gains are realised through logging. An attempt to shed some more light to the validity of this theory is made by running model (4) with expenditures on electricity and energy omitted from the dependent variable. This specification does not however alter the results notably, and the approach is hence not pursued further[33]. A feature also worth noting is that farmer owned forestland estates, and the logging income they generate, are often used for funding farm associated investments (Säylä, 2000). For many farmer households, personal finances are very closely tied to those of the farm. It is thus highly likely, that the realisation of forest wealth in the form of logging income coincides with a reduction in household consumption, in the case that logging income is indeed used to fund an investment. This would then lead to the observation of a negative estimate for the elasticity of consumption with respect to forest wealth. A more in depth analysis of this phenomenon would be possible with more detailed data spanning over several time periods.

The results for the subsample of forest owners and their possible explanations are both novel and interesting but it should be emphasised that the data set at hand is not ideal for the study of forest wealth effects on consumption. Caution should thus be exercised when interpreting the estimates from models (2) and (4).

6.3 Estimating Life-Cycle Behaviour in Consumption

Life-cycle theory maintains that households smooth consumption over their life time by saving, borrowing against their human wealth (e.g. higher future labour income in the case of younger households) and dissaving (e.g. using savings for consumption during retirement). The notion of consumption smoothing would imply that age itself is not necessarily a significant explanatory variable for the level of consumption, when controlling for all other factors correlated with both the level of consumption and age. However, age is of interest when we want to examine how it affects the *proportions* in which different *components of wealth and income* are used to fund consumption.

As the data set at hand is cross-sectional, it will not be possible to trace actual life-cycle behaviour of households in this study. The analysis will be confined to

33 Results not reported.

comparing differences in wealth effects between age groups during the observation period. For this purpose, regressions with interaction terms of the age dummies and income and wealth components (3) are performed for the whole sample, the subsample of homeowners and the subsample of forest owners. As expected, none of the estimates for the subsample of forest owners are significant. Since the majority of households in the subsample belong to the two oldest age groups, we cannot expect to see much variation in the results from such an interactions model. Slightly more surprising is the finding, that the interactions model does not yield significant results for the whole sample of households. To obtain some insight into this finding, fitted regression lines of the scatter diagrams of log expenditures against the different log income and wealth components by age group are plotted. For there to be notable differences in the elasticities of consumption between different age groups, graphs 6.1 through 6.4 should portray clearly observable variation in the slopes of the fit lines. As can be seen, such notable variation is only observed in the net housing wealth variable in graph 6.4. Although there is some slight variation in the slopes of the diagrams for income and financial wealth for different age groups, this variation is not strong enough to produce significant estimates from all of the interactions models.

Clear evidence of a life-cycle pattern in consumption is thus observable only for homeowners, and for the most part, only in the net housing wealth variable. This seems reasonable, given that housing is the single largest component of household wealth, and constitutes the majority of both total and physical wealth of households in Finland. The main results of interest from the age effects regression for the subsample of homeowners are presented in table 6.5. The complete regression results are given in appendix 4.

Figure 6.1
Log Expenditures against Log Income, Age Groups

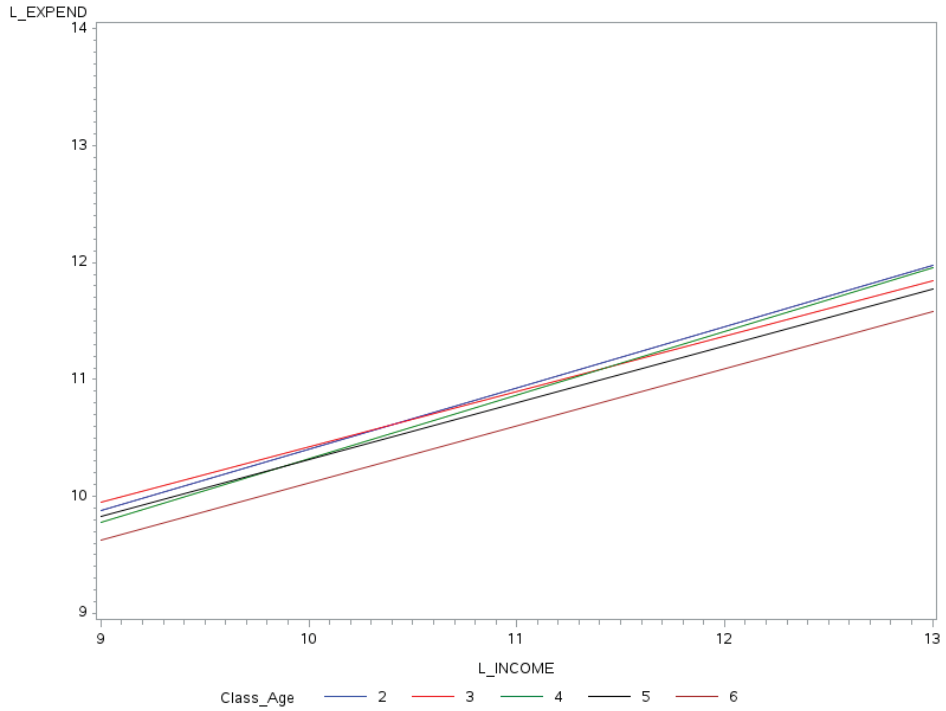

Figure 6.2
Log Expenditures against Log Gross Financial Wealth, Age Groups

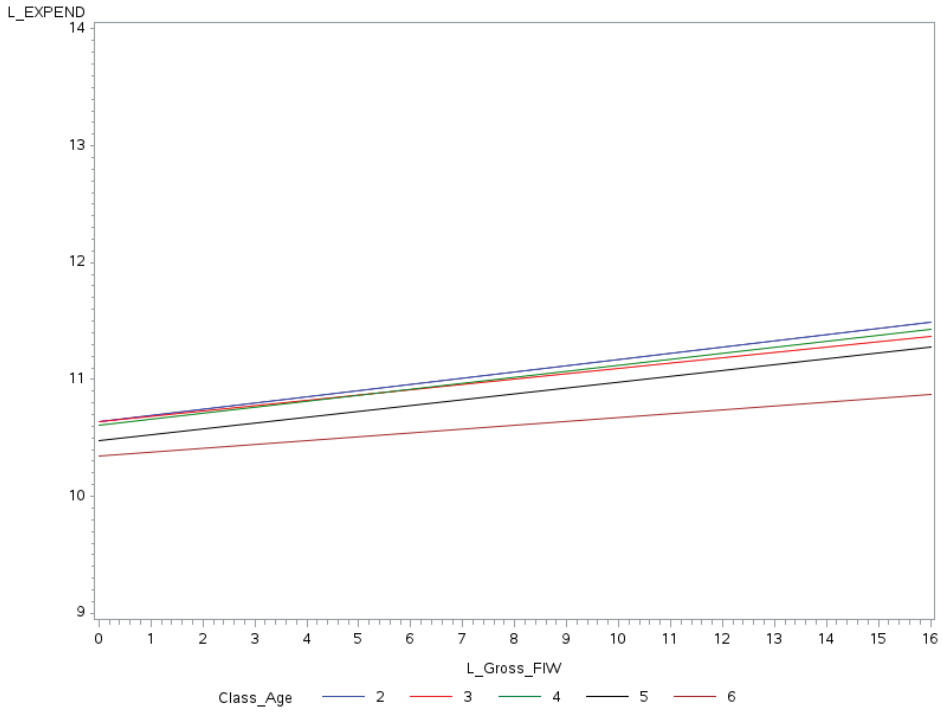

Figure 6.3
Log Expenditures against Log Net Forest Wealth, Age Groups

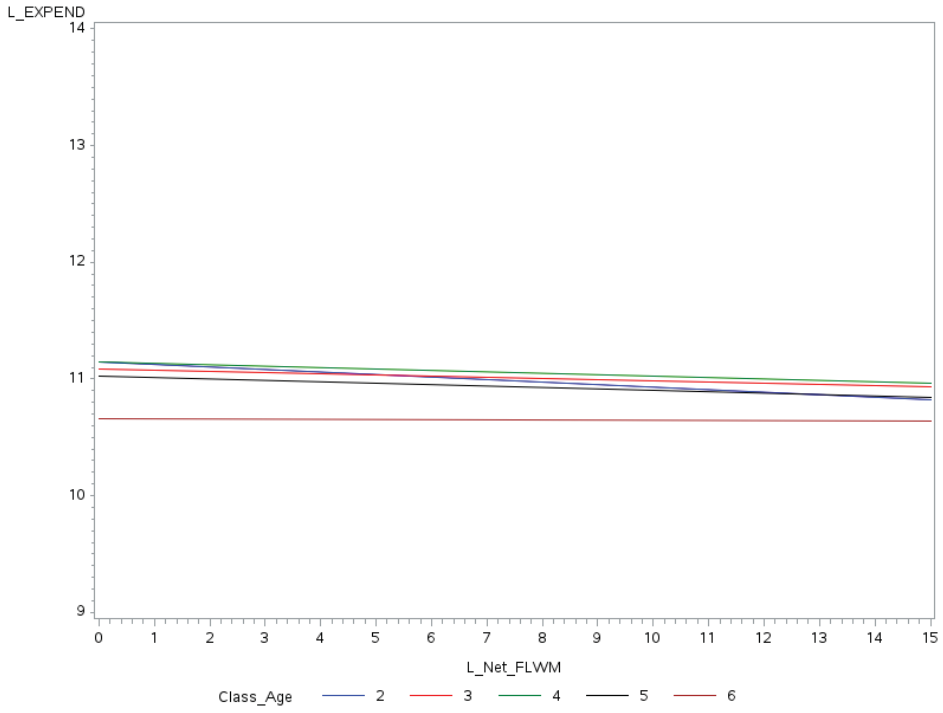

Figure 6.4
Log Expenditures against Log Net Housing Wealth, Age Groups

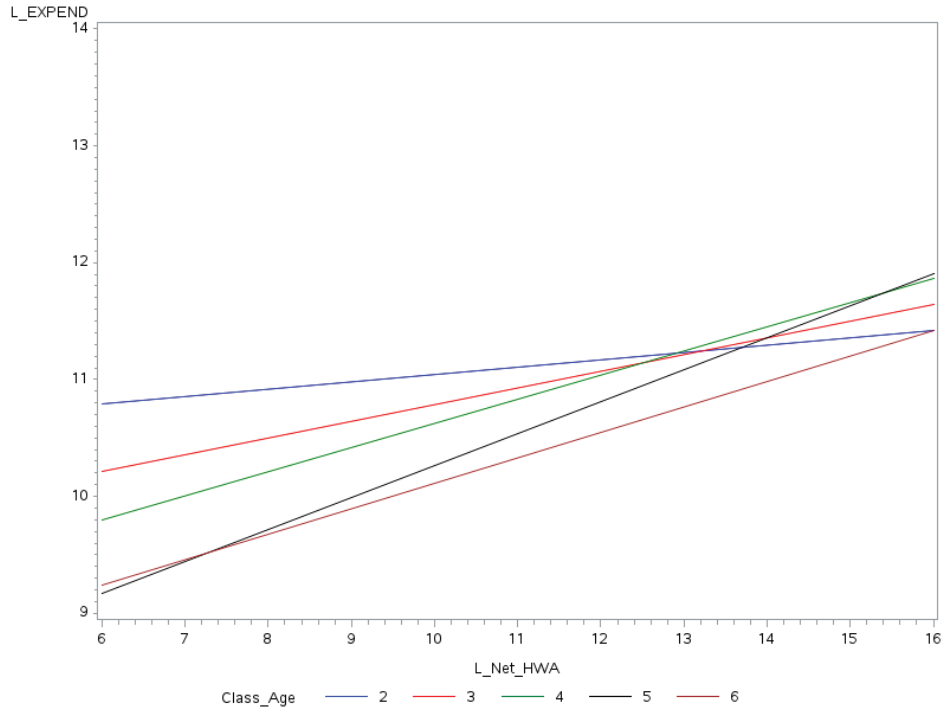

Table 6.5
Summary of elasticity of consumption estimates from the age effects regression. Subsample of homeowners. Model (3)

	Age 25–34 years	Age 35–44 years	Age 45–54 years	Age 55–64 years	Age over 64 years
Income	0.385%	0.385%	0.385%	0.385%	0.385%
Net Housing Wealth	0.036%*	0.079% *	0.107%	0.156%	0.139%
Gross Financial Wealth	0.049%	0.013%	0.027% *	0.029% *	0.021%

* = result significant only at 20 % level. F-tests for estimates performed.

The estimates from the age effects regression for the subsample of homeowners give evidence of the existence of a life-cycle pattern in consumption. The elasticity of consumption with respect to net housing wealth rises steadily with age and is the largest, 0.156%, for the group of households aged 55–64 years. In the light of life-cycle theory this is a sensible result, as these households are most likely to be downsizing their homes and realising their housing wealth gains ahead of retirement (Lehnert, 2004). The elasticity of consumption with respect to financial wealth displays a similar pattern, although the estimates are not as clearly significant as those for housing wealth. The larger estimate for the elasticity of consumption with respect to financial wealth for the youngest age group, may indicate that younger households are more likely to be credit constrained and earn less, rendering their consumption more sensitive to changes in the financial wealth component (Lehnert, 2004). Younger households may thus be more inclined to use their assets as a buffer stock in case of unanticipated changes in income rather than a long-term savings device.

Since household level panel data is not available for Finnish households, the above results are bound to be subject to endogeneity to a certain degree . However, as the

estimates in table 6.5 are derived for the subsample of homeowners, the claim of a behavioural link between changes in net housing wealth and expenditures does not seem unreasonable. The fact that evidence of life-cycle behaviour in consumption is clearly observable only for housing wealth, may to some degree reflect the effects of the Finnish statutory pension insurance system on the savings rate of households. As mentioned in chapter 1, claims due of households in statutory pension insurance funds are omitted from the estimates of household wealth. Statutory pension insurance payments into these funds by households (and their employers) before retirement guarantee a steady income for households in old age, which is likely to lower the incentives for private saving in preparation for retirement.

6.4 Concavity of the Consumption Function

Over the recent years, studies of income and wealth effects have focused on the impact of wealth distribution on consumption. The aim of this section is to briefly shed some light on the empirical finding that in the presence of income and asset price uncertainty, households with a precautionary savings motive typically have a concave consumption function both in wealth and income. This means that marginal propensities to consume[34] (MPCs) out of income and wealth should be decreasing along the wealth distribution (Mian et al., 2013).

As discussed in chapter 2, Mian et al. (2013) find evidence in their US based study, that the distribution of wealth and debt in an economy is important in explaining how aggregate consumption reacts to sudden changes in wealth. If households with less net wealth have a larger marginal propensity to consume out of wealth than wealthier households, a wealth shock that adversely affects the poorer households may cause aggregate consumption to fall more than predicted by traditional aggregate wealth models. In their study with data from the US and Europe, Carroll et al. (2013) also estimate the household level MPCs out of one-time income shocks (e.g. a fiscal stimulus) to be much larger for households with lower net wealth. In addition, they find that the marginal propensity to consume is on average lower in Europe than in the US because of a higher level of wealth and lower wealth inequality, and that the MPC is usually higher for low-wealth, low-income households.

In order to study if income and wealth effects on consumption differ by household wealth in Finland, model (2) is estimated separately for the net wealth quintiles of households using the whole sample of observations[35]. The detailed results are presented in appendix 5. The estimates for the effect of gross financial wealth on consumption, as those for income, are significant for all net wealth quintiles, since the majority of households hold at least some financial wealth, for example in the form of deposits. No clear decreasing pattern along the quintiles is observed for the elasticity of consumption with respect to income, although the elasticity

34 The marginal propensity to consume out of wealth can be interpreted to report by how many cents consumption will rise given a one euro increase in wealth.

35 It should be noted that this approach is not equivalent to studying the effects of transitory income shocks as in the paper by Carroll et al. (2013) or of sudden changes in wealth as in Mian et al. (2013).

Table 6.6
Marginal propensity to consume out of income and gross financial wealth. Household net wealth quintiles. Results in euros given a one euro increase in wealth

	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
Income	0.34	0.36	0.32	0.28	0.15
Gross Financial Wealth	1.79	0.18	0.09	0.02	0.01

of consumption with respect to financial wealth seems to be largest for the first (0.028%) and second (0.030%) net wealth quintiles. The elasticity is smallest for the fourth and fifth net wealth quintiles at 0.013% and 0.021%, respectively. However, the elasticities of consumption are estimates of the proportional change observed in consumption, given a proportional (1%) change in wealth, and are not as such comparable to MPCs. To this end, the marginal propensities to consume out of income and financial wealth are computed from the estimates by multiplying the observed elasticities by the ratio of each wealth quintile's median consumption to median income (or median gross financial wealth). The MPCs are reported in table 6.6.

The obtained estimates give some cautious support to the findings of Mian et al. (2013) and Carroll et al. (2013). The estimates of the MPCs are decreasing by household net wealth quintile, with the smallest MPCs out of both income and gross financial wealth observed for the highest quintile. This would suggest, that the consumption function for Finnish households is indeed concave[36]. The marginal propensities to consume out of income are also well within the range estimated by Carroll et al. (2013) for the US. In the light of the relatively even Finnish wealth distribution, the results could also help to explain why the financial wealth effect on consumption estimated for Finnish households is notably smaller than that obtained in some other studies using US data.

As Carroll and Kimball (1996) note in their paper, the notion that the consumption function is concave dates back to Keynesian macroeconomics[37]. It also seems intuitive, at least under the uncertainty of the real world, that as the wealth of a household increases, its marginal propensity to consume out of wealth and income decreases as the household engages in more saving. Standard perfect-certainty intertemporal optimisation models however imply that that the MPC is unrelated to the level of wealth (Carroll and Kimball, 1996). Carroll (1996) and Carroll and Kimball (1996) go on to show in their work, that introducing income uncertainty in to such a standard model does indeed result in a concave consumption function. As discussed previously, a visual inspection of the expenditures variable against the income and wealth components in the data set also suggests that there is a concave relationship between these variables (hence the log transformations).

36 It should be noted that some overlap in the 95% confidence intervals of the estimates is present.
37 Keynes argues in The General Theory of Employment, Interests and Money that the consumption function is concave.

6.5 Robustness Checks

This section presents robustness checks for the models employed in this study, along with discussion of the significance of survey design in regard to the results obtained. Regression details are given in appendix 6.

When conducting analysis using survey data, it is important to take into account the survey design used in the compilation of the data. In complex surveys, observations are often selected in to the sample with different probabilities. Sample weights included in the data set are reciprocals of these inclusion probabilities, that are further adjusted to account for nonresponse and calibrated to known population quantities (Lohr, 2012). The motivation behind the use of survey weights is, that it allows for statistical inference at population level based on the sample at hand. In general, in the presence of endogenous sampling, i.e. sampling in which the probability of selection varies with the dependent variable even after conditioning on the independent variables, estimation that ignores this sample design will be inconsistent (Solon et al., 2013). The impact of the use of survey weights on the regression point estimates can be seen by comparing the formulas for the OLS solutions for the standard and weighted least squares estimation. The standard least squares estimator in matrix form is given by $\hat{\beta} = (X'X)^{-1}X'Y$where $Y$is a $n \times 1$ vector of n observations on the dependent variable, X is the $n \times (k+1)$ matrix of n observations on the $k+1$ regressors (including the constant regressor for the intercept), and $(X'X)^{-1}$ is the inverse of the matrix $X'X$ (Stock and Watson, 2012). In the case when survey weights are used in the estimation, the formula alters to $\widehat{\beta_w} = (X'WX)^{-1}X'WY$ where W is a $n \times n$diagonal matrix with survey weights on the diagonal (Faiella, 2010).

Another reason for the application of survey design in analysis is the use of stratification and clustering[38] in sample selection. In stratified sampling the members of a population (e.g. households or individuals) are divided into uniform groups, strata, before sampling. After grouping, sampling is conducted within each group. In general, stratification reduces sampling error and hence improves the representativeness of the sample (SAS Institute, 2014). The use of stratification (or cluster) information does not affect the point estimates from the data, but omitting the stratification information may result in inaccurate estimation of standard errors, unless the survey design is a simple random sample (Lohr, 2012). In previous studies on wealth effects on consumption, survey considerations have seemingly quite often been omitted from the model design. One possible explanation is that complete data sets including information on weights and stratification are not readily disclosed to researchers outside of the compiling agency due to regulations concerning the confidentiality of the identities of respondents.

38 Clustering, or more specifically cluster sampling, refers to sampling that makes use of the naturally occurring groupings in a statistical population. Cluster sampling is not used in the sample selection of the data used in this analysis.

In this study, estimations are conducted using the SAS *surveyreg* procedure, which is able to handle complex survey sample designs including stratification, clustering, and unequal weighting. To perform robustness checks, the same models are estimated with the use of the SAS reg procedure, which is a general-purpose procedure for regression (SAS Institute, 2014). The *reg* procedure enables estimation with weights, but does not allow for the use stratification or domain[39] information in the regression analysis. The linear model (2) is first run without the use of weights, then with weights but omitting all control variables and finally with weights and control variables including dummy variables accounting for stratification by profession (i.e. each household belonging to either the group of employees, entrepreneurs, farmers, pensioners or others). Appendix 6 reports full regression results for the subsample of homeowners and the subsample of forest owners.

Results from the estimations using the SAS reg procedure are similar to the ones obtained using the SAS *surveyreg* procedure. There is some slight variation in the point estimates obtained from the different models, notably so in the case of the simple model without control variables. The variation between the two procedures is greater for the subsample of forest owners, which is to be expected, given the smaller size of the subsample. The estimates from the model with weights and dummies accounting for stratification are almost identical to the ones obtained using *proc surveyreg* for both homeowners and forest owners. The standard errors do not differ greatly for any model from those estimated using the *proc surveyreg* procedure. In light of these results, it seems safe to conclude that the estimation results from the main models of this study are robust.

39 As the formation of the groups of homeowners and forest owners is unrelated to the sample design, the sample sizes for the domains are random variables. The domain statement incorporates this variability into the variance estimation, whilst analysing the subsamples directly may yield inappropriate estimates of variance. (SAS Institute, 2014.)

7. Conclusion

The aim of this paper is to study the effects of household wealth, especially physical wealth, on consumption in Finland. The results from the study provide evidence in support of the existence of such a wealth effect on consumption regarding housing wealth, forest wealth and financial wealth. To the best of my knowledge, no previous studies on forest wealth effects on consumption have been performed, but the obtained results for the other wealth components are in line with the preceding literature. The empirical estimation of wealth effects is conducted using cross-sectional household level data obtained from the 1998 Household Wealth Survey compiled by Statistics Finland. The estimation of wealth effects is performed taking into account the survey design used in the compilation of the data. The use of sample weights in estimation allows for statistical inference at population level based on the sample at hand, whilst stratification reduces sampling error and improves the precision of the estimates.

This study finds the housing wealth effect on consumption to be positive and much larger than the financial wealth effect for households that are homeowners. The magnitude of the wealth effect does however seem to differ by the amount of accumulated net housing wealth, and may be negative or nonexistent for households with positive but small net housing wealth. For the whole sample (i.e. sample including households who are renting) the housing wealth effect is found to be slightly negative. This negative effect of an increase in housing wealth on consumption may to some extent reflect the effect of rising housing prices on those households that are not homeowners, and those households with positive but small net housing wealth (i.e. households with a large mortgage relative to house value). Evidence of the existence of a life-cycle pattern in consumption is also confirmed for the subsample of homeowners by comparing differences in wealth effects between household age groups.

A somewhat surprising discovery from this study is that the effect of forest wealth on consumption appears negative for the subsample of forest owners. Further study reveals that the negative estimate for the effect of net forest wealth on consumption observed for the whole subsample seems to arise from the much stronger and significant negative elasticity estimate obtained for the subgroup of forest owning farmer households. This finding could in part be explained by the skewed age distribution of forest owning households, the fact that farmer households are likely to be engaging more in home production, which lowers *observed* consumption outside of the home, and that farmer owned forestland estates, and the logging income they generate, are often used for funding farm associated investments.

In order to study the concavity of the consumption function in Finland, wealth and income effects are estimated separately for the net wealth quintiles of households using the whole sample of observations. The results indicate that the effect of a change in financial wealth or income on consumption is indeed larger for households with small total net wealth. This finding suggests that in the case of a wealth or income shock that adversely affects households with less net wealth,

the economy level effects on aggregate consumption may be larger than those estimated by traditional models.

The study of wealth effects on consumption would benefit greatly if better quality household level data for research purposes were made available. Access to household level panel data would help to tackle endogeneity issues and allow researchers to trace actual life-cycle behaviour by following the development of the wealth and consumption of the same households through time. With year-specific data, the analysis of life-cycle behaviour is confined to comparing possible differences in wealth effects between age groups during the observation period. For a more in depth analysis of the effects of forest wealth on consumption in Finland, the phenomenon should be studied using more recent and more accurate data on the forest wealth of households.

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Appendix 1

A. Dependent variable

Expenditures
Food (in home and in restaurants)
+ Clothes
+ Housing (includes rental costs, power & heating, interest on mortgage loans, renovation costs etc.)
+ Healthcare
+ Travel (includes transportation costs and travel for leisure)
+ IT costs
+ Leisure
+ Childcare
+ Insurance

B. Independent variables

Income
(Investment income is omitted from the analysis)

Total household labour income
+ Income transfers (including pensions from statutory pension insurance funds)
– Taxes
– Statutory pension insurance payments
– Alimony

Gross Housing wealth (asset value)
Value of primary residence
+ Value of other owner occupied or investment residences (excluding holiday homes)

Net Housing wealth
Gross housing wealth
– Mortgage debt

Gross Forest wealth (market value)
Taxation value of forest wealth * (2.0416)
+ Forest sales income

Net Forest wealth
Forest wealth market value
– Forest related debt

Gross Financial wealth (asset value)
Deposits

+ Value of stock holdings
+ Value of holdings in bonds and securities
+ Private pension insurance and (investment) assurance policies
+ Claims due (does not include claims in statutory pension insurance funds)
+ Cash holdings

C. Control variables

Categorical variables for sociodemographic characteristics of households

Age
By reference individual 6 age groups at ten year intervals
< 25 years, 24-35 years, …, > 64 years

Education Level
By reference individual
3 levels: Primary Education or None, High School or Vocational School, Bachelor's Degree or higher

Employed
= 1 if one or more household members are in employment

Gender
= 1 if reference individual is male

Geographic Location
5 areas: Metropolitan, Other Southern Finland, Eastern Finland, Central Finland, Northern Finland

Inheritance
= 1 if the household has received inheritance during the past 4 years

Liabilities
=1 if household has debt

Married
=1 if reference individual is married or cohabiting

Members
Continuous variable
Number of individuals in household.

Net Wealth Quintiles
Quintiles by household net wealth (all wealth, including holiday homes and vehicles).

Presence of children
=1 if household has children under the age of 18

Appendix 2

Table A2.1
Regression results for model (1). Monetary variables in logs

Variable	Estimate	Standard Error	t-value	Pr > |t|
Intercept	6.707	0.313	21.450	0.000
Income	**0.357**	**0.029**	**12.280**	**0.000**
Net Housing Wealth	**–0.087**	**0.017**	**–5.170**	**0.000**
Net Housing Wealth2	**0.007**	**0.001**	**4.980**	**0.000**
Net Forest Wealth	–0.002	0.002	–0.910	0.360
Gross Financial Wealth	**0.024**	**0.003**	**7.060**	**0.000**
Age 35–44 years	0.004	0.024	0.150	0.881
Age 45–54 years	–0.017	0.025	–0.690	0.493
Age 55–64 years	**–0.062**	**0.032**	**–1.920**	**0.055**
Age over 64 years	**–0.147**	**0.037**	**–3.970**	**0.000**
Metropolitan area	**0.042**	**0.023**	**1.810**	**0.071**
Eastern Finland	**–0.053**	**0.023**	**–2.330**	**0.020**
Central Finland	0.005	0.024	0.210	0.837
Northern Finland	–0.011	0.025	–0.450	0.652
Intermed. Level Ed.	**0.077**	**0.021**	**3.700**	**0.000**
Higher Level Ed.	**0.146**	**0.027**	**5.420**	**0.000**
Employed	**0.123**	**0.026**	**4.760**	**0.000**
Gender	0.017	0.017	1.000	0.318
Presence of Children	0.031	0.026	1.190	0.233
Inheritance	**0.074**	**0.020**	**3.630**	**0.000**
Married	**0.050**	**0.021**	**2.350**	**0.019**
Members	**–0.059**	**0.010**	**–5.780**	**0.000**
Liabilities	0.131	0.019	6.870	0.000
2nd Wealth Quintile	–0.044	0.032	–1.380	0.167
3rd Wealth Quintile	**–0.112**	**0.042**	**–2.650**	**0.008**
4th Wealth Quintile	**–0.106**	**0.050**	**–2.140**	**0.033**
5th Wealth Quintile	–0.088	0.058	–1.510	0.131
Adjusted R^2	0.431			
Sample Size	3576			

Appendix 3

Table A3.1
1 Interactions regression results for the subsample of forest owners. Model (4). Monetary variables in logs

Variable	Estimate	Standard Error	t-value	Pr > |t|
Intercept	7.745	0.792	9.780	0.000
Income	**0.199**	**0.080**	**2.490**	**0.013**
Net Housing Wealth	0.005	0.008	0.690	0.488
Net Forest Wealth	−0.032	0.028	−1.110	0.267
Gross Financial Wealth	**0.031**	**0.011**	**2.770**	**0.006**
Income*Farmer	0.098	0.105	0.930	0.352
Net HW*Farmer	**0.110**	**0.051**	**2.150**	**0.031**
Net FLW*Farmer	**−0.116**	**0.049**	**−2.350**	**0.019**
Gross FIW*Farmer	0.002	0.019	0.100	0.923
Farmer	−1.180	1.162	−1.020	0.310
Age 35–44 years	0.031	0.083	0.370	0.712
Age 45–54 years	0.025	0.086	0.290	0.775
Age 55–64 years	0.006	0.093	0.070	0.946
Age over 64 years	−0.132	0.109	−1.210	0.225
Metropolitan area	**−0.169**	**0.094**	**−1.800**	**0.072**
Eastern Finland	−0.104	0.057	−1.830	0.067
Central Finland	−0.042	0.056	−0.750	0.455
Northern Finland	0.052	0.065	0.810	0.419
Intermed. Level Ed.	**0.084**	**0.051**	**1.660**	**0.097**
Higher Level Ed.	**0.185**	**0.066**	**2.790**	**0.005**
Employed	**0.186**	**0.063**	**2.930**	**0.003**
Gender	−0.002	0.045	−0.040	0.966
Presence of Children	0.080	0.066	1.200	0.230
Inheritance	0.083	0.054	1.530	0.125
Married	0.020	0.053	0.370	0.711
Members	**−0.075**	**0.021**	**−3.490**	**0.001**
Liabilities	**0.182**	**0.045**	**4.050**	**0.000**
2nd Wealth Quintile	**0.836**	**0.122**	**6.850**	**0.000**
3rd Wealth Quintile	**0.700**	**0.090**	**7.780**	**0.000**
4th Wealth Quintile	**0.785**	**0.085**	**9.280**	**0.000**
5th Wealth Quintile	**0.954**	**0.092**	**10.330**	**0.000**
Adjusted R^2	0.352			
Sample Size	795			

Appendix 4

Table A4.1
Regression results for age effects model, subsample of homeowners. Model (3). Monetary variables in logs

Variable	Estimate	Standard Error	t -value	Pr > |t|
Intercept	5.980	1.170	5.110	0.000
Income	**0.385**	**0.097**	**3.960**	**0.000**
Net Housing Wealth	0.036	0.029	1.270	0.204
Net Forest Wealth	−0.009	0.008	−1.140	0.256
Gross Financial Wealth	**0.050**	**0.016**	**3.040**	**0.002**
Income*(Age 35–44)	−0.085	0.107	−0.800	0.425
Income*(Age 45–54)	0.021	0.104	0.200	0.843
Income*(Age 55–64)	−0.028	0.109	−0.260	0.798
Income*(Age > 64)	−0.134	0.128	−1.050	0.295
Net HW*(Age 35–44)	0.042	0.032	1.310	0.191
Net HW*(Age 45–54)	0.070	0.033	2.120	0.034
Net HW*(Age 55–64)	**0.119**	**0.046**	**2.570**	**0.010**
Net HW*(Age > 64)	**0.102**	**0.042**	**2.430**	**0.015**
Net FLW*(Age 35–44)	**0.007**	**0.009**	**0.750**	**0.452**
Net FLW*(Age 45–54)	0.007	0.009	0.740	0.459
Net FLW*(Age 55–64)	0.009	0.009	1.030	0.304
Net FLW*(Age > 64)	0.005	0.010	0.530	0.595
Gross FIW*(Age 35–44)	**−0.037**	**0.018**	**−2.070**	**0.039**
Gross FIW*(Age 45–54)	−0.023	0.018	−1.310	0.190
Gross FIW*(Age 55–64)	−0.021	0.018	−1.160	0.247
Gross FIW*(Age > 64)	**−0.029**	**0.018**	**−1.640**	**0.102**
Age 35–44 years	0.794	1.252	0.630	0.526
Age 45–54 years	−0.909	1.242	−0.730	0.464
Age 55–64 years	−1.055	1.314	−0.800	0.422
Age over 64 years	0.352	1.441	0.240	0.807
Metropolitan area	−0.013	0.028	−0.450	0.651
Eastern Finland	−0.036	0.026	−1.380	0.168
Central Finland	0.039	0.029	1.330	0.183
Northern Finland	0.008	0.029	0.290	0.775
Intermed. Level Ed.	**0.086**	**0.024**	**3.560**	**0.000**
Higher Level Ed.	**0.155**	**0.030**	**5.170**	**0.000**
Employed	**0.098**	**0.035**	**2.790**	**0.005**
Gender	0.008	0.021	0.390	0.698
Presence of Children	0.022	0.030	0.730	0.463
Inheritance	0.087	0.022	3.860	0.000
Married	**0.093**	**0.025**	**3.660**	**0.000**
Members	**−0.056**	**0.011**	**−4.950**	**0.000**
Liabilities	**0.154**	**0.023**	**6.770**	**0.000**
2nd Wealth Quintile	**−0.351**	**0.115**	**−3.060**	**0.002**
3rd Wealth Quintile	**−0.419**	**0.120**	**−3.480**	**0.001**
4th Wealth Quintile	**−0.413**	**0.124**	**−3.330**	**0.001**
5th Wealth Quintile	**−0.398**	**0.129**	**−3.070**	**0.002**
Adjusted R^2	0.441			
Sample Size	2900			

Appendix 5

Table A5.1
Regression results by net wealth quintiles (domains). Model (2). Monetary variables in logs

Variable	1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
Intercept	6.302*	5.39*	5.299*	6.258*	8.007*
	(0.874)	(0.748)	(0.652)	(0.609)	(0.483)
Income	**0.395***	**0.479***	**0.485***	**0.412***	**0.214***
	(0.081)	**(0.068)**	**(0.060)**	**(0.054)**	**(0.045)**
Net Housing Wealth	0.021**	–0.005	–0.010**	–0.022**	0.022*
	(0.009)	(0.005)	(0.005)	(0.009)	(0.008)
Net Forest Wealth	–0.096*	0.009	–0.007***	–0.011*	–0.002
	(0.011)	(0.009)	(0.004)	(0.004)	(0.003)
Gross Financial Wealth	**0.028***	**0.030***	**0.023***	**0.013****	**0.021****
	(0.008)	**(0.009)**	**(0.006)**	**(0.006)**	**(0.010)**
Age 35–44 years	–0.063	0.035	0.032	0.008	–0.003
	(0.046)	(0.048)	(0.052)	(0.058)	(0.074)
Age 45–54 years	–0.010	–0.059	0.016	0.013	–0.028
	(0.065)	(0.049)	(0.049)	(0.058)	(0.068)
Age 55–64 years	0.0320	–0.197***	–0.122***	0.003	–0.010
	(0.091)	(0.103)	(0.068)	(0.072)	0.074)
Age over 64 years	–0.127	–0.298*	–0.097	–0.080	–0.156***
	(0.085)	(0.083)	(0.076)	(0.086)	(0.090)
Metropolitan area	0.131**	0.096***	–0.067	0.079	–0.030
	(0.054)	(0.054)	(0.054)	(0.051)	(0.043)
Eastern Finland	–0.117	–0.024	–0.060	–0.029	–0.078
	(0.081)	(0.046)	(0.040)	(0.049)	(0.052)
Central Finland	0.005	–0.080	0.030	0.039	–0.004
	(0.050)	(0.050)	(0.046)	(0.051)	(0.059)
Northern Finland	–0.013	–0.022	–0.063	0.052	0.075
	(0.047)	(0.048)	(0.046)	(0.046)	(0.093)
Intermed. Level Ed.	0.053	0.025	0.004	0.076***	0.185*
	(0.051)	(0.052)	(0.042)	(0.040)	(0.043)
Higher Level Ed.	0.101	0.104***	0.126**	0.121**	0.263*
	(0.075)	(0.063)	(0.060)	(0.048)	(0.051)
Employed	0.120**	0.027	0.085	0.147**	0.118**
	(0.053)	(0.059)	(0.063)	(0.060)	(0.055)
Gender	–0.021	0.027	0.042	0.035	–0.028
	(0.039)	(0.039)	(0.033)	(0.037)	(0.038)
Presence of Children	–0.052	0.137**	0.028	0.014	0.048
	(0.061)	(0.057)	(0.052)	(0.054)	(0.057)
Inheritance	0.097	0.002	0.016	0.061***	0.142*
	(0.061)	(0.045)	(0.042)	(0.037)	(0.039)
Married	–0.063	–0.012	0.052	0.105**	0.103**
	(0.048)	(0.052)	(0.041)	(0.044)	(0.047)
Members	–0.031	–0.067*	–0.049*	–0.052**	–0.087*
	(0.025)	(0.021)	(0.018)	(0.022)	(0.026)
Liabilities	0.122*	0.078	0.084**	0.157*	0.219*
	(0.046)	(0.052)	(0.043)	(0.040)	(0.037)
Adjusted R^2	0.508	0.469	0.445	0.473	0.415
Sample Size	356	535	771	880	1034

Significance Levels: * = 1 %, ** = 5 %, *** = 10 %. Robust standard errors in parentheses.

Appendix 6

Table A6.1
Robustness check. Regression results for the subsample of homeowners, no weights. Model (2).
Monetary variables in logs

Variable	Estimate	Heteroscedasticity Consistent Standard Error	t-value	Pr > |t|
Intercept	6.417	0.332	19.340	0.000
Income	**0.311**	**0.025**	**12.380**	**0.000**
Net Housing Wealth	**0.096**	**0.017**	**5.740**	**0.000**
Net Forest Wealth	**–0.008**	**0.002**	**–4.470**	**0.000**
Gross Financial Wealth	**0.021**	**0.004**	**5.560**	**0.000**
Age 35–44 years	–0.005	0.027	–0.180	0.857
Age 45–54 years	–0.034	0.027	–1.260	0.208
Age 55–64 years	**–0.123**	**0.034**	**–3.670**	**0.000**
Age over 64 years	**–0.253**	**0.041**	**–6.090**	**0.000**
Metropolitan area	0.011	0.023	0.490	0.622
Eastern Finland	–0.038	0.022	–1.690	0.091
Central Finland	–0.027	0.023	–1.180	0.238
Northern Finland	0.010	0.025	0.380	0.702
Intermed. Level Ed.	**0.064**	**0.019**	**3.310**	**0.001**
Higher Level Ed.	**0.132**	**0.025**	**5.230**	**0.000**
Employed	**0.079**	**0.029**	**2.690**	**0.007**
Gender	0.013	0.017	0.790	0.432
Presence of Children	0.021	0.023	0.880	0.378
Inheritance	**0.060**	**0.018**	**3.360**	**0.001**
Married	**0.101**	**0.021**	**4.710**	**0.000**
Members	**–0.062**	**0.008**	**–7.320**	**0.000**
Liabilities	**0.148**	**0.018**	**8.040**	**0.000**
2nd Wealth Quintile	**–0.277**	**0.115**	**–2.400**	**0.017**
3rd Wealth Quintile	**–0.390**	**0.119**	**–3.280**	**0.001**
4th Wealth Quintile	**–0.373**	**0.122**	**–3.050**	**0.002**
5th Wealth Quintile	**–0.328**	**0.127**	**–2.580**	**0.010**
Adjusted R^2	0.378			
Sample Size	2900			

Table A6.2
Robustness check. Regression results for the subsample of homeowners, with weights and no controls. Model (2).
Monetary variables in logs

Variable	Estimate	Heteroscedasticity Consistent Standard Error	t-value	Pr > |t|
Intercept	3.598	0.367	9.790	0.000
Income	**0.585**	**0.033**	**17.880**	**0.000**
Net Housing Wealth	**0.041**	**0.013**	**3.110**	**0.002**
Net Forest Wealth	**–0.006**	**0.003**	**–2.450**	**0.015**
Gross Financial Wealth	**0.026**	**0.004**	**5.950**	**0.000**
Adjusted R^2	0.308			
Sample Size	2900			

Appendix 6 (cont.)

Table A6.3
Robustness check. Regression results for the subsample of homeowners, with weights and controls including strata dummies. Model (2). Monetary variables in logs

Variable		Heteroscedasticity Consistent		
	Estimate	Standard Error	t–value	Pr > |t|
Intercept	6.023	0.423	14.240	0.000
Income	**0.338**	**0.033**	**10.230**	**0.000**
Net Housing Wealth	**0.103**	**0.019**	**5.380**	**0.000**
Net Forest Wealth	**–0.002**	**0.003**	**–0.780**	**0.438**
Gross Financial Wealth	**0.025**	**0.004**	**5.910**	**0.000**
Age 35–44 years	–0.025	0.032	–0.800	0.426
Age 45–54 years	–0.049	0.032	–1.530	0.125
Age 55–64 years	**–0.083**	**0.040**	**–2.080**	**0.038**
Age over 64 years	**–0.134**	**0.054**	**–2.490**	**0.013**
Metropolitan area	–0.014	0.028	–0.500	0.619
Eastern Finland	–0.039	0.026	–1.520	0.129
Central Finland	0.040	0.029	1.370	0.170
Northern Finland	0.006	0.030	0.220	0.829
Intermed. Level Ed.	**0.091**	**0.024**	**3.780**	**0.000**
Higher Level Ed.	**0.158**	**0.030**	**5.210**	**0.000**
Employed	**0.075**	**0.039**	**1.940**	**0.053**
Gender	0.007	0.021	0.340	0.735
Presence of Children	0.027	0.029	0.930	0.352
Inheritance	**0.081**	**0.023**	**3.570**	**0.000**
Married	**0.089**	**0.025**	**3.550**	**0.000**
Members	**–0.055**	**0.011**	**–4.950**	**0.000**
Liabilities	**0.151**	**0.023**	**6.590**	**0.000**
2nd Wealth Quintile	**–0.416**	**0.112**	**–3.700**	**0.000**
3rd Wealth Quintile	**–0.510**	**0.115**	**–4.430**	**0.000**
4th Wealth Quintile	**–0.505**	**0.119**	**–4.240**	**0.000**
5th Wealth Quintile	**–0.476**	**0.125**	**–3.810**	**0.000**
Employees	**0.047**	**0.027**	**1.760**	**0.078**
Entrepreneurs	**0.130**	**0.038**	**3.470**	**0.001**
Farmers	–0.047	0.040	–1.160	0.245
Pensioners	–0.037	0.042	–0.880	0.376
Adjusted R^2	0.437			
Sample Size	2900			

Appendix 6 (cont.)

Table A6.4
Robustness check. Regression results for the subsample of forest owners, no weights. Model (2).
Monetary variables in logs

Variable	Estimate	Heteroscedasticity Consistent Standard Error	t-value	Pr > |t|
Intercept	7.350	0.462	15.900	0.000
Income	**0.278**	**0.042**	**6.620**	**0.000**
Net Housing Wealth	**0.013**	**0.007**	**1.920**	**0.055**
Net Forest Wealth	**–0.067**	**0.017**	**–4.000**	**0.000**
Gross Financial Wealth	**0.021**	**0.008**	**2.520**	**0.012**
Age 35–44 years	**0.117**	**0.067**	**1.760**	**0.079**
Age 45–54 years	**0.060**	**0.065**	**0.910**	**0.363**
Age 55–64 years	–0.041	0.072	–0.570	0.571
Age over 64 years	–0.200	0.087	–2.290	0.022
Metropolitan area	–0.077	0.079	–0.970	0.333
Eastern Finland	–0.061	0.042	–1.470	0.143
Central Finland	**–0.087**	**0.043**	**–2.030**	**0.042**
Northern Finland	0.022	0.050	0.440	0.657
Intermed. Level Ed.	0.049	0.038	1.300	0.193
Higher Level Ed.	**0.163**	**0.052**	**3.140**	**0.002**
Employed	0.062	0.051	1.220	0.223
Gender	–0.016	0.035	–0.460	0.645
Presence of Children	0.071	0.049	1.460	0.144
Inheritance	0.022	0.035	0.620	0.532
Married	**0.111**	**0.043**	**2.610**	**0.009**
Members	**–0.083**	**0.016**	**–5.080**	**0.000**
Liabilities	**0.174**	**0.033**	**5.200**	**0.000**
2nd Wealth Quintile	**0.799**	**0.103**	**7.770**	**0.000**
3rd Wealth Quintile	**0.696**	**0.072**	**9.730**	**0.000**
4th Wealth Quintile	**0.761**	**0.064**	**11.830**	**0.000**
5th Wealth Quintile	**0.906**	**0.072**	**12.560**	**0.000**
Adjusted R^2	0.283			
Sample Size	795			

Table A6.5
Robustness check. Regression results for the subsample of forest owners, with weights and no controls. Model (2).
Monetary variables in logs

Variable	Estimate	Heteroscedasticity Consistent Standard Error	t-value	Pr > |t|
Intercept	6.859	0.767	8.940	0.000
Income	**0.345**	**0.081**	**4.250**	**0.000**
Net Housing Wealth	**0.020**	**0.008**	**2.580**	**0.010**
Net Forest Wealth	**–0.041**	**0.024**	**–1.690**	**0.091**
Gross Financial Wealth	**0.039**	**0.012**	**3.300**	**0.001**
Adjusted R^2	0.166			
Sample Size	795			

Appendix 6 (cont.)

Table A6.6
Robustness check. Regression results for the subsample of forest owners, with weights and controls including strata dummies. Model (2). Monetary variables in logs

Variable		Heteroscedasticity Consistent		
	Estimate	Standard Error	t–value	Pr > |t|
Intercept	7.848	0.619	12.690	0.000
Income	**0.199**	**0.063**	**3.170**	**0.002**
Net Housing Wealth	0.006	0.007	0.850	0.397
Net Forest Wealth	–0.037	0.026	–1.460	0.145
Gross Financial Wealth	**0.029**	**0.010**	**2.920**	**0.004**
Age 35–44 years	0.054	0.082	0.650	0.514
Age 45–54 years	0.036	0.085	0.430	0.670
Age 55–64 years	0.038	0.093	0.410	0.685
Age over 64 years	–0.178	0.111	–1.610	0.109
Metropolitan area	**–0.158**	**0.092**	**–1.720**	**0.087**
Eastern Finland	**–0.112**	**0.056**	**–2.010**	**0.045**
Central Finland	–0.043	0.057	–0.740	0.457
Northern Finland	0.061	0.062	0.980	0.327
Intermed. Level Ed.	**0.084**	**0.051**	**1.660**	**0.098**
Higher Level Ed.	**0.173**	**0.068**	**2.550**	**0.011**
Employed	**0.146**	**0.068**	**2.160**	**0.031**
Gender	–0.018	0.045	–0.390	0.696
Presence of Children	0.081	0.068	1.190	0.236
Inheritance	**0.087**	**0.052**	**1.670**	**0.096**
Married	0.024	0.053	0.450	0.651
Members	**–0.077**	**0.022**	**–3.450**	**0.001**
Liabilities	**0.185**	**0.044**	**4.190**	**0.000**
2nd Wealth Quintile	**0.738**	**0.130**	**5.650**	**0.000**
3rd Wealth Quintile	**0.572**	**0.104**	**5.510**	**0.000**
4th Wealth Quintile	**0.644**	**0.094**	**6.850**	**0.000**
5th Wealth Quintile	**0.807**	**0.099**	**8.170**	**0.000**
Employees	**0.178**	**0.071**	**2.490**	**0.013**
Entrepreneurs	**0.158**	**0.083**	**1.900**	**0.059**
Farmers	0.045	0.062	0.720	0.469
Pensioners	**0.193**	**0.075**	**2.580**	**0.010**
Adjusted R^2	0.332			
Sample Size	795			

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