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A PROGRAM FOR RESEARCH ON

## **SOCIAL AND ECONOMIC DIMENSIONS OF AN AGING POPULATION**

**Life-cycle Asset Accumulation and  
Allocation in Canada**

**Kevin Milligan**

**SEDAP Research Paper No. 122**

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# Life-cycle Asset Accumulation and Allocation in Canada\*

Kevin Milligan<sup>†</sup>

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## Abstract

This paper documents the life-cycle patterns of household portfolios in Canada, and investigates several hypotheses about asset accumulation and allocation. Inferences are drawn from the 1999 Survey of Financial Security, with some comparisons to earlier wealth surveys from 1977 and 1984. I find cross-sectional evidence for asset decumulation at older ages when annuitized assets like pension wealth are included in the analysis. I also find that the portfolio share of financial assets increases sharply with age, while indicators of risk tolerance appear to decrease. This is consistent with families desiring more liquid and less risky assets as they age.

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# 1 Introduction

The study of financial portfolios has produced a broad and deep body of empirical and theoretical knowledge about the pricing of financial assets and their allocation within a portfolio. However, directly held financial assets represent only a small fraction of household portfolios — most households hold more wealth in housing and pensions, for example. This observation has driven an interest in documenting the broader asset allocation decisions made by households.

Household portfolio decisions may also provide insight into life-cycle patterns of saving. A key prediction of the life-cycle model is that households decumulate assets in retirement. The evidence on the decumulation hypothesis, as surveyed by Browning and Lusardi (1996), is mixed at best.<sup>1</sup> A variety of models have attempted to resolve this puzzle through, for example, bequests (Kotlikoff and Summers (1981)), uncertain lifetime (Davies (1981)), or precautionary savings (Zeldes (1989)). Examining the accumulation and decumulation of different household assets may provide further insight into the puzzle and these models.

The life-cycle holdings of risky assets present another motivation for the study of household portfolios. Samuelson (1969) sets out the theoretical case for age-independence of risk-taking, showing that investing over longer horizons does not diversify risk away. Ameriks and Zeldes (2001) and Gollier (2002) provide reviews of the theory, pointing out that the age-independence hypothesis depends critically on several assumptions.<sup>2</sup> There is empirical evidence on age patterns of risky asset holding from many countries.<sup>3</sup> Broadly, the existing evidence suggests that the age profile of risk-bearing tends to follow a hump shape pattern, with risk tolerance first increasing with age then decreasing in later life. The evidence is stronger on the extensive margin (the ownership rate) than on the intensive margin (portfolio shares).

In this paper, I study household portfolio allocation over the life-cycle in Canada, with two specific purposes. First, I document the life-cycle patterns in household wealth allocation in Canada, comparing data from the 1970s, 1980s, and 1990s. Second, I provide some evidence on the concordance of the life-cycle patterns in the data with established theories and evidence of life-cycle portfolio behaviour. On both fronts, I place the Canadian evidence in the context of international studies.

Using three cross-sections of microdata, I uncover several interesting facts about asset holding in Canada. Overall household assets at the peak of the life-cycle increased sharply from 1977 to 1999, rising by more than 40 per cent at the median. Among younger families, however, median assets

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<sup>1</sup>Börsch-Supan (2003) assembles recent evidence on six countries. Börsch-Supan and Lusardi (2003) note (p. 22) that there is strikingly little evidence of dissaving at older ages.

<sup>2</sup>For example, markets must be complete, investors must have no non-tradeable assets (such as human capital), and utility functions must be of the constant relative risk aversion class.

<sup>3</sup>See the country studies in Guiso et al. (2002), as well as Ameriks and Zeldes (2001) and Poterba and Samwick (2001).

were lower in 1999 than in 1977. The category showing greatest growth is tax-preferred savings accounts such as Registered Retirement Savings Plans. Wealth held in these accounts increased dramatically, from less than 2 per cent of assets in 1977 to more than 12 per cent in 1999. Finally, the estimated value of income security wealth is large. In 1999, including income security wealth increases total assets by 41 per cent.

I also examine the question of asset decumulation at older ages. Browning and Crossley (2001) suggest that the inclusion of assets that annuitize, such as pensions, might lead to stronger support for the decumulation hypothesis. I find that when annuitizing assets are excluded, there is little evidence of decumulation. However, when employer-provided pensions and public pensions are accounted for, there is stronger evidence of decumulation. This accords with the alternative resolution to the puzzle of asset decumulation presented by Jappelli and Modigliani (1998) using data for Italy — excluding annuitized assets from the analysis leads to age-wealth profiles that are too flat. Accordingly, tests for asset decumulation that ignore the assets that annuitize will be biased against finding decumulation.

Finally, I document the life-cycle patterns of household portfolio allocation, uncovering sharp differences through the life-cycle. I find that the share of wealth held in financial assets increases with age, particularly in bank accounts. As well, direct holding of stocks goes down with age while holding of fixed income securities goes up. This may suggest increasing preferences for liquidity and increasing risk aversion with age. It might also suggest that pensions are ‘over-’ annuitized, as funds from pensions and tax-preferred accounts move into liquid forms of savings rather than consumption.

Many researchers have addressed similar and related questions using Canadian data. Wealth inequality is the focus in Beach et al. (1981), Davies (1993), Siddiq and Beach (1995), and Morissette et al. (2002). More closely related to my work, two papers study the decline of total wealth at older ages. King and Dicks-Mireaux (1982) find some evidence of decumulation, especially when they consider pension wealth. Using the same data, Burbidge and Robb (1985) find evidence for decumulation only among blue-collar workers, although they do not consider pensions. Finally, Burbidge and Davies (1994) describe household portfolios in Canada using earlier waves of data.

## 2 Data and Descriptive Statistics

I use asset and debt surveys from 1977, 1984, and 1999 for the analysis. The 1977 and 1984 files are part of the Survey of Consumer Finances. The 1999 survey is called the Survey of Financial Security. I use the master files of the 1999 survey, which feature greater disaggregation than the public use files, but is otherwise similar.<sup>4</sup> Comparing the Survey of Consumer Finances to the Survey of

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<sup>4</sup>The public use data is subjected to the addition of random ‘noise’, as well as being rounded and subjected to top and bottom coding. The public use data set also groups the age variable, making age profiles more coarse. The

Financial Security, the latter survey includes a broader range of assets, notably employer-provided pensions and Registered Retirement Income Funds. As shown by Davies (1979), under-reporting may be a problem in asset surveys. I assess the extent of this problem below by comparing the survey data to available aggregate data. Results from all three surveys are reported in 1999 dollars, adjusted by the consumer price index.

The surveys are based on samples drawn from the geographically stratified sampling frames of the Labour Force Survey, which is broadly representative of Canadians when the survey weights are applied.<sup>5</sup> The unit of observation is the census family, with demographic information provided for the respondent and each family member aged 15 and over.<sup>6</sup> All references in the paper to the ‘family’ encompass both census families and non-family persons. Asset and debt variables are aggregated to the family level. In 1999, an additional sample of families from high income areas was added in order to ensure a sufficiently large sample of households with wealth. This structure makes necessary the use of sample weights to ensure results are nationally representative. In both years of the Survey of Consumer Finances, a small number of observations are labelled ‘special family units,’ indicating that demographic information is masked to prevent privacy disclosure. I remove these special family units from the sample for 1977 and 1984. I use the provided weights for all results appearing in the paper.

Compared to U.S. data sources, the Canadian data has advantages and disadvantages. The larger sample size of the Canadian samples helps by providing sufficient data for the study of particular subsamples, such as age groups. As well, the imputed pension wealth data available in the 1999 Survey of Financial Security helps by broadening the wealth measures included in the data. In contrast, the U.S. Survey of Consumer Finances has a smaller sample size and less information on employer pensions. The major advantage of the American data is the greater disaggregation of the wealth categories. As one example, researchers can observe asset allocation *within* tax-preferred accounts and mutual funds. This disaggregation is not possible with the Canadian data.

## 2.1 Income Security Wealth

In addition to the variables provided by the surveys, I include one further measure of wealth in the analysis. Income security wealth represents the estimated net present value of future public differences between the public use and master files are described in Statistics Canada (2003).

<sup>5</sup>According to Statistics Canada (2001a), the exclusions from the sampling frame are residents of the territories, those living on Indian reserves, representatives of foreign countries and their families, members of the military living on bases, residents of penal institutions, members of religious and communal colonies, and chronic care patients. In 1999, the survey universe included 98 per cent of the population.

<sup>6</sup>When comparing 1999 data to earlier years, it is important to note that changes in family formation may affect the measurement of wealth, since it is measured on a family basis. Because of increased marital breakdown, the same assets are split across more families.

pension flows, based on the work history to date.<sup>7</sup> While phantasmal rather than physical in nature, income security wealth arises through foregone consumption when young (taxes and contributions) which generate a flow of income when older (pension benefits). Jappelli and Modigliani (1998), among others, argue that its consideration is crucial to making inferences about life-cycle wealth accumulation. The country studies in Börsch-Supan (2003) also feature a comparison between ‘mandatory’ public pension wealth and ‘discretionary’ wealth.

The calculation of income security wealth requires data beyond what is available in the surveys at hand. Specifically, knowledge of earnings histories back to age 18 or 1966, along with an estimate of income in retirement, is necessary to calculate the entitlements to the Canada/Quebec Pension Plans and the income-tested benefits of the Guaranteed Income Supplement and the Allowance. To proceed, I impute this information to individuals using the observed characteristics of household members in the survey. The imputation is described in the Appendix, and exploits an income security wealth calculator developed in previous work (Baker et al. (2003)). Of special importance, the income security wealth calculations assume that retirement occurs at age 62. This means that income security wealth profiles necessarily decline from this age.<sup>8</sup> The dependence of the results on the imputation procedure renders inferences about income security wealth only partially informative. For this reason, I include measures of wealth that include income security wealth only as a supplement to the main results.

## 2.2 Descriptive Statistics

I report descriptive statistics for the 1999 Survey of Financial Security in Table 1. With the exception of pensions, the reported values are the respondent’s assessments of the current market value of the asset.<sup>9</sup> Pensions are valued by matching the reported pension registration number to administrative data sources.<sup>10</sup> For each variable, several statistics about the distribution are displayed across the row. First is the unconditional mean over all observations, followed by the aggregate share of total assets for each measure. For many assets, some families have no holdings. For this reason, I provide the mean, standard deviation, and several percentiles of the distribution

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<sup>7</sup>Treating future public pension flows as ‘wealth’ goes back to Feldstein (1974), who introduced the concept of social security wealth.

<sup>8</sup>Assigning individual retirement ages would detract from the transparency of the income security wealth analysis and avoids the endogeneity of the retirement decision to wealth. Age 62 was chosen to match the age at which more males are out of the labour force than in it, as calculated using the 1999 Survey of Labour and Income Dynamics. Alternative definitions of retirement lead to average retirement ages in the 60-63 range. When the analysis in this paper is repeated using other ages near 62, the inferences do not change.

<sup>9</sup>For example, for the value of the primary residence the respondent is asked “how much would this property sell for today?” The questions for other assets are similar.

<sup>10</sup>The survey questionnaire asks for the pension registration number from the respondent’s T-4 tax form. By matching this number to administrative data on pensions maintained by Statistics Canada, the provisions of the pension (such as the earnings base, the rate of accrual with years of service, flat or indexed benefits) are obtained. See Statistics Canada (2001b) for details on the methodology used.

for each variable *conditional* on holding the asset.

The rows of the table present information on different asset categories. At the top is total assets. I decompose total assets into six mutually exclusive and exhaustive categories: financial, pensions, tax-preferred savings, property, durables, and business equity. For these categories, where appropriate, I further disaggregate into several components. In all cases, the aggregation and disaggregation was verified against the totals variables reported in the survey. Statistics on debt and net worth are provided at the bottom of the table.

The aggregation of assets across different categories raises a measurement question. All asset values are reported on a pre-tax basis, but the tax treatment of the assets varies greatly. For example, capital gains taxes may be owing on financial assets but capital gains on primary residences are tax-exempt. Lacking a transparent method of placing the asset categories on an after-tax basis, I follow the international literature and leave the assets on a pre-tax basis. The taxable status of different categories of assets should be kept in mind when comparing across categories.

The first row contains information on total assets. The mean family total assets in the sample is \$286,784, reported in 1999 dollars. Aggregated to the national level using the weights, this represents a total of 3.50 trillion dollars. As a comparison, the National Balance Sheet Accounts show a similar total, with aggregate Total Assets reported at 3.75 trillion dollars in 1999.<sup>11</sup> The distribution of assets is skewed toward higher wealth levels, with the mean situated above the median and just below the 75th percentile.

In the second row I report total assets using a restricted set of assets chosen to mimic the assets reported in the 1977 and 1984 Survey of Consumer Finance surveys. I follow Morissette et al. (2002) in excluding work-related pensions, household contents, *other durables*, annuities, and Registered Retirement Income Funds to arrive at the measure I call *Total assets, SCF definition*. It should be noted, however, that this exclusion assumes that there has been no substitution from the assets included in the restricted measure to those in the excluded assets. The mean of *Total assets, SCF definition* is \$212,264, with 96.7 per cent of households reporting a positive value.<sup>12</sup>

Financial assets is the first asset category in the table. This category includes deposits in bank accounts, term deposits such as guaranteed investment certificates (GICs), mutual funds, directly held publicly traded or private equity, fixed income assets, along with a residual *other financial assets* category. Overall, financial assets represent 12.1 per cent of total family assets. The distribution is highly skewed, with a mean of \$34,782 and a median of only \$4,350. The median holdings of bank account deposits is \$2,000, which represents about 1.96 weeks of average family

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<sup>11</sup>The National Balance Sheet Accounts are assembled using data on aggregated financial flows. More detail on the construction of the National Balance Sheet Accounts is found in Statistics Canada (1989). The Total Assets series is taken from CANSIM series V33462.

<sup>12</sup>Few households reported no assets in 1999 because household contents are included as assets. With this category excluded under the SCF definition, more households show zero total assets.



income in 1999. While more than 87 per cent of families have bank account deposits, participation in other types of financial assets is more limited. Only 11.2 per cent of households hold stocks directly, while 14.7 per cent hold fixed income securities.

Next in Table 1 are statistics on pensions. Actuarial present values of rights accrued under pensions provided by past and current employers are reported in the Survey of Financial Security. Around 32 per cent of families in the sample have a family member enrolled in a pension plan in his or her workplace. As a comparison, 33.4 per cent of the labour force is covered by an employer pension, as reported in Statistics Canada (2002).<sup>13</sup> The proportion of households holding an annuity or a foreign pension is very small. Overall, pension benefits amount to 17.4 per cent of family assets.

Tax-preferred savings accounts constitute 12.0 per cent of family assets. All five of the registered plans listed in the table provide special tax treatment to savings. The most popular are Registered Retirement Savings Plans, which must be converted to Registered Retirement Income Funds by age 69 (71 prior to 1996). Registered Education Savings Plans have grown in popularity, but are still relatively small relative to Registered Retirement Savings Plans. New contributions to Registered Home Ownership Savings Plans were discontinued in 1985, but funds contributed previous to then continue to be held inside the plans. Deferred Profit Sharing Plans play a relatively small role in household portfolios.

Property holdings exceed \$109,000 per family, on average over all families. Conditional on owning property, the value is \$172,251 at the mean and \$132,000 at the median. The bulk of property holdings is in primary residences. Real estate holdings other than the primary residence are also relatively large at the mean, at \$116,998. However, the distribution of other real estate holdings is much more skewed than the value of primary residences — the median of *Other real estate* is about 56 per cent of the mean value, conditional on holding.

Real estate has traditionally been the largest asset in family portfolios. On first look, this appears to be true for 1999 as well, with the value of primary residences representing 38.2 per cent of family assets. However, the sum of the shares of pensions and tax-preferred assets is 29.4 per cent. This sum exceeds the *net* value (less the value of mortgages) of real estate of 28.1 per cent.

In the durables category I place vehicles, contents, and other durables including collectibles, valuables, and other non-financial assets. All families report a positive level of household contents, making the *durables* category positive for all families. The largest skewness in this category is found in the *other durables* component, as some families hold much larger amounts of *other durables*.

Around 18 per cent of the families in the sample report a positive amount of business equity. However, the median value of this equity is only \$10,000, suggesting that many of these busi-

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<sup>13</sup>Since my sample includes non-workers, the proportion with a pension should be lower than in the employer pension data.

nesses are very small. The business equity category includes both farms and professional practices. Business equity accounts for around 10 per cent of total family wealth.

The next category in Table 1 reports the debt position of Canadian families, followed immediately by net worth. The average family debt of \$37,499 offsets about 13 per cent of average total assets, leaving average net worth of \$249,285. The largest debt by far is mortgages, at an average value of \$82,844, conditional on having a mortgage. Student loans and credit card debt play a much smaller role on average across all families. However, the incidence of student loans is lower and the average value conditional on holding is higher than credit card debt. The *other debt* component includes consumer and vehicle loans, and has a fairly broad incidence across families of 42.1 per cent.

The final rows of the table report statistics related to the income security wealth position of the family. Because of the assumptions necessary to generate an imputed income security wealth number for each family, the values should be interpreted carefully. I provide the estimates here only to illustrate the importance of the relative magnitude — it is equal to 41 per cent of total family assets. Aggregated up to the national level, this represents \$1.45 trillion.<sup>14</sup>

Table 2 contains some of the same descriptive statistics, but restricting the sample to the lowest and the highest quartiles of net worth. The quartiles are formed separately by age, so the age distribution is identical across quartiles. The mean level of every asset category is higher for the top quartile. Total assets in the top quartile have a mean of \$726,221, while in the bottom quartile the mean of total assets was only \$25,455. Positive holdings of financial assets outside bank accounts are much lower in the low quartile compared to the top quartile. The same low holdings pattern is true for pensions and for property holdings. Interestingly, 21.2 per cent of low quartile families show positive level of Registered Retirement Savings Plans. The observed differences in household portfolio allocation across high and low wealth households may contradict two-fund separation, which predicts all agents will hold a similar risky portfolio.<sup>15</sup> Finally, the income security wealth level in the bottom quartile is \$99,007. The comparable figure for the top quartile is \$133,609; not much higher. The closeness of the level of income security wealth is a result of the strong redistributive effect of the income-tested programs such as the Guaranteed Income Supplement.

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<sup>14</sup>This figure also represents an estimate of the total public pension liability. An alternative calculation of the public pension liability provides a ‘reality check’ for the 1.45 trillion dollar figure. According to the Office of the Superintendent of Financial Institutions (2001), the liability for future Canada Pension Plan payments at December 31, 2000 was \$486.68 billion. Human Resources Development Canada (2000) reports that Canada Pension Plan expenditures represented 39.29 per cent of public pension expenditures in the September to December quarter of 2000. (The balance of the public pension expenditures went to Quebec Pension Plan, Old Age Security, Guaranteed Income Supplement, and Allowance payments.) If one assumes that Canada Pension Plan expenditures remain a constant fraction of total public pension expenditures, then the \$486.68 billion may be scaled by  $1/0.3929$  to arrive at an estimate of the total public pension liability: \$1.24 trillion. These calculations contribute some confidence that the imputed income security wealth variable is of a sensible magnitude.

<sup>15</sup>See Gollier (2002) for a discussion of the application of portfolio theory to the study of household portfolios. Agents will hold a similar risky portfolio only if they have linear absolute risk tolerances with the same slope parameter.

The same set of descriptive statistics are reported for the 1977 and 1984 Survey of Consumer Finances data sets in Table 3. (All dollar values are adjusted to 1999 using the consumer price index.) As mentioned above, several assets were not included in the earlier surveys, so care must be taken in comparing the 1977 and 1984 surveys with the corresponding numbers from the 1999 Survey of Financial Security survey in Table 1. Moreover, the differences in sampling between the surveys may also contribute to differences in reported wealth across the surveys. With these limitations in mind, total assets at both the mean and median dropped slightly over the seven years between 1977 and 1984. In the next 15 years to 1999, however, there was substantial growth in total assets. Comparing to the *Total assets, SCF definition* measure reported in Table 1, total assets increased by 56.5 per cent at the mean, and 36.0 per cent at the median between 1984 and 1999.

Among the asset categories, the two largest differences between the 1999 results and the 1977 and 1984 results are tax-preferred savings and property. Registered Retirement Savings Plans grow from only 1.6 per cent of family assets in 1977 to 9.8 per cent in 1999. Both participation and average holdings expanded greatly over this period. Whether these new tax-preferred assets represent new savings or just savings diverted from other sources is difficult to determine, as the 1977 and 1984 surveys lack information on pension assets. For property holdings, the median value of primary residences advanced by 13 per cent, but this did not stop a large drop in the share of property in family assets from 59 per cent in 1977 to 46.2 per cent of non-pension assets in 1999.

Business equity was not as widely held in the earlier surveys with 13.6 per cent with positive holdings in 1984 and 18.5 per cent in 1999. However, the share of household wealth held in this form dropped by 1999 as the growth in this category was overshadowed by growth in other asset categories.<sup>16</sup>

### 3 Asset holding over the life cycle

In this section, I study the life-cycle patterns of wealth holding and accumulation. For this first pass at the data, the analysis is univariate in nature, comparing only across ages. Importantly, across-cohort differences in preferences, lifetime earnings, or opportunities may contribute to the patterns evident in the univariate analysis. In a single cross-section, it is not possible to distinguish between cohort effects and age effects. The potential dangers of misinterpretation are made clear in Börsch-Supan and Lusardi (2003), who show that cross-sectional and panel data from Germany display very different patterns across ages. However, by drawing comparisons to the 1977 and 1984 cross-sections and to the international evidence, some inferences on the life-cycle patterns of asset holding may be reasonably made.

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<sup>16</sup>For more on the growth of self-employment through the 1990s, see Lin et al. (1999).

The three surveys were conducted at different parts of the business cycle and in both high-return and low-return periods for asset markets. The 1977 survey followed several years of fluctuating growth and high inflation. The 1984 survey took place in the midst of a robust recovery from the disinflationary recession of 1982. Finally, the end of the 1990s was a period of strong economic growth leading up to the 1999 survey. In 1977 stock markets were weak in the five years before the survey with the Toronto Stock Exchange index losing 5.6 percent, but in both 1984 and 1999 the stock market was strong in the five years before the survey. Finally, housing markets were strong in 1999, but weak in 1984 following the recession of the early 1980s.<sup>17</sup> Because of these differences, comparisons across different survey years should take account of the differing economic environment.

Another caveat is raised by family structure. I use data from all families rather than restricting the analysis to married and common-law families.<sup>18</sup> At younger and older ages, singles predominate. For this reason, the marital composition of the sample may contribute to the asset allocation choices appearing in the figures. This is appropriate if the question of interest is understanding how the allocation of a typical family changes through time, since the family structure also changes through time.

A related point is mortality. Shorrocks (1975) argues that the well-known positive correlation between longevity and wealth results in a bias toward higher wealth-holding at old ages.<sup>19</sup> In my analysis, I do not adjust for mortality, meaning that the values reported for older ages should be interpreted as conditional on survival to that age.

I use three-year age groups for the analysis in order to ensure an adequate number of families in each age group. The age groups are formed based on the age of the older partner in the couple. When there is an age gap between the partners, the assets and debts of the younger partner are consequently attributed to the age group of the older partner. The number of observations in the age groups ranges between 269 and 1,159 in 1999.

In the graphs appearing below, three figures are presented for each category of wealth. The first graphs the mean, median, 25th, and 75th percentile of the wealth measure against age. Second, the incidence of holding for each asset type is displayed. Finally, I show the mean of each family's asset shares by age. I begin by examining total assets, then proceed to study each of the six categories in turn.

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<sup>17</sup>All macro statistics are taken from the CANSIM database.

<sup>18</sup>For the rest of the paper I refer to both married and common-law relationships as 'married' families.

<sup>19</sup>More recent evidence is found in Attanasio and Emmerson (2003).

### 3.1 Total assets

The first set of figures examines total assets. In Figure 1a, mean assets peak with the 55-57 age group at \$500,737, while the peak of the median lies directly below at \$316,346. The 25th and 75th percentiles also peak in this age group, at \$126,571 and \$625,427 respectively. After the peak, total assets drop at all displayed parts of the distribution. From ages 55-57 to 82-84, the decline at the 75th percentile is to 41.4 per cent of the peak value, while at the 25th percentile the decline is similar, at 38.8 per cent.

Figure 1b graphs the ownership rates for the asset categories, uncovering diverse patterns among the categories. Financial assets and durables are held constantly across the ages at high levels. In contrast, annuitizing assets such as tax-preferred savings and pensions follow a strong hump-shaped pattern across the ages in this cross-section. Property holding increases through the 20s and 30s, but only begins to fall in the 70s. Venti and Wise (2001) find that families in the United States rarely stop home-ownership in the absence of a severe health or mortality shock. If this holds true for Canadian families, then an increased incidence of health and mortality shocks after age 70 could explain this pattern. Finally, business equity holding begins to drop in the data after age 60.

The mean of the category shares is displayed in Figure 1c. At early ages, families hold almost all of their assets in durables and financial assets. At middle ages, the dominant asset is property, reaching 40.3 per cent at ages 43-45. Tax preferred and pension assets also grow through middle ages. During the retirement years, the most striking feature of the figure is the rebounding share of financial assets. After reaching a low of 7.1 per cent at ages 43-45, the share of total assets held in financial assets rises to over 30 per cent by age 80. A very similar pattern is visible in the data for 1977 and 1984 as well, providing some evidence that this phenomenon is not a cohort effect but a true age effect. However, longitudinal data are necessary to find decisive evidence.

The pie charts in Figures 1d through 1f display cross-sections taken from Figure 1c at different ages. The age patterns for the asset categories are shown clearly in the three charts. Business equity, pensions, and tax-preferred assets first increase then decrease. In contrast, the financial asset share decreases then increases, while durables and property shares move monotonically across these three age categories.

Figures 2a, 3a, and 4a repeat the analysis of Figure 1a for other definitions of wealth. Figure 2a shows the life-cycle path of total assets including the imputed income security wealth measure. Median assets including income security wealth peaks at \$529,597, with a more starkly hump-shaped accumulation pattern. Because income security wealth accumulates with age, and then is forcibly annuitized in retirement, it follows that including income security wealth in the measure of assets will make for a more hump-shaped accumulation pattern. The decline in median assets from ages 64-66 to 79-81 is \$231,531 (44 per cent) when income security wealth is included, but only \$117,267 (38 per cent) when income security wealth is not included. This steeper decline provides

evidence that the inclusion of annuitized assets like income security wealth strengthens the case for asset decumulation in retirement.

The next figure displays the cross-sectional age pattern of accumulation using the SCF definition of total assets, which will be useful for comparisons with the 1977 and 1984 figures. Finally, Figure 4a graphs net worth, calculated as total assets less debt. There is little difference between total assets and net worth from middle ages onward, as debt becomes increasingly unimportant at those ages. Through the 20s, 30s, and 40s, however, the slope of the accumulation of net worth is much higher than total assets, reflecting the decrease in debt over these ages.

Figures 5 and 6 repeat the analysis for the 1977 and 1984 data. There are differences in both the levels and the slopes across years. Assets at the peak of the life-cycle are almost unchanged around \$150,000 for the median in 1977 and 1984. Large increases occurred by 1999, however. Comparing to the SCF definition values for 1999 in Figure 3a, there was an increase at the life-cycle peak of 42.3 per cent to \$205,501 at the median. The slope of total assets across ages also undergoes large changes across the different years. In 1977, the difference in median wealth between ages 28-30 and the peak was \$83,635. In 1999, the same difference was \$174,531. It is not until ages 46-48 that median wealth in 1999 exceeds the level in 1977. Taken together, this suggests that the cross-sectional age-wealth profile is substantially steeper in 1999 than 1977.

The sources of the increase in peak assets can be seen more clearly by examining the allocation of assets across categories in Figures 5c and 6c. Tax-preferred savings take a negligible share of assets in 1977, and although the share in tax-preferred forms nearly doubles at the peak of the life-cycle by 1984, tax-preferred assets still represent only around 5 per cent of the average family's portfolio. This contrasts with 11 per cent at the life-cycle peak in 1999. The other main source of the increase is in property holdings. At the age 58-60 mean, the value of property increased by 53 per cent to \$157,052 in 1999 compared to 1984.

Figure 7 displays median total assets (using the comparable SCF definition) for several cohorts through the three surveys. The 1977 and 1984 data points are 7 years apart, and the 1999 data point records the total assets for the cohort another 15 years later. The cohorts are labelled for their year of birth. For each of the cohorts, median total assets changes little between 1977 and 1984, but grows substantially higher in 1999. Looking within cohorts, there is little evidence of declining assets at older ages. However, this may be a result of a positive year effect shock in 1999 rather than continued asset accumulation at older ages. The increase in assets for the older cohorts, however, appears to be more moderate than for younger cohorts. For example, the 1915 cohort increased \$46,513 at the median between 1984 and 1999 (or 43 percent), while the 1924 cohort increased by \$117,596 (or 97 percent).

This initial analysis of the data reveals three interesting observations. First, total assets in Canada have increased substantially at the peak of the life-cycle between 1977 and 1999, while

accumulation toward the peak has become remarkably steeper. Second, there are sharp differences in the holding and allocation of assets in different categories across ages. In particular, if annuitized assets such as employer-provided pensions or income security wealth are left out of the analysis, then the remaining observed assets show a slower rate of decumulation in retirement. Third, the portfolio share of financial assets traces an intriguing U-shaped pattern through the life cycle. In the remainder of the paper I will examine these findings more closely first by breaking down each asset category into its components to study the data at a more disaggregated level, and then in section 4 with regressions to control for observable differences across age groups.

### 3.2 Breakdown by asset category

I next turn to breaking down each asset category into its constituent components. This analysis allows deeper insight into the factors driving the patterns seen above with more aggregated data. The same three graphs are presented for each of the six asset categories. I focus only on the 1999 Survey of Financial Security results as they provide the deepest level of disaggregation. Results from 1977 and 1984 appear similar, however, when comparisons are feasible.

The first category is financial assets, in Figure 8. In 8a, the mean lies above the 75th percentile at most ages. However, even at the 25th percentile, financial assets are rising with age through retirement. This is consistent with the age pattern of the financial asset share observed earlier.

The second graph for *financial assets* shows ownership rates, in Figure 8b. The ownership rate for *accounts* is not shown, as it does not fit the scale of the other lines — it is relatively constant across the ages between 85 and 95 per cent. The other rates of ownership are much lower, at less than 25 per cent. Mutual fund ownership displays an odd pattern, bumping up at middle age before heading back down under 15 per cent. As broad-based mutual fund investing has arisen only in recent decades, the pattern of mutual fund ownership may reflect cohort effects more than age effects.

The most interesting pattern in the figure is the divergence between fixed income and equity holding. At middle ages they track each other closely at around 15 per cent of families. After age 54, however, they diverge greatly until reaching a gap of more than 15 percentage points at ages 82-84. This phenomenon is consistent with an increase in aversion to risk with age.<sup>20</sup> Any inference from these data should be tempered by consideration of across-cohort differences in financial strategy. However, it should be noted that the same pattern appears in the 1977 and 1984 results. In addition, the inability to see inside mutual fund and tax-preferred account holdings makes it impossible to conclude that the divergence holds across the entire portfolio.

Finally, in Figure 8c, the components of *financial assets* are presented. The components that appears to be driving the upward trend in the share of financial assets with age are *accounts* and

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<sup>20</sup>See Ameriks and Zeldes (2001) for a detailed discussion of the theoretical basis for age effects in risk preferences.

*term deposits*. Combined, they rise at the mean from 4.7 per cent of assets at age 55-57 to 25.1 per cent at age 82-84. A very similar pattern appears in the 1977 and 1984 data, suggesting that this result is not simply a cohort effect. While term deposits may reflect a desire for safety, the increase in the share for bank accounts is a switch into liquidity. Poterba and Samwick (2002) find similar results in a repeated cross-section sample of US data, with higher ownership rates and asset shares in bank accounts among older Americans. However, in Poterba and Samwick (2001) the authors find that cohort effects may contribute to much of the observed increase in bank account ownership with age.

To the extent that a true age effect underlies the observed patterns, the results suggest that families build up a base of very liquid assets as they age, substituting away from categories such as business equity and tax-preferred savings. The run-up of liquid financial assets may indicate that the forced annuitization of Registered Retirement Income Funds and employer-provided pensions is *more* than sufficient for current consumption. Some evidence is provided by Lin (2000) who studies repeated cross-sections of flow-savings data for Canada. Lin finds that the savings rate drops at retirement but then grows again. More study of consumption patterns through retirement is necessary to better understand this phenomenon. Also, the funds accumulated in financial assets may provide a buffer against longevity risk, or they may represent a desire to consume less in order to make a larger bequest at death.

The age profiles for pensions in Figure 9 show distinct life-cycle patterns. In Figure 9a, the profile at the median is non-zero only at middle ages, consistent with the prevailing rates of coverage of employer-provided pensions in Canada. the peak for pension assets at the mean is reached at age 61-63. As pensions are typically annuitized through retirement, pension wealth necessarily falls at a relatively smooth rate. In the ownership graph 8b, the rise of *in-pay* pensions and the fall of *current employer* pensions is evident, crossing at ages 58-60. The transition reflects the change from employment to retirement. This transition is also evident in the share graph in Figure 8c. There is a strong and sharp increase in *in-pay* pensions starting in the early 50s, accompanied by a sharp drop in the share of *current employer* pensions.

Why does total pension wealth in Figure 9a rise so steeply near the ages of retirement? One might argue that the net present value of future pension flows should be the same one day before retirement (when it is included in *current employer*) and one day after retirement (when it is included in *in-pay*). Two possible resolutions to the puzzle arise. First, there may be differences in the pension valuation methodology that drive the observed differences in pension wealth at ages near retirement. For example, before pension receipt begins, the form of the pension that is to be received in the future must be imputed given available information. In contrast, after pension receipt begins, information is revealed and less must be imputed. If there were a systematic bias in the imputation, then it might explain the observed age patterns.



However, there is good reason to believe that the observed increase is correct. The second potential resolution to the puzzle comes from the patterns of accrual of pension benefits, as documented in Pesando and Gunderson (1988) and Pesando et al. (1992). Accrual at later ages is much higher than early ages in general, accounting for the sharp slope at pre-retirement ages evident in Figure 7c.<sup>21</sup> The authors also document very sharp spikes in the accrual profile at ages when workers become eligible for early retirement, or when age plus years of service hits some special number. If workers follow the incentives and indeed retire in great numbers at these ages, then the shift from *current employer* to *in-pay* pensions would therefore coincide directly with a great accrual in their pension wealth. This could account at least in part for the large increase in total pension wealth at these ages.

Tax-preferred accounts exhibit some of the same patterns as pension wealth, as forced annuitization of the wealth leads to sharp declines through retirement ages. In Figure 10a the mean and percentiles of the distribution of wealth held in tax-preferred savings are displayed. The peak of the mean is at ages 58-60. After age 70, the decline is particularly steep, falling from over \$50,000 at ages 73-75 to less than \$10,000 at ages 10 years older.

Figures 10b and 10c document the transition to Registered Retirement Income Funds from Registered Retirement Savings Plans. The age at which funds must be switched into Registered Retirement Income Funds is 69, but the age groups are formed on the older spouse's age, so those married to spouses older or younger than themselves will show later or earlier transitions of family holdings into the Registered Retirement Income Funds. The cross-over point for participation in Registered Retirement Income Funds and Registered Retirement Savings Plans is after the 67-69 age group. While 92.2 per cent of tax-preferred savings are in Registered Retirement Savings Plans at ages 61-63 versus 5.9 per cent in Registered Retirement Income Funds, there is an almost complete reversal to 7.1 per cent versus 91.0 per cent by ages 76-78. For the other three forms of tax-preferred savings in the graphs, participation and mean wealth is quite limited. Of note, participation in Registered Education Savings Plans rises above 10 per cent for families after age 40.

The graphs in Figure 10 show that tax-preferred wealth falls very abruptly with age. From a mean of \$64,766 at ages 67-69, tax-preferred wealth falls to \$5,496 by ages 82-84. What accounts for this pattern? The first possibility to consider is the difference in Registered Retirement Savings Plan participation and accumulation across cohorts. As seen earlier, participation in 1977 and 1984 was much lower across all ages. This suggests that the older cohorts observed in 1999 likely had less tax-

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<sup>21</sup>The cause of the higher accrual rate at older ages is the 'final earnings' used in many pension benefit formulas. At older ages, an extra year of work contributes not only an extra year of service, but also makes all previous years of service more valuable if benefits are determined as some function of the best years of earnings. In contrast, if someone leaves a firm at a younger age, her 'best' years of earnings would not seem high relative to contemporary wages when the pension is actually paid, especially if there is substantial inflation or wage growth. See Pesando and Gunderson (1988) for more detail.

preferred wealth accumulated than the younger cohorts in 1999. However, other explanations could contribute to the observed effect. For example, withdrawals from Registered Retirement Income Funds could be occurring more quickly than required.<sup>22</sup> These withdrawals might be influenced by the income-testing of public pension benefits. Guaranteed Income Supplement benefits are subjected to an income test of 50 cents for each dollar of income, including income from Registered Retirement Savings Plans or Registered Retirement Income Funds. In addition, Old Age Security benefits are reduced by 15 cents per dollar of income over a threshold (\$57,879 in 2003). A family trying to maximize its future public pension benefits might find it optimal to withdraw funds from tax-preferred accounts very quickly in order to receive some benefits in future years, rather than having continued withdrawals wipe out income-tested benefit eligibility in every future year. This would have to be balanced against the value of continued tax-exempt accrual within the registered account. Further research on withdrawals would shed more light on the observed cross-sectional age patterns.

The next set of figures displays the age profile of property assets. In Figure 11a, the mean of the distribution of property holdings lies fairly close to the median, in contrast with the financial asset graph in Figure 11a. The median peaks at ages 58-60 at \$125,000. At the 25th percentile, only at middle ages does property ownership occur, with the line sitting at zero for other ages. In Figure 11b, the home ownership rate increases from the 20s until the 40s, after which it sits steadily above 70 per cent until the 70s. The rate then falls through the 80s. Investment in *other real estate* is much more limited, reaching a peak of 27.1 per cent at ages 64-66.

The final two asset categories are durables and business equity, displayed in Figures 12 and 13. The patterns for durables align quite closely with those seen for housing equity. This is not surprising, as accumulation and decumulation of household contents should depend on home ownership. In Figure 12b, the decline in vehicle ownership mirrors that of home ownership in Figure 11b. Consequently it may be that declines in vehicle ownership are also related to health or mortality shocks within the family. The accumulation and decline in business equity seen in Figure 13a is seen to be a result of changes in ownership rates in Figure 13b. This suggests that as small business owners retire, they sell their ownership stakes.

I bring the univariate examination to an end with debt holdings in Figure 14. The age profile of debt is quite distinct from assets, but strongly consistent with life-cycle behaviour. Families accumulate debts when younger and pay them off when older. In Figure 14a, the mean level of debt is remarkably flat from the late 20s until the early 50s, at around \$50,000. As can be seen in Figure 13b, the repayment of debt accelerates with age, particularly after age 60. The decline is fairly similar across all categories of debt.

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<sup>22</sup>Each year, at least a minimum amount must be withdrawn from the Registered Retirement Income Fund. The minimum amount increases with age. For example, the minimum is 5.0 per cent of fair market value for those age 70, and 10.33 per cent at age 85.

The one exception is student loan debt. Student loan debt displays an intriguing pattern, first dropping, then rising through the 40s, and finally falling from the 50s on. The pattern likely reflects the family basis for the data. The bump in the 50s may be debt incurred by children still living at home with their 50 year old parents.

Breaking down the wealth categories into their components has provided several interesting insights. First, the increase in the portfolio share of financial assets with age is driven in large part by bank accounts, which indicates a liquidity interpretation for this effect. As well, the liquidity findings suggest that pension assets may be ‘over-’ annuitized relative to the consumption preferences of seniors. Second, risk tolerance, as measured by direct ownership of stocks versus fixed income assets, appears to decrease with age. Third, the strongly hump-shaped life-cycle patterns for employer-provided pensions and tax-preferred savings emphasized the importance of including these assets when measuring the life-cycle accumulation and decumulation of wealth.

## 4 Regression analysis

The previous section identified and documented several patterns in the age profile of wealth accumulation. In this section, I subject three of the observed age profile patterns to a stronger test by controlling for observable household characteristics in a regression framework. The econometric ambition of this exercise is modest — the goal is to improve the credibility of the inferences drawn in the descriptive analysis of the previous section. A more rigorous empirical analysis is left for future work. As before, it should be noted that the unavailability of panel data renders difficult the interpretation of the observed results as caused by aging rather than as manifestations of cross-cohort differences. However, results with the 1977 and 1984 cross-sections were similar, when the available asset data made comparisons feasible.<sup>23</sup>

### 4.1 Do assets fall in retirement?

The first question I address is whether assets fall in retirement. The unconditional age profiles showed declining profiles with age after retirement, especially when annuitized wealth measures such as employer-provided pensions, tax-preferred accounts, and income security wealth were included. Burbidge and Robb (1985) found some evidence of decumulation in the 1977 Survey of Consumer Finances, but only among married lower skill workers. The goal of the regressions below is to demonstrate the impact of including annuitized variables in the wealth measure on conclusions about the decumulation of wealth at older ages.

For these regressions, I exclude observations with negative business equity, and those with zero

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<sup>23</sup>Pooled regression analysis is made difficult by data constraints. The public-use version of the 1999 Survey of Financial Security reports age in groups.

assets.<sup>24</sup> I focus on the assets of those families where the older spouse is age 62 or more.<sup>25</sup> There are three dependent variables. The first is the logarithm of *total assets* less *pension wealth* and *tax-preferred savings*. This measure of assets excludes the annuitized assets, and more closely resembles what was available to researchers using the 1977 or 1984 Survey of Consumer Finances to study this question. The second measure of assets is simply the logarithm of *total assets*. The third and final measure is the logarithm of *total assets* plus *income security wealth*.

The empirical specification I estimate with ordinary least squares is:

$$\log(\text{Assets}) = \beta_0' \text{AGE} + \beta_1' X + \epsilon. \quad (1)$$

*Assets* is one of the three dependent variables described above. The vector  $X$  is a set of controls including dummies for older spouse education, sex, marital status, province, and size of urban area of residence. I make inferences about the decumulation pattern after retirement using a simple specification with linear age.

Table 4 displays the results. The three dependent variables are set in the three panels of the table. Across the columns are differing selection criteria for the sample. The first specification in Panel A takes all of the observations in the sample. The estimated coefficient on *AGE* is 0.007, which is statistically indistinguishable from zero. This suggests that there is no evidence of decumulation of non-pension assets in the data. The next column takes only the married families in the sample. I choose this specification to align more closely with the analysis of Burbidge and Robb (1985) who study only married families. Again, there is little evidence of decumulation. The insignificant point estimate of -0.006 implies that for married couples after age 62, there is an average decumulation of 0.6 per cent per year in non-pension assets. The large drop in the r-squared indicates that a large proportion of the variation in assets is between married and single couples. The final two columns break down the sample into those for which the older spouse is a high school dropout and those for which he or she is a university degree-holder. I take education groups as a simple proxy for lifetime earnings potential. The point estimates suggest a stronger decumulation effect for those with university, but the significance level is too low to draw conclusions.

Panel B of the table repeats the analysis for the *total assets* measure. Using all observations in the first column, the result is insignificant. However, when using just the married observations, there is a significant 1.7 per cent per year rate of decumulation. This contrasts with the Burbidge and Robb (1985) findings because of the inclusion of more annuitizing assets — pensions and tax-preferred savings. These data were not available in the earlier Surveys of Consumer Finances that were used by the authors. As in Panel A, there is some evidence of stronger decumulation among

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<sup>24</sup>There are only a handful of negative business equity observations. Results including the negative observations using the inverse hyperbolic sine transformation are very similar.

<sup>25</sup>Studying net wealth rather than assets makes little difference to the sample of older families, as debt is low.

the university educated, although it is statistically insignificant at conventional levels.

Finally, Panel C of Table 4 includes income security wealth in the measure of assets. Across all four samples in the panel the results are remarkably similar. In the sample with all observations, the families are predicted to draw down their assets at a rate of 2.4 per cent per year. Since income security wealth is annuitized, this result is mechanical. However, this is exactly the point of the regression. When annuitized assets are included in the measure of wealth, asset non-decumulation disappears. A similar case for annuitizing public pension wealth and non-decumulating financial wealth is made for Italy in Brugiavini and Padula (2003) and for Germany in Börsch-Supan and Lusardi (2003).

## 4.2 How do asset shares change with age?

In the unconditional age profiles, the portfolio share of financial variables rose at older ages, while the share of property fell. I subject this finding to a stronger test by controlling for a set of observable covariates in the following ordinary least squares specification:

$$SHARE = \beta_0'AGE + \beta_1'log(TotalAssets) + \beta_2'X + \epsilon. \quad (2)$$

Only households with the older spouse having reached at least age 62 are included in the sample. The variable *SHARE* is formed by the ratio of an asset category to total assets. The two categories I study here are *financial assets* and *property*. I again use a linear specification in age. The vector of controls *X* is the same as used in the decumulation regressions in equation 1, with one exception: in some specifications, I include the log of total assets as a regressor.

The regression results are reported in the top panel of Table 5. Across the table I report results excluding and including the log of assets as a regressor, and for the two asset share dependent variables. There is little difference between the coefficient with and without the control for total assets in either case. For financial asset share, the estimate of 0.008 for the coefficient on the older spouse age indicates that one more year of age increases the share of financial assets by a statistically significant 0.8 percentage points, or 4.8 per cent of the mean. The rate of increase is steep, implying almost a 50 per cent increase in financial asset share over a decade. These results indicate empirical support for the observation that liquid wealth increases with age in the 1999 cross-section. Again, either an age or a cohort explanation is consistent with this finding.

Property asset share results are displayed in the second half of the top panel of Table 5. The coefficient on the older spouse age is near zero and not statistically significant. This indicates a fairly flat average profile among those over 62 for property asset share in this linear specification. A quadratic specification (not shown) does indicate some support for property asset share decreasing at older ages in this sample.

Taken together, this evidence may indicate an increasing preference for more liquid assets in retirement. At older ages, the likelihood of a strong health or mortality shock increases. Rather than the prospect of a ‘fire sale’ of illiquid assets, older families may hold more liquid assets to facilitate fast access to their wealth in case of a shock.

### 4.3 How does ownership of risky assets change with age?

The final set of regressions examines the age profile of the ownership of risky assets. In the unconditional age profiles, ownership of stocks declined slightly at older ages while ownership of fixed income securities increased markedly. If stocks are assumed to be riskier than fixed income securities, then this may be evidence in support of a decreasing age profile for risk tolerance. The regressions will subject this observation to a more rigorous test. For the regressions, I take binary variables indicating ownership of stocks and of fixed income securities to form dependent variables in an ordinary least squares regression of the form

$$OWNERSHIP = \beta_0'AGE + \beta_1'AGESQUARED + \beta_2'log(TotalAssets) + \beta_3'X + \epsilon. \quad (3)$$

The control variables are the same as in equation 2. I estimate the equations using a linear probability model with ordinary least squares. Results using a probit were similar.

The bottom panel of Table 5 provides the regression results for the ownership regressions, showing specifications with and without the total asset control. The linear effect of age on stock ownership is estimated to be very close to zero in both the regression with and without the total asset control. Fixed income ownership, on the other hand, is estimated to increase at 0.5 percentage points per year in the specification without the asset control, and also 0.5 percentage points per year in the specification with the asset control. This indicates strongly that families headed by older individuals in the 1999 sample are more likely to hold fixed income assets. Again, this is consistent with evidence from the earlier waves of Canadian data and the international evidence, which gives more credibility to an age over a cohort interpretation.

The evidence suggests that there is some aversion to ownership of stocks at older ages, and more holding of bonds and other fixed income securities. This is consistent with studies in Italy (Guiso and Jappelli (2002)), the United Kingdom (Banks and Tanner (2002)), and the United States (Bertaut and Starr-McCluer (2002) and Ameriks and Zeldes (2001)). In contrast, evidence for Germany by Eymann and Börsch-Supan (2002) and for the Netherlands by Alessie et al. (2002) does not support a drop in risk tolerance among the elderly. A further caveat for the Canadian results must be raised because the data do not allow researchers to see inside mutual funds or tax-preferred accounts to see the asset allocation of those funds and accounts. Still, this provides some evidence consistent with an hypothesis of increasing risk-aversion at older ages.

## 5 Conclusion

This paper has provided some basic facts about life-cycle asset accumulation and allocation by Canadian families. Comparisons of the data from 1999 to earlier surveys revealed several striking trends, including a sharp increase in the level of median assets and the steepness of asset accumulation, the rise of tax-preferred savings accounts to a prominent place in family portfolios, and a relative decrease in the importance of housing wealth. Income security wealth was found to be equal to about 41 per cent of other household assets. In addition, I found evidence in support of three important observations. First, total assets decline more sharply in retirement when annuitized assets are included. Second, the portfolio share of liquid assets increases at older ages. Third, holdings of less risky financial assets appear to increase in retirement. These findings are broadly consistent with the international literature.

Some caveats limit the interpretation of the findings. Foremost is the necessary reliance on cross-sectional rather than panel data to draw inferences, requiring an assumption that cohort effects are not driving the observed patterns in the data. In addition, the disaggregation of assets in the Survey of Financial Security is not as great as in the Survey of Consumer Finances in the United States. Both of these data limitations render some of the inferences somewhat more tentative. However, the consistency of the patterns across years and the similarity of the results with those from other international studies of household portfolios lend more confidence to the age interpretation of the results.

A parade of puzzles remain for future work. Among them, more answers must be found about the causes of the rise in financial assets at older ages. What roles are played by the sale of homes and business equity, the annuitization of pension assets, and money flowing out of tax-preferred accounts? In addition to implications for different models of household saving, the answers to these questions have important policy implications for the design of pensions and for income security programs for the elderly.

## A Description of Variables

Below is a brief description of each of the wealth measures used in the analysis of the 1999 Survey of Financial Security. For more details, please consult the questionnaire (Statistics Canada (1999)), the guidebook (Statistics Canada (2003)), or the pension valuation methodology guide (Statistics Canada (2001b)).

### A.1 1999 Survey of Financial Security

*Accounts:* Chequing accounts and savings accounts.

*Term deposits:* Term deposits and guaranteed investment certificates.

*Stocks:* Directly held equity; outside of mutual funds or registered accounts.

*Fixed income:* Bonds, mortgage backed securities, and t-bills; outside of mutual funds or registered accounts.

*Other financial assets:* trust funds, loans, and other financial assets.

*Pension from current employer:* Valued on a going-concern basis, meaning that only earnings up to the present are included in the pension valuation formula.

*Pension from previous employer:* Valued based on reported last earnings from the previous employer.

*Pension currently paying:* Valued based on observed pension income.

*Foreign pension:* Valued based on observed pension income.

*Annuity:* Reported asset value of annuities.

*Registered Retirement Savings Plans:* Reported amount in Registered Retirement Savings Plans including locked-in funds.

*Registered Home Ownership Savings Plan:* Reported amount in Registered Home Ownership Savings Plan.

*Registered Education Savings Plan:* Reported amount in Registered Education Savings Plan.

*Registered Retirement Income Fund:* Reported amount in Registered Retirement Income Fund.

*Deferred Profit Sharing Plan:* Reported amount in Deferred Profit Sharing Plan.

*Primary Residence:* Self-reported market value of primary residence.

*Other Real estate:* Self-reported market value of real estate not including primary residence, both Canadian and foreign.

*Vehicles:* Value of all personal use vehicles, including watercraft, recreational vehicles, and aircraft.

*Contents:* Contents of primary residence, including furniture, appliances, and electronic equipment.

*Other durables:* Reported value of jewellery, artwork, antiques, collectibles plus any other assets such as copyrights, patents, or royalties.

*Mortgages:* Reported total of mortgage on principal residence and other real estate.

*Student Loans:* Reported value of student loan debt.

*Credit card:* Reported value of credit card and installment debt.

*Other debt:* Reported value of car loans, lines of credit, and other debt.



## A.2 1977 and 1984 Survey of Consumer Finances

For these surveys, most of the variables were used directly as provided. Below I list the exceptions where aggregations or imputations were used. The aggregations and disaggregations have been checked against reported total assets to ensure each asset category is included once and only once.

*Fixed Income*: Reported value of savings bonds.

*Other financial assets*: Reported value of other assets, cash, and imputed value of other liquid assets. The imputed value of other liquid assets was calculated as the residual of reported liquid assets less cash, savings bonds, and deposits.

*Vehicles*: Reported value of cars plus the reported value of other vehicles.

## A.3 Income Security Wealth Imputation

The imputation of income security wealth requires a work history back to age 18 or the year 1966 in order to calculate Canada/Quebec Pension Plan benefits. In addition, an estimate of total future retirement income is necessary to properly impute income-tested benefits such as the Guaranteed Income Supplement and the Allowance, as well as federal and provincial taxes.

The work history is imputed based on marital status, sex, age, and education. Earnings regressions using data from the 1971-1997 Survey of Consumer Finances were run to obtain the estimated coefficients, which provided an earnings estimate for each year given the observed characteristics of each family member in 1999. For years not available in the Survey of Consumer Finances, I take the nearest available year of data and adjust earnings based on growth in the average industrial wage.

Future non-labour income is imputed to households based on marital status, sex, and age using data from the closest Census. The procedure is identical to the imputation used in Baker et al. (2003).

Given these imputed data, the calculation proceeds using a calculator developed for, and fully described in, Baker et al. (2003). The calculator accounts for benefits from the Canada/Quebec Pension Plan, the Guaranteed Income Supplement and Allowance, and Old Age Security. Provincial and federal taxes are subtracted from all flows. All parameter values are assumed to remain constant in real terms for future years; the 1999 data assume 1999 parameters into the future. Future benefits are discounted for life expectancy and a real interest rate of three per cent per annum.

In all cases, I assume that retirement occurs at age 62. Mechanically, this leads income security wealth to begin falling at that age. An earlier draft of the paper used age 65 and found similar results.

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Table 1: Descriptive Statistics: 1999 Survey of Financial Security

	Unconditional	Share of	Proportion	Conditional on Positive				
	Mean	Total Assets	Positive	Mean	Std Dev	25th	Median	75th
Total assets	286784	1.000	1.000	286891	610565	29169	165518	351324
Total assets, SCF definition	212264		0.967	219495	547524	18000	124100	250000
<b>Financial</b>	34782	0.121	0.899	38672	202136	1000	4350	19800
Accounts	5880	0.021	0.872	6746	19820	600	2000	6000
Term deposits	7282	0.025	0.180	40400	87003	5000	13000	40000
Mutual funds	6554	0.023	0.142	46188	96775	4000	13000	48000
Stocks	10602	0.037	0.112	94892	458550	2000	10000	43000
Fixed income	2330	0.008	0.147	15830	56121	1000	2750	10000
Other financial assets	2134	0.007	0.069	31109	108971	1000	5000	20000
<b>Pensions</b>	49910	0.174	0.476	104817	145548	12391	49391	137069
Pension from current employer	20217	0.070	0.321	63028	92690	5672	26763	79849
Pension from previous employer	2096	0.007	0.052	40046	44773	10691	24045	51250
Pension currently paying	27149	0.095	0.140	193648	188046	58302	134190	264728
Foreign pension	156	0.001	0.002	77594	108515	3500	56000	100000
Annuity	292	0.001	0.006	45979	64874	6000	19000	62000
<b>Tax-preferred savings</b>	34468	0.120	0.610	56498	115104	6000	20000	60000
Registered Retirement Savings Plan	28080	0.098	0.549	51190	104346	5300	20000	51854
Registered Home Ownership Saving Plan	57	0.000	0.003	20291	41329	1000	10000	20000
Registered Education Savings Plan	409	0.001	0.058	7105	17793	1700	3500	6800
Registered Retirement Income Fund	5329	0.019	0.066	81034	108723	16000	43000	100000
Deferred Profit Sharing Plan	592	0.002	0.031	19408	57445	1500	6000	18300
<b>Property</b>	109614	0.382	0.636	172251	213185	85000	132000	200000
Primary residence	90356	0.315	0.604	149662	146527	83000	125000	180000
Other real estate	19258	0.067	0.165	116998	252302	26000	65000	130000
<b>Durables</b>	28980	0.101	1.000	28980	83829	6000	18000	36500
Vehicles	10290	0.036	0.772	13329	17695	3450	9000	18000
Contents	15298	0.053	1.000	15298	31043	1000	10000	20000
Other Durables	3391	0.012	0.277	12239	132022	1500	4000	10000
<b>Business Equity</b>	29031	0.101	0.185	158164	759600	1	10000	85000
<b>Debt</b>	37499		0.680	55155	73336	6500	29000	84500
Mortgages	29069		0.351	82844	74257	40000	69000	106000
Student loans	1218		0.118	10361	10512	3800	7280	13500
Credit card	1167		0.385	3033	4028	700	1800	4000
Other debt	6046		0.421	14371	26207	3000	8200	17000
<b>Net Worth</b>	249285		0.941	265743	614396	31136	1E+05	3E+05
<b>Income Security Wealth</b>	117813		1.000	117813	64727	65609	103729	160971
Assets + Income Security Wealth	404597		1.000	404697	632161	123362	279834	499957
Net Worth + Income Security Wealth	367097		0.999	367567	621354	107493	226999	454933

All values reported in 1999 Canadian dollars. Sample weights used in calculations. Based on 15,933 observations from the Survey of Financial Security.

Table 2: Descriptive Statistics: High and Low Asset Quartiles in the 1999 Survey of Financial Security

	Low quartile			High quartile		
	Uncon- ditional Mean	Share of Total Assets	Pro- portion Positive	Uncon- ditional Mean	Share of Total Assets	Pro- portion Positive
Total assets	25455	1.000	0.999	726221	1.000	1.000
Total assets, SCF definition	17956		0.905	549249		1.000
<b>Financial</b>	<b>2400</b>	<b>0.094</b>	<b>0.793</b>	<b>107716</b>	<b>0.148</b>	<b>0.973</b>
Accounts	1414	0.056	0.776	12268	0.017	0.939
Term deposits	472	0.019	0.048	20050	0.028	0.320
Mutual funds	170	0.007	0.028	21064	0.029	0.301
Stocks	65	0.003	0.018	40178	0.055	0.270
Fixed income	123	0.005	0.041	7207	0.010	0.257
Other financial assets	155	0.006	0.036	6949	0.010	0.113
<b>Pensions</b>	<b>2467</b>	<b>0.097</b>	<b>0.162</b>	<b>120724</b>	<b>0.166</b>	<b>0.660</b>
Pension from current employer	1080	0.042	0.103	43964	0.061	0.431
Pension from previous employer	337	0.013	0.022	3797	0.005	0.073
Pension currently paying	1039	0.041	0.037	71533	0.099	0.226
Foreign pension	1	0.000	0.000	518	0.001	0.005
Annuity	11	0.000	0.001	911	0.001	0.015
<b>Tax-preferred savings</b>	<b>1914</b>	<b>0.075</b>	<b>0.241</b>	<b>94599</b>	<b>0.130</b>	<b>0.864</b>
Registered Retirement Savings Plan	1572	0.062	0.212	76132	0.105	0.777
Registered Home Ownership Saving Plan	1	0.000	0.001	151	0.000	0.004
Registered Education Savings Plan	60	0.002	0.018	1068	0.001	0.106
Registered Retirement Income Fund	255	0.010	0.016	15621	0.022	0.118
Deferred Profit Sharing Plan	27	0.001	0.009	1625	0.002	0.050
<b>Property</b>	<b>11294</b>	<b>0.444</b>	<b>0.178</b>	<b>238350</b>	<b>0.328</b>	<b>0.912</b>
Primary residence	9927	0.390	0.152	182266	0.251	0.877
Other real estate	1367	0.054	0.037	56084	0.077	0.318
<b>Durables</b>	<b>7349</b>	<b>0.289</b>	<b>1.000</b>	<b>58331</b>	<b>0.080</b>	<b>1.000</b>
Vehicles	2599	0.102	0.529	19329	0.027	0.914
Contents	4280	0.168	1.000	29678	0.041	1.000
Other Durables	470	0.018	0.159	9324	0.013	0.388
<b>Business Equity</b>	<b>30</b>	<b>0.001</b>	<b>0.079</b>	<b>106502</b>	<b>0.147</b>	<b>0.319</b>
<b>Debt</b>	<b>13105</b>		<b>0.613</b>	<b>55850</b>		<b>0.682</b>
Mortgages	6605		0.099	44833		0.457
Student loans	2552		0.191	547		0.063
Credit card	1134		0.367	874		0.301
Other debt	2813		0.326	9597		0.438
<b>Net Worth</b>	<b>12350</b>		<b>0.771</b>	<b>670371</b>		<b>1.000</b>
<b>Income Security Wealth</b>	<b>99007</b>		<b>1.000</b>	<b>133609</b>		<b>1.000</b>
Assets + Income Security Wealth	124470		1.000	859830		1.000
Net Worth + Income Security Wealth	111358		0.996	803980		1.000

All values reported in 1999 Canadian dollars. Sample weights used in calculations. Based on 15,933 observations from the Survey of Financial Security.

Table 3: Descriptive Statistics: 1977 and 1984 Surveys of Consumer Finances

	1977 Survey of Consumer Finances					1984 Survey of Consumer Finances										
	Unconditional Mean	Share of total Assets	Proportion Positive	Conditional on Positive			Unconditional Mean	Share of Assets	Proportion Positive	Conditional on Positive						
				Mean	25th	Median				75th	Std Dev	Mean	25th	Median	75th	Std Dev
Total assets, SCF definition	140222	1.000	0.983	142665	13611	96688	184902	218871	133716	1.000	0.986	135676	11824	85749	170710	199413
Financial	23188	0.165	0.963	24089	1437	5804	21219	63685	24651	0.184	0.970	25391	1111	5589	22209	64342
Accounts	14200	0.101	0.876	16208	1381	5166	15194	36633	13973	0.104	0.882	15834	1088	4239	14713	37243
Stocks	1724	0.012	0.083	20746	1174	4973	15056	52455	2843	0.021	0.130	21806	920	3985	15326	68898
Fixed Income	4109	0.029	0.254	16166	1519	4511	14592	34274	3728	0.028	0.277	13456	1533	4598	13947	27238
Other financial assets	3154	0.022	0.873	3615	83	193	553	32863	4107	0.031	0.889	6479	61	184	613	36220
Tax-preferred savings	2417	0.017	0.167	14511	2763	6906	14365	24731	5602	0.042	0.295	19005	3065	9196	23295	27946
RRSPs	2212	0.016	0.141	15649	3108	7183	16575	26293	5362	0.040	0.273	19613	3678	9196	24522	28415
RHOSPs	205	0.001	0.039	5291	2763	4144	6354	3972	240	0.002	0.044	5491	1533	3065	7663	5471
Property	82749	0.590	0.618	133820	71549	116025	165750	109584	72492	0.542	0.597	121387	63603	99619	145596	104107
Primary residence	70996	0.506	0.595	119381	69063	110500	151938	80472	61496	0.460	0.570	107837	61304	91956	131037	83939
Other real estate	11753	0.084	0.161	72968	16575	41438	82875	118482	10996	0.082	0.175	62680	15326	38315	75097	88711
Durables	6392	0.046	0.726	8801	3039	6906	12431	8052	8174	0.061	0.769	10628	3065	7663	13947	11629
Vehicles	6392	0.046	0.726	8801	3039	6906	12431	8052	8174	0.061	0.769	10628	3065	7663	13947	11629
Business Equity	25476	0.182	0.128	199317	328624	19338	69063	248625	22798	0.170	0.136	167513	15326	61304	199237	266559
Debt	22234	--	0.651	34145	4144	16630	52488	43985	18247	--	0.666	27410	2299	11019	41303	38993
Mortgages	16209		0.321	50438	21548	41438	71825	41951	12681		0.282	45031	18238	38315	61304	35825
Other debt	6025		0.571	10552	1343	5249	12155	21378	5566		0.602	9248	920	3831	10268	20946
Net Worth	117989	--	0.892	133168	16851	75969	167192	217836	115469	--	0.909	127670	14541	69111	155941	197474
Income Security Wealth	85058	--	1.000	85058	51954	73203	110185	47076	103189	--	1.000	103189	61508	91041	133302	57434
Assets + ISW	225280		1.000	225280	78657	182853	288623	234407	236905		1.000	236945	88311	188934	307722	224387
Net worth + ISW	203046		0.998	203586	70618	149600	263567	228165	218658		0.999	218991	80757	160263	286299	218992

All values reported in 1999 Canadian dollars. Sample weights used in calculations.

Table 4: Asset Decumulation Among Those 62 and Over

	All obser- vations	Married only	High school dropouts only	University degree only
n	4152	1775	1788	489
<b>A Dependent variable: log (Total assets less pensions and tax-preferred savings)</b>				
mean of dependent variable	92,639	164,573	69,451	227,265
r-squared	0.185	0.097	0.171	0.069
coefficient on older spouse age	0.007 (0.005)	-0.006 (0.005)	0.014 ** (0.007)	-0.014 (0.019)
<b>B Dependent variable: log (Total assets)</b>				
mean of dependent variable	151,979	283,484	104,825	452,245
r-squared	0.210	0.127	0.183	0.066
coefficient on older spouse age	-0.001 (0.005)	-0.017 *** (0.005)	0.003 (0.007)	-0.019 (0.020)
<b>C Dependent variable: log (Total assets plus Income Security Wealth)</b>				
mean of dependent variable	385,316	570,729	310,165	774,304
r-squared	0.454	0.279	0.416	0.176
coefficient on older spouse age	-0.024 *** (0.002)	-0.026 *** (0.002)	-0.025 *** (0.002)	-0.028 *** (0.008)

Regressions on 1999 Survey of Financial Security, using provided weights.

Controls included in regression: province, urban size, older spouse education, older spouse is male, marital status. The numbers in parentheses are standard errors. One, two, and three asterisks signify statistical significance at the 10, 5, and 1 percent levels.

Sample includes only households with oldest partner at least age 62 and not older than 89.



Table 5: Asset Shares and Ownership Among Those 62 and Over

<b>A Dependent variable: Shares in total assets</b>					
	Financial asset share		Property asset share		
	no asset control	with asset control	no asset control	with asset control	
mean of dependent variable	0.175	0.175	0.336	0.336	
r-squared	0.136	0.138	0.064	0.146	
coefficient on log(Total assets)	--	-0.006 *	--	0.054 ***	
		(0.003)		(0.003)	
coefficient on older spouse age	0.008 ***	0.008 ***	0.000	0.001	
	(0.001)	(0.001)	(0.001)	(0.001)	
<b>B Dependent variable: Positive holding of assets</b>					
	Stock ownership		Fixed income ownership		
	no asset control	with asset control	no asset control	with asset control	
mean of dependent variable	0.102	0.102	0.182	0.182	
r-squared	0.053	0.117	0.036	0.088	
coefficient on log(Total assets)	--	0.050 ***	--	0.057 ***	
		(0.004)		(0.004)	
coefficient on older spouse age	0.000	0.000	0.005 ***	0.005 ***	
	(0.001)	(0.001)	(0.001)	(0.001)	

Regressions on 1999 Survey of Financial Security, using provided weights.

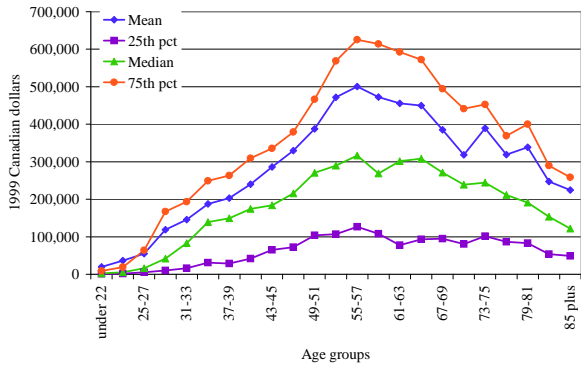
Sample includes households with older spouse at least 62 years old and no more than 89.

Controls included in regression: province, urban size, older spouse education, older spouse is male, marital status. There are 4225 observations in each regression.

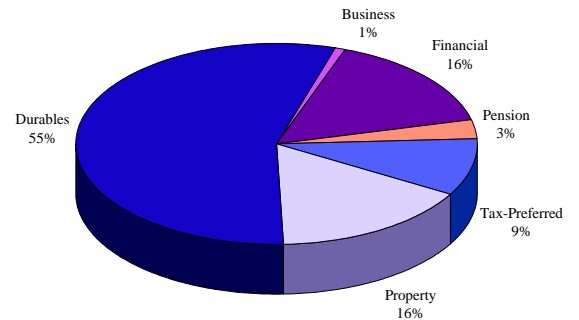
The numbers in parentheses are standard errors.

One, two, and three asterisks signify statistical significance at the 10, 5, and 1 percent levels.

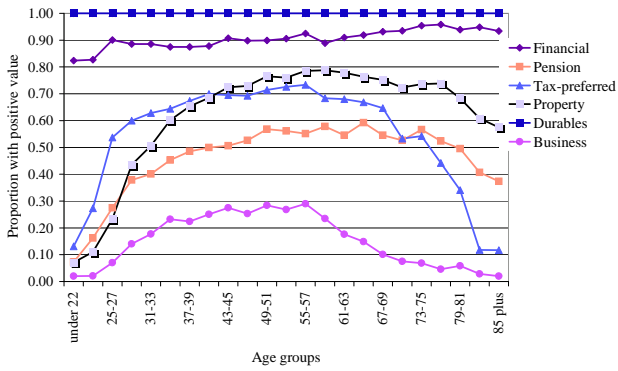
**Figure 1a: Total Assets 1999 - Accumulation**



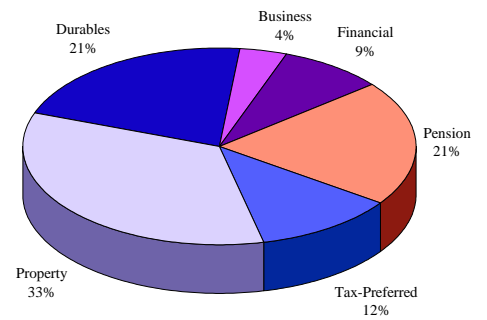
**Figure 1d: Shares at Age 25-27**



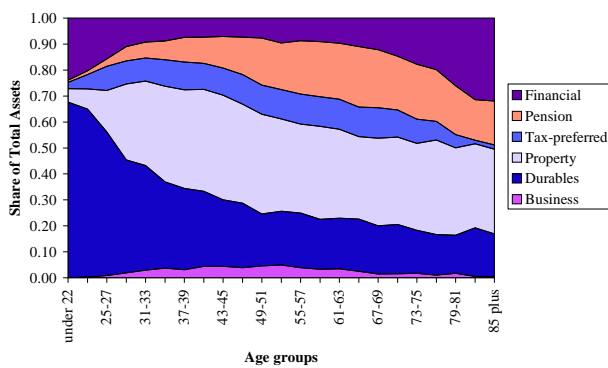
**Figure 1b: Total Assets 1999 - Ownership**



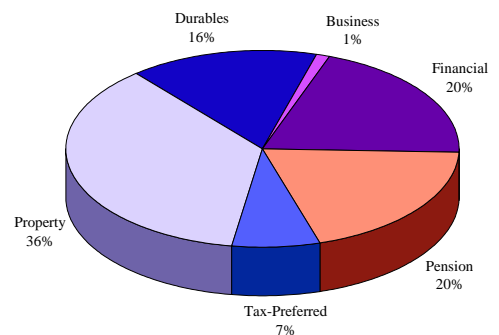
**Figure 1e: Shares at Age 55-57**



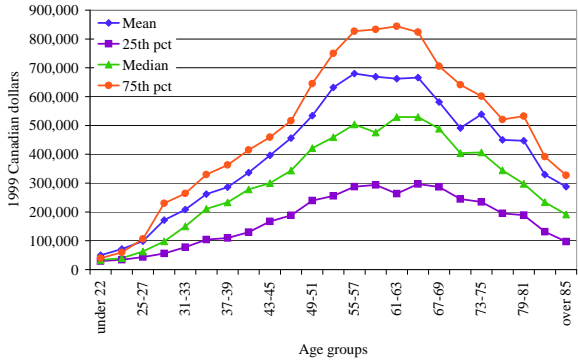
**Figure 1c: Total Assets 1999 - Allocation**



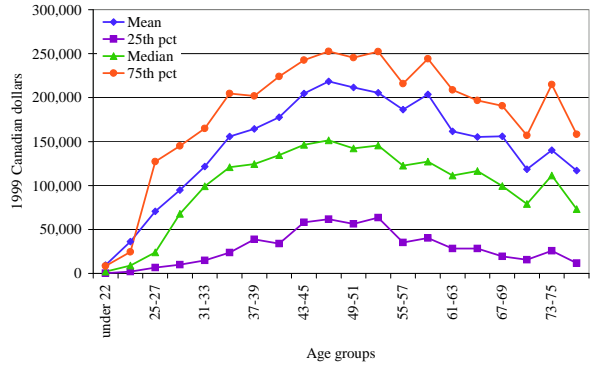
**Figure 1f: Shares at Age 76-78**



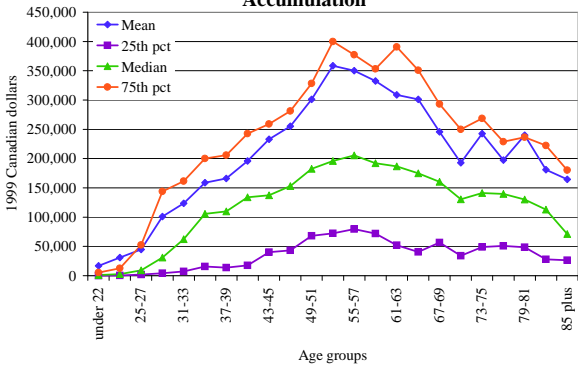
**Figure 2a: Total Assets (plus ISW) 1999 - Accumulation**



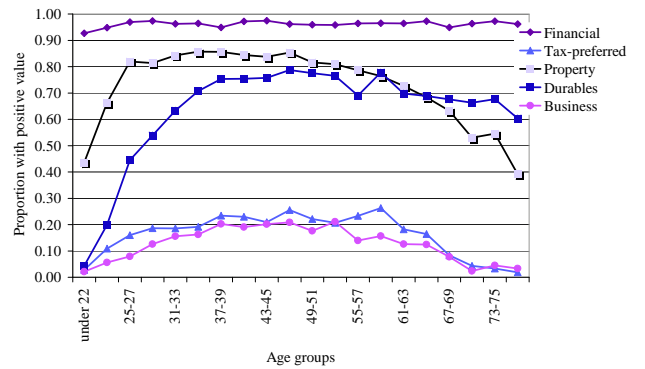
**Figure 5a: Total Assets 1977 - Accumulation**



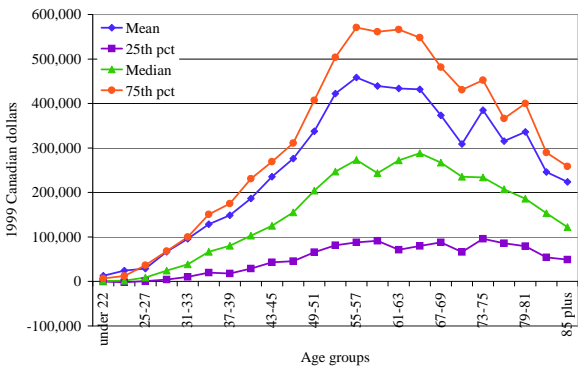
**Figure 3a: Total Assets (SCF definition) 1999 - Accumulation**



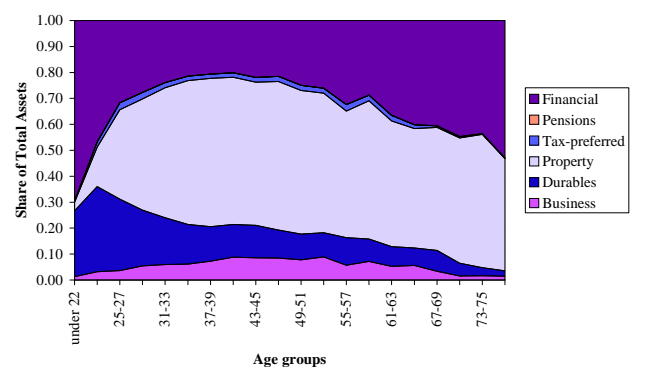
**Figure 5b: Total Assets 1977 - Ownership**



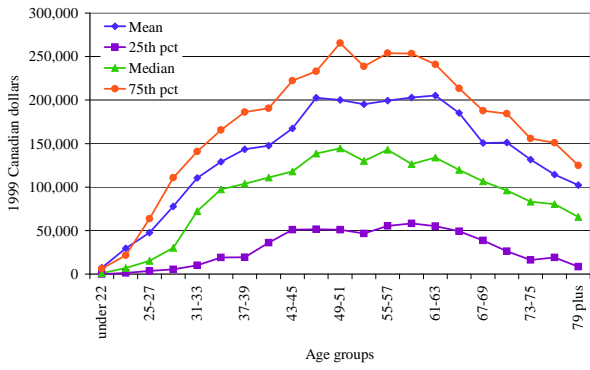
**Figure 4a: Net Worth 1999 - Accumulation**



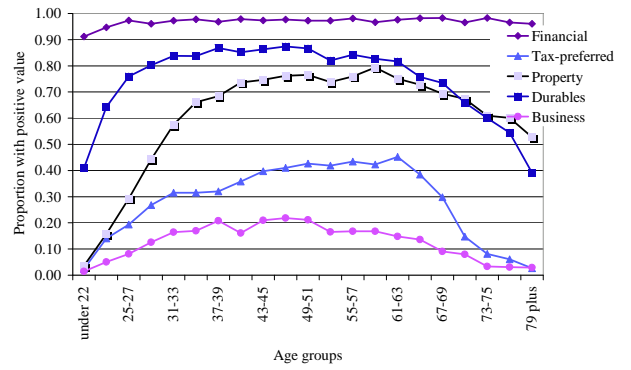
**Figure 5c: Total Assets 1977 - Allocation**



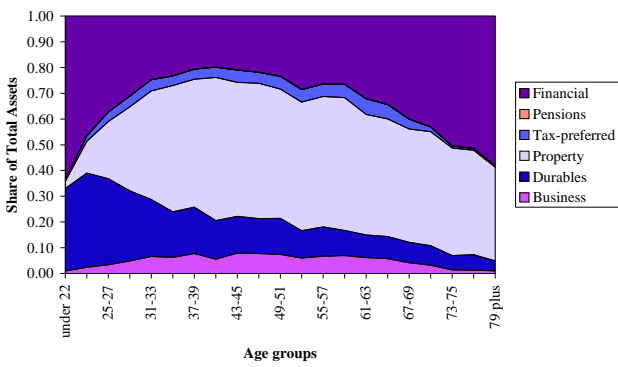
**Figure 6a: Total Assets 1984 - Accumulation**



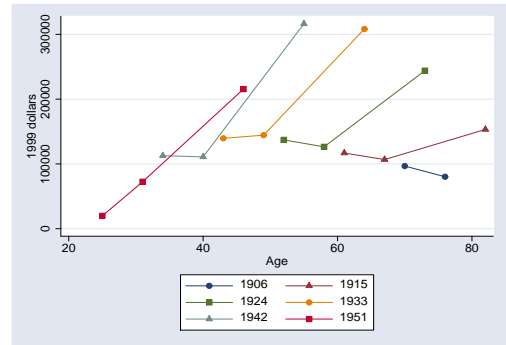
**Figure 6b: Total Assets 1984 - Ownership**



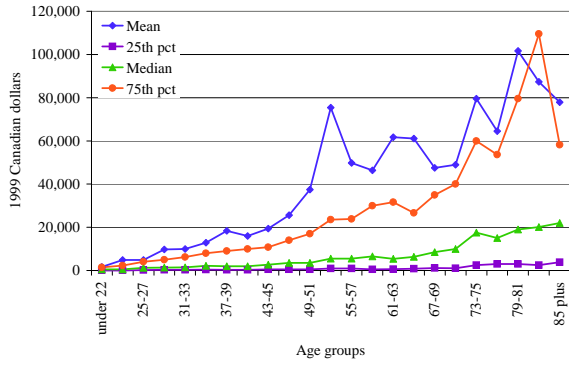
**Figure 6c: Total Assets 1984 - Allocation**



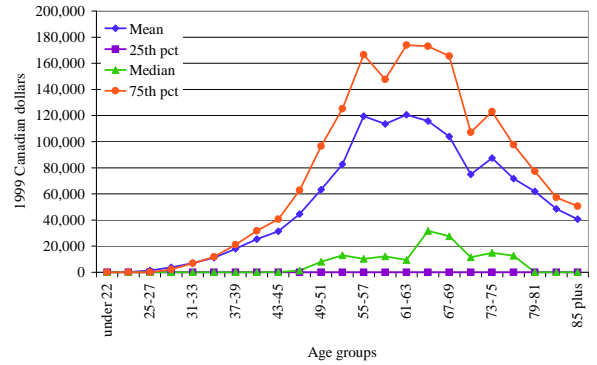
**Figure 7: Total Assets by cohort from 1977, 1984 and 1999**



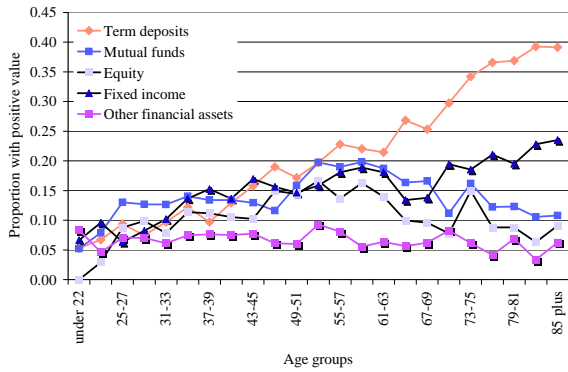
**Figure 8a: Financial Assets 1999 - Accumulation**



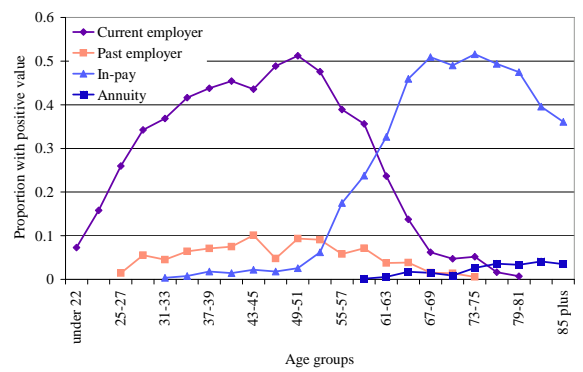
**Figure 9a: Pensions 1999 - Accumulation**



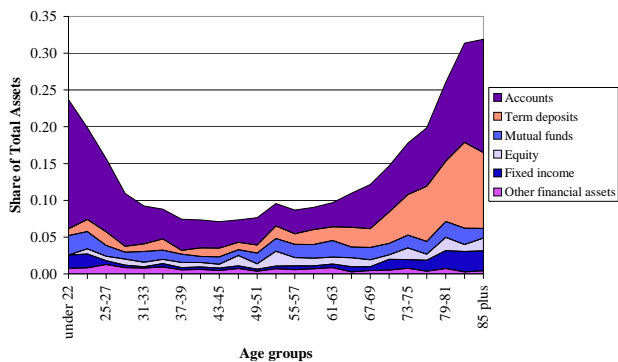
**Figure 8b: Financial Assets 1999 - Ownership**



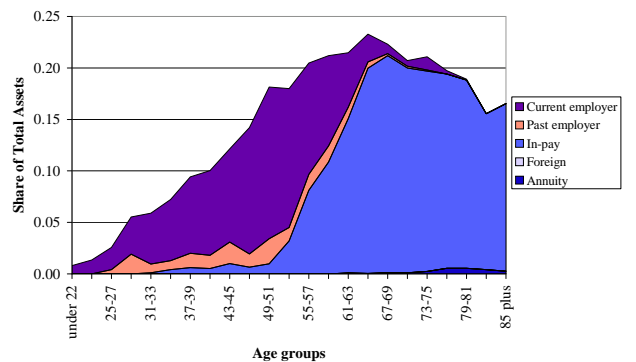
**Figure 9b: Pensions 1999 - Ownership**



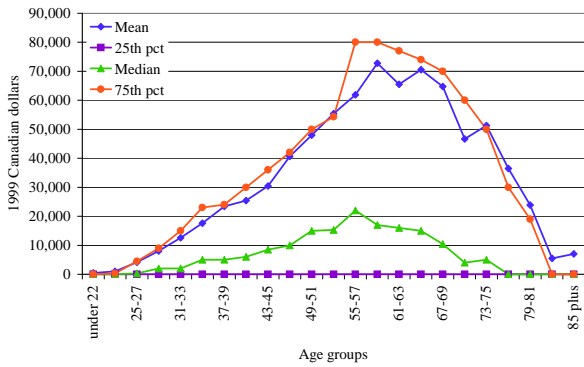
**Figure 8c: Financial Assets 1999 - Allocation**



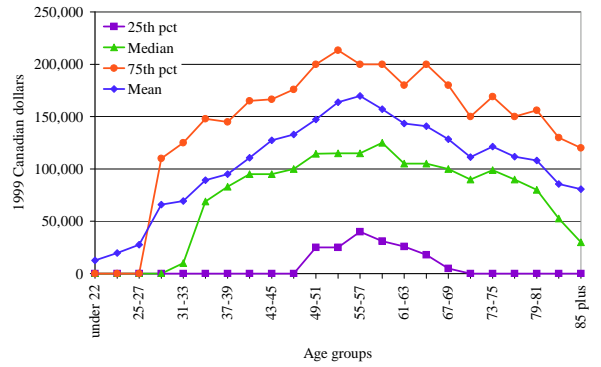
**Figure 9c: Pension Assets 1999 - Allocation**



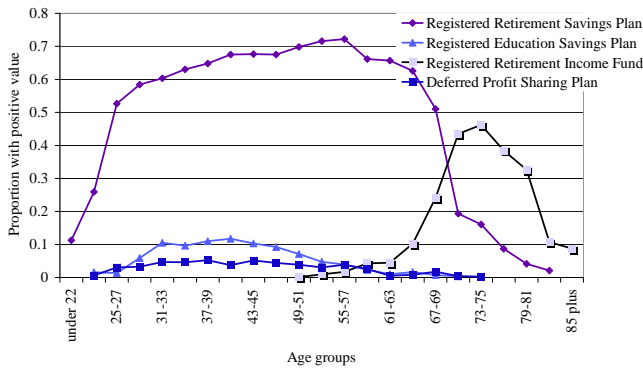
**Figure 10a: Tax-preferred Savings 1999 - Accumulation**



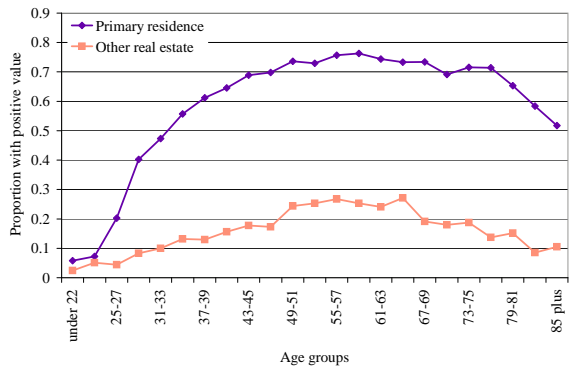
**Figure 11a: Property 1999 - Accumulation**



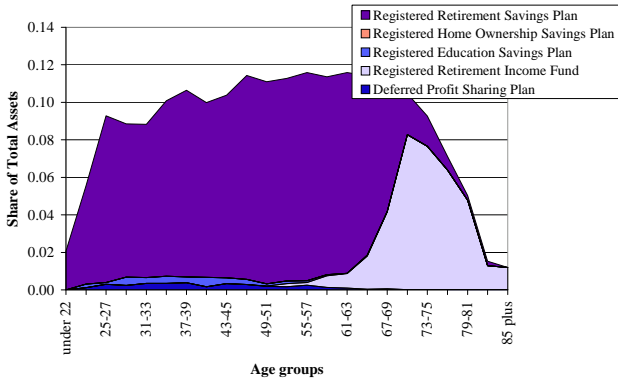
**Figure 10b: Tax-preferred Savings 1999 - Ownership**



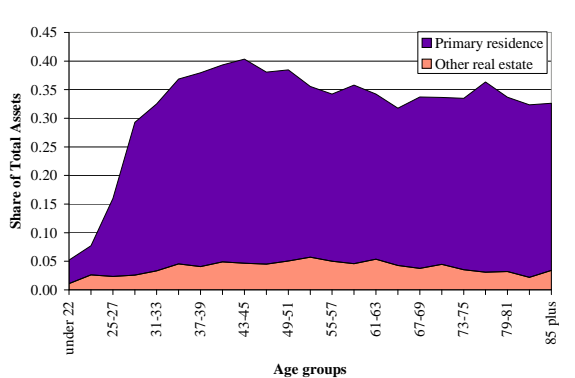
**Figure 11b: Property 1999 - Ownership**



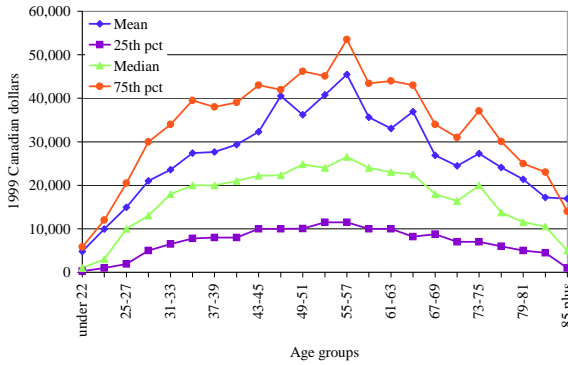
**Figure 10c: Tax-Preferred 1999 - Allocation**



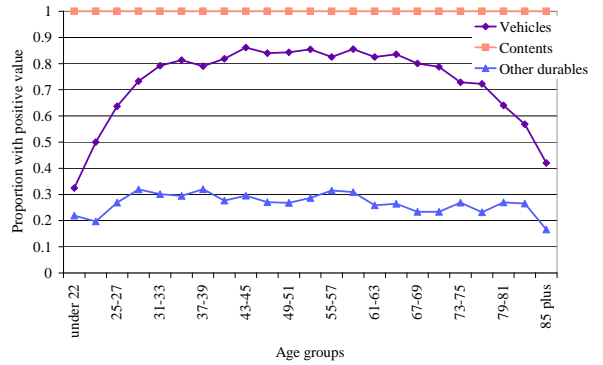
**Figure 11c: Property 1999 - Allocation**



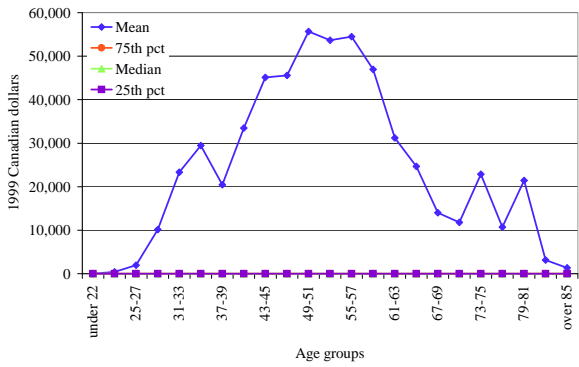
**Figure 12a: Durables 1999 - Accumulation**



**Figure 12b: Durables 1999 - Ownership**



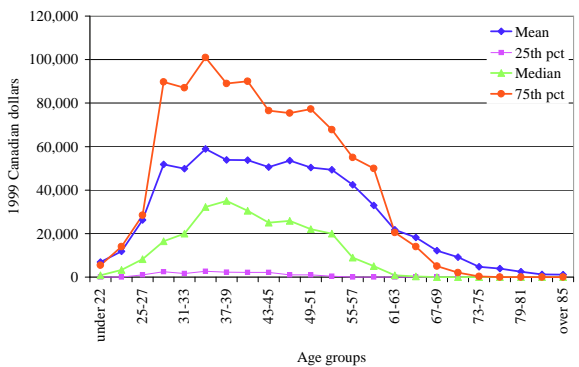
**Figure 13a: Business Equity 1999**



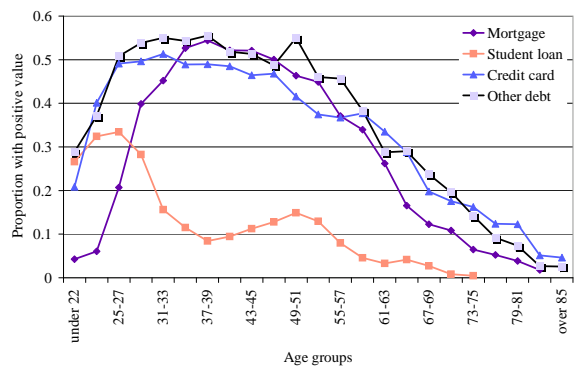
**Figure 13b: Business Equity 1999 - Ownership**



**Figure 14a: Debt 1999 - Accumulation**



**Figure 14b: Debt 1999 - Ownership**



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