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# Portfolio Composition of Individual Investors in Finland[1]


## ABSTRACT

*The purpose of this study is to research the relationship between investor characteristics and property ownership. The data in this paper are obtained from the Finnish tax authorities and consists of property ownership records of 51,673 inhabitants of Finland, which represent the situation as at December 31, 2000. The aggregate value of total wealth is divided into nine sub-categories, i.e. (1) forest, (2) real estate, (3) apartments, (4) family enterprises, (5) foreign property, (6) shares of mutual funds, (7) private firm net assets, (8) agricultural net assets, and (9) other property. In the paper a descriptive analysis is employed to create an understanding of the wealth distribution in Finland, a regression analysis is conducted in order to identify the key drivers for wealth in Finland, and lastly, I will use Markowitz's Portfolio Selection model to examine the optimality of portfolio composition among Finnish individual investors. The results indicate that wealth is concentrated among more senior people, that females have less property than males, and that Swedish as a mother tongue has a positive effect on property ownership. Also debt and income have a positive correlation with wealth. In addition, Finnish individual investors do not have very optimal portfolios, but people with higher income or wealth have more optimal portfolios than others.*


***Key words:*** *Property ownership, asset allocation, wealth, income, capital gain, individual investor, modern portfolio theory*

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## 1. INTRODUCTION

Wealth and income, in all forms, have a central role in determining people's consumption habits, standards of living and social status. Therefore, they are important also in the field of finance. During the last decade there has also occurred a switch from saving on a risk free savings account towards a more complex portfolio. Owning stocks, bonds, mutual funds, options, and other risky assets, is no longer just the domain of the rich and adventurous.

Despite of this, very little is known about the patterns of property ownership in Finland. The main reason is probably the fact that there are no sources of property ownership data readily available. This paper fills in some of the gap by presenting an analysis of property ownership patterns among the population of Finland at the end of year 2000. By using the data obtained from the Finnish tax authorities, the study also adds to the literature by introducing a unique and comprehensive data source, which has not been used by many researchers in Finland.

Another phenomenon in Finland that has been explored very little is the optimality of portfolio composition. Modern portfolio theory and its applicability are common topics in financial journals and other forums but the testing of the theory in practise has been limited to stocks and other financial instruments (e.g. Cohn et al., 1975 and McInish et al., 1993), most probably because of the lack of data. To widen the applicability of the Markowitz Portfolio Selection model this paper utilises the entire range of asset classes and investigates the optimality of Finnish investors' portfolios in relation to the efficient frontier.

In some respect, this paper is an extension to the study of Karhunen and Keloharju (2001), which looked, among other things, at share-ownership patterns in Finland in June 2000. The main difference is that in this paper the study is extended from the mere investment wealth to all categories of property. Moreover, portfolio optimality and the impacts of investor characteristics on property ownership patterns are considered thoroughly. However, for practical purposes and to set up a framework for further studies, this paper concentrates only on individual investors in Finland.

The remainder of the paper is organised as follows. The next section describes the data used in this paper, and the third one presents the results of the descriptive analysis. The fourth section shows the results from the regression analyses, and section five deals with the portfolio optimality measures. Section six concludes the paper.



## 2. DATA

The data consist of property ownership records of 51,673 inhabitants of Finland. The ownership records represent the situation as at December 31, 2000 and they are calculated accord-

ing to taxation values. The income measures are gross measures for the fiscal year 2000. The sample is selected on the basis of the latter part of the Finnish social security code of individual investors. This code can be consider as random and should have no effect on, for example, the value of property that a person holds. Fredriksson (2002) describes the selection process in more detail.

The data include total wealth (forest, real estate, apartments, family enterprises, foreign property, shares of mutual funds, private firm net assets, agricultural net assets, and other property), debt (mortgages and equivalent debt, and other debt), the yearly salary income (salaries from both the primary and the secondary employers, and social benefits such as pensions, subsidies for students, and unemployment benefits), the yearly capital gain (rent, dividends, profit and loss from assets sold, and other capital gain), gender, age (as full years at the end of 2000), mother tongue (Finnish or Swedish, according to the language of the official documents requested by the person him- or herself), city of residence, province of residence, and housing status (whether the person owns the house or apartment that she or he is living in).

Taxation values are used in the data throughout the study, which might raise some thoughts about the validity of the results. However, taxation follows a unique set of valuation logic, which ensures equal treatment for all asset categories. For example, real estate and apartments are valued relative to their net balance sheet worth, which is usually significantly lower than the fair market value. The same applies to family enterprises, which are valued only into a small fraction of their fair market value (30% of true net wealth). For publicly quoted shares the starting point is market value but it is discounted by 30% making the category ”other property” also somewhat undervalued. As these examples show, the taxation system uses different valuation methods for different assets but still tries to ensure proper balance between different asset classes. Because of this logic and due to the fact that the true values would be impossible to determine for some asset classes, I use predetermined taxation values for each asset category throughout this paper. This also ensures that the asset weights later on in this paper are reasonable.

Unlike assets, debt is always valued at its face value for taxation purposes. Therefore, debt is not directly comparable with the value of different property categories. Because of the valuation bias I will not calculate or use the net wealth measure in any of the analyses in this paper.

Numbers concerning the entire population of Finland are gathered from Statistics Finland as at December 31, 2000.

## 3. GENERAL PATTERNS OF PROPERTY OWNERSHIP

This section shows the distribution of individuals' property ownership by gender, age, province of residence, and mother tongue. In addition, I will describe the number and socio-economic attributes of individuals with at least FIM one million of capital, and the concentration of individuals' property ownership. In order to get a full understanding of wealth distribution in Finland, I will examine each of the different property categories and the aggregate value of total wealth separately.

### 3.1 Joint distribution of age and gender

Table 1 shows the joint distribution of age and gender for property owners at large and for the entire population of Finland. The Table also tabulates the gender and age distribution of property ownership as well as capital income. The mean age of male investors is 49.0 years and that of female investors is 51.1 years, whereas the corresponding numbers for the population are 37.7 and 41.0 years. In other words, male investors are on average 11.3 years and female investors 10.1 years older than the population average. These results are consistent with the results from share ownership records studied by Karhunen and Keloharju (2001), where the mean age of male and female investors was about the same (47.9 and 50.2, respectively) and investors were on average 10 years older than the population average.

The property ownership patterns of males and females differ partly from each other. The number of male and female investors is almost the same, 49.9% of individual investors are males and 50.1% of them are females. This is somewhat different from the share ownership patterns (Karhunen and Keloharju, 2001) where the corresponding numbers were 54.1% and 45.9%. This could indicate that female investors are more risk-averse than male investors and prefer investments that are less risky than shares. However, wealth is skewed towards males in both cases: males own 59.7% and females 40.3% of individuals' combined wealth in Finland, and for share ownership the numbers are 65.4% and 34.6%, respectively. Relating the results to population data suggests that 51.5% of males and 49.3% of females in Finland – 50.4% of the population – own some property.

Figure 1 illustrates the proportion of inhabitants and investors in each age category for males and females. Figure 2 compares the proportion of inhabitants in each age category to the proportion of property owned by the investors in this category for males and females.



The mean wealth for individual investors is FIM 237,900, which is expectedly larger than the median wealth of FIM 149,300. A difference occurs because there are some investors with very large ownership stakes. The difference, however, is much narrower than in share ownership (Karhunen and Keloharju, 2001), where the corresponding numbers were FIM 223,800

***TABLE 1. Population, investors and wealth in Finland by age and gender, and capital income among investors.***
**Population and investor age numbers as well as wealth numbers are from December 31, 2000 and income numbers are from the fiscal year 2000. A millionaire refers to investors with at least FIM 1 million worth of property.**

| | | | Investors at large | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Population | | # of investors | | Total wealth | | # of millionaires | | Capital income among investors | |
| Age | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| 90- | 0.1 % | 0.3 % | 0.1 % | 0.3 % | 0.1 % | 0.2 % | 0.2 % | 0.0 % | 0.1 % | 0.0 % |
| 85-89 | 0.3 % | 0.8 % | 0.4 % | 1.0 % | 0.4 % | 0.8 % | 0.6 % | 0.9 % | 0.1 % | 0.3 % |
| 80-84 | 0.6 % | 1.3 % | 0.9 % | 1.5 % | 1.0 % | 1.4 % | 1.3 % | 1.1 % | 0.9 % | 0.7 % |
| 75-79 | 1.1 % | 2.0 % | 1.8 % | 2.6 % | 2.1 % | 2.1 % | 2.7 % | 2.1 % | 1.1 % | 1.2 % |
| 70-74 | 1.7 % | 2.4 % | 2.9 % | 3.3 % | 3.2 % | 3.0 % | 3.2 % | 2.9 % | 1.9 % | 2.1 % |
| 65-69 | 2.0 % | 2.3 % | 3.5 % | 3.5 % | 5.0 % | 3.0 % | 5.2 % | 1.8 % | 3.2 % | 1.9 % |
| 60-64 | 2.4 % | 2.6 % | 4.0 % | 4.1 % | 6.4 % | 3.7 % | 7.8 % | 2.7 % | 7.1 % | 2.7 % |
| 55-59 | 3.0 % | 3.0 % | 4.4 % | 4.3 % | 8.1 % | 4.1 % | 9.0 % | 3.0 % | 15.3 % | 3.0 % |
| 50-54 | 4.2 % | 4.1 % | 6.3 % | 5.9 % | 8.7 % | 5.5 % | 12.9 % | 4.1 % | 12.0 % | 4.8 % |
| 45-49 | 3.9 % | 3.8 % | 5.8 % | 5.4 % | 7.0 % | 4.5 % | 9.2 % | 2.4 % | 7.2 % | 2.6 % |
| 40-44 | 3.7 % | 3.6 % | 5.3 % | 5.1 % | 6.2 % | 4.3 % | 8.2 % | 2.3 % | 8.6 % | 2.2 % |
| 35-39 | 3.7 % | 3.6 % | 4.8 % | 4.4 % | 5.3 % | 3.4 % | 6.4 % | 1.9 % | 9.3 % | 2.0 % |
| 30-34 | 3.4 % | 3.3 % | 4.1 % | 3.7 % | 3.8 % | 2.4 % | 3.9 % | 0.6 % | 4.2 % | 0.9 % |
| 25-29 | 3.0 % | 2.9 % | 2.5 % | 2.2 % | 1.5 % | 1.2 % | 1.3 % | 0.8 % | 1.5 % | 0.6 % |
| 20-24 | 3.2 % | 3.1 % | 1.3 % | 1.1 % | 0.7 % | 0.5 % | 0.6 % | 0.5 % | 1.2 % | 0.4 % |
| 15-19 | 3.3 % | 3.1 % | 0.7 % | 0.6 % | 0.1 % | 0.2 % | 0.1 % | 0.3 % | 0.3 % | 0.4 % |
| 10-14 | 3.1 % | 3.0 % | 0.5 % | 0.5 % | 0.1 % | 0.1 % | 0.1 % | 0.0 % | 0.1 % | 0.1 % |
| 5-9 | 3.2 % | 3.1 % | 0.4 % | 0.4 % | 0.1 % | 0.0 % | 0.1 % | 0.0 % | 0.1 % | 0.0 % |
| 0-4 | 2.9 % | 2.7 % | 0.3 % | 0.3 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % |
| Totals | 48.8 % | 51.2 % | 49.9 % | 50.1 % | 59.7 % | 40.3 % | 72.8 % | 27.2 % | 74.1 % | 25.9 % |
| Mean age | 37.7 | 41.0 | 49.0 | 51.1 | | | 52.6 | 56.6 | | |
| Mean wealth (FIM thousands) | | | | | 284.6 | 191.3 | | | | |
| Median wealth (FIM thousands) | | | | | 165.0 | 137.4 | | | | |
| Total # of people (thousands) | 2,529 | 2,652 | 1,303 | 1,307 | | | 41 | 15 | | |
| Total wealth (FIM mill.) | | | | | 370,504 | 249,814 | | | | |
| Population totals | 5,181 | | 2,611 | | 620,195 | | 56 | | | |

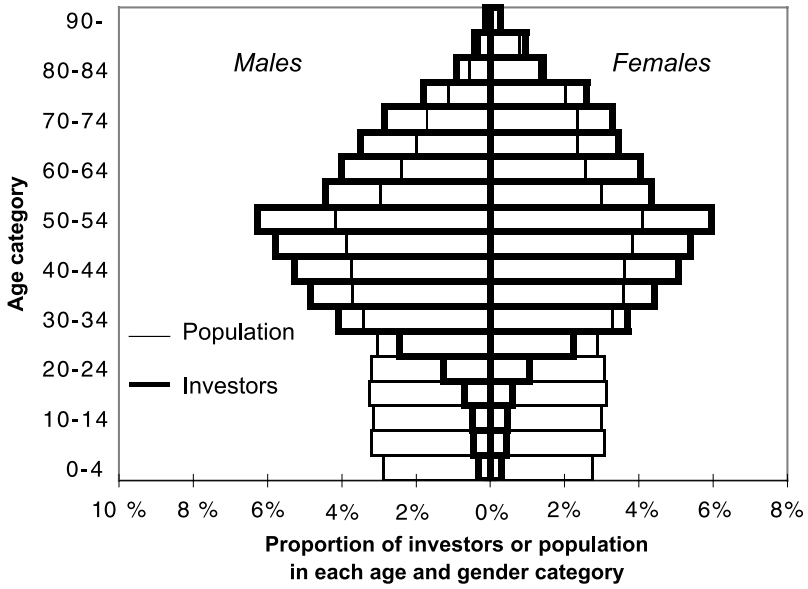



***FIGURE 1. Investors and population by age and gender.***

**This Figure presents the proportion of investors and population in each age category for males and females. Population data, which is gathered from Statistics Finland, as well as investor data are as at December 31, 2000.**

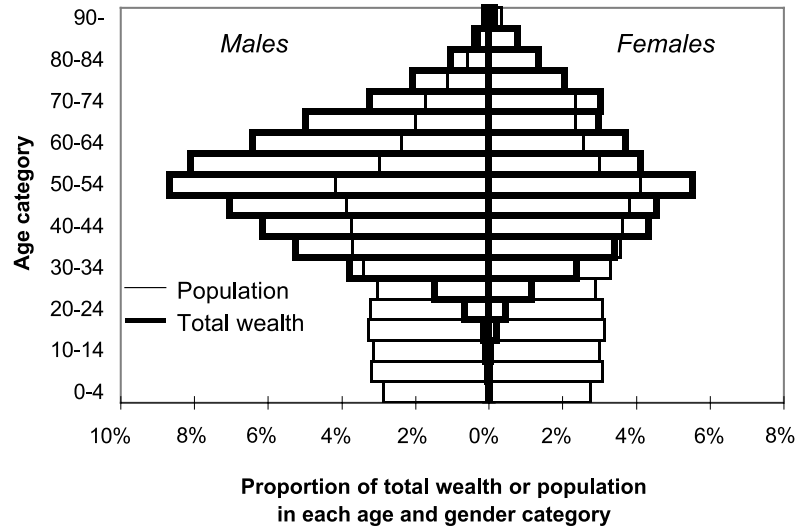





***FIGURE 2. Property and population by age and gender.***

**This Figure presents the proportion of property and population in each age category for males and females. Population data, which is gathered from Statistics Finland, as well as property data are as at December 31, 2000.**

and FIM 31,200. This is partly due to the fact that taxation values tend to smooth out the differences in property ownership.

Figures 3 and 4 display investors' mean wealth as a function of their age for males and females, respectively. Older investors are on average wealthier than the younger ones, but contrary to the studies of Karhunen and Keloharju (2001) for share ownership, the mean wealth declines among the oldest investors after around the age of 70. The phenomenon is not as clear for females as for males but the result supports the life-cycle theory, a hump-shaped savings profile over the life cycle (Modigliani et al., 1954 and Friedman, 1957). One plausible reason for the different behaviour of share ownership and property in this study might be that it is easier to govern investment wealth than other types of wealth and, therefore, for example family enterprises and real estate are handed down earlier in the life to the younger generations. A question, however, remains. Is the hump shape really a result of the life-cycle hypothesis or are people who lived through the war years of Finland just poorer to begin with? Without a time series data at least 10 years backwards, neither can be proven right or wrong. It is interesting to note, though, that the mean wealth increases almost linearly up to the age of 60.

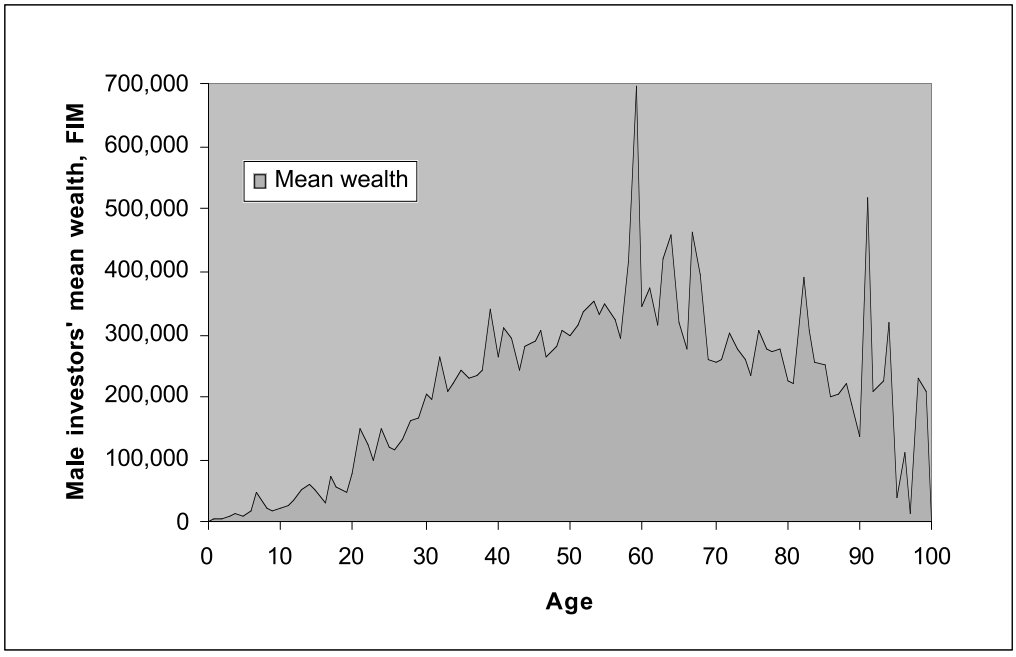



***FIGURE 3. Male investors' mean wealth as a function of age.***
**The data used for calculating the mean wealth are from December 31, 2000.**

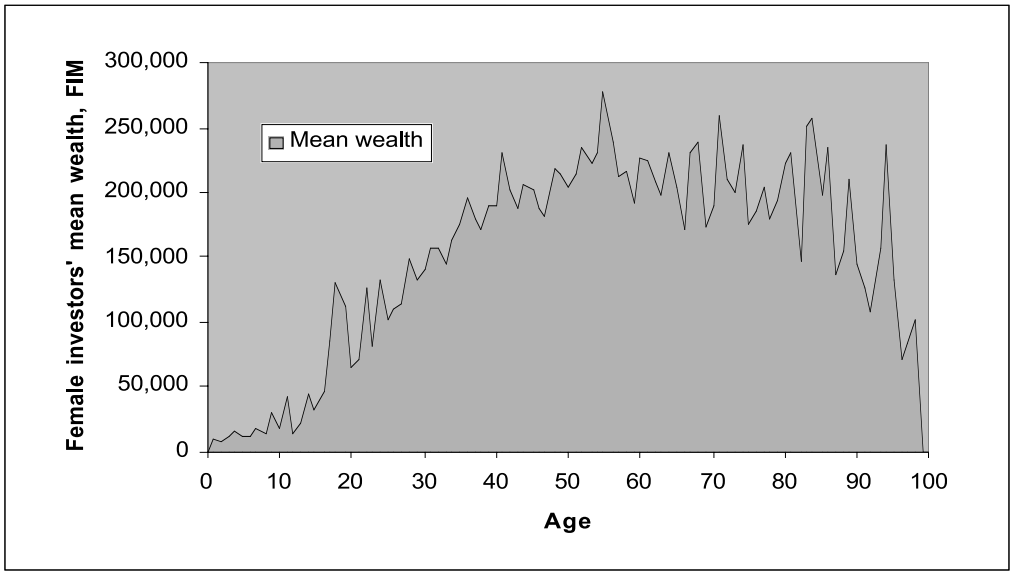



***FIGURE 4. Female investors' mean wealth as a function of age.***
**The data used for calculating the mean wealth are from December 31, 2000.**

As with the property ownership, capital income is skewed towards males. The degree of it, however, is very surprising. 74.1% of the capital income is distributed among males and only 25.9% among females. Even more surprising is that males close to retirement, i.e. 50 to 64 years old, receive 34.4% of all the capital income in Finland. These results combined with the ownership measures indicate that females tend to invest in lower-yield assets or keep the assets for their life, in which case no realisation of capital income occurs. The concentration of capital income to males between 50 and 64 years of age is harder to explain. Some possible causes for the phenomenon might be related to the close retirement. These investors might be milking out funds from their companies before retirement or they might be moving into smaller apartments. Another explanation could be related to the timing of this sample. Year 2000 was the last year that the economy was still in the upswing. Perhaps the risky investments were realised just before the turn, realising the highly skewed distribution of capital income (the riskier investments tend to be owned by male investors).

Table 1 also reports the fraction of investors with at least FIM one million worth of capital (henceforth, millionaires) by age and gender. As expected from the investment wealth numbers, males are more dominant among millionaires than among investors at large. Males account for 72.8% of all millionaires, which is over 20 percentage points more than their fraction of all investors. Moreover, millionaires also tend to be more senior people than investors

in general. Millionaire males are on average 52.6 years old, i.e. 3.6 years older than investors at large, and millionaire females are on average 56.6 years old (5.5 years older than investors at large). The same phenomenon was evident also in the study of share ownership by Karhunen and Keloharju (2001).

Table 2 presents a list of millionaire characteristics for each of the property categories separately. The distribution of millionaires between males and females is highly skewed towards males as expected from the wealth distribution. An interesting phenomenon is that even though the value of apartment ownership is higher for females, 68% of the apartment millionaires are males. Unlike for total wealth the mean age of millionaires for forest and agricultural net assets is lower than the mean age of the investors at large in that particular category. This could indicate that younger than average farmers run the largest farms. It would be reasonable since the so-called ”generation change” takes more time for the most valuable farms. Also the complexity of running a big farm due to the EU factors etc. forces younger and more educated people to take over the farming business. The list of top 5 cities in terms of the number of millionaires is for the most parts as expected with larger cities on top. However, some smaller cities have reached the top in, for example, apartment and mutual fund ownership.

In Tables 3, 4 and 5 the joint distribution of age and gender for capital owners is divided into the different categories of property, i.e. forest, real estate, apartments, family enterprises, mutual funds, other property, private firm net assets, agricultural net assets, and foreign property. Foreign property category is partly excluded because of the insufficient sample size. The categories can be examined as three separate groups according to the risk and function that they hold. The first group includes less risky assets, i.e. forest, real estate, and apartments (Table 3), the second one the most risky assets, i.e. family enterprises, mutual funds (includes, however, also money market funds that cannot be considered very risky), and other property (Table 4), and the third one the assets related to profession (Table 5). In the first group the mean age of investors in each category is higher than for investors at large whereas in the second group the mean age is lower indicating that younger people get more involved with riskier investments than the older ones. In the third group private firm net assets bears much more risk than agricultural net assets and the mean age follows the patterns of the two first groups.

Some individual property categories have distinct features that are not in line with the investors at large. Most of the ownership of apartments belongs to females. They have a majority of 56.9% in terms of number of investors and 56.7% in terms of total wealth. Another anomaly can be found in wealth concentration among the family entrepreneurs. Males own 77.7% of family enterprises, and as much as 56.1% is owned by males 50 to 64 years old. This also partly explains the concentration of capital income mentioned earlier.

***TABLE 2. Millionaire characteristics for different property categories.***
**A millionaire refers to an individual investor with at least FIM 1 million worth of property. Investor age numbers as well as wealth numbers are from December 31, 2000. Foreign property is excluded from the analysis because of the insufficient sample size.**

| Property category | # of millionaires | | | Mean age | Top five cities in terms of number of millionaires |
|---|---|---|---|---|---|
| | Total | Males | Females | | |
| Total wealth | 56,486 | 72.8 % | 27.2 % | 53.7 | 1. Helsinki<br>2. Espoo<br>3. Tampere<br>4. Turku<br>5. Kuopio |
| Forest | 2,071 | 85.4 % | 14.6 % | 52.4 | 1. Heinävesi<br>2. Kärkölä<br>3. Porvoo<br>4. Ruovesi<br>5. Savonlinna & Viitasaari |
| Real estate | 2,930 | 75.9 % | 24.1 % | 57.4 | 1. Helsinki<br>2. Vantaa<br>3. Kauniainen<br>4. Espoo<br>5. Kaarina |
| Apartments | 3,486 | 68.1 % | 31.9 % | 53.9 | 1. Helsinki<br>2. Espoo<br>3. Kokkola<br>4. Oulu<br>5. Kaarina |
| Family enterprises | 2,173 | 72.1 % | 27.9 % | 49.6 | 1. Helsinki<br>2. Espoo<br>3. Janakkala<br>4. Joensuu<br>5. Vaasa |
| Mutual funds | 1,061 | 71.4 % | 28.6 % | 60.5 | 1. Helsinki<br>2. Espoo<br>3. Asikkala<br>4. Oulu<br>5. Maalahti |
| Private firm net assets | 303 | 66.7 % | 33.3 % | 52.5 | 1. Helsinki<br>2. Espoo<br>3. Joensuu<br>4. Lempäälä<br>5. Oulu |
| Agricultural net assets | 606 | 75.0 % | 25.0 % | 46.6 | 1. Perniö<br>2. Lieksa<br>3. Nurmijärvi<br>4. Lapinjärvi<br>5. Nastola |
| Other property | 14,703 | 63.9 % | 36.1 % | 56.3 | 1. Helsinki<br>2. Espoo<br>3. Tampere<br>4. Turku<br>5. Kauniainen & Maarianhamina |

***TABLE 3. Investors and wealth in Finland for forest, real estate and apartment ownership by age and gender.***
**Investor age and wealth numbers are from December 31, 2000.**

| | Forest | | | | Real estate | | | | Apartments | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of investors | | Total wealth | | # of investors | | Total wealth | | # of investors | | Total wealth | |
| Age | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| 90- | 0.2 % | 0.3 % | 0.1 % | 0.2 % | 0.1 % | 0.2 % | 0.1 % | 0.1 % | 0.1 % | 0.4 % | 0.1 % | 0.4 % |
| 85-89 | 0.7 % | 0.7 % | 0.7 % | 0.6 % | 0.4 % | 0.6 % | 0.3 % | 0.5 % | 0.5 % | 1.4 % | 0.5 % | 1.6 % |
| 80-84 | 1.7 % | 1.2 % | 1.7 % | 0.9 % | 1.0 % | 0.9 % | 0.9 % | 0.6 % | 1.0 % | 2.3 % | 1.1 % | 2.4 % |
| 75-79 | 3.3 % | 2.6 % | 3.2 % | 2.1 % | 2.2 % | 1.9 % | 2.0 % | 1.3 % | 2.0 % | 3.8 % | 2.0 % | 3.9 % |
| 70-74 | 5.5 % | 3.0 % | 5.3 % | 2.3 % | 3.7 % | 2.6 % | 3.7 % | 1.9 % | 2.8 % | 4.8 % | 2.7 % | 4.9 % |
| 65-69 | 7.1 % | 3.7 % | 7.1 % | 2.3 % | 4.6 % | 3.2 % | 5.2 % | 2.3 % | 3.3 % | 4.6 % | 3.1 % | 4.6 % |
| 60-64 | 7.4 % | 4.7 % | 8.4 % | 3.7 % | 5.3 % | 4.0 % | 6.1 % | 3.1 % | 3.8 % | 5.3 % | 4.0 % | 5.4 % |
| 55-59 | 7.4 % | 4.7 % | 8.3 % | 2.8 % | 5.7 % | 4.2 % | 7.2 % | 3.5 % | 4.4 % | 5.5 % | 4.9 % | 6.1 % |
| 50-54 | 9.1 % | 5.4 % | 10.8 % | 4.2 % | 7.9 % | 5.8 % | 9.6 % | 5.5 % | 5.8 % | 7.2 % | 6.0 % | 7.6 % |
| 45-49 | 7.4 % | 4.0 % | 9.2 % | 3.3 % | 7.3 % | 5.4 % | 8.4 % | 5.2 % | 4.5 % | 5.8 % | 4.9 % | 5.7 % |
| 40-44 | 5.2 % | 3.0 % | 8.3 % | 2.3 % | 6.2 % | 5.1 % | 7.2 % | 4.9 % | 4.1 % | 4.9 % | 4.0 % | 5.1 % |
| 35-39 | 4.2 % | 2.4 % | 5.2 % | 1.6 % | 5.3 % | 4.5 % | 6.1 % | 4.4 % | 3.7 % | 4.0 % | 3.9 % | 3.8 % |
| 30-34 | 2.3 % | 0.9 % | 2.8 % | 0.8 % | 3.6 % | 3.4 % | 3.9 % | 3.1 % | 3.7 % | 3.5 % | 3.4 % | 3.0 % |
| 25-29 | 0.7 % | 0.6 % | 1.1 % | 0.4 % | 1.6 % | 1.6 % | 1.3 % | 1.2 % | 2.3 % | 2.2 % | 1.8 % | 1.6 % |
| 20-24 | 0.4 % | 0.2 % | 0.2 % | 0.1 % | 0.5 % | 0.5 % | 0.3 % | 0.2 % | 0.9 % | 0.9 % | 0.7 % | 0.6 % |
| 15-19 | 0.1 % | 0.0 % | 0.1 % | 0.0 % | 0.3 % | 0.2 % | 0.1 % | 0.1 % | 0.1 % | 0.2 % | 0.1 % | 0.1 % |
| 10-14 | 0.1 % | 0.0 % | 0.0 % | 0.0 % | 0.1 % | 0.1 % | 0.0 % | 0.0 % | 0.1 % | 0.1 % | 0.1 % | 0.0 % |
| 5-9 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.1 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.1 % | 0.0 % | 0.0 % |
| 0-4 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % |
| Totals | 62.7 % | 37.2 % | 72.6 % | 27.5 % | 55.9 % | 44.1 % | 62.2 % | 37.8 % | 43.1 % | 56.9 % | 43.3 % | 56.7 % |
| Mean age | 56.1 | 57.3 | | | 52.1 | 51.6 | | | 51.5 | 55.0 | | |
| Mean wealth (FIM thousands) | | | 116.7 | 74.4 | | | 173.4 | 133.6 | | | 155.4 | 153.9 |
| Median wealth (FIM thousands) | | | 55.0 | 33.5 | | | 142.5 | 113.4 | | | 120.0 | 129.9 |
| Total # of people (thousands) | 229 | 136 | | | 881 | 695 | | | 482 | 637 | | |
| Total wealth (FIM millions) | | | 26,155 | 9,894 | | | 152,855 | 92,957 | | | 74,793 | 97,798 |
| Population totals | 365 | | 36,045 | | 1,575 | | 245,787 | | 1,119 | | 172,574 | |
| % of all investors | 14.0 % | | 5.8 % | | 60.3 % | | 39.6 % | | 42.8 % | | 27.8 % | |
| % of population | 7.0 % | | | | 30.4 % | | | | 21.6 % | | | |

***TABLE 4. Investors and wealth in Finland for family enterprise, mutual fund and other property ownership by age and gender.***

**Investor age and wealth numbers are from December 31, 2000.**

| | Family enterprises | | | | Mutual funds | | | | Other property | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of investors | | Total wealth | | # of investors | | Total wealth | | # of investors | | Total wealth | |
| Age | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| 90- | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.2 % | 0.0 % | 0.1 % | 0.1 % | 0.2 % | 0.0 % |
| 85-89 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.2 % | 0.4 % | 0.6 % | 0.9 % | 0.2 % | 0.5 % | 0.3 % | 0.6 % |
| 80-84 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.5 % | 0.8 % | 1.6 % | 1.0 % | 0.8 % | 0.8 % | 1.3 % | 2.2 % |
| 75-79 | 0.0 % | 0.1 % | 0.0 % | 0.0 % | 1.5 % | 1.5 % | 5.0 % | 2.1 % | 1.7 % | 1.7 % | 2.3 % | 1.4 % |
| 70-74 | 0.9 % | 0.6 % | 0.4 % | 6.0 % | 2.1 % | 2.9 % | 3.7 % | 3.8 % | 2.5 % | 2.5 % | 3.3 % | 2.9 % |
| 65-69 | 1.9 % | 1.1 % | 0.8 % | 1.5 % | 3.0 % | 4.1 % | 6.3 % | 4.8 % | 3.8 % | 2.9 % | 8.5 % | 2.5 % |
| 60-64 | 2.4 % | 2.2 % | 10.8 % | 1.4 % | 3.7 % | 4.4 % | 7.3 % | 4.4 % | 4.8 % | 3.7 % | 10.4 % | 2.7 % |
| 55-59 | 5.8 % | 2.2 % | 38.3 % | 0.8 % | 3.9 % | 4.8 % | 5.6 % | 4.5 % | 5.6 % | 4.5 % | 11.4 % | 3.8 % |
| 50-54 | 14.1 % | 5.9 % | 7.0 % | 7.7 % | 4.6 % | 5.6 % | 7.3 % | 4.7 % | 8.1 % | 5.3 % | 9.9 % | 2.8 % |
| 45-49 | 11.4 % | 5.5 % | 7.3 % | 1.6 % | 3.7 % | 3.9 % | 5.1 % | 4.4 % | 6.6 % | 4.5 % | 5.4 % | 2.4 % |
| 40-44 | 10.9 % | 4.2 % | 6.8 % | 0.7 % | 3.3 % | 3.2 % | 4.9 % | 2.8 % | 6.2 % | 4.4 % | 4.9 % | 3.3 % |
| 35-39 | 8.7 % | 3.3 % | 2.0 % | 2.0 % | 3.2 % | 2.5 % | 5.2 % | 1.5 % | 5.9 % | 4.0 % | 4.6 % | 1.5 % |
| 30-34 | 7.6 % | 2.6 % | 2.5 % | 0.4 % | 3.9 % | 2.6 % | 2.2 % | 1.1 % | 4.9 % | 3.1 % | 4.4 % | 1.0 % |
| 25-29 | 2.9 % | 0.6 % | 0.3 % | 0.0 % | 3.3 % | 2.3 % | 1.6 % | 1.0 % | 2.9 % | 1.7 % | 1.5 % | 0.7 % |
| 20-24 | 1.4 % | 0.7 % | 1.4 % | 0.1 % | 3.6 % | 2.1 % | 1.5 % | 0.9 % | 1.6 % | 1.0 % | 1.3 % | 0.9 % |
| 15-19 | 1.0 % | 0.7 % | 0.0 % | 0.1 % | 2.6 % | 2.1 % | 0.9 % | 0.7 % | 1.0 % | 0.8 % | 0.3 % | 0.8 % |
| 10-14 | 0.2 % | 0.4 % | 0.1 % | 0.0 % | 2.2 % | 2.2 % | 0.6 % | 0.6 % | 0.5 % | 0.5 % | 0.1 % | 0.1 % |
| 5-9 | 0.4 % | 0.3 % | 0.1 % | 0.0 % | 2.7 % | 2.7 % | 0.5 % | 0.5 % | 0.3 % | 0.3 % | 0.1 % | 0.0 % |
| 0-4 | 0.1 % | 0.1 % | 0.0 % | 0.0 % | 2.1 % | 2.1 % | 0.2 % | 0.2 % | 0.2 % | 0.2 % | 0.0 % | 0.0 % |
| Totals | 69.5 % | 30.4 % | 77.7 % | 22.3 % | 50.0 % | 50.0 % | 60.2 % | 39.8 % | 57.6 % | 42.4 % | 70.4 % | 29.6 % |
| Mean age | 44.5 | 45.5 | | | 40.7 | 44.4 | | | 48.2 | 49.8 | | |
| Mean wealth (FIM thousands) | | | 368.4 | 240.8 | | | 57.0 | 37.7 | | | 205.4 | 117.3 |
| Median wealth (FIM thousands) | | | 39.0 | 28.4 | | | 13.7 | 11.5 | | | 35.5 | 20.5 |
| Total # of people (thousands) | 39 | 17 | | | 168 | 168 | | | 322 | 237 | | |
| Total wealth (FIM millions) | | | 13,365 | 3,829 | | | 9,817 | 6,486 | | | 80,784 | 33,992 |
| Population totals | 57 | | 17,192 | | 336 | | 16,304 | | 559 | | 114,799 | |
| % of all investors | 2.2 % | | 2.8 % | | 12.9 % | | 2.6 % | | 21.4 % | | 18.5 % | |
| % of population | 1.1 % | | | | 6.5 % | | | | 10.8 % | | | |

***TABLE 5. Investors and wealth in Finland for private firm net asset, agricultural net asset and foreign property ownership by age and gender.*** **Investor age and wealth numbers are from December 31, 2000. Some of the data concerning foreign property are excluded because of the insufficient sample size.**

| | Private firm net assets | | | | Agricultural net assets | | | | Foreign property | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # of investors | | Total wealth | | # of investors | | Total wealth | | # of investors | | Total wealth | |
| Age | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females | Males | Females |
| 90- | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.3 % | 0.3 % | 0.0 % | 0.0 % | | | | |
| 85-89 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 1.1 % | 0.7 % | 0.2 % | 0.1 % | | | | |
| 80-84 | 0.2 % | 0.0 % | 0.1 % | 0.0 % | 2.6 % | 1.0 % | 0.9 % | 0.2 % | | | | |
| 75-79 | 0.4 % | 0.1 % | 0.1 % | 0.0 % | 4.7 % | 2.3 % | 1.7 % | 0.3 % | | | | |
| 70-74 | 0.7 % | 0.3 % | 0.4 % | 0.8 % | 7.3 % | 1.8 % | 2.3 % | 0.4 % | | | | |
| 65-69 | 1.8 % | 0.5 % | 1.9 % | 1.0 % | 9.8 % | 1.9 % | 5.0 % | 0.8 % | | | | |
| 60-64 | 4.1 % | 2.0 % | 3.9 % | 4.1 % | 9.8 % | 2.1 % | 9.4 % | 0.7 % | | | | |
| 55-59 | 8.3 % | 3.5 % | 11.0 % | 4.2 % | 9.4 % | 2.2 % | 9.8 % | 1.2 % | | | | |
| 50-54 | 10.7 % | 6.0 % | 15.6 % | 3.9 % | 11.4 % | 2.3 % | 17.8 % | 0.9 % | | | | |
| 45-49 | 10.2 % | 5.7 % | 13.2 % | 4.0 % | 9.2 % | 1.8 % | 14.6 % | 0.6 % | | | | |
| 40-44 | 10.0 % | 6.2 % | 10.6 % | 3.6 % | 6.3 % | 1.3 % | 12.9 % | 1.8 % | | | | |
| 35-39 | 8.3 % | 4.5 % | 7.2 % | 1.6 % | 4.5 % | 0.9 % | 9.9 % | 0.6 % | | | | |
| 30-34 | 6.3 % | 2.9 % | 7.5 % | 1.4 % | 2.8 % | 0.7 % | 5.2 % | 0.3 % | | | | |
| 25-29 | 3.1 % | 2.2 % | 1.8 % | 0.8 % | 0.8 % | 0.3 % | 1.3 % | 0.3 % | | | | |
| 20-24 | 1.2 % | 0.5 % | 0.9 % | 0.5 % | 0.4 % | 0.0 % | 0.7 % | 0.0 % | | | | |
| 15-19 | 0.2 % | 0.1 % | 0.0 % | 0.0 % | 0.2 % | 0.0 % | 0.1 % | 0.1 % | | | | |
| 10-14 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.1 % | 0.0 % | 0.0 % | 0.0 % | | | | |
| 5-9 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | | | | |
| 0-4 | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | 0.0 % | | | | |
| Totals | 65.6 % | 34.4 % | 74.1 % | 25.9 % | 80.4 % | 19.6 % | 91.7 % | 8.3 % | 50.0 % | 50.0 % | 63.0 % | 37.0 % |
| Mean age | 46.3 | 45.3 | | | 57.1 | 60.3 | | | 52.8 | 51.6 | | |
| Mean wealth (FIM thousands) | | | 93.8 | 62.5 | | | 55.4 | 20.6 | | | 111.5 | 65.4 |
| Median wealth (FIM thousands) | | | 38.1 | 15.8 | | | 6.1 | 2.6 | | | 16.1 | 15.2 |
| Total # of people (thousands) | 48 | 25 | | | 169 | 41 | | | 2 | 2 | | |
| Total wealth (FIM millions) | | | 4,642 | 1,621 | | | 9,596 | 872 | | | 483 | 283 |
| Population totals | 74 | | 6,263 | | 210 | | 10,466 | | 4 | | 766 | |
| % of all investors | 2.8 % | | 1.0 % | | 8.0 % | | 1.7 % | | 0.2 % | | 0.1 % | |
| % of population | 1.4 % | | | | 4.0 % | | | | 0.1 % | | | |

Another noticeable phenomenon is related to stock ownership categories, i.e. mutual funds and other property. Many financial institutions have been successful in introducing and marketing mutual funds as a low threshold risky asset, available to many individual investors. Still, the majority of the population in Finland holds neither stocks nor mutual funds (the participation rates are 10.8% and 6.5%, respectively). This lack of participation can partly be explained by monetary transaction costs and information costs (e.g. Guiso et al., 2000) but also the dramatic stock market downturn in the early 1990's in Finland may have some effect.

## 3.2 Investment activity and wealth by province

Table 6 shows how wealth in Finland is distributed across provinces. There are only minor differences in investment wealth per inhabitant as well as in the relative frequency of investor-inhabitants. Turku ja Pori and Vaasa stand out in terms of the ratio of investor-inhabitants to all inhabitants. For Turku ja Pori the ratio is 53.5% and for Vaasa 53.1% whereas the average is 50.4%. However, the greatest average wealth per inhabitant is FIM 297,700 in Uusimaa, and given its large weight it is not surprising that it is the only province where the investor's mean wealth is above the country average of FIM 237,600.

***TABLE 6. Investment activity and wealth by province in Finland.***
**The data concerning the inhabitants, investors and wealth are from December 31, 2000. The number of investors is based on actual numbers received from the Finnish tax authorities, not the sample. Ahvenanmaa is included in Turku ja Pori in the upper part of the Table and the Greater Helsinki Area consists of Helsinki, Espoo, Vantaa and Kauniainen.**

| Province | Number of investors | Proportion of total number of investors | Number of investors/ Number of inhabitants | Investors' mean wealth (FIM thousands) | Investors' median wealth (FIM thousands) | Total wealth (FIM mill.) | Proportion of total wealth | Wealth per inhabitant (FIM thousands) |
|---|---|---|---|---|---|---|---|---|
| Häme | 419,308 | 16.1 % | 51.8 % | 222.5 | 143.0 | 93,302 | 15.0 % | 115.2 |
| Keski-Suomi | 128,682 | 4.9 % | 48.8 % | 231.1 | 148.3 | 29,736 | 4.8 % | 112.7 |
| Kuopio | 125,833 | 4.8 % | 49.9 % | 208.4 | 143.8 | 26,221 | 4.2 % | 104.0 |
| Kymi | 251,935 | 9.6 % | 51.2 % | 215.2 | 143.4 | 54,219 | 8.7 % | 110.2 |
| Lappi | 91,910 | 3.5 % | 47.9 % | 191.3 | 143.6 | 17,579 | 2.8 % | 91.7 |
| Oulu | 213,543 | 8.2 % | 46.9 % | 198.2 | 146.8 | 42,315 | 6.8 % | 93.0 |
| Pohjois-Karjala | 86,064 | 3.3 % | 50.2 % | 235.1 | 147.8 | 20,232 | 3.3 % | 117.9 |
| Turku ja Pori | 380,265 | 14.6 % | 53.5 % | 222.9 | 147.6 | 84,769 | 13.7 % | 119.3 |
| Uusimaa | 679,627 | 26.0 % | 48.7 % | 297.7 | 160.8 | 202,314 | 32.6 % | 145.1 |
| Vaasa | 233,577 | 8.9 % | 53.1 % | 212.0 | 146.9 | 49,508 | 8.0 % | 112.5 |
| Total | 2,610,744 | 100.0 % | 50.4 % | 237.6 | 149.3 | 620,195 | 100.0 % | 119.7 |
| And two interesting regions | | | | | | | | |
| Ahvenanmaa | 14,349 | 0.5 % | 55.7 % | 361.0 | 186.4 | 5,174 | 0.8 % | 200.7 |
| The Greater Helsinki Area | 389,997 | 14.9 % | 40.8 % | 344.8 | 166.7 | 134,297 | 21.7 % | 140.5 |

The corresponding statistics for Ahvenanmaa and the Greater Helsinki Area are presented separately at the bottom of the Table since they are of special interest to many researchers. These statistics clearly show that both areas are well above the country average by any measures, especially Ahvenanmaa.

The distribution of the aggregate wealth by province gives a good idea of where most of the property resides. Since Uusimaa, Häme and Turku ja Pori have much more inhabitants than the other provinces, they account for the majority, 61.3%, of the property. It is important to notice that in population terms they still account only for 56.3%.

## 3.3 Property ownership and mother tongue

Table 7 investigates how mother tongue is related to property ownership. As also pointed out by the study of Karhunen and Keloharju (2001), the Swedish-speaking minority (5.6% of the population in Finland) is much wealthier than the Finnish-speaking majority (92.4%). The average wealth of the Finnish-speaking investors is FIM 230,500, which is almost a third less than the FIM 348,600 of the Swedish-speaking investors. The difference is, however, not as big as with the share ownership (Karhunen and Keloharju, 2001), and indicates that other property than shares are more equally distributed. Also the number of investors per inhabitants in both language groups is close to equal. However, strengthening the evidence of unequal distribution of wealth, the number of Swedish-speaking millionaires relative to the Swedish-speaking inhabitants is over three times bigger compared to the Finnish-speaking population (3.2% and 1.0%, respectively).

***TABLE 7. Investment activity and wealth by mother tongue.***
**Mother tongue refers to the language at which the official documents are requested by the investor. The very small proportion of other minority languages than Swedish are included in the category "Finnish". Inhabitant, investor and wealth data are from December 31, 2000.**

| Mother tongue | Number of investors | Proportion of total number of investors | Number of investors / inhabitants | Investors' mean wealth (FIM thousands) | Investors' median wealth (FIM thousands) | Number of millionaires / inhabitants | Total wealth (FIM mill.) | Proportion of total wealth | Wealth per inhabitant (FIM thousands) |
|---|---|---|---|---|---|---|---|---|---|
| Finnish | 2,454,523 | 94.0 % | 50.2 % | 230.5 | 148.7 | 1.0 % | 565,743 | 91.2 % | 115.7 |
| Swedish | 156,221 | 6.0 % | 53.6 % | 348.6 | 167.4 | 3.2 % | 54,452 | 8.8 % | 186.7 |
| Total | 2,610,744 | 100.0 % | 50.4 % | 237.6 | 149.3 | 1.1 % | 620,195 | 100.0 % | 119.7 |

## 3.4 Concentration of property ownership



The degree of concentration in property ownership among individuals in Finland in December 31, 2000 is shown in Figure 5. It also illustrates the concentration of the share ownership in Finland by a Lorenz curve. The richest 0.5% of individual investors own 13.4% and the rich-

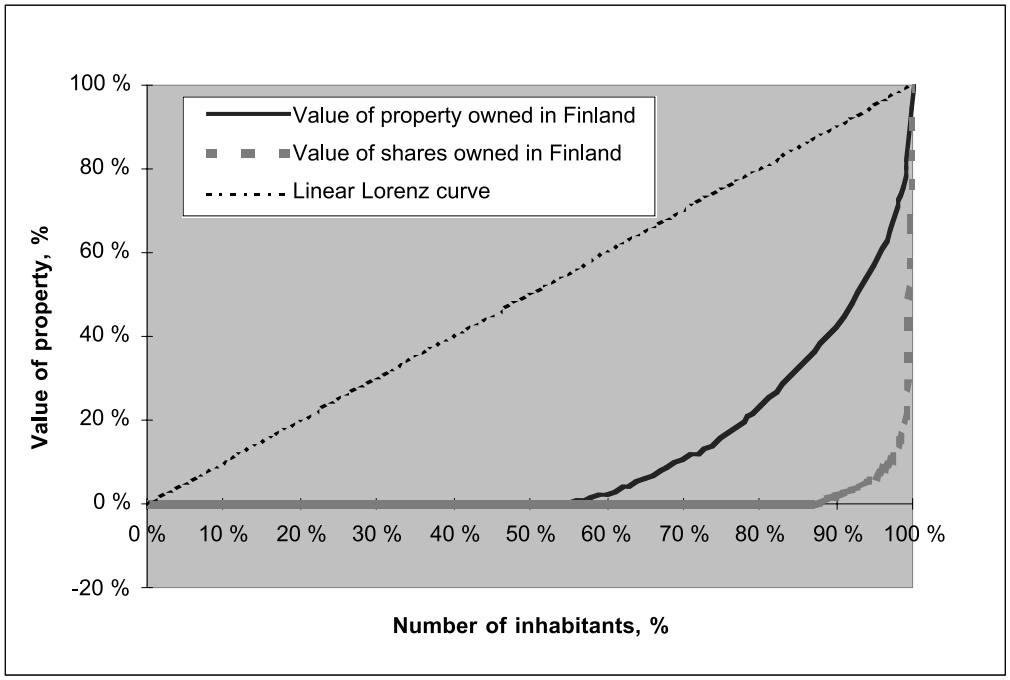



***FIGURE 5. Concentration of total wealth and share ownership in Finland.***
**All numbers except for comparative data are from December 31, 2000. The data on Finnish share ownership are from the study of Karhunen and Keloharju (2001).**

est 5% own 32.4% of the property of individuals. Relative to the share ownership concentration (Karhunen and Keloharju, 2001) property ownership is far less concentrated. The corresponding numbers for share ownership are 47.9% and 75.9%, respectively. Similarly, the richest 0.5% of all inhabitants of Finland own 17.2% (71.6% for share ownership) and the richest 5% own 43.0% (93.5% for share ownership) of the property of individuals.

The difference is clear, but so are the reasons. The overall level of participation in the stock markets is much lower than in the markets for all property. Only 14.2% of the Finnish population hold stocks directly (Karhunen and Keloharju, 2001) whereas 50.4% of the population has some property.

In order to get a more precise picture of the actual degree of concentration I will calculate the Gini coefficients for each of the different property categories. The Gini coefficient is calculated as two times the area between a linear and the actual Lorenz curve. The measure varies between 0 and 1, with larger numbers indicating larger degrees of concentration. As presented by Deltas (2000), the Gini coefficient is estimated as follows:

$$(1) \quad \text{Gini coefficient} = \frac{2 * \text{cov}(y, r_y)}{n * E(y)},$$

where $n$ is the number of individuals sampled, $\text{cov}(y, r_y)$ is the covariance between the value of ownership, $y$, and the ranks of individuals according to their wealth, $r_y$, from the poorest ($r_y = 1$) to the richest ($r_y = n$), and $E(y)$ is he mean wealth in the particular category. The Gini coefficients for different property categories are listed in Table 8.

***TABLE 8. Gini coefficients for the different property categories.*** **The Gini coefficient indicates the degree of concentration of the particular property category. The measure gets values between 0 and 1, and the higher the measure is the more concentrated the category is. All numbers are calculated using data from December 31, 2000.**

| Property category | Gini coefficient |
|---|---|
| Apartments | 0.348 |
| Real estate | 0.427 |
| Total wealth | 0.542 |
| Forest | 0.641 |
| Private firm net assets | 0.658 |
| Mutual funds | 0.756 |
| Foreign property | 0.808 |
| Agricultural net assets | 0.813 |
| Other property | 0.838 |
| Family enterprises | 0.894 |

The Gini coefficients above show that apartment and real estate ownership are clearly the most equally distributed. Forest and private firm net asset ownership with a stronger concentration than total wealth are next. Mutual fund, foreign property, agricultural net asset and other property ownership along with family enterprise ownership are the most concentrated. This is also indicated by the low participation rates and the more risky nature of the assets. Karhunen and Keloharju (2001) calculate a Gini coefficient of 0.884 for share ownership in June 1, 2000. Other property consists mainly of shares and the corresponding measure (0.838 as presented above) is in line with the finding of Karhunen and Keloharju.

## 4. KEY DRIVERS FOR WEALTH IN FINLAND



This section presents the empirical results from the regression analyses defining the key drivers for different wealth categories in Finland in 2000. The relationship of property ownership with investor characteristics and income is examined by using ordinary least squares (OLS) regres-

sion with different asset categories along with the total wealth measure as dependent variables, and investor characteristics, debt and income measures as independent variables. The descriptive statistics for the variables are presented in Table 9.

In the regression analyses salary income and capital gains are combined into an aggregate income variable. This is done because it reduces the multicollinearity problems encountered while not affecting the results negatively through the missing variable bias. Because of the insufficient sample sizes, foreign property and family enterprises have been omitted from the analysis. The detailed results of the regressions can be found in Tables 10 and 11.

From the set of regression analyses made, total wealth is best explained by the regression variables chosen for this study. The explanatory power of the model reaches 34.4%, which is a reasonably good level. The regression models for the other property categories have somewhat lower explanatory powers, the lowest being 8.3% with private firm net assets as a dependent variable.

### 4.1 Age

Age explains the distribution of wealth in Finland relatively well. In the total wealth regression the coefficients for the age dummies grow steadily until the age of 80 after which they start to decline. This pattern follows a hump-shaped savings profile over the life cycle – the main prediction of the life-cycle theory (Modigliani et al., 1954 and Friedman, 1957). However, the peak in wealth occurs later than the expected retirement age. The results in general do not give very strong support to the life-cycle hypothesis, although in the descriptive part, in Figures 3 and 4, the pattern seemed clearer. One of the factors leading into distortions could be that it has become more popular to hand down some property to younger generations in advance (Katajamäki, 2002) but also at the same time to skip over a generation in order to save in taxes. The addition to the existing wealth for the younger generations is usually rather substantial, causing the variance of wealth for the younger age levels to increase.

Aside from the life-cycle theory, apartment ownership is clearly concentrated around the older people whereas the oldest age levels negatively affect real estate ownership. This could indicate that older people live in apartments instead of houses, probably because taking care of real estate is more strenuous. It could also indicate that senior people are more risk averse than others and invest rather in apartments as a less risky asset.



### 4.2 Gender

In the regression for total wealth the coefficient for the female dummy indicates that females have, other things being equal, 9.7% less wealth than males. The difference is not as large as one could have expected but still statistically significant. By taking also the results from the

***TABLE 9. Descriptive statistics of the data sample for 2000.***
**The sample consists of 51,673 randomly chosen individual persons who own any property in any of the nine property categories, and the data are as at December 31, 2000. The average and median values as well as standard deviation for the variables with monetary (FIM) values are calculated from the set of non-zeros. The city statistics are not included here since there are 449 different cities included in the data.**

| | | Statistics | | | | | |
|---|---|---|---|---|---|---|---|
| | Dependent variables | # of non-zeros | Average value | Median value | Maximum value (FIM in millions) | Sum (FIM in millions) | St. Dev. |
| Property categories (FIM) | Forest | 7,193 | 100,954 | 45,692 | 3.9 | 726.2 | 172,549 |
| | Real estate | 31,222 | 155,836 | 128,689 | 8.7 | 4,865.5 | 143,126 |
| | Apartments | 22,293 | 154,536 | 125,451 | 6.3 | 3,445.1 | 143,086 |
| | Family enterprises | 1,084 | 329,534 | 34,608 | 122.0 | 357.2 | 3,927,272 |
| | Foreign property | 90 | 88,427 | 15,675 | 2.6 | 8.0 | 294,476 |
| | Mutual funds | 6,694 | 47,387 | 12,571 | 5.8 | 317.2 | 168,762 |
| | Private firm net assets | 1,474 | 83,078 | 27,890 | 3.1 | 122.4 | 195,932 |
| | Agricultural net assets | 4,121 | 48,569 | 5,005 | 1.5 | 200.2 | 120,677 |
| | Other property | 11,602 | 168,019 | 28,000 | 81.2 | 1,949.4 | 1,267,895 |
| | Total assets | 51,673 | 237,904 | 149,282 | 203.5 | 12,292.0 | 1,105,575 |
| | Independent variables | | | | | | |
| Age dummies | 0-4 | 328 | 0.6 % | - | - | - | - |
| | 5-9 | 455 | 0.9 % | - | - | - | - |
| | 10-14 | 483 | 0.9 % | - | - | - | - |
| | 15-19 | 663 | 1.3 % | - | - | - | - |
| | 20-24 | 1,192 | 2.3 % | - | - | - | - |
| | 25-29 | 2,417 | 4.7 % | - | - | - | - |
| | 30-34 | 4,038 | 7.8 % | - | - | - | - |
| | 35-39 | 4,785 | 9.3 % | - | - | - | - |
| | 40-44 | 5,335 | 10.3 % | - | - | - | - |
| | 45-49 | 5,766 | 11.2 % | - | - | - | - |
| | 50-54 | 6,317 | 12.2 % | - | - | - | - |
| | 55-59 | 4,540 | 8.8 % | - | - | - | - |
| | 60-64 | 4,169 | 8.1 % | - | - | - | - |
| | 65-69 | 3,591 | 6.9 % | - | - | - | - |
| | 70-74 | 3,180 | 6.2 % | - | - | - | - |
| | 75-79 | 2,281 | 4.4 % | - | - | - | - |
| | 80-84 | 1,211 | 2.3 % | - | - | - | - |
| | 85-89 | 718 | 1.4 % | - | - | - | - |
| | 90- | 204 | 0.4 % | - | - | - | - |
| Gender dummies | Female | 25,871 | 50.1 % | - | - | - | - |
| | Male | 25,802 | 49.9 % | - | - | - | - |
| Province dummies | Greater Helsinki Area | 7,719 | 14.9 % | - | - | - | - |
| | Other Uusimaa | 5,979 | 11.6 % | - | - | - | - |
| | Häme | 8,216 | 15.9 % | - | - | - | - |
| | Keski-Suomi | 2,618 | 5.1 % | - | - | - | - |
| | Kuopio | 2,463 | 4.8 % | - | - | - | - |
| | Kymi | 4,986 | 9.6 % | - | - | - | - |
| | Lappi | 1,836 | 3.6 % | - | - | - | - |
| | Oulu | 4,280 | 8.3 % | - | - | - | - |
| | Pohjois-Karjala | 1,754 | 3.4 % | - | - | - | - |
| | Turku ja Pori | 7,032 | 13.6 % | - | - | - | - |
| | Vaasa | 4,506 | 8.7 % | - | - | - | - |
| Language dummies | Finnish | 48,581 | 94.0 % | - | - | - | - |
| | Swedish | 3,092 | 6.0 % | - | - | - | - |
| Housing dummy | Living at own residence | 29,166 | 56.0 % | - | - | - | - |
| Debt (FIM) | Mortgages and equivalent | 25,748 | 145,436 | 102,827 | 7.3 | 3,744.7 | 183,265 |
| | Other debt | 2,739 | 156,326 | 61,260 | 5.3 | 428.4 | 271,269 |
| Income (FIM) | Total income | 50,433 | 139,934 | 113,174 | 82.3 | 7,057.3 | 472,756 |

***TABLE 10. Results of the OLS regressions for total wealth, forest, real estate and apartment ownership.*** **This table presents the results of OLS regressions explaining the logarithmic value of an individual's total wealth, forest, real estate, and apartment ownership in Finland as at December 31, 2000. The samples consist of individuals who own property in the given category according to the Finnish tax authorities. The adjusted R squared indicates the explanatory power of the model. ** and * indicate the statistical significance at 1% and 5% level, respectively.**

| | | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Total wealth | | Forest | | Real estate | | Apartments | |
| Independent variables | | Coeff. | t-stats | Coeff. | t-stats | Coeff. | t-stats | Coeff. | t-stats |
| Constant | | 9.618 | 208.55 ** | 9.394 | 49.10 ** | 10.568 | 184.64 ** | 10.404 | 182.20 ** |
| Age dummies | 0-4 | -1.803 | -25.21 ** | 1.138 | 0.84 | -0.992 | -2.28 * | 0.336 | 1.01 |
| | 5-9 | -1.423 | -22.65 ** | -0.408 | -0.42 | -0.656 | -3.71 ** | -0.158 | -0.94 |
| | 10-14 | -1.090 | -18.31 ** | 0.683 | 1.36 | -0.469 | -3.95 ** | -0.166 | -1.26 |
| | 15-19 | -1.263 | -26.87 ** | 0.324 | 0.71 | -0.869 | -10.57 ** | -0.512 | -5.79 ** |
| | 20-24 | -0.979 | -27.88 ** | -0.166 | -0.74 | -0.562 | -9.77 ** | -0.208 | -5.22 ** |
| | 25-29 | -0.543 | -20.32 ** | -0.377 | -2.57 * | -0.213 | -6.10 ** | -0.194 | -6.96 ** |
| | 30-34 | -0.319 | -14.20 ** | -0.182 | -1.83 | -0.045 | -1.74 | -0.111 | -4.71 ** |
| | 35-39 | -0.241 | -11.39 ** | -0.182 | -2.40 * | 0.002 | 0.09 | -0.095 | -4.17 ** |
| | 40-44 | -0.177 | -8.67 ** | -0.042 | -0.60 | -0.006 | -0.27 | -0.061 | -2.83 ** |
| | 45-49 | -0.083 | -4.19 ** | -0.055 | -0.87 | -0.004 | -0.20 | -0.027 | -1.30 |
| | 50-54 | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | 55-59 | 0.095 | 4.48 ** | 0.046 | 0.73 | -0.014 | -0.61 | 0.069 | 3.27 ** |
| | 60-64 | 0.146 | 6.63 ** | 0.049 | 0.78 | -0.023 | -0.96 | 0.062 | 2.85 ** |
| | 65-69 | 0.154 | 6.64 ** | 0.137 | 2.08 * | -0.015 | -0.58 | 0.056 | 2.44 * |
| | 70-74 | 0.185 | 7.65 ** | 0.192 | 2.70 ** | -0.065 | -2.39 * | 0.127 | 5.42 ** |
| | 75-79 | 0.212 | 7.77 ** | 0.190 | 2.34 * | -0.099 | -3.11 ** | 0.176 | 6.84 ** |
| | 80-84 | 0.252 | 7.25 ** | 0.330 | 3.13 ** | -0.082 | -1.91 | 0.212 | 6.72 ** |
| | 85-89 | 0.127 | 2.92 ** | 0.370 | 2.59 * | -0.152 | -2.74 ** | 0.210 | 5.30 ** |
| | 90- | 0.039 | 0.50 | 0.247 | 0.98 | -0.371 | -3.59 ** | 0.184 | 2.62 ** |
| Gender dummies | Female | -0.093 | -9.45 ** | -0.279 | -8.05 ** | -0.165 | -14.44 ** | 0.085 | 8.29 ** |
| | Male | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| Province dummies | Greater Helsinki Area | 0.148 | 8.51 ** | -0.265 | -2.87 ** | -0.197 | -8.47 ** | 0.296 | 18.45 ** |
| | Other Uusimaa | 0.055 | 2.94 ** | -0.270 | -3.33 ** | 0.095 | 4.34 ** | 0.083 | 4.45 ** |
| | Häme | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | Keski-Suomi | 0.058 | 2.39 ** | 0.427 | 5.57 ** | 0.011 | 0.42 | -0.039 | -1.47 |
| | Kuopio | 0.012 | 0.47 | 0.192 | 2.49 * | -0.086 | -3.10 ** | -0.057 | -2.20 * |
| | Kymi | -0.014 | -0.70 | 0.394 | 6.01 ** | -0.036 | -1.66 | -0.059 | -2.83 ** |
| | Lappi | -0.109 | -3.86 ** | -1.095 | -13.42 ** | 0.050 | 1.69 | -0.065 | -1.82 |
| | Oulu | -0.022 | -1.09 | -0.839 | -13.18 ** | 0.039 | 1.73 | -0.092 | -4.03 ** |
| | Pohjois-Karjala | 0.004 | 0.13 | -0.052 | -0.65 | -0.067 | -2.20 * | -0.065 | -1.98 * |
| | Turku ja Pori | 0.018 | 1.00 | -0.619 | -9.76 ** | 0.035 | 1.78 | 0.004 | 0.23 |
| | Vaasa | -0.110 | -5.25 ** | -0.572 | -8.90 ** | 0.014 | 0.61 | -0.119 | -4.61 ** |
| Language dummies | Finnish | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | Swedish | 0.070 | 3.30 ** | -0.308 | -4.56 ** | 0.198 | 8.12 ** | 0.131 | 5.23 ** |
| Housing dummy | Living at own residence | 0.690 | 65.31 ** | 0.130 | 3.68 ** | 0.389 | 31.99 ** | 0.157 | 14.20 ** |
| Debt (lg FIM) | Mortgages and equivalent | 0.013 | 12.59 ** | -0.038 | -11.08 ** | 0.016 | 13.51 ** | 0.005 | 4.95 ** |
| | Other debt | 0.083 | 41.72 ** | 0.123 | 34.30 ** | 0.026 | 13.47 ** | -0.012 | -3.55 ** |
| Income (lg FIM) | Total Income | 0.153 | 42.52 ** | 0.108 | 7.03 ** | 0.064 | 14.07 ** | 0.091 | 20.02 ** |
| | Number of observations | 51,673 | | 7,193 | | 31,218 | | 22,293 | |
| | Adjusted R squared | 34.4% ** | | 26.0% ** | | 11.3% ** | | 9.1% ** | |

***TABLE 11. Results of the OLS regressions for mutual fund, private firm net asset and other property ownership.***

**This table presents the results of OLS regressions explaining the logarithmic value of an individual's mutual fund, private firm asset, agricultural asset, and other property ownership in Finland as at December 31, 2000. The samples consist of individuals who own property in the given category according to the Finnish tax authorities. The adjusted R squared indicates the explanatory power of the model. ** and * indicate the statistical significance at 1% and 5% level, respectively.**

| | | Dependent variables | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Mutual funds | | Private firm net assets | | Agricultural net assets | | Other property | |
| Independent variables | | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Constant | | 8.666 | 56.07 ** | 9.524 | 30.81 ** | 9.368 | 24.32 ** | 5.124 | 28.56 ** |
| Age dummies | 0-4 | -0.863 | -5.32 ** | omit. | omit. | omit. | omit. | 2.083 | 7.55 ** |
| | 5-9 | -0.606 | -3.93 ** | omit. | omit. | 0.523 | 0.29 | 1.663 | 7.79 ** |
| | 10-14 | -0.454 | -3.02 ** | omit. | omit. | -1.406 | -1.81 | 1.615 | 8.92 ** |
| | 15-19 | -0.567 | -4.68 ** | -3.285 | -3.81 ** | -0.918 | -1.35 | 0.782 | 5.82 ** |
| | 20-24 | -0.941 | -8.90 ** | 0.189 | 0.51 | 0.382 | 0.84 | 0.207 | 1.87 |
| | 25-29 | -0.691 | -6.60 ** | -0.411 | -1.80 | 0.220 | 0.80 | -0.060 | -0.68 |
| | 30-34 | -0.402 | -4.09 ** | -0.129 | -0.70 | 0.160 | 0.95 | -0.140 | -1.96 |
| | 35-39 | -0.251 | -2.49 * | -0.331 | -1.99 * | 0.143 | 1.00 | -0.154 | -2.31 * |
| | 40-44 | -0.181 | -1.90 | -0.280 | -1.80 | 0.251 | 1.98 * | -0.128 | -1.98 * |
| | 45-49 | -0.032 | -0.36 | 0.070 | 0.45 | 0.070 | 0.62 | -0.094 | -1.48 |
| | 50-54 | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | 55-59 | 0.100 | 1.14 | -0.006 | -0.04 | -0.052 | -0.47 | 0.132 | 2.02 * |
| | 60-64 | 0.158 | 1.75 | -0.211 | -1.00 | -0.204 | -1.83 | 0.181 | 2.61 ** |
| | 65-69 | 0.126 | 1.35 | -0.310 | -1.00 | -0.364 | -3.24 ** | 0.089 | 1.18 |
| | 70-74 | 0.349 | 3.32 ** | -0.418 | -0.92 | -0.486 | -3.99 ** | 0.220 | 2.66 ** |
| | 75-79 | 0.552 | 4.37 ** | -1.348 | -2.06 * | -0.512 | -3.82 ** | 0.069 | 0.71 |
| | 80-84 | 0.383 | 2.20 * | -1.196 | -1.20 | -0.293 | -1.74 | 0.411 | 3.08 ** |
| | 85-89 | 0.497 | 1.89 | omit. | omit. | -0.310 | -1.37 | 0.239 | 1.23 |
| | 90- | 0.826 | 1.19 | omit. | omit. | -0.484 | -1.34 | 0.065 | 0.17 |
| Gender dummies | Female | -0.306 | -7.86 ** | -0.624 | -6.51 ** | -0.666 | -9.16 ** | -0.361 | -10.95 ** |
| | Male | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| Province dummies | Greater Helsinki Area | 0.217 | 3.39 ** | -0.169 | -0.99 | -0.538 | -3.14 ** | 0.341 | 6.62 ** |
| | Other Uusimaa | -0.057 | -0.78 | 0.267 | 1.52 | -0.060 | -0.43 | 0.205 | 3.22 ** |
| | Häme | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | Keski-Suomi | -0.134 | -1.24 | -0.186 | -0.78 | -0.565 | -4.25 ** | -0.073 | -0.79 |
| | Kuopio | -0.279 | -2.44 * | -0.102 | -0.42 | -0.581 | -4.39 ** | -0.333 | -3.65 ** |
| | Kymi | -0.092 | -1.10 | -0.152 | -0.84 | -0.383 | -3.27 ** | -0.027 | -0.38 |
| | Lappi | -0.390 | -3.39 ** | 0.429 | 1.76 | -1.664 | -11.60 ** | -0.243 | -2.24 * |
| | Oulu | -0.223 | -2.55 * | 0.164 | 0.88 | -1.131 | -10.15 ** | 0.069 | 0.79 |
| | Pohjois-Karjala | 0.017 | 0.12 | -0.200 | -0.72 | -1.029 | -7.46 ** | -0.285 | -3.25 ** |
| | Turku ja Pori | -0.093 | -1.25 | -0.026 | -0.17 | 0.290 | 2.66 ** | 0.020 | 0.35 |
| | Vaasa | -0.390 | -4.45 ** | 0.303 | 1.68 | -0.349 | -3.11 ** | -0.276 | -4.40 ** |
| Language dummies | Finnish | comp. | comp. | comp. | comp. | comp. | comp. | comp. | comp. |
| | Swedish | 0.135 | 2.06 * | -0.105 | -0.56 | 0.091 | 0.82 | 0.489 | 8.11 ** |
| Housing dummy | Living at own residence | 0.313 | 6.64 ** | 0.467 | 4.73 ** | 0.031 | 0.49 | 0.274 | 7.60 ** |
| Debt (lg FIM) | Mortgage and equivalent | -0.095 | -21.88 ** | -0.020 | -2.33 * | -0.071 | -12.04 ** | -0.024 | -7.61 ** |
| | Other debt | 0.039 | 1.82 | 0.025 | 1.94 | 0.193 | 29.88 ** | -0.004 | -0.68 |
| Income (lg FIM) | Total Income | 0.120 | 11.07 ** | 0.064 | 2.74 ** | -0.013 | -0.40 | 0.435 | 30.66 ** |
| | Number of observations | 6,694 | | 1,474 | | 4,121 | | 11,602 | |
| | Adjusted R squared | 25.6% ** | | 8.3% ** | | 30.5% ** | | 14.1% ** | |

descriptive analysis into consideration one can see that while the participation, i.e. number of investors, is almost the same for males and females, the value of wealth allocated to each gender is clearly larger for males. Furthermore, in seven of the eight regressions the coefficient for the female dummy is negative, the only exception being apartment ownership. And most importantly, the gender dummy has strong statistical significance in each of the regression models presented in this analysis. Similarly, Karhunen and Keloharju (2001) find in their study that both the fraction of the number of investors and share ownership wealth itself are skewed towards males.

Looking at the results from a different perspective reveals some additional notifications. The negative relationship between women and wealth is largest in the models for private firm and agricultural net assets as well as for other property and mutual funds. Since the only positive relationship occurred in the model for apartment ownership, the interpretation could be that women are more reluctant to invest in the most risky asset categories. Also, for example, Riley and Chow (1992) in their study on asset allocation find that women appear to be slightly more risk averse than men.

In examining the results one should remember that, for example, the level of education is not controlled for in the regressions. Also if women are indeed more risk averse than men, adding interest-bearing instruments to the study might change the results dramatically. In addition, spouses have ownership rights to the property of each other through marriage.

### 4.3 Geographical location

The results concerning the province dummies indicate very interesting patterns. They, however, only partly support the findings of Karhunen and Keloharju (2001) who found that people living at urban areas have greater investment wealth on average than people living at rural areas. As expected with total wealth, people living at the Greater Helsinki Area have more wealth than people in any other province. The coefficient of 0.15 means 16.0% more wealth if a person lived at the Greater Helsinki Area as opposed to the comparable case of Häme. Also other Uusimaa expectedly has a positive correlation with wealth since it is the second most densely populated province in Finland. Somewhat surprisingly, however, Keski-Suomi with the biggest city being Jyväskylä, attain a statistically significant positive coefficient. On the other end, Vaasa and Lappi are the only ones that have a negative coefficient indicating a difference of 11.6% to Häme in total wealth.



The model for forest ownership indicates a very strong geographical dependence on forest wealth distribution. Keski-Suomi, Kuopio and Kymi have a positive relationship with forest wealth, whereas the coastal area and northern part of Finland have a significantly negative effect. This is reasonable since according to the Ministry of Agriculture and Forestry in Finland

(2000) the provinces with the most forest, i.e. in productive terms, are Kymi, Keski-Suomi, Kuopio, and Pohjois-Karjala. Unexpectedly however, the value of forest wealth in Pohjois-Karjala does not significantly differ from the comparable case of Häme.

In terms of financial wealth, i.e. mutual funds and other property, the largest positive relationship is with the people living in the Greater Helsinki Area. Lappi and Vaasa on the other end seem to be the poorest provinces. For agricultural net assets the results are interesting since Turku ja Pori is the area with the only positive coefficient.

### 4.4 Mother tongue

One of the most interesting results in the regression analyses concerns the language dummy. Karhunen and Keloharju (2001) in their study on share ownership find that the Swedish speaking people are much wealthier than the Finnish speaking people, the average investment wealth for the Swedish speaking population being over three times the one for the Finnish speaking population. The results in my study are fully in line with that – the Swedish speaking population is on average wealthier than the Finnish speaking population, ceteris paribus. Although the difference is clear and statistically significant, it is surprisingly small. The coefficient in the total wealth model is only 0.07 indicating a difference of only 7.3% between the two language groups. However, the result from the regression analysis together with the descriptive analysis presented in Table 7 indicate that Swedish as a mother tongue has a positive effect on wealth ownership.

Unexpectedly forest ownership is still in the hands of the Finnish-speaking population. Although surprising, this is somewhat understandable since the Swedish-speaking population is concentrated around the coastal areas in Finland, where there are relatively fewer forests than in other parts of Finland. The coefficient for the Swedish dummy is –0.31, meaning that the difference is 36.1%.

### 4.5 Housing

The highest and most significant positive coefficient in the regression model for total wealth is given to the housing dummy. The variable indicates whether the person in question owns the residence that he or she is living at, and the result of 0.69 strongly suggests that people owning their residence have more wealth than those who do not. However, with this data it is very hard to determine the reasons. By looking at the real estate and apartment ownership regressions one may notice that the coefficient for the housing dummy is less in those regressions than in the one for total wealth. This means that the housing dummy has a positive effect on total wealth, which is more than merely a result of the larger stake in real estate and apartment ownership. Also the fact that the coefficient is positive for all property categories should be

noted. This could be interpreted as a sign of the profitability of living at a self-owned residence – there is more to invest when one doesn't have to pay rent.

### 4.6 Debt

In addition to the above-mentioned factors also debt has a significant impact on wealth. Debt should have a direct positive effect on the overall wealth since it is often related to a purchase of an asset. On the other hand, people with too much debt may eventually drift into repayment difficulties and could risk losing the assets to creditors. In this study both debt variables, mortgages and equivalent debt, and other debt, are positively related with total wealth. The effect is not very large but it is statistically significant.

An interesting phenomenon is that mortgages and equivalent debt have a positive relationship with total wealth, real estate and apartment ownership whereas the coefficients in all other property categories are negative. This could be an indication of people being very cautious with additional investing while they still have unpaid mortgages. Furthermore, it is commonly acknowledged that investing in equity with borrowed money is very risky.

### 4.7 Income

The income variable has a statistically significant positive coefficient in almost each of the regression models. This is reasonable since people that earn more will under normal conditions also have more to consume and to invest. The exception of agricultural net assets is also understandable because personal income is usually channelled into personal use, not for investments in professional assets. The same applies even for private firm net assets, although the coefficient is a positive borderline case in terms of statistical significance.

Another phenomenon is also evident in the analysis. The income coefficients in the models for mutual funds and other property are 0.12 and 0.44, respectively. These numbers are the largest among the individual property categories and the conclusion is that the ownership of financial wealth is more dependent on income than the ownership of other wealth.

## 5. PORTFOLIO OPTIMALITY

This section assesses the optimality of the portfolios of Finnish individuals in relation to the efficient frontier. Determining the efficient frontier, and furthermore the optimal portfolio, is directly derived from the original ideas presented by Markowitz (1952, 1959), and some additional ideas have been brought forward by Elton et al. (1976, 1978, 1995). Portfolio evaluation on the other hand relies on the thoughts of Sharpe (1966, 1994) and Fama (1972). The following analyses will require many assumptions and the results may vary significantly de-

pending on those assumptions. Due to this the results should be interpreted with caution. However, there will be additional analyses to assess the effect of the different factors and the sensitivity of the results.

Since some of the asset categories cannot be evaluated in terms of return and risk with the data at hand, I will group the different wealth categories into three blocks. Forest ownership will be alone in the first block, and real estate and apartment ownership are in the second one called housing. The rest, i.e. family enterprises, mutual funds, foreign property, private firm net assets, agricultural net assets and other property are in essence equity of all kinds. Therefore they are assigned together in the third block, which is called stocks.

The somewhat artificial classification of the different property categories into three major ones might create problems in assessing the optimality of the individual portfolios. It is obvious that if a person has invested all of his or her wealth in, for example, Nokia's stocks, the risk and return characteristics for that portfolio are totally different from the one with, for example, mutual funds in it. In this study, because of the limitations, both will be treated equally in terms of risk and return. Another drawback would be that the diversification choices for an individual investor are often limited. The most common asset category that is missing would be bonds and equivalent. These are not taxable for net wealth, only for the interest and capital gain, and therefore they are not shown in the records of the tax authorities. Despite of the limitations mentioned above, I think that this categorisation is well founded, although the results should be very carefully interpreted. The return and risk measures for the different blocks as well as correlation matrices are recovered from the study of Lausti and Penttinen (1998). These measures are presented in Tables 12 and 13.

***TABLE 12. Annualised standard deviation and average return for different asset categories.***

**The return and risk measures are recovered from the study of Lausti and Penttinen (1998). The measures are derived from a data series covering the period from 1972 to 1996. The average returns include dividends and share issues for stocks, rent for housing and the change in the net increment of the growing stock for forest.**

| Asset category | Average return | Standard deviation | Sharpe ratio |
|---|---|---|---|
| Forest | 10.0 % | 14.8 % | 0.68 |
| Housing | 10.0 % | 12.7 % | 0.79 |
| Stocks | 14.8 % | 27.1 % | 0.55 |

***TABLE 13. Correlation coefficients for different asset categories.*** **The correlation coefficients are recovered from the study of Lausti and Penttinen (1998). The measures are derived from a data series covering the period from 1972 to 1996.**

| Asset category | Forest | Housing | Stocks |
|---|---|---|---|
| Forest | 1.00 | 0.59 | 0.16 |
| Housing | 0.59 | 1.00 | 0.53 |
| Stocks | 0.16 | 0.53 | 1.00 |

In this paper the purpose is first to determine the risk-return opportunities available to the investor. These are summarised by the minimum-variance frontier (efficient frontier) of risky assets. Given the set of data for expected returns, variances, and covariances, we can calculate the minimum-variance portfolio for any targeted expected return.

All the portfolios that lie on the minimum-variance frontier upward from the global minimum-variance portfolio provide the best risk-return combinations and thus are candidates for the optimal portfolio. Now the risk-free interest rate needs to be defined. It could be the rate of a government bond but one could also argue that it should be the average interest rate paid on a bank deposit, which usually is close to zero. The reason for this is that many people have their liquid capital lying on a zero-interest bearing savings account and are not able to attain the best possible lending rate. However, since investors have also the possibility to borrow in order to invest, I assume the risk-free interest rate to be the 12-month Euribor presenting the average market rates for borrowing and lending. At the end of 2000 the corresponding rate was 4.7%, which is used in the analysis.

Having determined all the parameters we may now derive the weights for the optimal asset portfolio. With the chosen risk-free interest rate of 4.7% the expected return of the optimal portfolio is 11.3% and the standard deviation is 13.4% resulting in a Sharpe ratio of 0.49. The asset weights for forest, housing and stocks are 43%, 31%, and 26%, respectively. A sensitivity analysis shows that the interest rate has an effect on the optimal portfolio, even though relatively small. The expected returns deviate approximately a tenth of a percentage point when the interest rate changes by 0.5 percentage points. For the standard deviation the respective number is 0.25 percentage points. For asset weights the deviations are much larger indicating that the results concerning the absolute optimality measures might be somewhat sensitive. Also altering the underlying assumptions concerning the risk (i.e. standard deviation) and return measures of the different asset categories has an effect. For example, lowering the assumptions on the return measures of the different asset categories down to more conventional risk premium levels, i.e. 3% for forest, 3% for housing and 7% for stocks (see e.g. Welch, 2000), chang-

es the corresponding asset weights for the optimal portfolio to 46%, 17% and 37%, respectively. The indication is that this kind of a change in the underlying assumptions causes the efficient frontier to move down, making the optimal asset allocation line flatter. As a result the optimal portfolio on the efficient frontier moves up and right. This should be kept in mind especially when, for example, looking at Figures 6, 7, and 8.

The performance of an individual portfolio may be evaluated by a variety of means. There are measures such as the Sharpe ratio (Sharpe, 1966), the Treynor ratio (Treynor, 1965), the alpha of Jensen (1968, 1969), and the use of randomly generated passive portfolios of the same risk of Friend et al. (1970). Since none of the measures evaluate a portfolio in the above- or below-average sense, it is necessary to repeat the techniques for the benchmark portfolio (in this case the optimal portfolio) and then compare the corresponding values to resolve the question of superior or inferior performance. In this study, in order to assess the optimality of a portfolio, I will use the difference between the Sharpe ratios of an individual portfolio and the optimal one, and Fama's (1972) net selectivity. Fredriksson (2002) explains the use of these measures in more detail.

In order to assess the optimality of a portfolio in relation to the efficient frontier I will start with investigating the level of diversification for the portfolios in question. To get an idea of the level of diversification in the individual investor's portfolio I have listed the number of different property categories in one's portfolio for the original property categories and the compressed ones in Table 14. Table 14 also presents the level of diversification conditional to ownership in certain property categories. The results indicate that the degree of diversification is very low for most Finnish individual investors. The mean for the number of different property categories in one's portfolio is 1.66 while considering the original categories and 1.43 for the compressed ones. Especially the portfolios consisting of real estate or apartments have low levels of diversification proposing that investments in housing limit the other investment choices.

The low level of diversification suggests that the portfolios cannot be very optimal. Furthermore, the t-tests assessing whether the portfolios of Finnish individual investors are optimal or not indicate that the mean for both optimality measures (i.e. the Sharpe difference and Fama's net selectivity) are significantly lower than zero. This leads into a conclusion that Finnish investors do not have optimal portfolios in relation to the efficient frontier. The reasons for this are most likely related to the information asymmetry, the transaction costs, and pure ignorance as presented by Guiso et al. (2000). Another reason might be that when it comes to personal property, the investors start to act more like consumers and as a result other factors than financial utility determine the investment decision. Gordon (1994) also suggests that the long-term nature of many investments, particularly those in real property (i.e. real estate, personal businesses etc.) make it difficult to find portfolio adjustments.

***TABLE 14. The level of diversification for the portfolios of Finnish individual investors.***
**This table presents the number of different property categories in the portfolios of Finnish individual investors. The statistics are for both, the original property categories and the compressed ones. The original ones include forest, real estate, apartments, family enterprises, foreign property, mutual funds, private firm net assets, agricultural net assets and other property. The compressed ones are forest, housing (i.e. real estate and apartments) and stocks (i.e. the rest of the original categories). The data used in calculating these statistics are as at December 31, 2000.**

| Original property categories | | Compressed property categories | | Conditional to ownership in a certain category | |
|---|---|---|---|---|---|
| # of categories in a portfolio | # of cases | # of categories in a portfolio | # of cases | Property category | Mean number of categories in a portfolio |
| 1 | 58.7% | 1 | 66.7% | Forest | 3.10 |
| 2 | 23.9% | 2 | 24.1% | Real estate | 1.91 |
| 3 | 11.4% | 3 | 9.2% | Apartments | 1.82 |
| 4 | 4.7% | | | Family enterprises | 2.98 |
| 5 | 1.1% | | | Foreign property | 3.38 |
| 6 | 0.2% | | | Mutual funds | 2.20 |
| 7 | 0.0% | | | Private firm net assets | 2.50 |
| 8 | 0.0% | | | Agricultural net assets | 3.54 |
| 9 | 0.0% | | | Other property | 2.58 |
| Mean = 1.66 | | Mean = 1.43 | | Real estate and apartments | 2.83 |

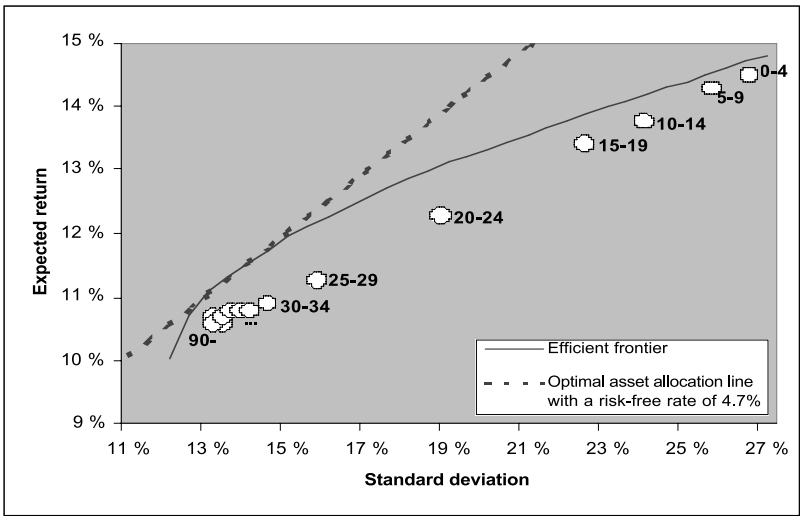



***FIGURE 6. Average risk and return for the portfolios of individual investors by age.***



**This Figure plots the average return and standard deviation pairs for individual investors in Finland in different age categories. They are plotted in relation to the efficient frontier and the optimal asset allocation line presented in section 5. All data are as at December 31, 2000.**

To get an idea of where exactly the portfolios of individual Finnish investors lie, I have plotted the average portfolios for different investor clusters – i.e. by age, gender, province, language and housing – relative to the efficient frontier and the optimal asset allocation line. The results may be seen in Figures 6, 7 and 8.

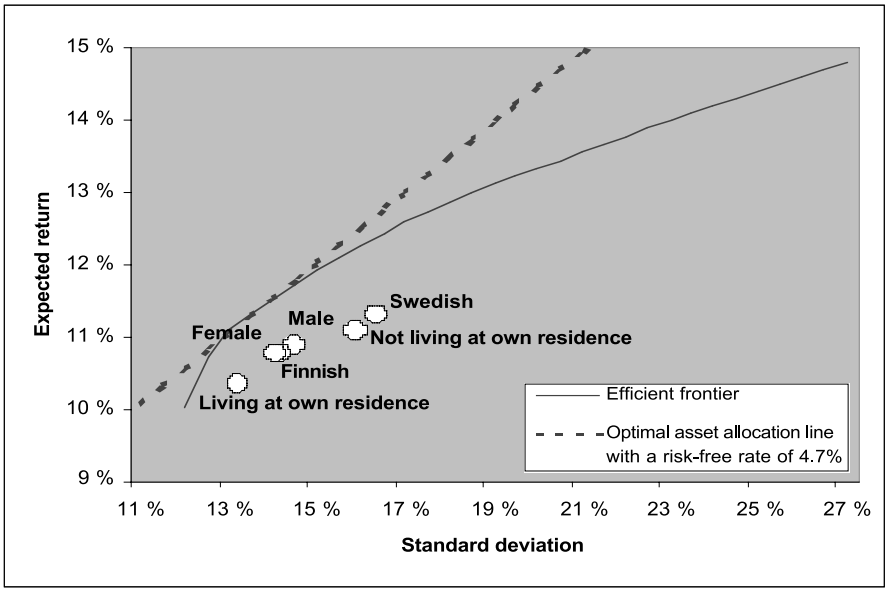



***FIGURE 7. Average risk and return for the portfolios of individual investors by gender, mother tongue, and the housing conditions.***
**This Figure plots the average return and standard deviation pairs for individual investors in Finland in different gender, mother tongue, and housing condition categories. They are plotted in relation to the efficient frontier and the optimal asset allocation line presented in section 5. All data are as at December 31, 2000.**

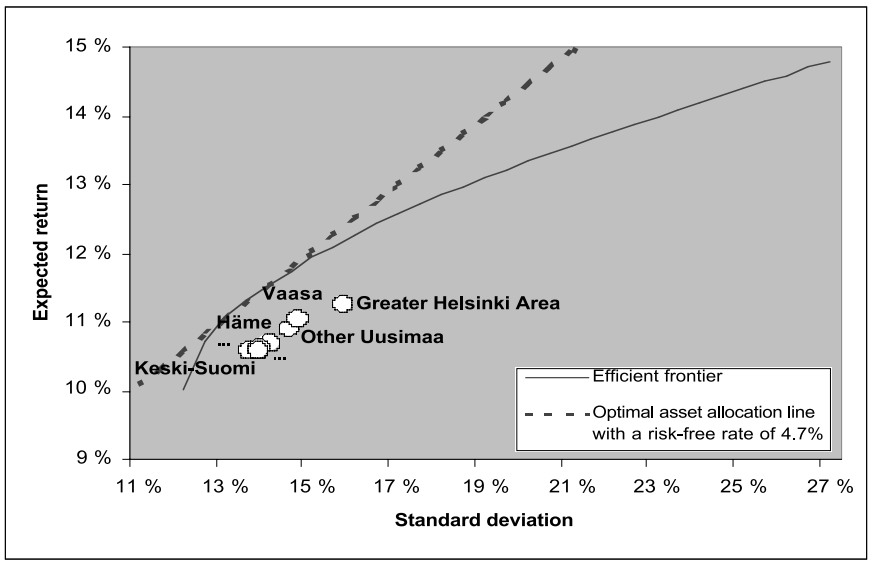
Figure 6 shows that age is a very good determinant for portfolio optimality. One possible reason for this is that knowledge and experience together are positively correlated with portfolio optimality. However, the almost linear increase in the optimality measures by age could also be merely a result of a higher degree of diversification or of a tendency to invest in certain asset categories at different ages. As the descriptive analysis presented, forest ownership is very much concentrated among the more senior people, and in this analysis forest is a strong determinant for the optimality since it correlates the least with the other asset categories.



The plot of the average return and risk by gender and mother tongue in Figure 7 reveals that there is no significant difference in the optimality of the portfolios of males and females or Finnish and Swedish speaking population. The same applies to the geographical dependence

***FIGURE 8. Average risk and return for the portfolios of individual investors by province.***

**This Figure plots the average return and standard deviation pairs for individual investors in Finland in different province categories. They are plotted in relation to the efficient frontier and the optimal asset allocation line presented in section 5. All data are as at December 31, 2000.**




presented in Figure 8. Some interesting patterns, however, may be found by looking at the housing dummy in Figure 7. People living in a self-owned residence have more optimal portfolios than others. The positive relationship might indicate that house owners in Finland are aware and concerned with the efficiency in investing, and owning the residence gives perhaps better opportunities to optimise the portfolio.

To further examine the key elements affecting portfolio optimality a regression analysis similar to the one presented in section 4 is conducted (not fully reported here for brevity). The dependent variables are the Sharpe difference (Fredriksson, 2002) and Fama's (1972) net selectivity. The explanatory powers of the models are 23.5% for the Sharpe difference and 32.2% for the net selectivity, and the results in general support the previous findings. In addition, total income has a positive coefficient indicating that people with more income have more optimal portfolios. Because of the multicollinearity problems I am not able to include total wealth as a variable in the model but testing it separately shows that also wealth has a statistically significant positive effect on optimality. It seems reasonable since people with higher wealth would most likely have more and better investing opportunities to optimise their portfolios, and in addition the transaction costs would be relatively lower than for those with less wealth (Guiso et al., 2000).

In the case of higher income it would also be easier to optimise the portfolio because the investor would have more loose money to invest in a way that would shift the asset weights closer to a more optimal portfolio without having to liquidate the existing property.

I have replicated the analyses presented above for alternative underlying assumptions. Altering the return and risk measures has some effect as explained earlier but the interpretation of the results does not change dramatically. For example, decreasing the risk or increasing the average return of stocks brings the lower age category coefficients closer to zero indicating an improved optimality for those categories. This is understandable since people in the lowest age categories have most of their assets invested in stocks and improving the optimality of stocks alone brings the overall portfolios closer to the optimal asset allocation line. However, the optimality still increases along with age and the results are in this respect quite robust. The same applies also for other risk and return assumptions as long as the changes are reasonably low. Changing the covariance assumptions has a stronger effect on the results, especially on the efficient frontier, but again as long as the changes remain relatively low the interpretation of the results does not differ from the original set of analyses. Increasing the assumed risk-free interest rate brings the optimal asset allocation line closer to the high end of the efficient frontier. This makes the portfolios with more stocks more optimal altering the results somewhat. However, a change of e.g. one percentage point does not significantly change the results.

## 6. CONCLUSIONS

Three different types of analyses have been used in order to fulfil the main objectives of this paper. First, a descriptive analysis has been employed to create an understanding of the wealth distribution in Finland. Second, a regression analysis has been conducted in order to identify the key drivers for wealth in Finland, and lastly, I have used Markowitz's Portfolio Selection model together with a regression analysis to examine the optimality of portfolio composition among Finnish individual investors.

The results indicate that wealth is concentrated among more senior people, that females have less property than males, and that Swedish as a mother tongue has a positive effect on property ownership. Also debt and income have a positive correlation with wealth. In addition, Finnish individual investors do not have very optimal portfolios, but people with higher income or wealth have more optimal portfolios than others.

As a final conclusion I could state that portfolio composition of individual investors in Finland follows some specified patterns. This paper has been able to investigate the relationship between investor characteristics and property ownership in many forms and all the individual objectives have been reached. Moreover, the results are relatively robust and clear.

## REFERENCES

**COHN, R., W. LEWELLEN, R. LEASE and G. SCHLARBAUM** (1975): "Individual investor risk aversion and investment portfolio composition", *Journal of Finance* 30 (2), 605–620.

**DELTAS, G.** (2000): *The small sample bias of the Gini coefficient: Results and implications for empirical research,* working paper, University of Illinois at Urbana-Champaign.

**ELTON, E., M. GRUBER and M. PADBERG** (1976): "Simple criteria for optimal portfolio selection", *Journal of Finance* 11 (5), 1341–1357.

**ELTON, E., M. GRUBER and M. PADBERG** (1978): "Simple criteria for optimal portfolio selection: tracing out the efficient frontier", *Journal of Finance* 13 (1), 296–302.

**ELTON, E. and M. GRUBER** (1995): *Modern Portfolio Theory and Investment Analysis,* 5. edition, John Wiley & Sons, New York.

**FAMA, E.** (1972): "Components of investment performance", *Journal of Finance* 27 (3), 551–67.

**FREDRIKSSON, J.** (2002): *Portfolio Composition of Individual Investors in Finland,* Master's thesis, Helsinki School of Economics, HeSE-Print, Helsinki.

**FRIEDMAN, M.** (1957): *A Theory of the Consumption Function,* Princeton University Press, Princeton.

**FRIEND, I., M. BLUME and J. CROCKETT** (1970): *Mutual Funds and Other Institutional Investors,* McGraw-Hill, New York.

**GORDON, R.** (1994): "Comments" in J. Slernrod, ed., *Tax Progressivity and Income Inequality,* MIT Press, Cambridge.

**GUISO, L., M. HALIASSOS and T. JAPPELLI** (2000): *Household portfolios* (working title), The MIT Press, Cambridge (forthcoming).

**JENSEN, C.** (1968): "The performance of mutual funds in the period 1945–1964", *Journal of Finance* 23 (2), 389–415.

**JENSEN, C.** (1969): "Risk, the pricing of capital assets, and the evaluation of investment portfolios", *Journal of Business* 42 (2), 167–247.

**KARHUNEN, J. and M. KELOHARJU** (2001): "Shareownership in Finland 2000", *The Finnish Journal of Business Economics* 50, 188–226.

**KATAJAMÄKI, M.** (2002): "Perijˆiden sukupolvea saadaan vielä odotella" (an article about inheritance in Finland, in Finnish), *Kauppalehti Saldo* (April 5th), 4–5.

**LAUSTI, A. and M. PENTTINEN** (1998): "The analysis of return and its components of non-industrial private forest ownership by forestry board districts in Finland", *Silva Fennica* 32 (1), 75–94.

**MARKOWITZ, H.** (1952): "Portfolio Selection", *Journal of Finance 7*, 77–91.

**MARKOWITZ, H.** (1959): *Portfolio Selection: Efficient Diversification of Investments,* Wiley, New York.

**MCINISH, T., S. RAMASWAMI and R. SRIVASTAVA** (1993): "Do more risk-averse investors have lower net worth and income?", *The Financial Review* 28 (1), 91–106.

**MINISTRY OF AGRICULTURE AND FORESTRY IN FINLAND** (2000): *Suomen metsätalouden tila 2000: Kestävän metsätalouden kriteerit ja indikaattorit* (a report on the state of the Finnish forests, in Finnish), Kirjapaino PrintLink, Helsinki.

**MODIGLIANI, F. and BRUMBERG, R.** (1954): "Utility analysis and the consumption function: An interpretation of cross-section data", in Kurihara, K.K (ed.): *Post-Keynesian Economics,* Rutgers University Press, New Brunswick.

**RILEY, W. and K. CHOW** (1992): "Asset allocation and individual risk aversion", *Financial Analysts Journal* 48:6, 32–37.

**SHARPE, W.** (1966): "Mutual fund performance", *Journal of Business* 39, 119–138.

**SHARPE, W.** (1994): "The Sharpe ratio", *Journal of Portfolio Management,* 49–57.

**TREYNOR, J.** (1965): "How to rate management of investment funds", *Harvard Business Review* 43, 63–75.

**WELCH, I.** (2000): "Views of financial economists on the equity premium and on professional controversies", *Journal of Business* 73 (4), 501–537.