SAVING BEFORE AND AFTER RETIREMENT

THREE ESSAYS ON
SAVING BEFORE AND AFTER RETIREMENT:
A STUDY OF CANADIAN COUPLES,
1969 - 1992

By

XIAOFEN LIN, B.A., M.A.

A Thesis
Submitted to the School of Graduate Studies
in Partial Fulfillment of the Requirements
for the Degree of Doctor of Philosophy

McMaster University

Doctor of Philosophy (1998)
(Economics)

McMaster University
Hamilton, Ontario

Title: Three Essays on Saving Before and After Retirement: A Study of Canadian Couples, 1969 – 1992

Author: Xiaofen Lin,
B.A., M.A.

Supervisors: Professor John Burbidge (Chairperson)
Professor Martin Browning (Chairperson)
Professor Lonnie Magee
Professor Michael Veall

Number of Pages: xv, 265

ABSTRACT

The conventional life-cycle model predicts that households save prior to retirement and use their savings to finance consumption during retirement. Thus whether households dissave after retirement or at older ages is critical to the validity of life-cycle theory. This question is also of concern to policy makers as aggregate saving and investment, in Canada and elsewhere, may fall as the population ages. Many studies based on aggregate data for a cross-section of OECD countries provide support for the life-cycle hypothesis, since the data suggest that countries with a greater proportion of elderly people have lower household saving rates. On the other hand, most empirical research directed at household consumption and saving behaviour based on household data has found little evidence that supports the life-cycle hypothesis.

The three essays comprising this thesis attempt to establish and explain the micro evidence on saving behaviour of older households, and also try to overcome some of the usual barriers to using cross-section survey data in empirical research in the field. All three essays employ Canadian FAMEX data from 1969 to 1992.

Like much other research in the field, the empirical work reported in Essay 1 in this thesis provides evidence against the prediction of life-cycle theory that households dissave at older ages. It is found that the median saving rate for older households exhibits a distinct age pattern: it drops sharply at retirement age, but then rises, thereby forming a saving dip. The most important contribution of Essay 1 is to address two well-known problems, cohort bias and differential mortality bias, arising from using cross-section survey data. Cohort bias is dealt with by forming a synthetic longitudinal sample from repeated cross-section data, and a new method is developed to correct the differential mortality for the age profile of the saving rate. However, the puzzle in the

saving pattern of the elderly still remains after the corrections; the median saving rates are positive and rising with age after retirement.

Essay 2 focuses on the estimation of the saving rate as a function of various income sources as well as age. During the transition from work to retirement, households experience a dramatic change in composition as well as in the level of their income. Following the permanent income hypothesis, if consumers have different perceptions of the permanence of different income sources, they would react differently to income changes, depending on which income component changed. The main finding of the essay is that, in the after-retirement period, the "pure" aging effect is solely responsible for the rising trend of the saving rate. However, for a given level of total income, higher pension income is associated with a higher saving rate, while higher transfer income is associated with higher consumption.

Essay 3 examines the change in the composition of consumption demands as households age, and how the effects of three factors - age, total expenditure and retirement - contribute to this change. It is found that the "savings puzzle" comes largely because reductions in food consumption at home, private transportation expenditure and perhaps tobacco/alcohol spending due to age alone are larger than the offsetting age effect associated with an increase in gifts to other households by the elderly. On the other hand, for some reason, older households largely "obey" the cross-section income elasticities in reducing their consumption of most goods as their incomes fall with age.

ACKNOWLEDGEMENTS

I wish to express my deep appreciation to my supervisor, Professor John Burbidge, for his constant guidance and assistance throughout each and every stage. My thesis would never have gone to its completion without his support and encouragement. I also wish to thank Professor Martin Browning, my supervisor in the early stage of the thesis research, who introduced me to the research topic and guided me through for the first essay of my thesis. My sincere gratitude also goes to the other members of my supervisory committee, Professor Lonnie Magee and Professor Michael Veall. I will always remember how countless times they patiently corrected my errors and mistakes, and provided valuable comments and suggestions.

Without the love, support and understanding of my family I would not be able to complete my doctoral studies. My special thanks go to my husband, Wenxuan, and my daughter, Ying, for their unconditional support and sacrifice.

I gratefully acknowledge financial support from the Social Science and Humanities Research Council, Ontario Graduate Scholarship, and the School of Graduate Studies at McMaster University.

TABLE OF CONTENTS

ESSAY 2: SAVING AND INCOME

ESSAY 3: SAVING AND CONSUMPTION

LIST OF TABLES

ESSAY 1:

ESSAY 3:

LIST OF FIGURES

ESSAY 1:

ESSAY 2:

ESSAY 3:

INTRODUCTION

The conventional life-cycle model predicts that households save prior to retirement and use their savings to finance consumption during retirement. Thus whether households dissave after retirement or at older ages is critical to the validity of life-cycle theory. Though simple, life-cycle theory has important predictions about aggregate saving behaviour. These predictions will assume greater importance in Canada and elsewhere, as the population ages.

The next decades will see major shifts in population structure in the developed industrialized countries. The numbers in the groups aged in their sixties or above will rise and people may well retire earlier. The relationship between an aging population and a reduction in aggregate saving rate posited by the life-cycle hypothesis of saving implies, among other things, that the government will have to cope with various consequences stemming from a lowering level of aggregate saving and investment. Many studies based on aggregate data for a cross-section of OECD countries provide support for the life-cycle hypothesis, observing that countries with greater number of elderly people have lower household saving rates (see Disney, 1996, p.229-239).

On the other hand, most of empirical research directed at household consumption and saving behaviour based on household data has found little evidence that supports the life-cycle hypothesis (e.g., see Poterba, 1994). As a result, new theories have been developed to explain why the elderly may not deplete their wealth, because, for example, there is uncertainty about the remaining life span, a bequest motive, or a consumption constraint due to the deterioration of health at older ages. These theories have not yet received adequate empirical support. There are also barriers in using cross-sectional survey data that prevent an accurate assessment of saving behaviour over time. Differential mortality bias and bias arising from not following birth cohorts are the two that work in opposite directions from each other. If wealthier individuals tend to survive longer, it is their higher wealth that is observed in the data. If each successive cohort is (or is expected to be) wealthier, the lower wealth of the oldest cohort observed from data, if any, may not stem from any dissaving behaviour. While the cohort difference may or may not present, the differential mortality bias certainly exists.

The three essays comprising this thesis are directly motivated by the considerations outlined above; that is, they attempt to establish and explain the micro evidence on saving behaviour of older households, and also try to overcome common barriers in using cross-section survey data in empirical research in the field. All three essays employ Canadian FAMEX data from 1969 to 1992. Essay 1 examines the age patterns of income, consumption and saving of elderly couples. Essay 2 then looks into how the saving behaviour can be related to the change in various income components and to aging. Essay 3 examines the consumption behaviour of the elderly.

Whether households dissave after retirement or at older ages is vital to the life-cycle theory. Like much other research in the field, the empirical work reported in Essay 1 of this thesis provides evidence against the prediction of life-cycle theory that households dissave at older ages. It is found that the cross-section median saving rate for older households exhibits a distinct age pattern: it drops sharply at retirement age, but then rises, thereby forming a saving dip. It is well known however, that in the use of cross-section data, cohort bias and mortality bias obscure the assessment of the age pattern of savings, as outlined earlier. The most important contribution of Essay 1 is to address both of these problems. Cohort bias is dealt with by forming a synthetic longitudinal sample from repeated cross-section data, and a new method is developed to correct the differential mortality for the age profile of the saving rate. However, the puzzle in the saving pattern of the elderly still remains after the corrections; the saving rates are positive and rising with age after retirement.

Essay 2 focuses on the estimation of the saving rate as function of various income sources as well as age. Although it is established in Essay 1 that the saving rate falls until retirement, then rises again thereafter, we do not know whether this age pattern is due entirely to age, or to other factors, such as changing composition of income with age. During the transition from work to retirement, households experience a dramatic change in composition as well as in the level of their income. Also, according to the permanent income hypothesis, consumers will alter their consumption by a smaller amount if they perceive the income change as temporary rather than permanent. It follows that, if consumers have a different perception of the permanence of different income sources, they would react differently to income changes, depending on which income component changes. The main findings of the essay are that, in the after-retirement period, the "pure" aging effect (or age related factors) is solely responsible for the rising trend of the saving rate; for a given level of total income, higher pension income is associated with a higher saving rate, while higher transfer income is associated with higher consumption.

Essay 3 examines the change in the composition of consumption demands as households age, and how the effects of three factors, age, total expenditure and retirement, contribute to this change. Saving is the difference between net income and consumption expenditure. Because net income decreases with age, positive saving and the saving rate at older ages is generated entirely by a faster decrease in total consumption with age. Moreover, the change in the composition of consumption observed at older ages is the result of not only the effect of the aging process itself, but also the effects of other factors, such as a drop in the spending power (the income effect), and a permanent exit from the labour force (the retirement effect). The basic finding of the essay is that the "savings puzzle" comes largely because reductions in food consumption at home, private transportation expenditure and perhaps tobacco/alcohol spending due to age alone are larger than the offsetting age effect associated with an increase in gifts-contributions by the elderly. On the other hand, for some reason, older households largely "obey" the cross-section income elasticities in reducing their consumption of most goods as their incomes fall with age.

The results from the three essays have important implications for economic policy in general and for policy with respect to older households in particular. If older households do not appear to be dissaving, fear of a reduced level of aggregate investment and output per capita with the population aging may not be warranted. As far as the wellbeing of the elderly is concerned, it may be that at least part of any problem associated with low consumption by the elderly may not be a consequence of a lower level of income alone. It may be that for many elderly the problem is one of uncertainty of income sources or a physical/health restriction that prevents certain kinds of consumption. If these barriers were lessened, in many cases the elderly themselves would find the resources from their savings to increase their consumption.

Essay 1:

Age Pattern of Saving

1 Introduction

This essay examines issues of life-cycle savings of Canadian elderly married-couple households just before and after retirement within both a pooled cross-sectional and a synthetic longitudinal frameworks. We investigate whether the saving behaviour of elderly couples appears to be motivated by life-cycle factors[1], how the growth of our economy has affected lifetime income, consumption and saving across generations, and, because we use a time series of repeated cross-sections data set, how to correct the profiles distorted by the presence of differential mortality between the rich and the poor. We provide evidence against the prediction of standard life-cycle theory that the typical household dissaves in retirement. Our analysis could be of use to policy makers concerned with various social programs for the elderly in Canada.

The basic theory of saving behaviour is the life-cycle model of Modigliani and Brumberg (1954). In its simplest version, a consumer decides his lifetime consumption and savings by solving the problem of maximizing lifetime utility, which is the sum of all present and future instantaneous utilities, subject to a present and future resource constraint. Assuming an unchanging utility function for each period, no uncertainty, no changes in the interest rate and time discount rate, and perfect capital markets (people can borrow and lend at the known interest rate), the theory has very sharp implications for the life-cycle pattern of consumption, saving and wealth. Derived from the optimality condition of the maximization problem that consumers seek to keep marginal utility of expenditure constant from one period to the next, an important implication is that the

[1] Browning and Lusardi (1996) give nine motives for "why do people save?", one of which is the life-cycle motive, which is the focus of our analysis.

shape of the lifetime path of consumption is independent of the shape of the expected path of income. In other words, people save to smooth consumption in the face of an uneven income profile. As most people have high income during their working life and low income when they retire, a simple but powerful prediction is that people save until retirement, then dissave. Consequently, individual assets accumulate up to the retirement age and then decumulate down to zero by the (certain) date of death, producing the well-known hump shaped wealth-age pattern.

This basic life-cycle theory is also a forward-looking theory. It assumes that people decide how much to consume and to save by looking at present and future resources and present and future needs. Thus, in addition to the assumptions of the basic model above, it is also assumed that an increase in lifetime resources (lifetime wealth or permanent income) leads to a proportional increase in consumption at each stage in life.[2] An important prediction of this "proportionality" assumption is that, in a growing economy, since the resources available to each generation (or cohort) increase over time due to technical progress, consumption in any period should also increase proportionally to the increase in permanent income for yonger cohorts. In other words, the cohort effects of income and consumption should line up. Consequently, unless cohorts expect other economic circumstances to be different for them than for their predecessors, the saving rates should not vary across cohorts.[3]

Though powerful and intuitive, the basic life-cycle model is restrictive and so is likely to be rejected by the data. A recent volume edited by Poterba (1994) provides

---

[2] Also see Browning and Lusardi (1996), page 10-11, for a discussion of this assumption.

[3] Also see Baker and Benjamin (1995).

international comparisons of household saving behaviour in six OECD countries: Canada, Italy, Japan, Germany, the United Kingdom, and the United States. The authors from each country examine micro data sets of household saving patterns by age, income, and other demographic factors. The country studies provide very little evidence that supports the life-cycle model. In virtually all nations, the saving rate is positive even after retirement. In Italy and Japan, the saving rate among the elderly households, those aged 65 and over, actually exceeds 30%. Among low-saving countries, however, there is some evidence that saving rates peak in the years prior to the retirement. In Canada, for example, the median saving rates, as estimated by the 1990 FAMEX data using all observations, is 11% for households aged 55-59, compared to 9% for those aged 60-64 and 6% for those aged 65-69 and 70-74. But for the oldest age group, those aged 75 and older, the saving rate increases to 8%.[4] The data in Germany and the United Kingdom exhibit a similar saving pattern. The U.S. data, however, show the lowest saving rate (1.1%) for the oldest age group, the 70-74 year olds. In another recent Canadian study by Baker and Benjamin (1995), which uses the 1982-1992 FAMEX data set and includes all households, the results suggests a steady decline in saving rates across all cohorts studied. That is, each successive cohort is saving less than the previous one, which is in contradiction to what the life-cycle model would predict. Yet, the age effects in saving rates in their study are more consistent with the life-cycle model: the elderly appear to reduce their savings as they age.

Various extensions and modifications to the basic life-cycle model have been

---

[4] See Burbidge and Davies (1994), table 1.1, in Poterba (1994).

explored in the literature in the past several decades. The presence of liquidity constraints, in particular, that people are unable to convert their future income into current consumption, may explain why consumption tracks income closely at younger ages. But Browning and Lusardi (1996) argue this is much less credible for the older households. Precautionary saving models incorporate various forms of uncertainty into the life-cycle model. Uncertainty about future income, future health hazards or length of lifetime may depress current consumption and thereby increase current saving. But for the elderly, future incomes are, in most part, observable because they consist of various government-provided social security programs, private pensions and the return to capital. If a nation offers a comprehensive system of health insurance or health care, for example like that in Canada, the need to set aside resources as a precaution against illness will also be reduced. Davies (1981) suggests that even with life time uncertainty wealth must decline at some age (not necessarily at retirement) and that after this age wealth should continue to decline smoothly. Another important modification is to introduce a bequest motive for saving. The requirement that wealth should be positive on the date of death entails a lower level of consumption at each age during retirement. But it does not rule out dissaving by the elderly. Many studies and tests[5] also show that the bequest-motive of the elderly is not as important as it might at first appear. Introducing uncertain life spans and bequests may extend the age at which saving becomes negative, but it does not

---

[5] See, for example, Davies (1982) and Hurd (1990b).

invalidate the basic prediction that the elderly will eventually dissave.[6]

Because panel data are rare or even non-existent in many countries, for example in Canada, cross-section survey data have been the most common source for empirical research in this area. However, the evidence from a single cross-section (single sample year) data confounds age and cohort effects. If we have repeated cross-sections for more than a few years, we can make better estimates for both cross-sectional and longitudinal analysis. By pooling repeated cross-sections survey data and controlling the year by year differentials in the variables of interest, cohort effects can be partially washed out and the resulting "cross-section" evidence can give us much better estimates than those available with a single cross-sectional sample. Better still, by following the same year of birth cohort through these series of cross-sections, we can get estimates that actually describe life-cycle paths of the variables of interest for a particular cohort. Though this alternative longitudinal analysis has proven useful for pre-retirement households in various studies, for the elderly this suffers from the fact that the survival rate is positively correlated with wealth and that living arrangements may also be correlated with income or wealth. This means that the poor would vanish from the sample earlier than the rich, resulting in an upward bias in the cohort average over time.

In the present study, therefore, we use repeated cross-sections of time series data, the Canadian Family Expenditure Surveys (FAMEX) from 1969-1992, to examine the life-cycle saving pattern of elderly couples. Unlike most other Canadian studies which

---

[6] Bőrsch-Supan and Stahl (1991) and Bőrsch-Supan (1992) also explore the model in which there exists an upper limit to consumption depending on health status and age, with zero marginal utility if consumption is above this ceiling, so the elderly reduce their consumption as they age or as their health status declines.

include all households in the analysis, we focus only on elderly couples because we believe that wealth decumulation behaviour may be very different between couples and singles[7], and most elderly households are typically couples. In light of the discussion in the previous paragraph, we first investigate the pooled cross-sectional evidence on age patterns of income, consumption and savings, both for overall households and specific household types. We then re-organize the data so that we can follow the same cohorts over time. Life-cycle patterns and cohort patterns of saving are then examined together in detail. We also respond to the pitfalls of using repeated cross-sections data to examine the behaviour of the elderly by developing a method to correct the estimated age profiles for differential mortality.

Thus, the present study contributes to the literature in two major respects. First, the age profiles of income, consumption and the saving rate using all available FAMEX data for the elderly couples-only households has not yet been estimated within both pooled cross-sectional and synthetic longitudinal frameworks and this study fills that gap. Second, the method developed in this study to correct the age profiles for differential mortality is new to the literature, although there are alternatives (Shorrocks (1975); Attanasio and Hoynes (1995)).

Here are some of the key results. For Canadian elderly couples within the sample years studied, because incomes fall considerably at retirement and maintain a stable level thereafter while consumption is relatively smooth and decreasing over time, the saving

---

[7] For example, Browning and Lusardi (1996) point out that "we have also to be careful about family composition since the decumulation of couples can be lower than singles given that the expected `lifetime' of the household is greater for couples."

rate has a sharp drop at retirement age, and rises steadily thereafter. The dip of the saving rate at retirement is found both in pooled cross-sections and cohort analysis. There are strong cohort effects in both income and consumption variables: younger cohorts have higher income and higher consumption in any given age, and the increase in consumption appears the same as that in income. There are no cohort effects in the saving rate: each cohort saved the same portion of income at any given age. Thus the relation between the saving rate and age looks much the same whether we employ pooled cross-section or a cohort analysis. Differential mortality does make a difference to all estimated profiles, but the corrected median saving rate profile still does not become negative after retirement.

The rest of the study is organized as follows. Section 2 discusses some data issues. Section 3 gives the results on the pooled cross-sectional study, both on overall households and on specific types of couples according to their retirement status. Section 4 contains cohort analysis where again overall and specific studies are attempted. Section 5 is devoted specially to the development of a method to correct the median age profiles for differential mortality with detailed illustration for the two cases: the extreme case and the normal case. The application of the method is demonstrated on the cohort profiles in Section 4. A summary and conclusions are offered in Section 6.

2 Data Issues

The data used for this study are all publicly available Canadian Family Expenditure Surveys (FAMEX) for sample years 1969, 1974, 1978, 1982, 1984, 1986, 1990 and 1992, which are multistage stratified clustered samples selected from the Labour Force Survey sampling frame. The surveys are carried out in February and March and collect information by recall referencing to the previous calendar year on each household's total annual income and expenditures, their components, changes in assets and liabilities and information on many other characteristics of each household, including education levels and working status of both spouses (if any). The term family (or the spending unit) upon which FAMEX data are based is defined, prior to 1990, "as a group of persons dependent on a common or pooled income for the major items of expense and living in the same dwelling or one financially independent individual living alone". After 1990, it is "a person or group of persons occupying one dwelling unit."[8] The coverage of the survey includes urban and rural areas throughout the ten provinces of Canada as well as Whitehorse and Yellowknife with the exception of sample years 1984 and 1990, in which only seventeen major cities of Canada whose population is 100,000 or more are covered. All surveys exclude persons living full-time in institutions such as old age homes, penal institutions and hospitals.

Because the subjects of this study are a relatively homogeneous population of elderly couples, the sample selection criteria include:

---

[8] FAMEX Public Use Micro Tape documentation, various years. The difference between the two definitions of sample unit should not concern us much because we only select two-person, married couple households.

(1) using only two-person married couple households with male household head whose age is 55 or higher (in cross-section study), or is 53 or higher (in cohort study);

(2) excluding households who are farmers;[9]

(3) excluding households whose head or spouse are self-employed if they are working;

(4) for the cross-section study, in order to be comparable across sample years, only those households who live in cities whose population is 100,000 or more are selected from each sample year;

(5) for cohort study, in order to increase sample size because certain sample observations used in cross-section study have to be dropped due to the cohort structure[10], households who live in cities whose population is less than 100,000 and who live in rural areas but are not farmers are included.

Farm and self-employed households are excluded to achieve a relatively consistent picture of the general elderly saving pattern. Due to the nature of their profession, farm and self-employed bear higher income risk, so their saving patterns may differ from the others. For example, the theory on precautionary savings predicts that high income risk motivates high savings (Skinner, 1988; Zeldes, 1989). Their spending pattern may differ too, particularly if measured error in the observation included some business expenditures as household expenditures or vice versa.

However, just to see whether the exclusion of farmers and self-employed would

---

[9] There is a variable in the data set specifying that the unit is farm or non-farm. Another variable related to this is "area", farm is the same as area=rural farm (there is also a rural non-farm category).

[10] Details on the structure of cohorts will be explained in section 4: Cohort Analysis.

affect the results and whether using different sample arrangements for pooled cross-section and cohort analysis would change the main conclusions, several sensitivity analyses are incorporated in both the pooled cross-section and cohort analyses below to compare the results. We find no major difference in the median age patterns between including and excluding farmers and self-employed households in the analysis. There is a slight higher level of saving rates in all age ranges if we use the cohort sample to get the cross-section age patterns, but the shape of the age patterns are essentially the same as that of using cross-section sample. This slight higher level of saving rates is due to the exclusion of some observations consisting of only short-period cohorts which are in the low saving years.[11]

Saving is defined here as disposable income (or net income) minus total current consumption. In the FAMEX data set, gross income consists of wages and salaries, self-employed income, investment income, government transfers and miscellaneous income. Capital gains are not included in income. Government transfers include many income sources such as Old Age Security, Guaranteed Income Supplement, C/QPP benefits, Unemployment Insurance and social assistance. Because these transfers are lumped together, there is no way to allow further investigation as to how different sources affect spending and saving patterns differently. Miscellaneous income includes retirement pensions arising out of previous employment, individually purchased annuities and other money income. In addition to the above gross income, other money receipts is another separate variable in the data, which includes money gifts, inheritance and lump sum

[11] In the data set, year 1982 has the highest saving rate among all sample years.

settlements.

Although, given the data, one can form other definitions of disposable income, the preferred disposable income measure in this study is: gross income plus other money receipts, less personal tax, less UI and C/QPP premiums [definition (1)]. The inclusion of other money receipts in income is for obvious reasons: it is one's income and is at one's disposal. UI and C/QPP premiums are compulsory and are deducted directly from one's payroll. Moreover, as government transfers include UI and C/QPP benefits, including UI and C/QPP premiums as income would result in double counting. Another definition of net income used in this study is: income definition (1) less life insurance premiums [definition (2)]. However, as this definition is more controversial, it is only used in the general description section of cross-section studies.

The expenditure for total current consumption is defined by Statistics Canada as expenses incurred during the survey year for food; housing, fuel, light and water; household operations; clothing; automobile purchase and operation; other transportation; medical care; personal care; reading; recreation; education; smoking and alcoholic drinks and miscellaneous. However, in this study, one more item is added to the consumption expenditure, namely, gifts and contributions, which is also given in the data set as a separate variable. If we do not include this as consumption expenditure, the saving and saving rate variables, defined here as a residual of income after consumption, will be less informative, if not biased. This definition of total consumption expenditure [definition (1)] will be used throughout the study. There is another issue concerning the measurement of consumption. As noted, the above measure of consumption includes durable purchases such as cars and recreational vehicles which are not to be totally consumed within a year. Yet, some expenditures, namely, house additions and renovations, are treated totally as new additions to the stock of real assets, and are not at all reported as expenditures. To correct for this unreasonable treatment, another measure of total consumption is also used. This is consumption definition (1) less 80% of vehicle purchases and plus 20% of the expenditure on house additions and renovations[12] [definition (2)]. Within this context, the depreciation of the existing consumer durables should also be added to consumption, but the limitations of the data preclude this possibility. Thus this definition (2) of total consumption is examined only in the cross-section study.

As mentioned above, saving is defined as the residual of income less consumption. The saving rate here is always defined as saving divided by income.[13] It is worth noting that there is another measure of saving provided with the public use FAMEX data, i.e., change of assets and liabilities (Dassets), which includes the net change in all financial and real assets (cash, saving accounts, RRSPs, bonds and stocks, home equity and investment in non-incorporated business, etc.) and the net change in debt. According to these components of Dassets, it should be equal to the definition: gross income + other money receipts - personal tax - social security - (total consumption + gifts and contributions). Because social security includes UI and C/QPP premiums, life

---

[12] Household additions and renovations is a component of the variable: change of assets and liabilities (Dassets), a saving measure by Statistics Canada. In this definition, we assume that the average lifetime of the vehicle purchased and the addition and renovation part of the house are 5 years.

[13] In the analysis for saving rates, observations with zero incomes are excluded. We also exclude observations with both negative saving and negative income. Only around 5 observations are deleted on this accord.

insurance premium, annuity contracts and other retirement and pension payments (excluding RRSPs), it is clear that the residual measure of saving used in this study will be higher than Dassets because it also includes life insurance premiums (if using income definition (1)), annuity contracts and other retirement and pension payments, while these are not in Dassets. In the general description part of the cross-section study, Dassets will be examined along with the other definitions of saving variables, but it will be dropped in later sections, including the cohort analysis.

There is also a concern regarding whether the withdrawal of one's RRSP is included in one's current income variable in our data set because if so, we would observe an increase in income in later ages due to this withdrawal. According to the Canadian tax system, individuals can make a contribution to a retirement plan and deduct the contributions from income for tax purposes. Interest from the contributions then accrue tax-free until withdrawal, when income taxes are paid based on income including the withdrawals. Although the amount of withdrawal is in the base for calculation of income tax, it is not counted as FAMEX current income. Large withdrawals, if not spent, are rearranged as another form of saving, namely, in the annuity contracts component of social security. Records extracted from FAMEX data with large RRSP withdrawals are consistent with this treatment. This fact can make it clear for the results we will present later in the cohort analysis that the withdrawls of RRSPs at later ages are not the cause of the increasing income with age for the older elderly.

3 Cross-Section Evidence

This section examines saving behaviour of elderly Canadian couples based on pooled cross-section analysis. To ensure a relatively homogeneous subsample, we include only those couples who are not farmers, who live in major urban centres, who reported no self-employment income, and who are headed by males aged over 55. All income, consumption and saving variables are deflated by the Canadian Consumer Price Index series to 1986 dollars. Table 1.0 shows sample size by age group and sample year. These five age groups, arranged by the age of household heads, 56-60, 61-65, 66-70, 71-75 and 76+, are the primary focus for the examination of age patterns of income, consumption and savings in our cross-section analysis. Data on all sample years are pulled together to form the base sample for cross section study in the concern that using any one particular sample year may lose the representativeness of a general age pattern because of the small sample size.

The rest of this section is divided into three sub-sections. Section 3.1 looks at the general age patterns of income, consumption and savings. Section 3.2 presents a more detailed picture of savings by examining the age pattern of four distinct types of couples according to their working status. Summary and comments follow in section 3.3.

3.1 Income, Consumption and Savings: A First Look

We start with a general description of the data. Because of fat tails in the distribution of the variables in question, especially income and saving rates, we use the median rather than mean most of the time as our primary measure of the central tendency of the variables. The medians of the variables for each age group are estimated by running quantile regressions with the quantile set to 0.5 (the same as Least Absolute Deviation regression or median regression).[14] The right hand side variables are just a set of age dummies (or other dummies of interest) and a set of year dummies with a constant term. We add the year dummies to pick up different year effects in our pooled eight-year samples with 1992 as the reference (omitted) group.[15] Thus the age coefficients (plus the constant term) in regressions correspond to the medians of age groups (with an adjustment to allow for yearly differences).

The advantage of using the quantile regression method to describe our data is that we can control for independent variables as well to find patterns that are beyond the reach of simple descriptive statistics. Adding year dummies is an example. Later on, we will also control for other variables that affect the shape of the profiles we study.

General Age Pattern

Tables 1.1-1.3b present general age patterns for household income, consumption, savings and saving rates of the Canadian elderly couples. Table 1.1 shows the age patterns for the medians of net income and total consumption, with two definitions for

---

[14] All work in this essay including data management, estimation, simulation and graphing are done using STATA version 3.1.

[15] Because the year dummies are not interacted with other variables, the age patterns are affected by all observations. We set all non-omitted year dummies to zero to get the predicted medians of all age groups for all the tables in the cross-section analysis. The medians in the tables are thus affected by all observations in the sample, not just by observations in reference year 1992.

each. Standard errors of the medians are also presented[16]. We note certain important trends from the table. First, income and consumption are uniformly decreasing with age for both definitions. Second, the declines in consumption are very evenly paced with age, while the declines in income experience a large drop from ages 61-65 to ages 66-70 when most people begin retirement. Here there seems to be some evidence in favour of the "consumption smoothing" prediction from Life-Cycle theory if we believe that the age pattern from cross-section data is valid for the prediction. As stated in the Introduction section, using pooled cross-section should yield much better results than using only a one year sample because cohort effects can be partially washed out. We shall see later that this relatively smooth consumption pattern also exists in cohort analysis. Lastly, there is no fundamental difference in the age patterns between the two definitions of income or between the two definitions of consumption. For income, even the levels are very close, especially after ages 66-70. For consumption, definition (2) always yields lower value than definition (1). Their differences are much higher in the first two age groups than in the oldest two groups. This tells us that the older elderly are much less active in buying cars and recreational vehicles than the younger elderly.

Table 1.2 gives age patterns for four definitions of saving plus a measure of saving by Statistics Canada: change of net assets and liabilities (Dassets). Saving (1) to

---

[16] Because the regressions include constant terms, standard errors of the coefficients on dummy variables are not the standard errors of the medians we want and these cannot be calculated by simply adding to standard error of the constant. We solved this problem by adding a test procedure after each regression, which tests, for each dummy variable, whether the sum of the coefficients on the constant and the respective dummy variable equal to zero. The F values resulting from this test procedure are then used to calculate the standard errors of the medians which are presented in all the tables below.

(4), defined as the residual of income less consumption, are also declining quickly up to, and including, ages 66-70. But as age continues to increase, saving rises again. This pattern also holds for Dassets, albeit its levels are just around half of the other saving definitions. The differences in magnitudes between the four definitions also depend on the differences between two definitions of income and consumption. Because the measure of incomes (1) and (2) are almost the same, saving (1) and (3) are almost identical and so are saving (2) and (4). Saving (2) and (4) are greater than saving (1) and (3) because the former treats a portion of durable goods purchases as saving.

Tables 1.3a and 1.3b show median and truncated mean saving rates, defined as saving as a proportion of the corresponding income. From table 1.3a, all four definitions of median saving rates display a very distinct pattern: they have a modest decline in ages 61-65, then have a big dip in ages 66-70. Thereafter, saving rates rise steadily. Notice also that, even at the trough, saving rates remain positive in the range of 5 to 11 percent, and they are also statistically significant. This is certainly in contradiction with what would be predicted by the Life-Cycle Model. There is also a similar observation as in table 1.2 above concerning the different definitions.

As a comparison to median figures, table 1.3b also gives truncated mean saving rates which include only couples whose saving rates are between -100% and +100%. Only about 2% or less of the couples are excluded. We see that the age pattern of saving rates in this table is very similar to table 1.3a, although the levels are lower. This suggests that saving rates are symmetric.

A final observation on tables 1.3a and 1.3b is for the measure of saving rate on Dassets as a proportion of income. Although as expected, the figures are much lower than for other definitions, the age shape for this measure is the same as described above: a big dip (but still well above zero) in ages 66-70, and rising quickly thereafter.

Age Pattern by Income Quartiles

The tables we presented so far all give median (or mean) age patterns. They are sufficient for the purpose of studying the average tendency of household saving behaviour. In this subsection, however, we also want to answer the question: Do the poor and the rich have the same age pattern of saving? We study the age pattern by income quartiles.[17]

We could have used the current net income variable to rank households if the households were in the same age group and from the same sample year. But now, given the structure of our data, ranking households according to current income is inappropriate. First, if an older elderly household unit has the same current income as the median income of the younger elderly unit, it will be at a much higher position in the income distribution of its peers (table 1.1 makes this clear), and so may save a higher proportion of its income than the younger unit does. Second, given that our data consist of eight sample years, even if all units being compared are within one age group, a unit from an earlier sample year with the same income as a unit from a later sample year is also at a higher position in the income distribution of its peers of the same year (e.g., considering the growth of the economy).

---

[17] We should note that poor/rich should be defined in terms of wealth, not of current income. However, because wealth information is not observed in our data, we use income as an approximation.

We define now a new concept of income: relative income, which is comparable across all age groups and all sample years (see Danziger et al. 1981). We assume the following relationship:

$$Y^*_{ijk} = Y_{ijk} \,/\, \overline{Y}_{jk}$$

where: Y_{ijk} = net income of household i of age group j in sample year k,

$\overline{Y}_{jk}$ = median net income of age group j in sample year k.

Now when we rank households by Y^*, a unit in the oldest age group with a median income, say $17,346 in table 1.1, will be ranked the same position as a unit in the youngest age group with median income of $29,162.

We now return to our task. Tables 1.4a and 1.4b give the age pattern of median saving (1) and (2) by quartiles of relative income Y^*, while tables 1.5a and 1.5b examine saving rates (1) and (2) of the same kind.[18] The figures on the tables are obtained by running median regressions of saving and saving rates on a set of 19 age-quartile cell dummy variables plus a constant term and a set of year dummies (omitted from the tables) with reference year 1992. Standard errors of the medians are also given. Within each column, households have roughly the same relative position in the distribution of income of their age/year group. Within each row, we can examine savings or saving rates of different income classes for a given age group.

We first look at tables 1.4a and 1.4b. For each age group, the median saving,

---

[18] As we mentioned earlier, definitions (1) and (3), (2) and (4) on saving and saving rate are very close in magnitude as well as in shape. Therefore, we examine only definitions (1) and (2) below. Later we will only study definition (1).

either (1) or (2), rise as income rises. Within each column (i.e., for each income class), the by now familiar age pattern is still very clear, at least for the three upper income classes. Saving decline quickly until reaching ages 66-70, and remains constant or even rises thereafter. We observe dissaving only below the first quartile. Even so, the oldest age group below the first quartile still has positive saving, though the saving levels are not statistically significant (see standard errors). Comparing the magnitude of definition (1) in table 1.4a with that of definition (2) in table 1.4b, we observe that the richer members of the elderly (above the second quartile) also have more durable consumption than the poorer ones.

Tables 1.5a and 1.5b are for median saving rates (1) and (2) by age group and quartiles of Y^*. There is an even more distinct and robust shape to saving rates within all quartiles (see table 1.5a). For all couples above the first quartile, saving rates drop sharply in ages 66-70, then rise steadily thereafter. For the couples below the first quartile, the trough now occurs between ages 61-65. The saving dip occurring earlier for the poorest may reflect the fact that, as we shall see later, most early retirees (not working while in ages less than 65) have very low income levels, and thus there are more people below the first quartile who retired at ages 61-65 than there are above the first quartile. Thus, it may be more appropriate to state that the dip in saving rates occurs at retirement, not simply at ages 66-70. Nevertheless, the oldest group below the first quartile still has a positive saving rate, although all the other groups in the same income class are dissaving.

For the households above the third quartile, the median of saving rates is far higher than that of the middle higher households for every age group. This is also true comparing the lowest and the middle lower income households. This observation reflects the high sensitivity of saving rates to income.[19]

Section Summary

So far, we have shown the general age patterns in income, consumption and saving for elderly Canadian couples. We have also shown the age pattern of saving and saving rates for each income quartile. Income and consumption are both decreasing with age, but the decline in consumption is very evenly paced while income experiences a large drop around age 65 or, more accurately, retirement age. Saving and saving rates, measured as a residual of income after consumption and its relation to income, thus exhibit distinct age patterns: a big dip at ages 66-70, and a quick rise thereafter. Although there are small variations in levels as well as in shapes among the different definitions, these general trends in saving are very robust. This can also be seen in the study of age patterns by relative income quartiles. For most income quartiles, the saving pattern is the same as the general pattern above. We observe dissaving only in households within the first income quartile, and only for the age range below 76+. For the general age pattern, the medians of saving and saving rates are always far higher than zero even in the trough. These observations do not seem to be consistent with the prediction of the Life-Cycle model.

---

[19] Note that stratifying by income introduces a spurious correlation between saving rates and income if the latter has any measurement error so that *some* but *not all* of the positive correlation between income and saving rates can be explained this way. As we noted before, it would be better to use some 'permanent' measure, such as wealth or permanent income, that is not based on current income.

One of the most striking results from this section is the robust age pattern of the saving rates. This shape is closely related to the retirement status of the couples. To examine this point further, we will study the relationship between retirement status and the age patterns of saving in the next section.

3.2 Does Retirement Status Matter?

We begin this enquiry by grouping couples in terms of their working/retirement status. "Working" is defined as having either full time or part time work with positive earnings within a sample year. Thus "retired" is just "not working" for the whole year. Each age group is divided into four mutually exclusive types: both husband and wife are working (type (0, 0)); husband is working but wife is retired (type (0, 1)); wife is working but husband is retired (type (1, 0)) and both husband and wife are retired (type (1, 1)).[20] Note that we do not distinguish between couples that are not working for different reasons. The FAMEX data set does not provide this information on retirement status, and so it is difficult to assess the labour market status of individuals who are out of work close to their retirement age.[21] However, we believe that the proportion of the individuals 60 years of age and older in our sample who are not working at all during the year and who are still in the labour market (e.g., looking for a job) is relatively small, especially for those over age 65. For the age 56-60 group, the percentage of couples with non-working heads itself is small (see table 2.1a below), and this age range is not our primary

---

[20] It is worth stating that "retired" for many wives in these cohorts is not quite right since they may not have been in the labour force for a long time.

[21] The individuals themselves may not know whether they are "unemployed" or "retired".

focus in any case. Nevertheless, we should still keep in mind the fuzziness in the definition of the "retired" in the work that follows. Another note is that we define "retired" as not working for a whole year; that is, if an individual retires in the middle of the year when he turns to age 65, he will still be classified as "working" in that year.

Table 2.1a shows a very clear relationship between ages and types. Before ages 66-70, at least one of most couples is still working; but from ages 66-70 onward, the majority of couples are both retired. Notice that couples with retired heads (types (1, 0) and (1, 1) in ages 61-65) account only for about one third of the total couples in the age 61-65 range, while couples of these types in ages 66-70 account for over 80 percent of the total couples in their age range. Within ages 56-60, however, the percentage of the couples with non-working heads is small (about 17%), as we noted earlier.

As an interesting aside, table 2.1b also presents the average differences between the ages of husband and wife (husband's age less wife's age) by type of couples and age group. We see that type (0, 0) and (1, 0), in which the wives are working regardless of their husbands, have much larger age differences than the other types do. Especially for type (1, 0), in which the husbands are already retired, the age differences reach as high as four times of the average difference of total sample, which is only three years. While these are interesting background facts to note, preliminary analysis shows that age difference itself adds little explanatory power if we include it as one of control variables to explain saving rates, and so it is not included in the main analysis below.

Saving Rates by Type of Couples: An Overall description

We now give a general picture of saving rates for different types of couples.

Table 2.2a looks at the median saving rate (1) by type of couples and age group. The cell median figures and standard errors are obtained by running quantile regressions of saving rates on a set of type-age specific cell dummy variables and a set of year dummies plus a constant term as we did before. The total figures on the bottom row come from replacing type-age dummies with only age dummies. Likewise, the total figures on the second to last column are obtained by replacing type-age dummies with only type dummies. Finally, by removing type-age dummies together, we obtain the gross median figure of 10.0%. These separate regressions for the different total figures are necessary because the measurement on the table is median, not mean, and the median of the total is not equal to the average of cell medians. The remaining tables (except 2.3) are also obtained in this way. The main regression results (for type-age cell) for the coefficients of year dummies can be found in column one of table 2.3. Tables 2.2b (truncated mean saving rate (1)) and 2.2c (median saving rate (2)) may also be compared with table 2.2a.

Looking across age groups in table 2.2a, we first notice that, for types (0, 0), (0, 1) and (1, 0), there is virtually no age pattern. Saving rates oscillate, but there is no obvious relationship with age. We have tested the hypothesis that the saving rates across age groups are equal for each type[22], and the values of the test statistic (see the last column of the table) show acceptance of this null hypothesis for all three types. The only noticeable difference among the three types is the much higher level of saving rates for

---

[22] Because quantile regression requires a constant term, all coefficients represent the difference between the variable and constant term. The test procedure thus involves, for the first three types, testing whether the coefficients of all age group dummies are equal (the constant term is for the cell of type (1, 1) and age group 76+) and for type (1, 1), testing whether the coefficients on the first four age group dummies are jointly zero.

type (0, 0) with both couples are working. For types (0, 1) and (1, 0), saving rates are around the same level: the median is about 12.7% and 14.3%, respectively, compared to 21% for type (0, 0).

For type (1, 1), however, there is another story. First, the levels of saving rates, whether as a whole or within each specific age groups, are the lowest amongst all types. Second, saving rates increase with age, with the median of the oldest age group saving almost the same proportion of income (11.3%) as the overall median of type (1, 0) which is 12.7%. The hypothesis that the saving rates across age groups are equal for this type now is strongly rejected. Finally, we also notice that the two youngest age groups of this type are saving less than we expected. Age group 56-60, with some of the members of (1, 1) probably unemployed, has a median saving rate of -2.4%. This is the only case of dissaving in the whole table. For the age group 61-65, in which most members are early retirees, the saving rate is only 0.5%, far less than the other types in the same age range. Note also that the saving rates of the two groups are not statistically significantly different from zero.

Tables 2.2b and 2.2c provide an alternative perspective on the saving behaviour. Table 2.2b uses the same definition of saving rate as table 2.2a but uses the truncated mean instead of the median. Table 2.2c uses medians but uses definition (2) of saving rates. Except for the lower level of saving rates for most cells in table 2.2b and the higher level of saving rates in table 2.2c, the general patterns are the same as in table 2.2a. The first three types have no significant age patterns. Notice that type (1, 1) at ages 60-65 is now also dissaving using the truncated mean measure, while type (1, 1) at ages 56-60 now has a small positive saving rate using saving definition (2). Because of the similarities, from now on, we only focus on saving rate definition one and only use the median as our measure of overall tendencies.

Tables 2.2d, 2.2e and 2.2f provide an alternative perspective by addressing the question using different subsamples. As mentioned in section 2: Data Issues, data used in cross-section analysis exclude farmers and self-employed households and households residing in smaller cities and rural areas. The cross-section data also include some observations that will not be in the cohort analysis in later sections due to cohort structure. How will the results in table 2.2a change if we use an alternative data set that includes farmers and self-employed, or the sample used in the cohort analysis? Table 2.2d provides a comparison to table 2.2a, which uses cross-section data as in table 2.2a, but also includes farmers and self-employed households. Table 2.2e uses the cohort data we will use in later sections, which also excludes farmers and self-employed households. Table 2.2f uses cohort data but excludes farmers and self-employed households. In general, there is no major difference in saving patterns between including or excluding farmers and self-employed households in the data set, comparing table 2.2a with 2.2d, and table 2.2e with 2.2f. Because we use the median as our measure, it may not be affected much even if farmers and self-employed households do have different saving behaviour. There are about 2% higher in saving rates across all cells in the tables if we use cohort data instead of cross-section data, comparing tables 2.2a with 2.2e, and tables 2.2d with 2.2f. But the main patterns in the saving rates are essentially the same. The higher level in saving rates is because the excluded observations due to cohort structure are from the low saving years (70's and 90's).[23] Thus, using different subsamples essentially do not affect our results, and the saving patterns remain the same as in table 2.2a.

As further confirmation that saving rates do rise significantly for type (1, 1) but remain at the same level for other three types in the last part of life after retirement age, we also conduct a series of tests of the hypothesis that saving rates in ages 66-70 are the same as saving rates in ages 76+. The tests, which are shown in table 2.2g, are for saving rate definitions (1) and (2) in tables 2.2a and 2.2c respectively. For type (1, 1), the hypothesis is strongly rejected for both definitions of saving rates. But this is not the case for the other three types. We can conclude that it is only for the both-retired couples that there is strong evidence that saving rates are rising with age. For other types of couples, saving rates stay at a high level for all ages.

Saving Rates by Type of Couples: Controlling for Other Variables

The results to this point are based on quantile regressions using dummy variables for age and household type (as well as year, although the year dummy coefficients have been suppressed for brevity.) Now we wish to exploit further the regression method to control for other characteristics. We want to answer the question: will the saving behaviour for each type change if we also control for education and home ownership, or even control for income, because these factors may affect households' saving rates?

---

[23] See table 2.3, the regression results, for the coefficients of year dummies. The highest saving year is 1982.

Our first attempt is to control for education and home ownership in addition to years. The quantile (median) regression results for the control variables can be found in column (2) of table 2.3. The control variables other than year dummies are: a dummy variable for head having high school education ("high school"), a dummy for head having post secondary education ("post high school") and a dummy for "homeowner" defined as owning a home without outstanding mortgage.[24] The constant term thus represents the reference group (type four at ages 76+) with elementary education, non-homeowner and for the year 1992. We see that the saving rate is 5.8% higher for home owners than for non-homeowners and 5.5% higher for couples with heads having post secondary education than for couples with heads having only elementary education, although there is not much difference between high school and elementary education (only 1.2%). The coefficient on the high school dummy is not significant.

Table 2.4 shows the estimated median saving rates and their standard errors by type and age, for couples where the heads have a high school education and are homeowners. The calculations of these figures are the same as before for table 2.2 except that now we have to add the coefficients of the high school dummy and the homeowner dummy to the constant to get our results. Comparing with table 2.2a which is unconditional, this table shows higher saving rates for almost every cell as well as the total figures. Yet, the general patterns are the same. There is no age pattern for types with at least one working spouse. The saving rate is increasing with age for households

[24] "Non-homeowner" also consists of a small number of households owning a home but having outstanding mortgages. Because these households exhibit almost the same saving rates as households not owning a home, we combined them together.

with both couples retired. But recalling table 2.3, we can see that if we had focussed on non-homeowners, the median couple in the first two age groups of type four may well be dissaving because non-homeowners save 5.8% less than homeowners.

Our next task is to control for income as well to describe the saving pattern by types. Unlike controlling for education and home ownership which are thought of as exogenous variables, controlling for income raises econometric questions because income is likely endogenous. While some authors simply do not include income as a regressor to explain the saving rate (e.g., Attanasio, 1994), others do and still treat it as exogenous (e.g., Skinner, 1988). Our purpose, however, is simply descriptive; we do not attach any structural interpretation to the regression (and there may even be no correct ones).

We run median regressions of saving rates on the same set of right-hand side variables as in table 2.4 plus Log Net Income variable. The main regression results other than the coefficients of type-age cell dummies are in column (3) of table 2.3. Comparing them with those in column (2) of the same table, we have some interesting observations. First, after we controlled for income, the signs of the coefficients on two education dummies now are reversed: post secondary graduates now would save a smaller proportion of their income than those with high school education, or even those with elementary education. Yet homeowners still save more than non-homeowners. Second, the fitting of the regression is noticeably improved as is evidenced by the pseudo R square value of 0.128 now instead of only 0.0442 in column (2). Lastly, the income variable is the most significant factor positively affecting saving rates. It seems that it is this income effect that makes the "post high school" dummy correspond to a higher coefficient than the other education dummies in the previous regression (column (2) of table 2.3). Since income itself is strongly affected by education, however, we must interpret the coefficients carefully.

It is also interesting at this point that we examine the pattern of Log Income for the type-age cells. We run median regressions of Log Net Income on the same set of regressors used for table 2.4. Table 2.5 shows estimated median log income (definition one) and standard errors conditional on education (for high school) and home ownership (for homeowner) for the omitted year dummy (year 1992). The regression results (except for cell dummy coefficients) can be found in the last column of table 2.3. We note in table 2.5 that median income for the retired couples (type (1, 1)) is the lowest among all types, and it rises until ages 66-70, then falls from this age onward. We also note from table 2.3 that having post secondary education is associated with much higher income than having elementary and high school education; homeowners also have higher income than non-homeowners.

We now want to ask the question: what if all types of couples have the same income level regardless of their retirement status? Using the above saving regression results controlling for income, we set income equal to the gross median log income of 10.024 (in the bottom right corner of table 2.5) for every cell to calculate the cell median saving rates. Table 2.6 gives the results. Two marked changes emerge compared with previous ones. First is the uniformly decreased level of saving rates for types (0, 0), (0, 1) and (1, 0), although there is still no age pattern to be found. Type (0, 0) has the highest decline so that the three types are now at the same level of saving rates, around 10% in total. The other change is in type (1, 1). For the two age groups below 66-70, saving rates of type (1, 1) now are as high as the other three types. This suggest that the reason for low savings rates in those groups was their relatively low income levels. From ages 66-70 onward, the saving rate rises so sharply that the oldest age group now has the highest saving rate (21%) among all cells in the table.

Section Summary

In this section, we gained more insight into the saving behaviour for the four types of couples defined by their working status. We studied their saving patterns with and without controls for other variables such as education, home ownership and family income. The general shapes of savings from most of these exercises are the same. For the three types of couples in which at least one spouse is working, saving rates are higher (with the highest rate for couples with both spouses working) than for couples with both spouses retired, yet their saving rates exhibit no relationship with age. When both spouses are retired, however, saving rates are increasing with age. Finally, if we assume an equal level of income for every type and age, the prediction is that all couples with at least one spouse working would save less than both-retired couples, though there is still no age pattern, and both retired couples still exhibit increasing saving rates with age at older ages. In such a case, the oldest group with both spouses retired would then have the highest saving rate among all cells in the table.

3.3 Summary and Comments on Cross-Section Evidence

In the previous two sections, we have studied the general pattern of saving behaviour for all households together as well as a more detailed picture by household types. How do the newly discovered detailed patterns we just summarized above in section 3.2 relate to and explain the earlier results in section 3.1, which showed "a sharp drop in saving rates at retirement age, rising again thereafter"?

We can say now that the "drop" part can be explained by a "drop in income" effect while keeping consumption relatively stable. Suppose we take the majority case that couples usually switch from at least one spouse working when in ages 56-60 and 61-65 to both spouses retired when in ages 66-70 up to 76+, as the typical path indicated in table 2.1a with large cell sizes in each age range.[25] The saving rates in this section of tables 2.2a and 2.4, whether unconditional, or conditional on education and home ownership, both exhibit this sharp "drop" when reaching ages 66-70 from ages 61-65. But if, in addition, we control for income and assume the same level of income for each cell, this pattern virtually vanishes: the newly retired couples in ages 66-70 would save about the same portion of their income as their working counter part in ages 61-65. As we pointed out earlier, this "drop", in some sense, is consistent with the prediction of life-cycle model, although we hardly observe dissaving.

The subsequent rising saving rates amongst older retired couples, however, seems very robust: the effect is not reduced (and may even be enhanced) by controlling for income as well as other variables. We have also learned that this robust "rising" pattern is exclusively observed for the both-retired elderly couples and not for couples with at least one spouse working. In other words, the age effect on saving rate is significant only when both spouses are retired. For other types of couples, age has no effect on saving.

---

[25] Note that this path is the average pattern for 1969-1992. It may not be so typical now.

This evidence is in sharp contrast to what life-cycle theory would predicts.

However, there may still be some questions about these results. One concerns the suitability of using cross-section evidence to address lifetime issues. But in our analysis so far, all available sample years are pooled together, and so cohort or generation differences should be partially washed out. The results from our pooled cross-section analysis should be more reliable than that of using only a single sample year. It also serves us as a foundation or a starting point from which to further build our knowledge about lifetime behaviour. Furthermore, as we will see later, if there are no cohort effects in the data set for a particular variable of interest, our pooled cross-section results would be the same as cohort analysis. However, to establish definitively the saving pattern over the later lifespan, we need to further examine it longitudinally. Given that our data is a repeated time series of cross sections, it is possible to follow a sequence of birth cohorts over time. We take up this task in Section 4 below.

The second question is the concern over differential mortality. It is well known that the rich survive the poor. Because wealthy individuals have a lower mortality rate, more rich people are in higher age groups, causing an upward bias in a median saving rate if savings are positively related to income or wealth. While this effect could be present in the pooled cross-section evidence we discussed above, the cross-section analysis itself is not sufficient to establish the pattern of lifetime behaviour. We will deal with this problem only in conjunction with the cohort analysis.

It is also worth noting here that to detect whether differential mortality affects the results by simply looking at the age pattern of income (whether increasing or decreasing) from cross-section evidence is not appropriate because even if income is decreasing with age in the cross-sections, it may be increasing with age longitudinally.[26] Furthermore, even if income is also decreasing with age longitudinally, it does not necessarily lead to the conclusion of no differential mortality effect, because without this effect, income may decrease more with age.

[26] This is exactly the case in our data set, as will be shown later in the cohort analysis.

4 Cohort Analysis

In this section, we will study the dynamic relationships between income, consumption and savings by linking the data over time. Our data covers twenty four years, from 1969 to 1992. Many key features affecting individual life cycle behaviour changed over this period. For example, the productivity of an individual entering the labour force in the thirties may be lower than that of an individual entering in the sixties. Since the older generations are, in general, poorer than the younger ones over their lifetime, they also have lower permanent income and wealth which may affect their life cycle behaviour. To capture these differences, we have to take cohort effects into account in our analysis.

This sectin is organized as follows. Section 4.1 discusses the structure of the cohorts. Section 4.2 illustrates how the cohort's age profiles of income, consumption and saving rates are modelled and estimated, and the age profiles and cohort profiles are presented graphically. We also provide age-saving rate profiles by relative income quartiles in section 4.3. Section 4. 4 shows the age profiles controlling for retirement status. The final section gives a summary of the evidence and discusses its linkage to cross section results and differential mortality.

4.1 The Structure of the Cohorts:

Given that the FAMEX data set is a repeated time series of cross sections, we can form synthetic cohorts along the lines suggested by Browning, Deaton and Irish (1985). A cohort in this concept is defined by the year of birth of the individual. We define cohort for our couples by the year of birth of the husband. The choice of the interval that defines a cohort is arbitrary and is often determined by the available data and the purpose of the study. Narrower intervals (say one or two years) can reduce within cell differences of the individual characteristics, but at the expense of reducing cell size. For our data set, because available sample years are either two or four years apart, our choice is to use a 2-year date of birth band to divide the households. The sample we use for the cohort analysis is essentially the same as used in cross sections except that some observations are now dropped because they are not within a defined cohort, and that, as explained before, households living in small cities and in rural areas (but not farmers) are also included to increase sample size.

Because our purpose is to study the behaviour of the couples around and after retirement age, we focus on cohorts for which we have more than a few years data on either side of retirement.[27] Thus our cohorts are defined as follows: cohort 1 includes all couples with the husbands born between 1905-1906, cohort 2 those born between 1907-1908, and so on up to cohort 10, those born between 1923-1924. Couples with husbands born before 1905 and after 1924 are excluded. Note that a smaller cohort number always indicates an older cohort. When we show our results graphically later, we will also label the cohorts as 'age in 1982'. For example, the age of cohort 10 in 1982 is 58-59, which is the youngest cohort in our sample.

Another point to note is about the age 76+ group. Because of the top coding in

---

[27] Thus, cohorts, within the available sample years, whose oldest ages are less than 64 or whose youngest ages are greater than 66 (the short-period, or very young and very old cohorts) are excluded from our study. Banks and Blundell (1994) and Jappelli (1995) also constructed cohorts this way.

age in the FAMEX data set, all people aged 76 or older are recorded as age 76+ except in sample year 1969 and 1986 in which the top coding is at 80+. We have used the 76+ age group in the cross-section study and we still use it now.[28] Some existing work using the FAMEX data to form cohorts and examine the economic behaviour of the households chose to exclude the 76+ group (Burbidge and Davies (1994); Baker and Benjamin (1995)). Our reason to include this age group is simply that we do not want to lose the information: at least it can give us the information on the directions the oldest age group would go, and that, as we will explain later, including this last observation will not alter our estimation results much. On the other hand, in reading the results, the reader should keep in mind this point about the 76+ group.

One important feature about the structure of the cohorts from repeated time series of cross sections data is that, as also can be seen from table 3.1, age, cohort (if labelled as year of birth) and sample year are perfectly linked by the relationship: age = sample year - year of birth. This causes a difficulty in identifying age, cohort and year effects to examine the age profile of the variable in question. We will achieve identification using macro variables to model the year effect in what follows. Details will be presented later.

We have already seen in the cross section study that the retirement status of households has a very distinct age pattern: the majority of couples retire at normal ages while less than one third are early retirees. Is this still so across cohorts? Table 3.1 gives the information on proportion of both spouses retired by age and cohort.[29] Note that we

---

[28] The age should be only 76-77 in this age range in the cohort. Thus all couples aged 78+ are not the members of this cohort.

[29] We combined two cohorts in each column to calculate the proportions. Note the table also gives a rough illustration of our cohort structure discussed in the previous paragraph.

use "both spouses are retired" as the definition of the retirement of the household in what follows. This is even a stronger requirement since it excludes households with retired heads but working wives. As we have learned in the cross section study, households with at least one of the spouses working have very similar saving behaviour, and this similar saving pattern is in sharp contrast to that of the households with both spouses retired.

From table 3.1, looking from top to bottom for each column, we still see the familiar retirement pattern by age. There is a big jump in the proportion of retired households comparing the age group (62-65) with about 28% and the age group (66-69) with 72%. This is a very similar pattern to that in the cross section study. Note that if we look across each row for each age group (i.e., we compare different cohorts at a given age), we see that the proportions tend to be higher for younger cohorts, especially at ages 61-65. For this age group, the proportion of couples that are both retired reaches 44% for the two youngest cohorts compared to only 14% for the two oldest cohorts. This is in agreement with our expectation.

Having formed the year of birth cohorts and examined their working status by age and cohort, we are now ready to continue our task of investigating age profiles of the variables of interest.

4.2 Modelling and Estimating the Overall Age Profiles

There is now a growing literature estimating cohort-adjusted age profiles using repeated cross-sections data.[30] The basic functional form for the estimation from most existing studies can be summarized as:

$$W = f(a) + g(c) + h(y) + \varepsilon$$

where W is the variable of interest such as wealth, income, consumption and saving rate. a, c and y denote age, cohort and year, respectively. $f(.)$, $g(.)$ and $h(.)$ are specific functions of their arguments. Thus, the equation specifies that the dependent variable W is the sum of the pure age effects $f(a)$, the cohort-specific effects $g(c)$ and the year fixed effects $h(y)$. The difference is on the specifications of the age, cohort and year effects, i.e., the $f(.)$, $g(.)$ and $h(.)$. For the age effects, some authors simply use a set of age dummies, one for each age or age group (e.g., Deaton and Paxson (1994); Baker and Benjamin (1995)), while others prefer a smoothed profile and use an age polynomial of certain order instead (e.g., Attanasio (1993, 1994); Jappelli (1995)). For the cohort effects, they are most often specified as a set of cohort dummies, but they can also be modelled as a cohort polynomial of certain order (e.g., Gosling, Machin and Meghir (1994)). The additive nature of the age and cohort effects within the equation implicitly assumes that the shape of the age profile is the same for all cohorts, which thus differ only in the level of the profile.

As we noted earlier, the dependency between age, cohort and year introduces a perfect multicollinearity into the equation and so we cannot get estimates of all three effects separately. However, Deaton and Paxson (1994) noted that "In effect, any trend in

[30] See Deaton and Paxson (1994); Attanasio (1993, 1994); Gosling, Machin and Meghir (1994); Baker and Benjamin (1995); Jappelli (1995), among others.

the data can be arbitrarily reinterpreted as a year trend, or ... as trends in ages and cohorts that are equal but of opposite sign. [...] A steady growth in year effects simply means that consumption is growing with age and declining with cohort, and it is appropriate to attribute the effects to age and cohort, not time." (pp. 348).[31] Nevertheless, Deaton and Paxson (1994) uses a normalization procedure requiring that the coefficients of year dummies be constrained to be orthogonal to a time trend and to add to zero. This treatment is adopted by much of the work cited above.

In light of the literature, we experimented with several versions of the functional form trying to get the most reasonable one for our particular problem and data set. For the age effects $f(a)$, we used both the unrestricted specification, namely using a dummy variable for every age in our sample, and the restricted specification, namely the smoothed version. For the smoothed version, we experimented with several different functions: age polynomial, quadratic spline and cubic spline functions. Because we are particularly interested in the detailed saving path before and after retirement and going further into the very old ages, the smoothed profiles may not suitable for our purpose since they yield only a probable path that understates the peak and, most importantly, overstates the trough. Although higher order polynomial or spline functions may accommodate additional twists that are apparent in the unrestricted profile using age dummies, concern over the arbitrariness of the smoothed profile leads us finally to choose the unrestricted version for our age effects. In this way, the reader can always judge the profile by his or her own interpretation. Moreover, because the part of households in 76+

[31] In their paper, cohorts are measured as "age in 1976". Thus, the higher the "age in 1976", the older the cohort.

groups are not genuine members of their cohorts as we pointed out before, using this unrestricted profile will not affect much the coefficients of other age dummies and yet it still gives us information on this last age group.

For the cohort effects $g(c)$, we follow the most common way using a set of cohort dummies. For the year effects $h(y)$, though leaving them out of the equation has little consequence for the predicted profile as explained before, but because the effects show up by the presence of macroeconomic ups and downs that affect all cohorts to a more or lesser degree at particular times, we have decided to use a set of macro variables to pick up these effects. The macro variables chosen are the nominal interest rate, the inflation rate and the unemployment rate.

In addition to these three types of effects, a set of geographical location variables are also used to pick up the locational differences. They are four regional dummies: the east coast provinces, Quebec, the prairie provinces and British Columbia (Ontario is the excluded group), and one dummy variable for households residing in rural areas.

The median regression results for the overall age profiles are presented in table 3.2 for Log Net Income, Log Consumption and Saving Rate[32] along with joint F tests at the bottom of the table. To save space, all 23 coefficients on age dummies are omitted. They will be shown in the graphs later. The base group excluded from the regressions in the table is for age 76+, cohort number 10 and province Ontario. Before we going further, we note several interesting observations from table 3.2. First, for income and

---

[32] By "overall age profile", we mean that we do not control the working status and other characteristics (e.g., eduction) of the households in the regression, i.e., the profiles are for all types of couples together. We will include these variables later to supplement the current ones. Also note that only definition one is used for each variable in the rest of the analysis.

consumption, there are very strong cohort effects. Both variables are, generally, significantly lower for successively older cohorts at all ages. Yet, cohort effects disappear completely for the saving rate. All cohorts, young and old, have very similar saving rates, and in no case is the difference in saving rates between the indicated cohort and the youngest (excluded) cohort significant. These results can also be verified from the joint F tests of all coefficients on cohort dummies being zeros for the three regressions in the table. Second, all three regressions have very strong regional effects. We note, in particular, that the median saving rate in Quebec is significantly much lower (over 5%) than that in Ontario. Third, for the three macro variables, while their effects are significant only at 10% level for income and consumption from the joint F tests, their effects on saving rate are very significant (at 1%). We also see that, individually, though the interest rate and the inflation rate have no effect in all three regressions, the unemployment rate has a positive and significant effect on saving rate. An increase in the unemployment rate by 1% would lead to an increase in saving rate by about 0.9%, controlling for other variables in the regression. Yet, while the unemployment rate tends to be positively related to income and negatively related to consumption, it is not significant in either income or consumption regressions. Because the majority of households in our sample consist of older couples, the unemployment rate can hardly affect their income as most of their incomes are not earnings. Finally, although the age coefficients are not presented in the table, the joint F tests in all three regressions show highly significant age effects.

The age effects on income, consumption and saving rates are most conveniently presented in visual form. Figures 1.1-1.3b plot the lifetime path of these three variables along with the cohort profiles. As explained before, because the shape of the time path is the same for each cohort, we plot only one such profile (for the base cohort number 10) for each variable. Cohort profiles (identified by age in 1982) are also plotted in the same graphs as age profiles to provide a complete picture of age and cohort effects for each regression. To spread lines in the graph as much as possible, we have selected age 66 as the base age for the prediction of cohort profiles.[33] In any case, we are most interested in the relative position of the ages and cohorts, so whichever age and cohort is chosen as base has little consequence for our analysis. We also set all regional variables to zero and set all three macro variables to the average rates over the sample years.[34]

Figure 1.1 is for Log Income variable. The circled line at the top of the figure is the pure age profile of income for a given cohort. The general trend is that income decreases with age until reaching age 69 (a larger decline from age 60 to 65, then smaller declines until age 69), then rises or remains constant thereafter and never falls below the level at age 69. As we have shown in table 3.1, because the proportion of retired couples in the sample are increasing with age for every cohort, we should expect that the median log income for the overall age profile would decrease with age. Yet this is not the case from figure 1.1. The triangled line at the bottom of the figure is the cohort profile (defined as age in 1982) for a given age. As we have already seen in the regression result

[33] That is, when we use regression results to predict the cohort profiles, age 66 dummy is always set to 1 while all other age dummies are set to zero for each cohort. We chose to set age to 66 because from the saving rate regression, age 66 in the age profile is the lowest point and so will predict the lowest cohort profile which should be as different as possible from the age profile. Remember that the patterns of cohort profiles are also the same for each age.

[34] Thus the base region is Ontario and the interest rate, the inflation rate and the unemployment rate are set to 9.593%, 6.026% and 8.638%, respectively.

in table 3.3, there is, in general, a steady improvement from old to young generations (cohorts) of about 2.7% per cohort in income, a confirmation that older generations are poorer than younger ones in lifetime wealth. This is the key reason that we control for cohort effects in our analysis.

Figure 1.2 plots the age-consumption and cohort-consumption profiles. Comparing with the income profiles in figure 1.1, consumption path is flatter throughout, although it still decline slowly and continuously until about age 72. Afterwards, it rises continuously again until age 75. The large drop in consumption at age 76+ seems a little out of place with the whole picture. But as we noted earlier, we can read it as a general direction the oldest households aged 76 and over in the sample will go, not just for those at age 76. The relatively flat consumption path compared to income path in figure 1.1 indicates again that consumption is less sensitive to age, or to working status of the couples than income, which is consistent with the life-cycle model. The cohort profile at the bottom of the figure resembles the shape of the income profile, except that it seems some what steeper, i.e., the cohort effects on consumption seems larger than on income. This can also be seen on table 3.2, where the coefficient on cohort 1 (i.e., the difference between cohort 1 and cohort 10) is about 5% larger (in absolute value) in consumption than that in income. This translate to an average of 3.2% higher in consumption per cohort from the old to the young, comparing with 2.7% higher per cohort in income. But as it covers about twenty years span[35], this differences in cohort effects between income and consumption may not be as big as it seems. The F test on cohort effects in the saving

[35] Remember, our cohort is defined using 2-year interval band.

rate regression in table 3.2 gives an indirect piece of evidence that because cohort effects on income and consumption are roughly in the same order of magnitude, there is no significant cohort effects on saving rates. This is in agreement with Permanent Income Hypothesis which implies that the life-time consumption profiles shift with the life-time income profiles, i.e., the cohort effects of income and consumption should line up.

Figures 1.3a and 1.3b show the age profile and cohort profile for the saving rates. In figure 1.3a, we plot age-income and age-consumption profiles together to examine the possible age path of saving rates. Figure 1.3b shows estimated age-saving rate profile and cohort-saving rate profile. The gap between income and consumption before age 65 indicates that couples do seem to save for their retirement[36], and the high saving rates below age 65 in figure 1.3b catches this phenomenon. In the ages between 65-69, however, income and consumption are very close, and saving rates in this age range in figure 1.3b fall dramatically[37] with age 66 being the lowest point in the entire age profile. Just as the relatively flat consumption path implies, this sharp drop in saving rate is also consistent with the prediction of life-cycle model, albeit the median is still positive. After age 69, income and consumption paths again diverge, and saving rates also rise as a consequence. The age path of the saving rate is already familiar to us as it is the same pattern in the cross-section analysis.

---

[36] Because our sample consists of elderly households with head's age being over 55, other motives for saving before age 65 such as saving for buying a house, saving for the education costs of their children seems far less likely than saving for retirement, though it is also possible that they save for bequests.

[37] Note that, in figure 1.3a, log income and log consumption are almost the same in age 67 and exactly the same in age 69, yet saving rates in these ages are not zeros. This is possible because saving rates do not aggregate. That is, the group median of income minus the group median of consumption does not equal to the group median of saving rate in our definition.

Is the dip in saving rate near retirement statistically significant? We have conducted several significance tests based on the saving rate regression in table 3.2. The null hypotheses are: 1) the saving rates of pre-retirement ages are equal to the saving rates at ages just following retirement; 2) the saving rates at ages just following retirement are equal to the saving rates at older ages later in the retirement. We use the average saving rate over a range of ages in a particular period to represent the saving rates at that period. The test results are shown in table 3.3.

The left panel of table 3.3 shows the test results for the first hypothesis that there is no drop in saving rates at retirement. Two test results are given: one averaged over 4 years of age and the other averaged over 5 years of age for each test period. Both tests are strongly rejected, indicating that the saving rates following retirement are significantly lower than that of before retirement age. The right panel gives the test results for the second hypothesis that the saving rates at ages just following retirement are the same as the saving rates at later ages further into retirement. Average saving rates over some particular age ranges are also used for testing as indicated in the table. Five test results are given. Each one uses a different age range than others and the ranges are larger for successive tests. Four out of five results are significant at 1% level, and one result is significant at 5% level. Thus the second hypothesis can also be rejected. We can conclude that saving rates do rise significantly with age after retirement for the elderly couples.

The cohort-saving rate profile is also plotted in figure 1.3b. While there may seem to be, if we omit the two cohorts aged 62 and 64 in 1982, a declining tendency to save for younger cohorts. But as the F test in table 3.3 shows, there is no overall evidence of statistically significant cohort effects on saving rates. One reason, as we mentioned in the previous paragraph, is that cohort effects on income and consumption are the same. These results are different from Baker and Benjamin (1995, hereafter B&B) who report a steady decline in saving rates across cohorts (younger cohorts have lower saving rates) and a decline in saving rates as couples age. There may be many reasons which can lead to this difference. Imagine that all available FAMEX data can be represented in a two dimensional space: the horizontal axis is labelled AGE which can be from 25 to 76+; the vertical axis is labelled YEAR which can be from 1969 to 1992. Cohorts can thus be represented by the diagonal lines from bottom left to upper right. The sub-sample studied by B&B is in the upper half of the space: from 1982 to 1992 in years and from 25 to 75 in ages, while the sub-sample used for this essay is in the right half of the space: from 1969 to 1992 in years and from 55 to 76+ in ages. Thus, there is only a portion of the space overlapping in the two studies: the upper right portion. The younger half of the cohorts in our study are the older half of the cohorts in B&B. Moreover, our study includes only married couples, while B&B includes all households, whether they are singles or couples, living with or without children. Thus the results from the two studies are not directly comparable.

4.3 Age-Saving Rate Profiles by Relative Income Quartiles

The saving rate regression on table 3.3 does not include income as control variable. As explained in the cross-section study, there is an endogeneity issue about using income as regressor. Yet, saving rates are believed to be highly correlated and affected by income. To examine this relationship and also to avoid using income as control variable, we run median saving rate regressions separately by relative income quartiles. Relative income is defined in the same way as used in the cross-section study; that is, log income divided by age-year specific median of log income.[38] The four regression results for the saving rates by relative income quartiles are shown in table 3.4 and the age-saving rate profiles for each income quantile are plotted in figure 1.4. For brevity, we will indicate the phrase, e.g., "between the first and second income quartiles" and "between the second and the third income quartiles" as just "the second income quartile" and "the third income quartile", respectively, in what follows.

We first look at table 3.4. The regressors are the same as in table 3.2, only that now the coefficients on 9 cohort dummies are omitted to save space. The results on the joint F test for the significance of group variables are also provided on the bottom of the table. We first note that macro effects are significant in three out of four regressions and are stronger with higher income quartiles. Above the third income quartile, the evidence suggests that a 1% increase in inflation rate can lead to 1.3% increase in the saving rates. We also note that, below the first income quartile, the median saving rates in Ontario (the excluded group) are significantly lower (9-16% lower) than any other provinces in Canada. This result is startling given that the median income and median saving rates in Ontario are higher (see table 3.2) than in most regions, especially the east coast provinces and Quebec.

Figure 1.4 plots the age profiles of median saving rates for each relative income

---

[38] See section 3: Cross-Section Evidence, for a discussion of using relative income.

quartile. For comparison purposes, the age profile of the overall median saving rate is also imposed on the figure without the connecting line (the small circles in the middle). We note several general tendencies. First, saving rates are positively correlated with income. Higher saving rate profiles are almost always associated with higher income quartiles and, in general, the profiles for each different income quartile do not cross. In addition, the overall median saving rate profile (the small circles) lies almost everywhere in between the saving profiles associated with the second and the third income quartiles. Second, saving rates for couples in the upper three income quartiles exhibit the same general tendencies. The patterns of saving rates tend to drop around retirement age, and then tilt up gradually at later ages. For couples below the first income quartile, saving rates are continuously rising with age for the entire age rage.

4.4 Age Profiles Controlling for Retirement Status

All above profiles we present are for all couples together, whether they are working or not and whatever their other characteristics are. Will the profiles of income, consumption and saving rates change if we also take into account these factors in the regressions? We rerun the median regressions for income, consumption and saving rates as in table 3.2 but with additional regressors including a retirement dummy variable, the retirement dummy crossed with the set of age dummies, a dummy variable for elementary education of the household heads, a dummy variable for post high-school education of the household heads and a dummy variable for households not owning a home or owning a home but with outstanding mortgages. The regression results are presented in table 3.5

along with the joint F tests, and the age profiles are plotted in figures 1.5a and 1.5b.

Looking at table 3.5, we note that, as expected, age and retirement effects are highly significant in all three regressions (see F tests). However, the test for the interaction effect, i.e., testing all retirement and age dummy interaction terms are zeros, is significant only at the 5% level for consumption, compared with the 1% significance level for both income and saving rates. Thus, the difference in consumption profiles between retired and not retired households are not as significant as that for income and saving rates. Education effects are also highly significant in all three regressions. A higher education level is associated with higher income, higher consumption and higher saving rates. Non-homeowners have significantly less income than homeowners, yet their consumption is somewhat higher (though not significantly so). This in turn leads to significantly lower saving rates for non-homeowners. We also note that, as in the overall regressions, there is, again, strong cohort effects in income and consumption and no cohort effect in saving rates. Macro effects are now very significant in income as well as in saving rates, but there is still no effect in consumption. Lastly, the strong regional effects in saving rates in the overall regression now disappears completely after controlling for retirement, education and home ownership, though they still have strong effects in income and consumption.

Figures 1.5a and 1.5b give the age profiles for the three variables. The profiles are predicted from the estimated regressions by using only the base group (the excluded group) for every age, using average rates for three macro variables and setting the retirement dummy to zero for ages below 66 and to one for ages 66 and over. We chose age 66 as the starting retirement age for the prediction because: 1) if a person retires in the middle of the year when he is age 65, he is still counted as working in that year in our data; 2) according to table 3.1, the majority of the couples in the sample (over 70%) are working before age 66 and not working (also over 70%) after age 66. We plot the predicted income and consumption profiles together in figure 1.5a and plot the predicted saving rate profile in figure 1.5b.

Comparing figures 1.5a and 1.5b with figures 1.3a and 1.3b of overall age profiles, we note a general resemblance in the two sets of figures, except the former ones are more dramatic in the shapes around the retirement age. Income falls sharply at retirement and remains constant and even rises when couples age further. Consumption, too, falls at retirement, but apparently much less so than income, so that consumption and income are almost at the same level at the ages just following retirement. Afterwards, because consumption does not rise and sometimes even falls a bit, the gap between income and consumption appears again, but not as much as in pre-retirement ages. As a result, the saving rate profile experiences a very large drop by about 10 - 15% at retirement (compare about 4 - 8% in overall profile), remains there for a while and then rises quickly and remains at a level about half way between the pre- and at- retirement saving rates throughout the rest of the life cycle. It is worth noting that the age profiles in figures 1.3a-b represent all members of the cohorts at each age regardless of their working status and other characteristics and so it should be read in combination with the fact that there is a decreasing proportion of working couples at successive ages according to table 3.1, while the age profiles in figures 1.5a-b represent couples within a cohort who are working (or at least one of them working) before age 66 and not working afterwards. This is why the profiles in figures 1.3a-b have less dramatic shapes than figures 1.5a-b.

4.5 Summary and Implications

We have examined the age profiles of income, consumption and saving rates controlling for cohort and year as well as other household characteristics such as retirement status. We find, as in the cross-section study, that income and consumption are falling with age until about age 70. We also find, in contradiction to the cross-section study, that income and consumption remain at about the same level or even rise with age after age 70. There are significant cohort effects in both income and consumption. For any given age, each successive cohort has higher income and higher consumption than their predecessors. But as the cohort effects are about the same between income and consumption, saving rates do not exhibit a cohort pattern. Each cohort in our sample has about the same level of saving rates in any given age. As the result, the age profiles of the saving rates do not differ much between cross-section and cohort analysis. Couples have high saving rates before retirement age in anticipation for the retirement. The saving rates drop sharply once couples have retired, then rise again with age as couples aged further.

How should we interpret the now different profiles of income and consumption after around age 70? First of all, we see that the cross-section analysis was not sufficient to examine the lifetime path of a variable for an individual or household. To appreciate this point, figures 1.6a-b gives comparisons between cross section and cohort age profiles in income and consumption. The two profiles are estimated from the same data set used in this cohort analysis, only the control variables differ from each other. The age profiles controlling for cohorts are the same as in figures 1.1 and 1.2. The cross-section age profiles are predicted from the same regressions in table 3.2 but without cohort dummies. Thus, the only difference between the two profiles is the inclusion or exclusion of the set of cohort dummies. We even used the same macro variables in the regressions and used the same average levels of the macro variables for the prediction. It is clear that the two profiles are not the same. The cross-section profiles (triangled lines) are steeper throughout than the cohort profiles for both income and consumption and, in particular, are decreasing with age in the later part of the life cycle. Using only cross section results may indeed mislead us with respect to lifetime paths. In figure 1.6c, we also plot cohort and cross-section profiles for saving rates. As explained before, because there are no cohort effects in saving rates, the two profiles have almost the same age patterns. Note that the profile for cohort is predicted using cohort 10 (the youngest cohort) as the base group while cross-section profile does not even consider the cohort effects, so the *levels* of the two age profiles are not directly comparable.

The most apparent new feature of the cohort study is the rising income and non-decreasing consumption with age after age 70. An explanation based on retirement status alone is not enough now because the proportion of retired couples are increasing with age even after age 70 and this increasing proportion should predict a decreasing median income for the overall age profiles.[39] We also explained in Section 2: Data Issues that the withdrawals of the RRSP's after retirement are not counted as current income in the data

---

[39] One may argue that some people may go back to part-time work after retirement resulting an increase in income. But in our study, the proportion of retirement is calculated over a group of households for each cross-sections in the data, so this effect is already counted in the proportions.

set, so that this possibility can be ruled out[40]. Because capital gains are not included as income in the data set, this is also not an explanation. The two components in income which have a chance of increasing with age are investment income including interest income and dividends, etc., and other income, which mostly consists in pensions for the elderly. Given that the age profile of median saving rates is always positive, it is possible that investment income is increasing with age[41]. However, the chance that this possible increase in investment income and other income could overcome the expected decrease in income due to the reduction in earnings seems small.

A final possibility is that the phenomenon is caused by differential mortality between the rich and the poor. If the poorer individuals die younger, there will be a higher proportion of richer people within the surviving population in higher age groups. Thus, even if all households maintain their income, the median income of the surviving population will be higher as they age because of this differential mortality. As a consequence, we would overestimate the last part of the age profile if we use repeated cross-sections of time series survey data such as FAMEX, even if cohort effects have been already controlled for.

The income age profile has provided evidence of existing differential mortality. To the extent that the rich are also spending more and have higher saving rates, as is highly plausible, consumption and saving rate age profiles are overestimated as well.

---

[40] In fact, because RRSP withdrawals should be accompanied with a relatively larger taxes, they in turn reduce current disposable income.

[41] B&B shows that investment income is rising with age in cross-sections, but this rising tendency is mostly driven by cohort effects, not by age. Controlling for cohorts, the age profile is almost flat except a slight decline in older ages. But as their sample households are not the same as this study, the conclusion cannot be used here directly.

Thus, unless and until we have a way to correct these profiles distorted by differential mortality, we cannot proceed further. We start this task in Section 5 below.

5 Correction for Differential Mortality

The central implication of the Life-Cycle theory of consumer behaviour is the hump pattern of individual wealth holdings, increasing during the working lifetime and declining in later years. To have this pattern of wealth holdings, saving or saving rates, as the measure of additions to and subtractions from the wealth stock, should be positive during the working lifetime and negative in later years. Much research has focused on establishing whether people actually decumulate wealth or dissave in the last part of the life cycle.[42] Evidence varies considerably depending upon the available data. Even with the same data, the conclusion would also vary depending on the estimation procedures. Because it is very difficult to follow the same individuals over time, cross-section survey data for a single year or, if possible, repeated cross-sections for several years are often used for the analysis.

As we explained before, an examination from a single period cross-section information can be misleading because of cohort effects. While using repeated cross-sections data can overcome the shortcomings by forming synthetic cohorts, it would bring a different nature of bias into the results, an upward bias due to a non-random attrition caused by differential mortality between the rich and the poor. "It is a universal finding, across all nations, that overall mortality and most forms of morbidity ... follow a gradient across socioeconomic classes. Lower income and/or lower social status are associated

---

[42] See for example, Attanasio and Hoynes (1995), Baker and Benjamin (1995), Bőrsch-Supan and Stahl (1991), Burbidge and Robb (1985), Diamond and Houseman (1984), Hamermesh (1984), Hurd (1990b), Shorrocks (1975), among others.

with poorer health."[43] Thus, poorer people tend to vanish earlier from the sample, leaving the surviving population for the successive cross-sections surveys becoming 'richer' as it ages. Note that, although there are many reasons that households may leave or enter the sample, for example, divorce, remarriage, immigration and emigration, if these are considered random events or, at least, if they are not considered a 'universal finding' of a trend that is correlated with socio-economic class, they do not bias the mean or median wealth profiles. The importance of the differential mortality effect is that it is non-random, and thus causes an upward bias in the mean or median wealth profile, especially for the last part of life cycle.

Shorrocks (1975) first raised this problem and roughly corrected the observed wealth profile which was based on a sample of estate records data. The method used for the correction involves dividing the proportion of individuals in the surviving population whose wealth exceeds a certain level by a weight which is the survival ratio of the wealthy to the general population, and then recalculate the statistics. The corrected profiles for the top 1 to 10 percent of the wealth values showed asset decumulation while the uncorrected profiles did not. However, this method would hardly ever affect the median profile because only individuals in some upper portion of the wealth distribution received weights.

---

[43] The Canadian Institute for Advanced Research (CIAR) Publication No. 5, "The Determinants of Health", Toronto, August 1991.

Attanasio and Hoynes (1995)[44] use a similar method of weighting individuals by the reciprocal of their estimated probability of survival to a certain age to correct estimated cross sectional wealth profiles. Unlike Shorrocks', their correction involves weighting each observation in the sample, not just the upper portion, thus allowing them to correct the mean and median of wealth profiles. Their results show significantly more dissaving among the elderly than when there is no correction. However, the method of weighting every observation demands estimating the survival probability for each observation, which makes application of this approach quite difficult.

The method we propose to correct wealth profile for differential mortality is different from the methods in both papers above. The method is to correct longitudinal median profiles directly (as for our synthetic cohort data), using wealth specific as well as population survival rates which are easier to acquire. Note that although we call it correction for differential mortality by wealth, we believe that this correction would equally be applied for other economic variables such as the ones we have discussed so far.

This section is organized as follows. We first state the main idea of our correction method and give some assumptions. We then derive the relationship between quantile and mortality for a simple but unrealistic case (the extreme case) which assumes that all deaths are from the bottom of the wealth distribution. By analogy, we also derive the

---

[44] NBER working paper #5126, May 1995. The paper is mainly centred with the *estimation* of differential mortality given wealth. The *correction* of wealth profiles for differential mortality is a natural application in the paper using the estimated differential mortality as weights. I received this paper after I had already completed all the work for this essay and was in the middle of finishing writing the first draft.

relationship for a more involved but more realistic case (the normal case) which recognize that some wealthy people also die at younger ages and there are differential survival rates between the wealthy and the poor. Establishing their relationships, using a Canadian source on the differential mortality information combined with Canadian Life Table on the information of population survival rates, we are able to estimate the varying quantiles with age for the two cases. Finally, we demonstrate how to use these estimated varying quantiles to correct our empirical median age profiles presented in figures 1.3a and 1.3b. A summary is also provided in the end of the section.

5.1 The Method

As stated in the previous section, if we use repeated time series of cross section data to form synthetic cohorts, although we can follow same date-of-birth cohorts over time, the proportion of the wealthy among the surviving population will be larger with higher age groups because the poor tend to die younger. This is especially the case if the relevant population under study is the elderly. The consequence is that, if we use the median measure (as in this study) of income, consumption or saving rates to trace the time path of a cohort throughout the lifespan, we will go farther astray with age from the original median of the cohort population had they all survived to that age.

As a simple example, the following figure illustrates the consequence:

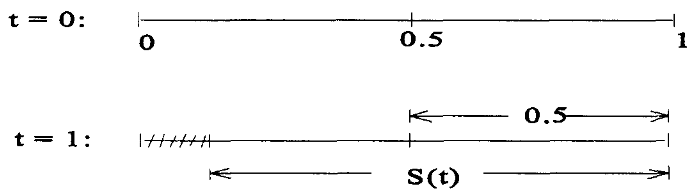


Figure for Illustrating the Example

At $t = 0$, the starting age, individuals in the population are ranked in terms of wealth and we assume that their wealth will be constant over time. The point marked 0.5 in the middle is the median location in terms of wealth. Suppose the individual who is at this median location has wealth of $50,000. It is also presumed that all members of the population are present at $t = 0$, so we marked 1 for the whole range (i.e., the population survival rate, say $S(t)$, is 1 at $t = 0$). Now suppose some fraction of the population (say 10%) in the bottom distribution did not survive to age 1, as illustrated by dashed portion of the line at $t = 1$. Thus, at age 1 ($t = 1$), the total fraction of population surviving $S(t)$ (or wealth distribution of population) is now $1 - 0.1 = 0.9$ at $t=1$ instead of 1 at $t = 0$. But because people who died were in the lower quantiles, the person at the median location of income distribution at time $t = 0$ (the point marked 0.5) would not be at the median at time $t=1$. He would be at a lower quantile than at the median even though his wealth is still $50,000 at $t=1$.

Thus, the main idea of our correction scheme is to use decreasing quantiles with age instead of using the median throughout lifespan. This scheme allows us to trace the original location of the median over time as if there is no such differential mortality.

However, to determine how the quantiles vary with age, we have to rely on the information of differential mortality rates among the wealth classes in order to establish the relationship between quantile and mortality.

As in the simple example above, the correction scheme we develop relies on several conditions. First, we make a crucial assumption about the relative position of individuals in the distribution of wealth among their cohort. We assume a stationary ranking with age; that is, the rank of the individual in terms of wealth is fixed with age. For example, if individual A is ranked lower than individual B at age t, A's rank will also be lower than B's at age $t+1$. This assumption may seem unreasonable for young individuals. But for the elderly population in our sample, because most of them have already passed their peak-earning ages, presumably fulfilled their career goals, and their incomes for the last part of their lives are almost completely observable, this assumption may be a workable approximation.

Second, we need to set a starting age, and all work concerning the survival rates are conditional on survival to this age, which corresponds to $t=0$ as in the figure above with the survival rate of population equals one. In the empirical application, this age is set to 55, the youngest age that appears in the figures presented later. Because in ages before 55 the mortality rates are low and the difference in mortality rates between classes are small compared to those in the older ages, we believe this setting will not seriously distort the results. This zero age setting together with the stationary ranking assumption allows us to convert the median wealth at age t to a quantile corresponding to the median wealth at age zero.

Finally, at this stage, we have made no allowance for differential mortality between classes other than wealth (e.g., between educational classes). To introduce an additional dimension of differential mortality, we would need information on how different are the mortalities jointly by wealth *and* education and such data are not available to us.

5.2 The Extreme Case

We start with the extreme case which are the same as the simple example in section 5.1. This case establishes a foundation to understand how the varying quantiles are related to mortality. It also serves as a lower bound for the correction of differential mortality.

This simple case, as the figure in section 5.1 illustrates, assumes that all people who died are from the lowest part of wealth distribution in the cohort. We denote $Q(t)$ as the wealth quantiles we seek which are decreasing with age t. Note that $Q(t) = 0.5$ (median) when $t = 0$; that is, $Q(t)$ is the original (t=0) location of the median wealth at age t. We denote $S(t)$ as the population survival rate at age t from $t = 0$, conditional on survival to age 0. Note also that this is a cumulative surviving rate. If $s(t)$ is the surviving rate of the population from the beginning of t to the beginning of t+1 (we call this the age specific population survival rate), then $S(t) = \Pi s(i)$, for $i = 0, 1, \ldots, t$-1, and $S(t) = 1$ at $t = 0$.

The relationship between quantiles and mortality in this simple case can be expressed as follows:

$$Q(t) = \frac{S(t) - 0.5}{S(t)}.$$

The denominator in this equation is the fraction of population surviving from age 0 to age t. Note that all individuals who survive are in the upper quantiles. The numerator represents the fraction of population, up to the median, that has survived from age 0 to age t. The "- 0.5" in the numerator exactly reflect the assumption that individuals in the quantiles above the median have all survived. This can be generalized to any age t after the starting age $t = 0$. The only difference for age t other than age 1 is that, we need to calculate the cumulative population survival rate $S(t)$ for every t, which depends on each age specific population survival rate $s(i)$, $i = 0, 1, \ldots, t\text{-}1$, as we have already noted before.

Note that, in this extreme case, the only information we need to calculate $Q(t)$ is the age specific population survival rate $s(i)$, $i = 0, 1, \ldots, t\text{-}1$, which can be found directly from the Life Table of the relevant population.

5.3 The "Normal" Case

This case recognizes that some wealthy people also die at younger ages and there are differential mortality rates between the rich and the poor. The task is still to find the $Q(t)$. But under this new situation, $Q(t)$ now also depends on different survival rates of the rich and the poor. We denote $S_w(t)$ as the survival rate of the wealthy at age t from age 0, conditional on survival to age 0. Here, "wealthy" is defined as individuals who are in the top A percent of the wealth distribution at age 0. $S_w(t)$ is also a cumulative survival rate as $S(t)$. If we let $s_w(t)$ be the age specific survival rate of the wealthy, then $S_w(t) = \Pi$ $s_w(i)$, $i = 0, 1, \ldots, t\text{-}1$, and $S_w(t) = 1$ at $t = 0$. By the same token, we denote $S_p(t)$ as the survival rate of the poor at age t from age 0, conditional on survival to age 0. "Poor" is defined as individuals who are in the bottom B percent of the wealth distribution at age 0. If $s_p(t)$ is the age specific survival rate of the poor, then $S_p(t) = \Pi s_p(i)$, $i = 0, 1, \ldots, t\text{-}1$, and $S_p(t) = 1$ at $t = 0$. For expositional convenience, we also denote $S_m(t)$ as the survival rate of the middle group between age 0 and age t. This group consists of individuals who are in the middle (1-A-B) percent of the wealth distribution at age 0. Later on, we will show that as long as we know the population survival rate $S(t)$, we do not actually need information on $S_m(t)$.

The derivation of the relationship between $Q(t)$ and these survival rates is based on the same logic as in the extreme case above. We still need to calculate the fraction of surviving individuals below the median at $t = 0$ over the wealth distribution of surviving population at age t. In terms of this fraction, we start with the following equation:

$$Q(t) = \frac{B \times S_p(t) + \frac{0.5 - B}{1 - A - B} \times (1 - A - B) \times S_m(t)}{B \times S_p(t) + A \times S_w(t) + (1 - A - B) \times S_m(t)}$$

We also note that:

$$S(t) = B \times S_p(t) + A \times S_w(t) + (1 - A - B) \times S_m(t).$$

That is, the denominator in the $Q(t)$ equation has the same meaning as in the extreme case: the distribution of wealth of the survival population at t from $t = 0$. To appreciate this, note that each of the three terms in the $S(t)$ equation represent what fraction of each wealth class at $t = 0$ has survived to age t. $S(t)$ is thus the average survival rate across all wealth classes from $t = 0$ to t, i.e., the population survival rate from $t = 0$ to t, as we have already defined in the extreme case. The numerator in the $Q(t)$ equation is the survival rate at t for individuals who are at or below the median wealth position at $t = 0$. The first term is the fraction of the poor at the bottom B percent at $t = 0$ who have survived to t. Because the bottom B fraction is supposedly less than 0.5 at t =0, there should be another (0.5 - B)/ (1 - A - B) fraction of the middle class which consists of individuals who are also in the position below the median wealth at $t = 0$. The second term in the numerator then represent the survival rate of just this (0.5-B)/(1-A-B) portion of the middle class at $t = 0$ who has survived to t.

Thus, while it seems complicated, $Q(t)$ for this normal case uses the same logic as in the simple extreme case, and its relationship with the various mortality rates can also be simplified. First, as information on $S(t)$, the population survival rate, is always available, we can eliminate a particular survival rate for a wealth class using $S(t)$ equation. For example, express $S_m(t)$ in terms of $S(t)$, $S_p(t)$ and $S_w(t)$. Thus, the $S_m(t)$ term in the numerator of $Q(t)$ equation can be substituted out. Next, we can substitute the whole denominator in $Q(t)$ equation by $S(t)$, and divide both numerator and denominator by $S(t)$. We then can further simplify it by expressing the ratio of the poor to population survival rate $S_p(t) / S(t)$ as $S_p^*(t)$; the ratio of the wealthy to population survival rate $S_w(t) / S(t)$ as $S_w^*(t)$. The final form for $Q(t)$ is then as follows:

$$Q(t) = B \times S_p^*(t) + \frac{0.5 - B}{1 - A - B} \times [1 - A \times S_w^*(t) - B \times S_p^*(t)]$$

$$if\ A = B: \qquad Q(t) = 0.5 \times \{1 - B \times [S_w^*(t) - S_p^*(t)]\}\ .$$

The reader can verify that these are the same as the previous $Q(t)$. Thus, if we know $S(t)$,

$S_w(t)$ and $S_p(t)$, and also know the proportion of the rich and the poor at $t = 0$, we can calculate this $Q(t)$ series which estimates the path of median person at $t = 0$ over time.

Some points are worth noting here. First, bear in mind that the actual raw information we need is $s(i)$, $s_w(i)$ and $s_p(i)$, $i = 0, 1, \ldots, t\text{-}1$. Second, by the derivation of $Q(t)$, we implicitly assumed that individuals within their corresponding wealth classes die randomly, i.e., all individuals within their classes have the same probability of survival; these are $S_w(t)$ and $S_p(t)$. But by analogy to $S(t)$, these survival rates themselves are also the average survival rates across all individuals within the classes, so this assumption may not, at least on average, affect the results. Third, the derivation of $Q(t)$ above is for a discrete version. It can be generalized to a continuous version as well. For this, see Attanasio and Hoynes (1995).

5.4 Estimating Quantiles

To estimate the quantiles for the two cases, the availability of the relevant information on mortality is critical. Because this study is based on the Canadian data, we also require mortality information for Canadians.

First, for obtaining $s(i)$, $i = 0, 1, \ldots, t\text{-}1$, the age specific population survival rate, we use information on "proportion surviving" (same as $s(i)$) directly from the Canadian Life Table for 1985-1987 for ages 55-76. Further, because our sample consists of families of two persons, to capture the fact that, if any one of spouses die, husband or wife, this observation would vanish from our sample, we have to use both males and females surviving rates to form $s(i)$. We calculate $s(i)$ as the product of male's and female's "proportion surviving" from i-1 to i to approximate the joint probability that the *couple* would survive within age i.[45] Note we choose age 55 to be age 0. $S(t)$ for every t then can be calculated using the cumulative formula given before.

Second, for obtaining $s_w(i)$, $i = 0, 1, \ldots, t\text{-}1$, we use the result from another Canadian study: Wolfson, M. et al. "Career Earnings and Death, A Longitudinal Analysis of Older Canadian Men." Canadian Institute for Advanced Research, Population Health working paper #12, February 1991.(Toronto: CIAR, 1991). The study uses a sample of over half a million administrative records of the Canada Pension Plan. The analysis is restricted to those males who attained age 65 on or after September 1, 1979[46]. All records used contain at least 13 years of year-by-year earnings history prior to attaining age 65 and provide mortality data (year and month of death) for up to nine years after age 65. The study shows (in Figure 3 of that paper) survival curves by year and month for five average pre-retirement earnings quintile groups after age 65 to age 74, conditional on reaching age 65. The curves do not cross and the distance between them gradually become wider, implying a significant mortality gradient throughout the earnings spectrum. However, because the CPP data exclude those with no employment incomes or very little incomes (the poor) since there is no need to file tax returns, the bottom quintile group in that study cannot represent the actual Canadian population at the same position.

The $s_w(i)$ we use is from the survival curve for the top quintile group in Figure 3 of the above cited paper combined with the information (from Life Table) of the ratio of

---

[45] We do not have life tables for married male and female population. As many research show, married people live longer than singles. So our population (couple) survival rates may be lower than what should have been used. However, we believe this will not cause too much difference because most people within population marry.

[46] These age ranges are the same as the older half of the 10 cohorts in our study.

female to male survival rates. Because the survival curve for the top quintile is conditional on survival to age 65[47] and only for males from age 65 to 74, it cannot be used directly for our purpose. The procedure to convert the available information to applicable information involves several steps. We first calculate the age specific survival rate of males (one component of $s_w(i)$) for ages 66 to 74, from the available survival curve (which is cumulative and empirical, i.e., not smoothed as that from the Life Table). Because age 66 is still far away from age 55, our starting age, we pick up this one observation at age 55 using data from Shorrocks (1975) as an approximation. The top quintile female's survival rates are obtained by multiplying top quintile male's survival rates by the ratio of population female's to male's survival rates as an approximation. As before, $s_w(i)$ is just the product of the top quintile male's and female's survival rates.[48] Next, using this 10 raw observations, we are able to fit a nonlinear curve and get predicted $s_w(i)$, for a whole age range from 55 to 76. The nonlinear function is exponential of the type: $s_w(t) = a + b \cdot r^t$, and the estimated non-linear regression result is:

$$s_w(t) = \underset{(.00356)}{0.9952495} - \underset{(.00136)}{0.0019258} \times \underset{(.03704)}{1.156291}^t \qquad t = 1, 2, \ldots, 22 \qquad R^2 \text{ adjusted} = .9457$$

where standard errors are in parentheses, and the actual age is $t + 54$. The raw (10 observations) and the predicted $s_w(t)$ using above regression result together with $s(t)$ from Life Table are plotted against age in Figure 2.1. We see clearly that the mortality rates are lower (higher proportion of surviving) for the top 20% than for the whole population,

---

[47] Thus the survival rate at age 65 is one.

[48] We note that the issue regarding married people live longer than singles do not exist here because we are using the top quintile survival rates, and the rates for married people will always stay at the top. This implies that the survival ratio of the wealthy to population we are using may overstate the 'true' ratio.

and the gap is gradually widening with higher age.

Figure 2.2 recovers the survival curves (cumulative survival probability) for the wealthy as well as the population, $S_w(t)$ and $S(t)$, from age 55 to age 76, conditional on survival to age 55. The shapes of the two curves seem similar to the ones on the left of the top panel, but note that the scale on the vertical axis is now from 0.5 onward, and both survival rates start at probability one at age 55.

From the two survival rates, we can formulate the wealthy to population survival ratio $S_w^*(t)$ which equals $S_w(t) / S(t)$. This ratio for the whole age range is plotted in Figure 2.3, the circled line above the horizontal line at 1 on the vertical axis indicating relative position of the population. Note that this ratio is always greater than one except at age 55, and is increasingly higher with age. Because the CPP data exclude the individuals with little or no incomes, we do not have suitable $S_p(t)$ in hand. However, by combining the existing information and the findings from other studies, it is possible to make some assumptions about the survival ratio of the poor to population. First of all, it is very likely that this ratio should be in the range that is about the same distance as the top quintile to population ratio from one but in opposite direction (from below one). For example, if the wealthy to population ratio is 1.2, the poor to population ratio might be around 0.8. Second, as other studies show, for example Attanasio and Hoynes (1995), most of the effect of wealth is from the high death rates among the lowest wealth quartile. For these reasons, we assume the survival ratio of the poor to population has the following form:

$$S_p^*(t) = 1 - (S_w^*(t) - 1) \times 1.25$$

and assume $B = .25$ ($A = .2$ as already indicated above). These assumptions imply that we give more weight for the low wealth group, i.e., towards higher differential mortality, but still within the reasonable range.[49] The computed poor to population ratio is plotted on the same picture of that for the top 20% to population ratio in Figure 2.3. The two ratios now have a increasingly widening gap between them with higher age, as expected.

The final step is using the two survival ratios to calculate the adjusted quantiles $Q(t)$ according to the relationships we have derived for the two cases. In Figure 2.4, we plot these two adjusted quantile series against age. The bottom circled line is for the extreme case, and the middle triangled line is for the normal case. The horizontal line at 0.5 is the usual median measure throughout the entire age range. Note that two quantiles for the oldest two ages in the bottom line of the figure for the extreme case are omitted because they are running out of the possible quantile range (i.e., become negative). This is not a surprise given that this case cannot happen. We see clearly a decreasing quantiles with age for both cases, although for the normal case, the decrease is much slower than the extreme case, as expected. Note that the last two observations in the extreme case are missing because the two calculated quantiles become negative and so are discarded.[50] As we stated at the beginning of the section, the extreme case can serve as an absolute lower bound (and the horizontal line as the upper bound) within which the quantiles can be adjusted according to whatever information we have on the actual differential mortality.

---

[49] This is also consistent with our earlier notion that the wealthy to population survival ratio may overstate the 'true' ratio, thus making differential mortality more important in the correction process.

[50] The negative quantiles in the oldest ages for the extreme case indicates that, by that age, more than half of the initial population has 'died' and this includes the original median household.

For example, if we believe that the mortality rates in the bottom quartile are actually higher than we assumed above, the triangled line in the normal case may be lower than we plotted, but surely it will never exceed or even reach the circled line for the extreme case.

5.5 Correcting Median Age Profiles

Having estimated the quantiles for every age, we are now in a position to correct the median profiles for income, consumption and saving rates given in Section 4: Cohort Analysis. The method of correction consists in running a set of quantile regressions according to Q(t). In our case, because the age range contains 22 years, we need to run a set of 22 regressions, one for each quantile, and all have the same regressors. We then can use the regression results to predict the dependent variables for each age from their corresponding quantiles. For example, because the quantile at age 60 is .459, the predicted value at age 60 will be picked up only from the predictions of .459 quantile regression. After age-by-age correction from their corresponding quantile regressions, a new age profile is formed, which purges away the bias generated by differential mortality, at least approximately.

To illustrate the correction process more clearly, figures 3.1a, 3.2a and 3.3a give the steps we take to correct the age profiles for income, consumption and saving rates for the extreme case. In each figure, we plot a set of selected quantile profiles[51] as well as the original median profile. From each quantile profile, we pick up one point corresponding

[51] Remember, there are 22 quantiles in total. It would be too crowded if we plot all 22 quantiles. The selected quantiles in the figures are approximately .05-.07 quantiles apart and the lowest quantile in the figures is about .05.

to its age. The corrected age profiles for the extreme case are the circled lines in the figures travelling, from young to old, across all quantiles. They are formed by connecting all these age-by-age correction points from different quantiles. Comparing the corrected profiles to the median ones (the top line) in each figure shows that the gap between them are increasingly widening with age.

We use the same steps to correct for the normal case. The median corrected and uncorrected age profiles for the normal case together with the profile for extreme case are shown in figures 3.1b, 3.2b and 3.3b for income, consumption and saving rates, respectively. The intermediate process showing a set of quantiles for the normal case is omitted from the figures. Looking at these figures, first of all, we see that the effect of differential mortality increases with age for all three variables. But apparently the degree of the effects is different among the variables. Because the quantiles near the median of the income distribution are so close, differential mortality effect does not have much force before age 70. However, in the last part of lifetime, the corrected profile reduces median income by the amount that make the level of income in the oldest ages about the same as that in ages just following the retirement. For consumption, the effects start to show at about age 65, and is increasing with age. Now the corrected age profile for consumption exhibits decreasing consumption with age throughout the entire age range.

The most notable effect of differential mortality for the normal case is shown on the saving rate profiles. To see the correction more clearly, figure 3.4 re-plots the corrected and uncorrected saving rate profiles for normal case with a re-scaling in vertical axis the same as that in figure 1.3b. Starting around age 60, the corrected profile reduces the median saving rate by around 3% on average before age 70, and by over 5% on average after age 70. This shows that differential mortality does make a difference in the estimates of saving behaviour among the elderly, especially in the later ages. As the result, the shape of the corrected age profile for saving rates is much flatter after age 65, comparing to the uncorrected profile. However, there is no sign of further drop in saving rates after an initial drop at the retirement age. If anything, we still see a tendency for the saving rates to rise in the last part of the life cycle.[52]

5.6 Summary

In this section, we first developed a relation between quantiles and differential mortality for two cases. We then use the information from another Canadian study on differential mortality as well as information on Canadian Life Tables for males and females to calculate the quantile series for the two cases. The quantiles are then used to correct the median age profiles. Comparing the corrected and uncorrected profiles for income, consumption and saving rates shows that differential mortality does make a difference for the estimated median profiles for all three variables. The corrected age profiles show that, after retirement age, income remains at approximately the same level throughout the last part of the lifetime; consumption is decreasing continuously with age; and the saving rate, though lower and flatter than the uncorrected profile, shows no sign of declining. If anything, there is still a tendency for saving rate to rise with age after retirement.

---

[52] Remember that our procedure to calculate the Q(t) series is biased toward making differential mortality more important than it probably is. Thus, if any doubts should arise here, the 'true' corrected profile should be higher everywhere than the ones we have presented in the figures.

6 Conclusions

In this essay, we have examined issues of life-cycle savings of Canadian elderly couples around and after retirement within both pooled cross-sectional and synthetic longitudinal framework. We have also developed a method to correct the age profiles for differential mortality because the data we use are repeated cross-sections.

For the pooled cross-section analysis, the results on overall median age patterns indicate that, though income and consumption are both decreasing with age, the decrease in consumption is relatively smooth while income fall considerably at retirement age. Savings and saving rates thus exhibit a distinct pattern: they drop sharply at retirement age, but rise again thereafter. When households are grouped into four types according to retirement status of both spouses, it is clear that this saving dip is found only among both-retired couples. For couples with at least one spouse working, saving rates remain high throughout later life. It is also found that controlling for income, households with both spouses retired have the highest saving rate among all types.

A cohort analysis is carried out by following over time couples whose head has the same year of birth. The cohort effects are mainly shown in lifetime wealth differences or productivity differences among different generations. The age profiles show that income and consumption remain at about the same level, or even increasing with age after retirement. There are significant cohort effects in both income and consumption and these effects are about the same for both variables. However, the results on saving rates are very similar to those based on pooled cross-section studies: a sharp drop at retirement, a quick rise thereafter. We find no cohort effects on saving rates in our sample. This is the core reason that we have the same results on saving profiles from both cross-section and cohort analysis.

Synthetic cohort analysis, however, is biased by the fact that the poorer tend to drop out from the sample earlier because of higher mortality. Based on the idea that decreasing quantiles with age should be used instead of straight median for every age, a new method is developed to correct the median profiles for differential mortality. Two cases, the extreme case and the normal case, are illustrated in detail. Using population survival rates from the Canadian Life Table and the top 20% (in wealth distribution) survival rates from a Canadian study due to Wolfson, et al., we are able to estimate the varying quantiles and to correct the age profiles from the cohort analysis. Differential mortality does make a difference in the estimated lifetime behaviour. The corrected income profile is fairly constant after retirement. Consumption decreases throughout the age range. Saving rates now are lower and flatter after retirement. However, there is no sign of further drop in saving rates after an initial drop at retirement age. If anything, we still see a tendency for the saving rates to rise after retirement.

The above results showed some consistency with life-cycle model: consumption is relatively smooth over the later life despite a large fall in income at retirement; saving rates also experienced a sharp drop at retirement age; the similarity in cohort effects on consumption and income does imply that lifetime consumption is proportional to lifetime wealth. However, a puzzle in the saving pattern of the elderly, which is of vital importance to the life-cycle model, still remains: the saving rates are positive and rising with age after retirement. Even though we have corrected the profiles for differential mortality, they still do not have any tendency to fall. This is in sharp contrast to what the life-cycle model would predict.

We also want to remind the reader that our results on saving rates are different from that of B&B (1995) which shows that the elderly do appear to reduce their savings as they age and the cohort effects suggest a steady decline in saving rates with younger cohorts. Because we look at a broader time span from 1969 to 1992 (instead of from 1982 to 1992 in B&B); a narrower age range which consists of only elderly married couples (instead of all households and from young to old in B&B), and our analysis includes more older cohorts and less younger cohorts, the results in the two studies are thus not directly comparable.

We have investigated a broad relationships between income, consumption and savings for the elderly couples in Canada. The most significant finding is the saving dip at the retirement age. Our future work, therefore, will explore in more detail the changing patterns of the components of these variables and in what way they are related to this dip in the savings rates.

Table 1.0
Sample Size for Couple-Only Households by Age Group and Year.

Age Group	Year								Total
	1969	1974	1978	1982	1984	1986	1990	1992	
56 - 60	99	101	110	139	86	103	98	90	826
61 - 65	131	158	127	165	109	113	98	119	1020
66 - 70	99	179	114	134	107	143	103	115	994
71 - 75	93	116	64	135	81	100	79	106	774
76+	96	120	69	105	73	88	85	101	737
Total	518	674	484	678	456	547	463	531	4351

Source: FAMEX data, for non-farm, non-self employed couples living in major urban centres.

Table 1.1
Median Net Income and Total Consumption by Age Group for Couples.
Definitions One and Two, in 1986$.

Age Group	Net Income (1)	Net Income (2)	Total Consumption (1)	Total Consumption (2)
56 - 60	29,162 (492)	28,995 (524)	24,731 (444)	23,540 (399)
61 - 65	26,060 (470)	25,865 (500)	22,430 (424)	21,214 (380)
66 - 70	20,398 (473)	20,368 (503)	19,297 (426)	18,483 (383)
71 - 75	18,673 (490)	18,673 (521)	17,006 (442)	16,728 (396)
76+	17,346 (495)	17,421 (527)	15,244 (447)	14,916 (401)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Net Income (1) = Gross income + other income - personal tax - uip - cpp;
Net Income (2) = Net Income (1) - life insurance payment;
Total Consumption (1) = Consumption + Gifts and Contributions;
Total Consumption (2) = Total Consumption (1) - 0.8 * (car and recreational vehicle purchase)
+ 0.2 * (house additions and renovations)

Table 1.2
Median Saving by Age Group for Couples.
All Definitions, in 1986$.

Age Group	Saving (1)	Saving (2)	Saving (3)	Saving (4)	Saving (Dassets)
56 - 60	3,713 (312)	4,686 (349)	3,418 (265)	4,379 (333)	2,168 (255)
61 - 65	2,464 (297)	3,483 (333)	2,351 (253)	3,401 (318)	1,568 (243)
66 - 70	1,264 (299)	1,879 (335)	1,104 (254)	1,758 (320)	781 (244)
71 - 75	1,565 (310)	1,919 (347)	1,441 (264)	1,740 (332)	781 (253)
76 +	1,755 (314)	1,988 (351)	1,724 (267)	1,970 (335)	974 (257)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Saving (1) = Net Income (1)-Total Consumption (1); Saving (2) = Net Income (1) - Total Consumption (2);
Saving (3) = Net Income (2)-Total Consumption (1); Saving (4) = Net Income (2) - Total Consumption (2);
Saving (Dassets) = Change of Net Assets and Liabilities.

Table 1.3a
Median Saving Rates (%) by Age Group for Couples.
All Definitions

Age Group	Saving Rate (1)	Saving Rate (2)	Saving Rate (3)	Saving Rate (4)	Saving Rate (Dasset/Y)
56 - 60	12.6 (1.4)	17.7 (1.6)	12.1 (1.6)	17.5 (1.4)	8.8 (1.0)
61 - 65	10.0 (1.4)	16.6 (1.5)	9.9 (1.5)	15.8 (1.3)	8.2 (1.0)
66 - 70	5.6 (1.4)	10.8 (1.5)	5.2 (1.6)	10.4 (1.3)	4.3 (1.0)
71 - 75	7.5 (1.4)	11.3 (1.6)	7.3 (1.6)	11.2 (1.4)	4.7 (1.0)
76+	10.2 (1.4)	12.8 (1.6)	10.4 (1.6)	12.9 (1.4)	6.5 (1.0)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Saving rate (1)-(4) are saving (1)-(4) divided by their corresponding Net Income.
Dassets/Y: Y = After tax income + other money receipts - security payment.

Table 1.3b
Truncated Mean Saving Rates (%) by Age Group for Couples.
All Definitions (-100% ≤ saving rate ≤ 100%)

Age Group	Saving Rate (1)	Saving Rate (2)	Saving Rate (3)	Saving Rate (4)	Saving Rate (Dasset/Y)
56 - 60	11.5 (1.5)	15.4 (1.4)	10.5 (1.5)	14.5 (1.4)	6.9 (1.5)
61 - 65	9.8 (1.4)	13.7 (1.3)	9.0 (1.5)	12.8 (1.3)	6.1 (1.4)
66 - 70	5.1 (1.5)	8.0 (1.3)	4.6 (1.5)	7.4 (1.3)	2.7 (1.4)
71 - 75	7.3 (1.5)	9.6 (1.6)	6.8 (1.5)	9.1 (1.4)	5.2 (1.5)
76+	11.2 (1.5)	12.4 (1.4)	11.0 (1.5)	12.3 (1.4)	8.3 (1.5)
% excluded	1.9	1.2	1.9	1.3	2.0

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.

Table 1.4a
Median saving (1) by Age Group and Quartile of Relative Income (in 1986$s)

Age Group	Below First Quartile	Between First and Second Quartile	Between Second and Third Quartile	Above Third Quartile	Total Sample
56 - 60	-129 (430)	2,726 (423)	6,323 (425)	14,242 (420)	3,713 (312)
61 - 65	-578 (388)	1,725 (390)	4,935 (392)	13,668 (389)	2,464 (297)
66 - 70	-361 (392)	751 (394)	2,334 (397)	7,984 (393)	1,264 (299)
71 - 75	-448 (427)	1,284 (430)	2,148 (431)	6,948 (428)	1,565 (310)
76+	301 (434)	1,495 (437)	2,477 (438)	6,957 (438)	1,755 (314)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Relative income equal to net income divided by age-year cell median of net income.
Quartiles are within age-year cell quartiles of relative income.

Table 1.4b
Median saving (2) by Age Group and Quartile of Relative Income (in 1986$s)

Age Group	Below First Quartile	Between First and Second Quartile	Between Second and Third Quartile	Above Third Quartile	Total Sample
56 - 60	418 (358)	3,975 (362)	7,047 (365)	16,373 (360)	4,686 (349)
61 - 65	-151 (330)	2,796 (334)	6,695 (336)	14,789 (334)	3,483 (333)
66 - 70	61 (352)	1,263 (337)	3,531 (340)	9,799 (336)	1,879 (335)
71 - 75	-1 (350)	1,656 (367)	2,811 (369)	8,398 (367)	1,919 (347)
76+	557 (371)	1,931 (376)	3,066 (376)	7,885 (376)	1,988 (351)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Relative income equal to net income divided by age-year cell median of net income.
Quartiles are within age-year cell quartiles of relative income.

Table 1.5a
Median (%) Saving Rates (1) by Age Group and Quartile of Relative Income

Age Group	Below first Quartile	Between First and Second Quartile	Between Second and Third Quartile	Above Third Quartile	Total Sample
56 - 60	-1.1 (2.4)	11.0 (2.4)	18.3 (2.5)	30.7 (2.4)	12.6 (1.4)
61 - 65	-4.5 (2.2)	7.3 (2.3)	16.9 (2.3)	30.7 (2.2)	10.0 (1.4)
66 - 70	-4.0 (2.3)	3.0 (2.3)	9.6 (2.3)	21.8 (2.3)	5.6 (1.4)
71 - 75	-2.5 (2.5)	7.0 (2.5)	10.0 (2.5)	23.8 (2.5)	7.5 (1.4)
76+	1.4 (2.5)	9.1 (2.5)	12.9 (2.5)	26.1 (2.5)	10.2 (1.4)

Source: FAMEX. Standard errors are in parenthesis. Figures are for base year 1992.
Relative income equal to net income divided by age-year cell median of net income.
Quartiles are within age-year cell quartiles of relative income.

Table 1.5b
Median (%) Saving Rates (2) by Age Group and Quartile of Relative Income

Age Group	Below first Quartile	Between First and Second Quartile	Between Second and Third Quartile	Above Third Quartile	Total Sample
56 - 60	1.1 (2.0)	15.8 (2.0)	22.8 (2.0)	35.4 (2.0)	17.7 (1.6)
61 - 65	-3.0 (1.8)	12.7 (1.8)	23.1 (1.9)	34.7 (1.8)	16.6 (1.5)
66 - 70	-1.3 (1.9)	6.1 (1.9)	15.2 (1.9)	28.8 (1.9)	10.8 (1.5)
71 - 75	-0.8 (2.1)	8.4 (2.0)	13.7 (2.0)	29.4 (2.0)	11.3 (1.6)
76+	2.7 (2.0)	11.8 (2.1)	15.8 (2.1)	28.9 (2.1)	12.8 (1.6)

Source: FAMEX. Standard errors are in parentheses. Figures are for base year 1992.
Relative income equal to net income divided by age-year cell median of net income.
Quartiles are within age-year cell quartiles of relative income.

Table 2.1a
Cell Size by Type of Couples and Age Group

HR, WR	Age Group					Total
	56 - 60	61 - 65	66 - 70	71 - 75	76+	
0, 0	305	239	51	16	8	619
0, 1	383	408	141	51	24	1007
1, 0	44	83	106	44	23	300
1, 1	94	290	695	663	682	2424
Total	826	1020	993	774	737	4350

Source: FAMEX.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.1b
Average Differences between the Age of Husband and Wife by Type of Couples and Age Group.

HR, WR	Age Group					Total
	56 - 60	61 - 65	66 - 70	71 - 75	76+	
0, 0	3.6	4.1	6.3	8.3	5.4	4.2
0, 1	1.1	2	3.1	4.8	4.8	2
1, 0	3.3	5.2	6.6	10.1	11.9	6.7
1, 1	1.1	1.4	2.3	3.5	3.2	2.7
Total	2.1	2.6	3.1	4.1	3.6	3

Source: FAMEX.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2a
Median % Saving Rate (1) by Type of Couples and Age Group

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	21.3 (2.2)	24.3 (2.4)	16.7 (4.4)	24.1 (7.6)	15.0 (10.2)	21.0 (1.7)	F = .87 P = .4819
0, 1	13.9 (2.1)	15.7 (2.0)	15.0 (2.9)	9.4 (4.5)	21.0 (6.3)	14.3 (1.6)	F = .82 P = .5098
1, 0	9.0 (4.8)	12.6 (3.5)	12.5 (3.2)	15.6 (4.8)	16.1 (6.4)	12.7 (2.1)	F = .34 P = .8535
1, 1	-2.4 (3.4)	0.5 (2.2)	4.8 (1.7)	8.6 (1.7)	11.3 (1.7)	6.3 (1.3)	F = 10.07 P = .0000
Total	12.6 (1.4)	10.0 (1.4)	5.6 (1.4)	7.5 (1.4)	10.2 (1.4)	10.0 (1.3)	F = 9.32 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2b
Truncated Mean % Saving Rate (1) by Type of Couples and Age Group.
(-100 ≤ Saving Rate (1) ≤ 100)

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	18.4 (1.9)	20.7 (2.1)	17.8 (4.0)	18.7 (7.1)	17.9 (9.6)	19.2 (1.6)	F = .27 P = .8965
0, 1	11.1 (1.8)	13.2 (1.8)	13.7 (2.6)	9.2 (4.0)	16.8 (5.7)	12.2 (1.5)	F = .70 P = .5896
1, 0	3.5 (4.3)	11.0 (3.2)	10.1 (2.9)	12.1 (4.3)	7.8 (5.9)	9.5 (1.9)	F = .73 P = .5746
1, 1	-2.3 (3.1)	-2.6 (2.0)	2.4 (1.5)	7.2 (1.5)	11.6 (1.5)	5.6 (1.2)	F = 19.15 P = .0000
Total	11.4 (1.5)	9.8 (1.4)	5.1 (1.5)	7.3 (1.5)	11.8 (1.5)	8.9 (1.2)	F = 8.30 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2c
Median % Saving Rate (2) by Type of Couples and Age Group

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	24.7 (2.0)	26.9 (2.2)	21.6 (4.1)	25.4 (7.0)	28.9 (9.5)	24.7 (1.4)	F = .47 P = .7594
0, 1	19.6 (1.9)	20.1 (1.9)	18.1 (2.7)	14.7 (4.2)	23.5 (5.9)	18.7 (1.3)	.63 .6422
1, 0	10.5 (4.4)	19.4 (3.3)	16.6 (3.0)	16.6 (4.5)	17.9 (6.0)	16.6 (1.7)	.72 .5813
1, 1	0.3 (7.9)	3.7 (2.0)	7.4 (1.6)	10.8 (1.6)	12.7 (1.6)	8.8 (1.1)	8.59 .0000
Total	17.7 (1.6)	16.6 (1.5)	10.8 (1.5)	11.3 (1.6)	12.8 (1.6)	13.0 (1.3)	10.21 .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
* HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2d
Compare to Table 2.2a: Cross-section data, but include self-employed
Median % Saving Rate (1) by Type of Couples and Age Group

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	20.9 (2.0)	24.0 (2.3)	20.1 (4.0)	15.3 (6.9)	13.5 (10.2)	20.6 (1.6)	F = .80 P = .5220
0, 1	13.0 (2.0)	14.4 (2.0)	11.0 (2.8)	13.8 (4.1)	20.8 (5.8)	12.9 (1.5)	F = .81 P = .5183
1, 0	10.0 (4.5)	12.6 (3.5)	14.6 (3.3)	15.7 (4.5)	16.1 (6.1)	12.9 (2.0)	F = .31 P = .8733
1, 1	0.0 (3.4)	0.6 (2.2)	4.7 (1.7)	8.9 (1.7)	11.1 (1.7)	6.3 (1.3)	F = 8.33 P = .0000
Total	13.2 (1.4)	10.6 (1.4)	6.2 (1.4)	8.2 (1.5)	10.9 (1.5)	10.1 (1.2)	F = 8.57 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2e
Compare to Table 2.2a: Cohort Data, no self-employed & farm
Median % Saving Rate (1) by Type of Couples and Age Group

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	23.0 (2.5)	25.3 (2.4)	17.8 (4.1)	10.6 (7.4)	14.3 (9.7)	25.5 (1.5)	F = 1.69 P = .1494
0, 1	15.1 (2.2)	15.7 (2.0)	11.8 (2.7)	16.1 (4.5)	14.2 (7.4)	17.4 (1.4)	F = .52 P = .7183
1, 0	6.3 (5.8)	12.3 (3.6)	11.3 (2.9)	13.1 (4.3)	31.0 (7.6)	14.5 (1.8)	F = 1.84 P = .1180
1, 1	-0.6 (3.5)	2.1 (2.2)	6.1 (1.6)	9.1 (1.5)	12.5 (1.5)	9.8 (1.0)	F = 8.25 P = .0000
Total	14.5 (1.9)	12.5 (1.7)	7.9 (1.5)	9.8 (1.4)	12.6 (1.5)	10.8 (1.2)	F = 6.58 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2f
Compare to Table 2.2a: Cohort Data, include self-employed & farm
Median % Saving Rate (1) by Type of Couples and Age Group

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61 - 65	66 - 70	71 - 75	76+		
0, 0	23.4 (2.4)	24.3 (2.3)	18.1 (3.5)	15.3 (6.0)	13.6 (9.1)	25.5 (1.6)	F = 1.34 P = .2521
0, 1	14.0 (2.1)	14.2 (1.9)	11.2 (2.5)	18.5 (3.7)	14.3 (6.5)	16.9 (1.5)	F = .89 P = .4706
1, 0	6.5 (5.7)	13.3 (3.6)	11.9 (2.9)	13.4 (4.4)	27.3 (7.4)	15.9 (2.0)	F = 1.35 P = .2506
1, 1	-3.7 (3.5)	2.6 (2.2)	5.8 (1.6)	9.1 (1.5)	12.7 (1.5)	9.8 (1.1)	F = 9.41 P = .0000
Total	14.3 (1.8)	12.3 (1.6)	8.3 (1.4)	10.0 (1.4)	13.1 (1.4)	11.1 (1.1)	F = 6.59 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses. Figures are for base year 1992.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.

Table 2.2g
Equality Tests for Saving Rates (1) and (2) in Tables 2.2a and 2.2c:
H_0: Saving rates in ages 66-70 = Saving rates in ages 76+

HR, WR	Saving rates (1) in table 2.2a:		Saving rates (2) in table 2.2c:	
(0, 0)	F = 0.02	P = 0.8970	F = 0.61	P = 0.4343
(0, 1)	F = 1.09	P = 0.2974	F = 1.43	P = 0.2321
(1, 0)	F = 0.18	P = 0.6724	F = 0.00	P = 0.9541
(1, 1)	F = 15.75	P = 0.0000**	F = 11.98	P = 0.0000**

Table 2.3
Median Regressions for Saving Rate (1) and Log Net Income

Variable	Saving Rate (1) (1)	Saving Rate (1) (2)	Saving Rate (1) (3)	Log Net Income (4)
Type-Age Cell Dummies	----	----	----	----
Year 1969	-7.13 (1.9)	-4.96 (1.8)	3.99 (1.7)	-.3686 (.025)
Year 1974	-1.38 (1.8)	1.28 (1.7)	6.99 (1.6)	-.2748 (.023)
Year 1978	2.84 (1.9)	4.56 (1.8)	5.71 (1.7)	-.0914 (.025)
Year 1982	5.12 (1.8)	7.06 (1.7)	8.85 (1.5)	-.0369 (.023)
Year 1984	2.45 (2.0)	3.69 (1.8)	2.70 (1.7)	-.0073 (.025)
Year 1986	1.81 (1.9)	2.97 (1.7)	1.16 (1.6)	.0008 (.024)
Year 1990	0.79 (2.0)	1.07 (1.8)	0.61 (1.7)	.0162 (.025)
Log Net Income	----	----	27.24 (1.0)	----
Post High school	----	5.51 (1.4)	-9.59 (1.4)	.5271 (.019)
High School	----	1.19 (1.0)	-3.31 (0.9)	.1988 (.013)
Home Owner	----	5.83 (0.9)	3.27 (0.8)	.0626 (.012)
Pseudo R square	0.0354	0.0442	0.128	0.2846

Source: FAMEX. Standard errors in parenthesis.
Coefficients and standard errors for three Saving Rate regressions are multiplied by 100 (i.e., in %).
Omitted categories are: year 1992, elementary school and non-homeowner.

Table 2.4
Median % Saving Rate (1) by Type of Couples and Age Group, Conditional on Education and Homeownership.

HR, WR	Age Group					Total	Test of Equality (F=..; P>F=..)
	56 - 60	61- 65	66 - 70	71 - 75	76+		
0, 0	21.8 (2.1)	24.0 (2.3)	18.3 (4.2)	28.5 (7.0)	15.0 (9.5)	22.8 (1.9)	F = .86 P = .4867
0, 1	15.9 (2.0)	16.1 (1.9)	15.2 (2.8)	11.4 (4.2)	18.3 (5.9)	16.2 (1.8)	F = .38 P = .8196
1, 0	9.8 (4.5)	14.1 (3.3)	12.1 (3.0)	16.3 (4.5)	20.9 (6.0)	14.9 (2.2)	F = .78 P = .5397
1, 1	0.2 (6.3)	2.8 (2.2)	6.1 (1.7)	9.4 (1.7)	12.5 (1.7)	9.2 (1.5)	F = 9.74 P = .0000
Total	15.8 (1.6)	12.3 (1.5)	8.3 (1.5)	9.6 (1.6)	12.3 (1.6)	10.8 (1.2)	F = 9.20 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.
Base group is: high school education, homeowner and year 1992.

Table 2.5
Median Log Net Income (1) by Type of Couples and Age Group, Conditional Education and Homeownership.

HR, WR	Age Group					Total
	56 - 60	61 - 65	66 - 70	71 - 75	76+	
0, 0	10.562 (.028)	10.468 (.031)	10.350 (.057)	10.434 (.099)	10.496 (.130)	10.516 (.024)
0, 1	10.291 (.027)	10.262 (.027)	10.200 (.038)	10.157 (.057)	10.287 (.080)	10.274 (.022)
1, 0	10.098 (.061)	10.296 (.045)	10.225 (.041)	10.208 (.061)	10.091 (.082)	10.239 (.028)
1, 1	9.668 (.044)	9.839 (.029)	9.898 (.023)	9.867 (.023)	9.804 (.023)	9.866 (.019)
Total	10.314 (.026)	10.203 (.025)	9.962 (.025)	9.891 (.025)	9.808 (.026)	10.024 (.032)

Source: FAMEX. Standard errors are in parentheses. HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes. Base group is: high school education, homeowner and year 1992.

Table 2.6
Median % Saving Rate (1) by Type of Couples and Age Group, Conditional on Log Net Income, Education and Homeownership.
(Same Conditional Median Log Net Income (=10.024) for All Cell)

HR, WR	Age Group					Total	Test of Equality: F = ..; P>F = ..
	56-60	61-65	66-70	71-75	76+		
0, 0	9.5 (2.0)	13.5 (2.2)	10.6 (3.9)	10.5 (6.8)	12.9 (8.9)	10.7 (1.7)	F = .79 P = .5319
0, 1	9.6 (1.9)	11.4 (1.8)	11.7 (2.6)	8.5 (3.9)	14.4 (5.5)	10.0 (1.5)	F = .59 P = .6701
1, 0	8.0 (4.1)	7.4 (3.1)	10.6 (2.8)	16.5 (4.2)	12.0 (5.6)	9.9 (2.0)	F = .97 P = .4218
1, 1	11.1 (3.0)	8.2 (2.0)	10.5 (1.6)	15.6 (1.6)	20.8 (1.6)	13.3 (1.3)	F = 18.26 P = .0000
Total	9.2 (1.3)	11.1 (1.3)	10.4 (1.3)	15.0 (1.3)	20.1 (1.3)	12.1 (1.3)	F = 27.14 P = .0000

Source: FAMEX. Standard errors (in %) are in parentheses.
HR = husband retired; WR = wife retired; 0 = no (i.e., working); 1 = yes.
Base group is: high school education, homeowner and year 1992.

Table 3.1
Proportion Both Spouses are not Working, by Age and Cohort
For Couples-Only Households

Age Group	Cohort Number (Year Household Heads Were Born)					Total	100-Total
	1, 2 (1905-1908)	3, 4 (1909-1912)	5, 6 (1913-1916)	7, 8 (1917-1920)	9, 10 (1921-1924)		
54 - 57	-	-	(69) 4.3	(74) 10.8	(78) 10.8	8.1	91.9
58 - 61	-	(69) 8.8	(74) 14.3	(78) 11.6	(82) 18.9	13.3	86.7
60 - 63	-	-	-	-	(84) 22.7	22.7	77.3
62 - 65	(69) 14.0	(74) 25.8	(78) 30.9	(82) 30.0	(86) 43.6	28.1	71.9
64 -67	-	-	-	(84) 57.3	-	57.3	42.7
66 - 69	(74) 67.6	(78) 63.2	(82) 75.9	(86) 78.9	(90) 75.3	72.3	27.7
68 - 71	-	-	(84) 74.2	-	(92) 82.2	79.7	20.3
70 - 73	(78) 82.1	(82) 86.0	(86) 88.2	(90) 85.5	-	85.5	14.5
72 - 75	-	(84) 84.1	-	(92) 87.0	-	86.2	13.8
74 - 77*	(82) 93.2	(86) 90.4	(90) 93.9	-	-	92.6	7.4
76+	(84) 94.5	-	(92) 95.7	-	-	95.4	4.6

Source: FAMEX.
1. The last column gives the proportion of at least one of spouses working for each age group.
2. In sample year 1969, the age group selected is one year younger than indicated (e.g., in cohort 1 and 2 year 69, the age group is 61-64 instead of 62-65) in order to keep the households within the same cohort.
3. For age group 74-77*, only in sample year 1986 is it the indicated age 74-77, other two years 1982 and 1990 include ages 74, 75 and 76+ because of the topcoding in the data.
4. Sample years are in parentheses; figures are for each pair of cohorts indicated.

Table 3.2
Median Regressions for Income, Consumption and Saving Rates for Overall Age Profiles of the Elderly Couples

Median Regression	Log Net Income		Log Consumption		Saving Rate	
	Coef.	|t|	Coef.	|t|	Coef.	|t|
23 age dummies	(See Fig. 1.1)		(See Fig. 1.2)		(See Fig. 1.3b)	
interest rate	.0039	0.74	.0014	0.32	.0000	0.02
inflation rate	.0016	0.34	-.0039	1.09	.0030	1.50
unemploy. rate	.0087	1.12	-.0082	1.34	.0087	2.60
rural area	-.1680	6.24	-.1816	8.49	-.0190	1.63
East Coast	-.1794	6.75	-.1393	6.60	-.0271	2.35
Quebec	-.1723	5.94	-.1219	5.30	-.0507	4.04
Prairie	-.0356	1.41	-.0457	2.29	.0076	0.70
British Columbia	.0338	1.18	.0253	1.11	-.0112	0.90
cohort 1	-.2663	4.02	-.3231	6.16	.0252	0.88
cohort 2	-.2702	4.43	-.3093	6.41	.0130	0.49
cohort 3	-.1994	3.42	-.2345	5.09	.0243	0.97
cohort 4	-.1646	3.01	-.1678	3.88	.0031	0.13
cohort 5	-.1135	2.17	-.1611	3.90	.0117	0.52
cohort 6	-.1271	2.72	-.1624	4.39	.0081	0.40
cohort 7	-.0556	1.17	-.0900	2.40	.0305	1.49
cohort 8	-.0002	0.00	-.0154	0.46	.0319	1.72
cohort 9	-.0083	0.18	-.0342	0.94	.0053	0.27
_cons	9.8485	88.21	9.9387	112.67	.0379	0.79
N	4915		4920		4915	
Pseudo R^2	0.1073		0.0964		0.0123	
Joint F Tests: All Coefficients of the Indicated Groups Are Zeros (P-Values in %)						
Age effect (23)	F=4.23	P=.00**	F= 2.12	P=.14**	F= 2.38	P=.02**
Cohort effect (9)	F= 4.21	P=.00**	F= 7.92	P=.00**	F= 0.83	P=58.50
					F= 7.57	P=.00**
Macro effect (3)	F= 2.26	P=7.95	F= 2.10	P=9.86		
					F= 7.09	P=.00**
Provinces (4)	F=23.41	P=.00**	F= 20.9	P=.00**		

Source: FAMEX.
The omitted group is: age 76+, cohort 10 and province Ontario.
In the test results, * indicates significance at the 5% level, ** indicates sig. at the 1% level.

Table 3.3
Equality Tests of the Age Effect
For the Saving Rate Regression in Table 3.3 and in Fig. 1.3b

H_0: Saving rates of pre-retirement ages = Saving rates at ages just following retirement			H_0: Saving rates at ages just following retirement = Saving rates at later retirement ages		
avg (pre-ages) = avg (ret-ages)	F=	P= (in %)	avg (ret-ages) = avg (later-ages)	F=	P= (in %)
avg (59 - 62) = avg (66 - 69)	24.87	0.00**	avg (66 - 67) = avg (75 - 76)	8.90	0.29**
avg (59 - 63) = avg (65 - 69)	28.24	0.00**	avg (66 - 68) = avg (74 - 76)	7.99	0.47**
			avg (66 - 69) = avg (73 - 76)	7.32	0.68**
			avg (65 - 69) = avg (72 - 76)	5.61	1.79*
			avg (65 - 69) = avg (71 - 76)	7.17	0.74**

Table 3.4
Median Saving Rate Regressions Separated by Relative Income Quartiles
For Elderly Couples

Median Regression	Within First Quartile Coef.	|t|	Within Second Quartile Coef.	|t|	Within Third Quartile Coef.	|t|	Within Fourth Quartile Coef.	|t|
23 age dummies	(See Fig. 1.4)		(See Fig. 1.4)		(See Fig. 1.4)		(See Fig. 1.4)	
9 cohort dummies	(Omitted)		(Omitted)		(Omitted)		(Omitted)	
interest rate	.0004	0.09	-.0001	0.03	.0055	1.06	.0015	0.29
inflation rate	.0050	1.38	.0002	0.05	.0040	0.90	.0131	2.98
unemploy. rate	.0069	1.12	.0124	1.69	.0085	1.10	.0018	0.24
rural area	.0308	1.68	.0102	0.44	-.0189	0.65	.0212	0.54
East Coast	.1566	7.16	.0183	0.74	-.0308	1.15	.0177	0.64
Quebec	.1149	4.86	-.0051	0.19	-.0453	1.55	-.0508	1.66
Prairie	.0882	3.80	.0197	0.84	-.0154	0.64	.0115	0.51
British Columbia	.0935	3.64	.0069	0.24	-.0011	0.04	.0102	0.40
N	1254		1220		1207		1234	
Pseudo R^2	0.0344		0.0261		0.0425		0.0509	
Joint F Tests: all Group Coefficients Are Zeros								
Group Coefficients	F=	P=(in%)	F=	P=(in%)	F=	P=(in%)	F=	P=(in%)
Ages (23)	1.04	40.53	1.13	30.33	1.66	2.65*	1.71	1.95*
Cohorts (9)	1.68	8.90	0.43	91.68	0.65	75.55	1.04	40.77
Macro effect (3)	3.10	2.59*	1.55	20.04	4.57	0.34**	7.50	.00**
Provinces (4)	13.21	.00**	0.39	81.71	0.86	48.77	1.28	27.78

Source: FAMEX. * indicates significance at the 5% level; ** indicates significance at the 1% level.

Table 3.5
Median Regressions for Income, Consumption and Saving Rates
Controlling for Retirement, Education and Homeownership

Median Regression	Log Net Income		Log Consumption		Saving Rate	
	Coef.	| t |	Coef.	| t |	Coef.	| t |
23 age dummies	(See Fig. 1.5a)		(See Fig. 1.5a)		(See Fig. 1.5b)	
24 ret. & ret*age dummies	(See Fig. 1.5a)		(See Fig. 1.5a)		(See Fig. 1.5b)	
9 cohort dummies	(Omitted)		(Omitted)		(Omitted)	
non-homeowner	-.0450	3.90	.0244	1.59	-.0535	5.78
elementary school	-.1883	15.8	-.1878	11.8	-.0244	2.54
post highschool	.3209	18.7	.2588	11.3	.0506	3.67
interest rate	.0004	0.12	-.0002	0.04	-.0002	0.06
inflation rate	.0048	1.70	-.0035	0.93	.0042	1.86
unemploy. rate	.0135	2.81	.0016	0.26	.0064	1.65
rural area	-.1099	6.41	-.0845	3.70	-.0228	1.66
East Coast	-.1379	8.34	-.1178	5.34	-.0046	0.35
Quebec	-.0755	4.12	-.0583	2.39	-.0178	1.21
Prairie	-.0165	1.06	-.0261	1.25	.0139	1.11
British Columbia	.0187	1.05	.0025	0.11	-.0039	0.27
N	4915		4920		4915	
Pseudo R^2	0.2372		0.1779		0.0347	
Joint F Tests: All Coefficients of the Indicated Groups Are Zeros (P-Values in%)						
Age effect (46)	F=18.4	P=.00**	F=1.67	P=.32**	F=24.6	P=.00**
Retirement effect (24)	F= 50.1	P=.00**	F=9.32	P=.00**	F=12.2	P=.00**
Interaction effect (23)	F=9.28	P=.00**	F=1.57	P=4.05*	F=6.56	P=.00**
education effect (2)	F= 417	P=.00**	F=187	P=.00**	F=13.8	P=.00**
Cohort effect (9)	F=10.7	P=.00**	F=5.64	P=.00**	F=0.68	P=72.65
Macro effect (3)	F=9.68	P=.00**	F=0.51	P=67.60	F=5.59	P=.08**
Provinces (4)	F=27.0	P=.00**	F=9.47	P=.00**	F=1.35	P=24.77

Source: FAMEX.
The omitted group is: age 76+, cohort 10, province Ontario, not both retired, homeowner and highschool education of the household head.
In the test results, * indicates significance at the 5% level, ** indicates sig. at the 1% level.

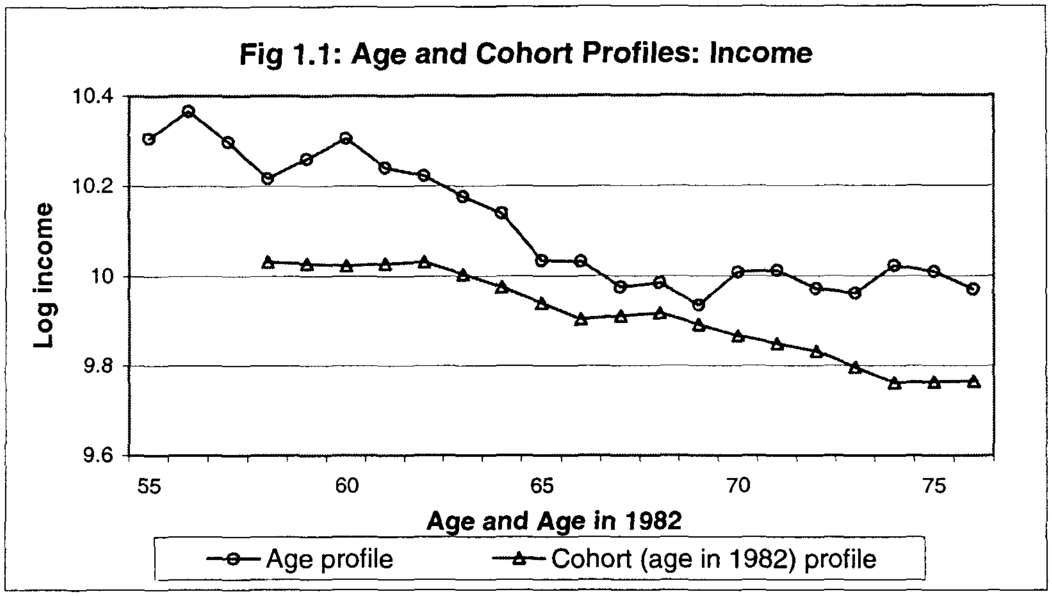


Fig 1.1: Age and Cohort Profiles: Income
10.4
10.2
10
9.8
9.6
Log income
55
60
65
70
75
Age and Age in 1982
Age profile
Cohort (age in 1982) profile

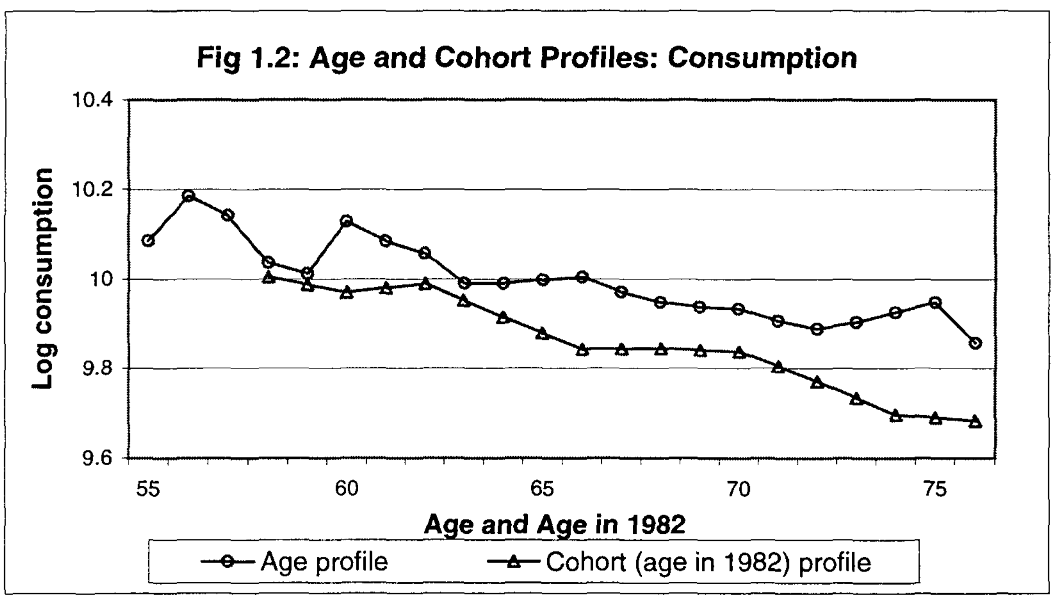


Fig 1.2: Age and Cohort Profiles: Consumption
10.4
10.2
10
9.8
9.6
Log consumption
55
60
65
70
75
Age and Age in 1982
Age profile
Cohort (age in 1982) profile

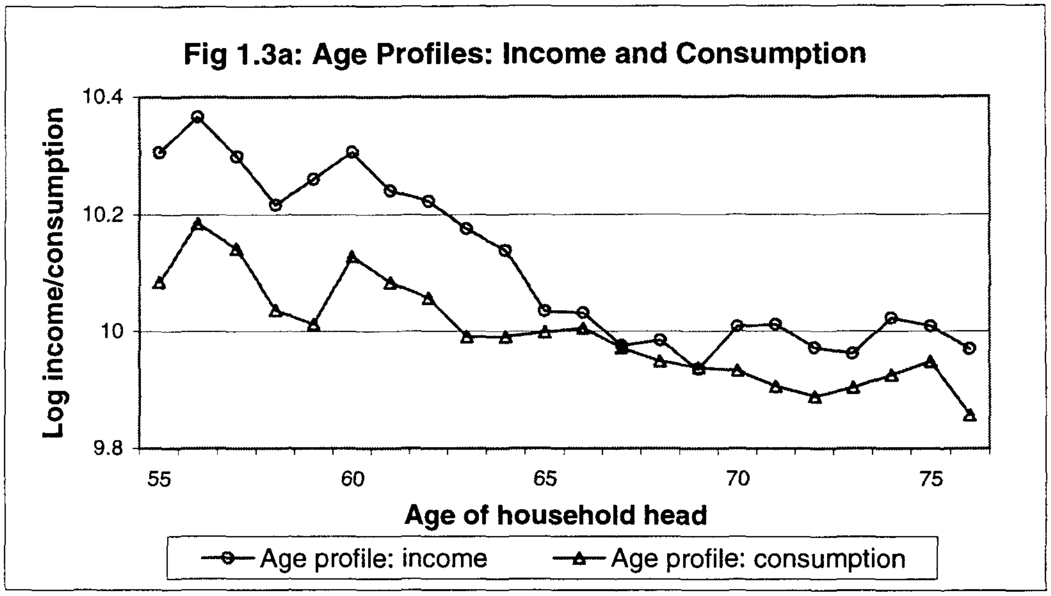


Fig 1.3a: Age Profiles: Income and Consumption
Log income/consumption
10.4
10.2
10
9.8
55
60
65
70
75
Age of household head
Age profile: income
Age profile: consumption

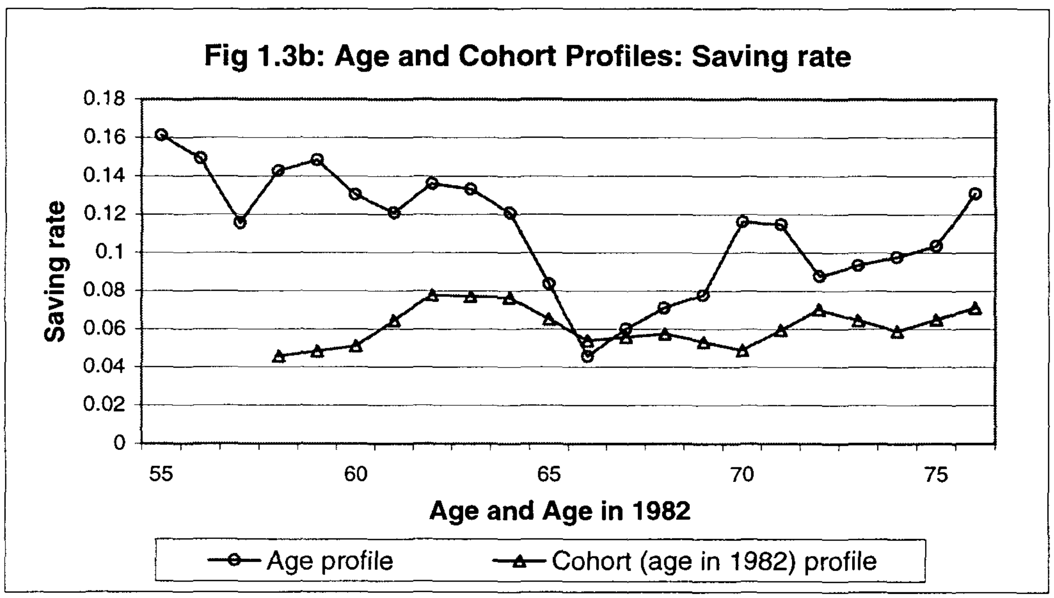


Fig 1.3b: Age and Cohort Profiles: Saving rate
Saving rate
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
55
60
65
70
75
Age and Age in 1982
Age profile
Cohort (age in 1982) profile

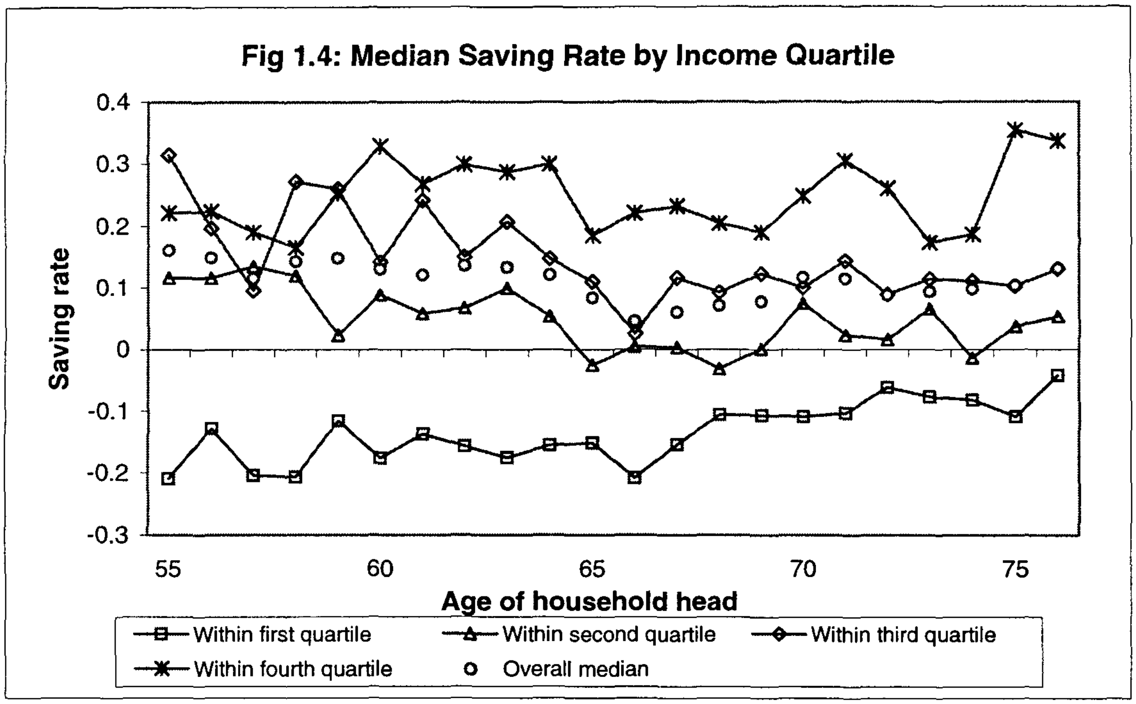


Fig 1.4: Median Saving Rate by Income Quartile
0.4
0.3
0.2
0.1
0
-0.1
-0.2
-0.3
Saving rate
55
60
65
70
75
Age of household head
Within first quartile
Within second quartile
Within third quartile
Within fourth quartile
Overall median

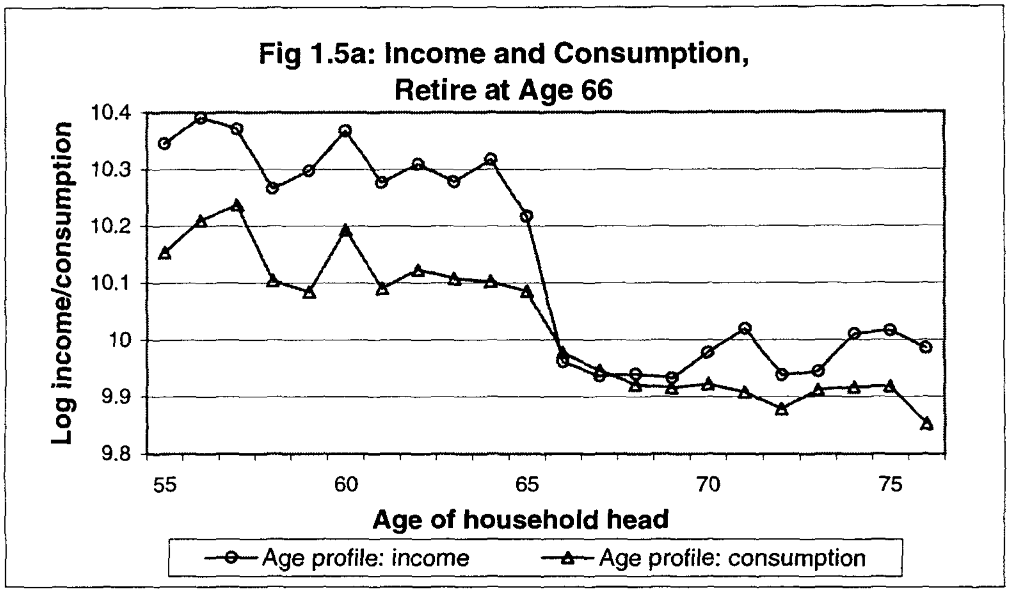


Fig 1.5a: Income and Consumption,
Retire at Age 66
Log income/consumption
10.4
10.3
10.2
10.1
10
9.9
9.8
55
60
65
70
75
Age of household head
Age profile: income
Age profile: consumption

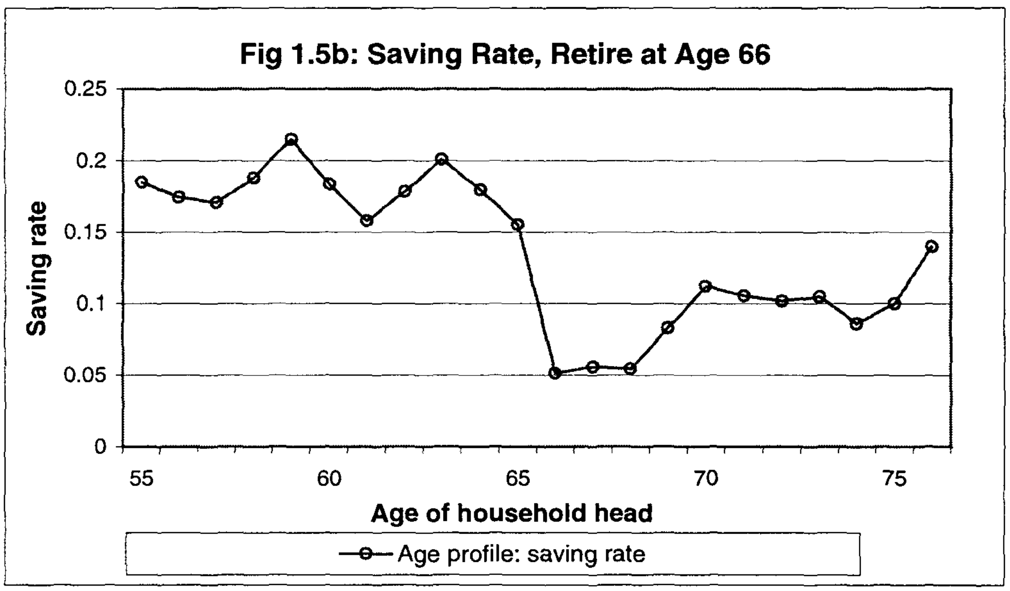


Fig 1.5b: Saving Rate, Retire at Age 66
Saving rate
0.25
0.2
0.15
0.1
0.05
0
55
60
65
70
75
Age of household head
Age profile: saving rate

Fig 1.6a: Income: Cohort & Cross-section Profiles

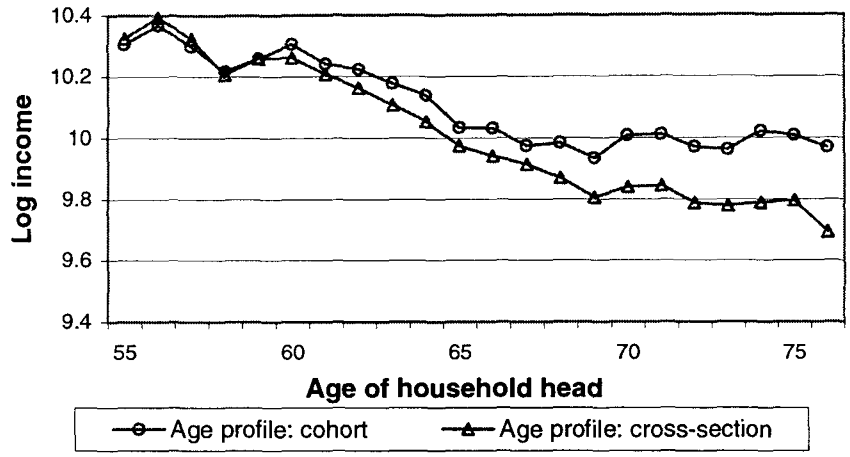


Fig 1.6b: Consumption: Cohort & Cross-section Profiles

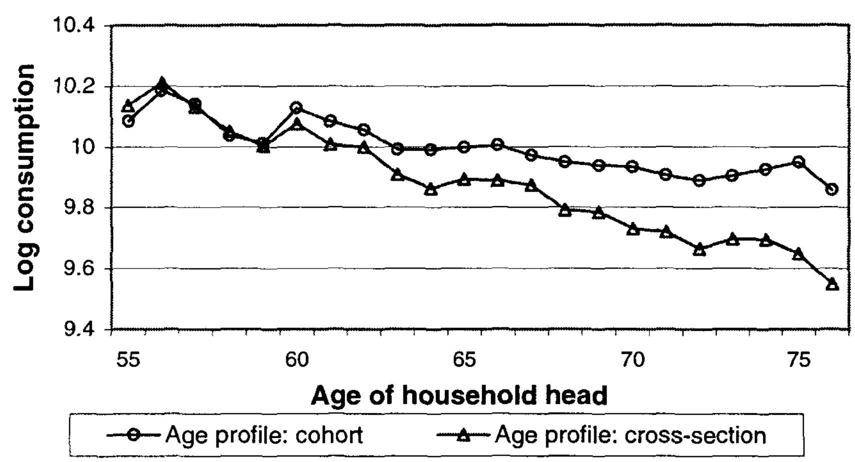
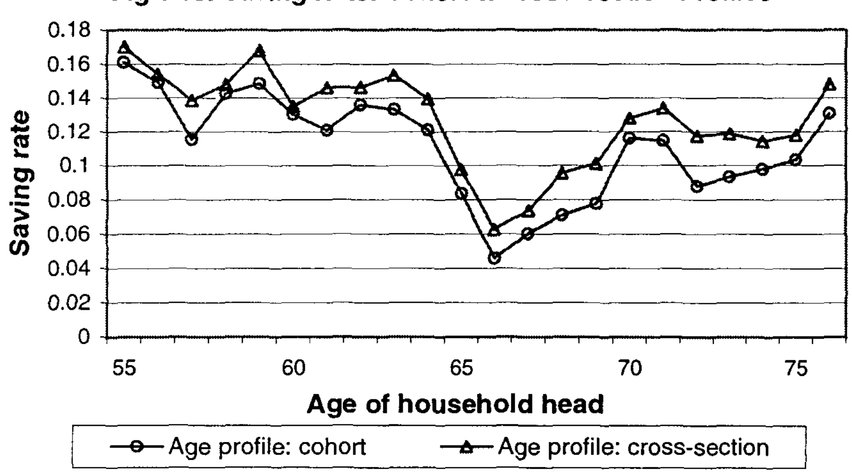


Fig 1.6c: Saving Rate: Cohort & Cross-section Profiles



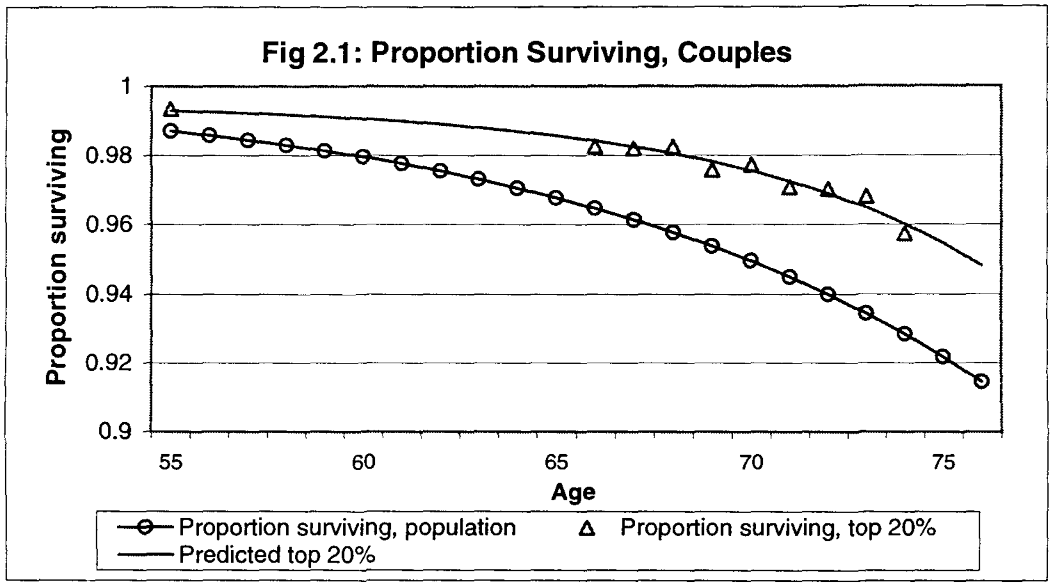


Fig 2.1: Proportion Surviving, Couples
Proportion surviving
1
0.98
0.96
0.94
0.92
0.9
55
60
65
70
75
Age
Proportion surviving, population
Proportion surviving, top 20%
Predicted top 20%

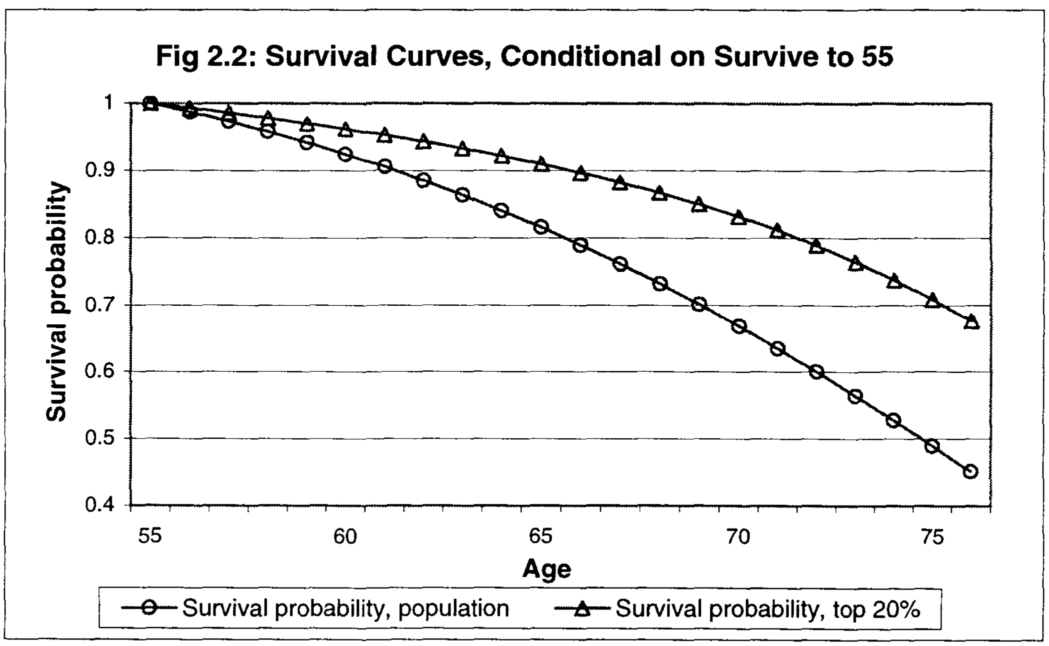


Fig 2.2: Survival Curves, Conditional on Survive to 55
Survival probability
1
0.9
0.8
0.7
0.6
0.5
0.4
55
60
65
70
75
Age
Survival probability, population
Survival probability, top 20%

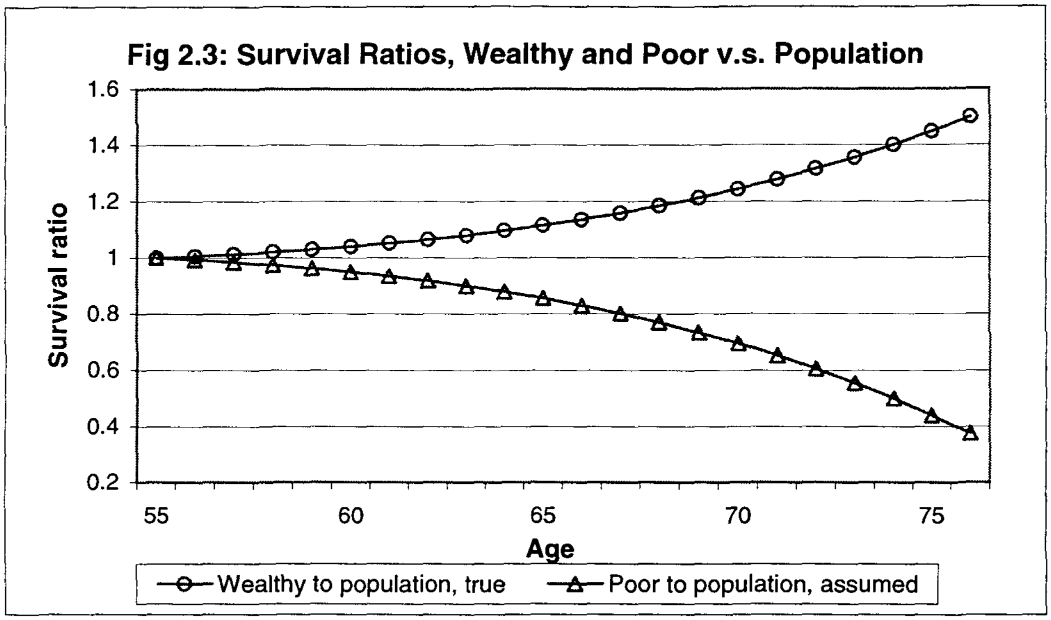


Fig 2.3: Survival Ratios, Wealthy and Poor v.s. Population
Survival ratio
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
55
60
65
70
75
Age
Wealthy to population, true
Poor to population, assumed

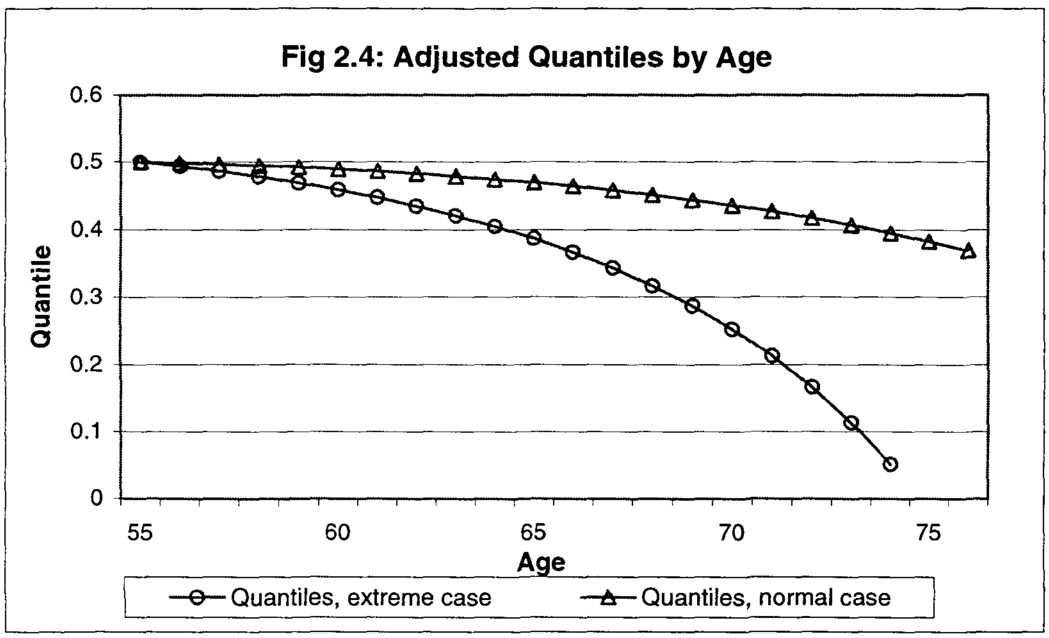


Fig 2.4: Adjusted Quantiles by Age
Quantile
0.6
0.5
0.4
0.3
0.2
0.1
0
55
60
65
70
75
Age
Quantiles, extreme case
Quantiles, normal case

Fig 3.1a: Income, Extreme Case

Selected quantiles: correction for differential mortality

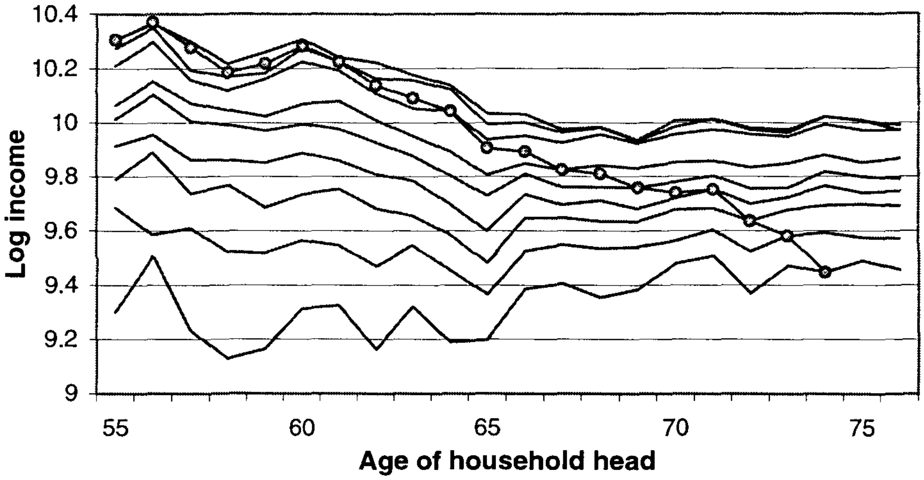
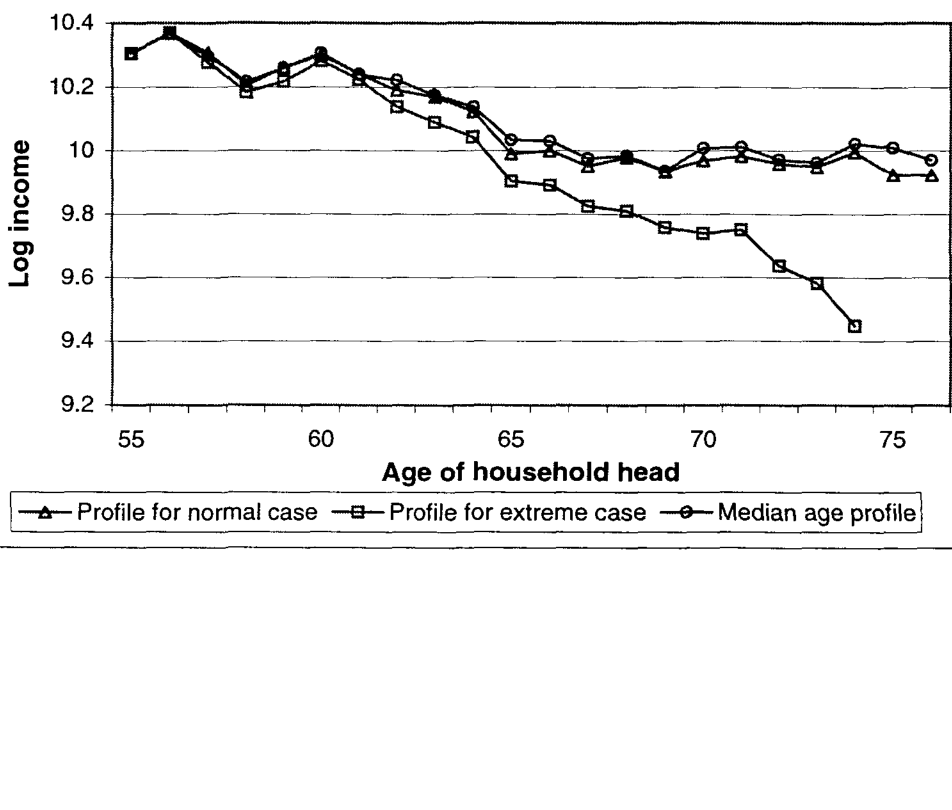


Fig 3.1b: Income, Extreme and Normal Case



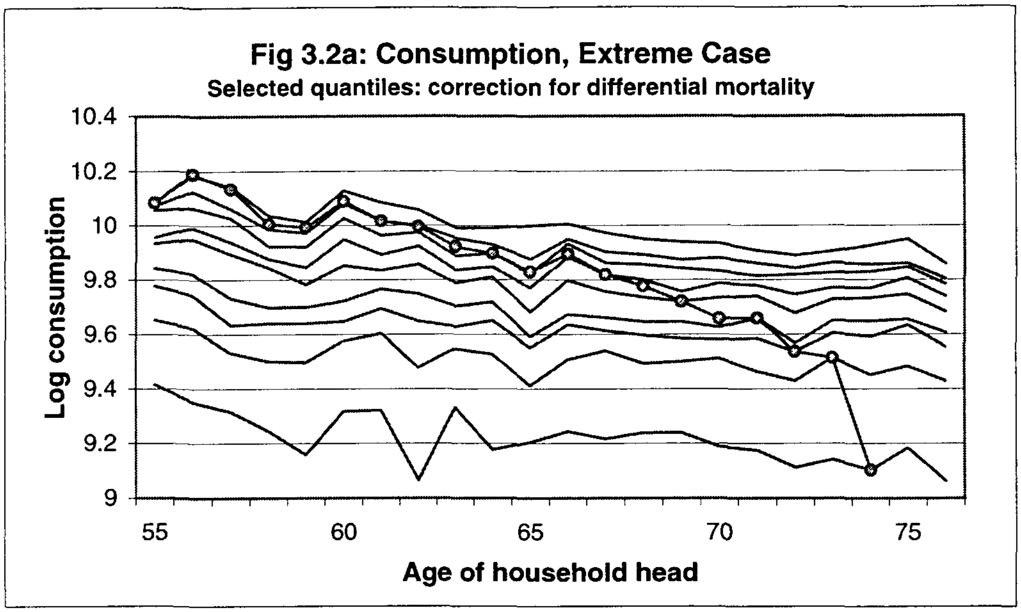


Fig 3.2a: Consumption, Extreme Case
Selected quantiles: correction for differential mortality
Log consumption
10.4
10.2
10
9.8
9.6
9.4
9.2
9
55
60
65
70
75
Age of household head

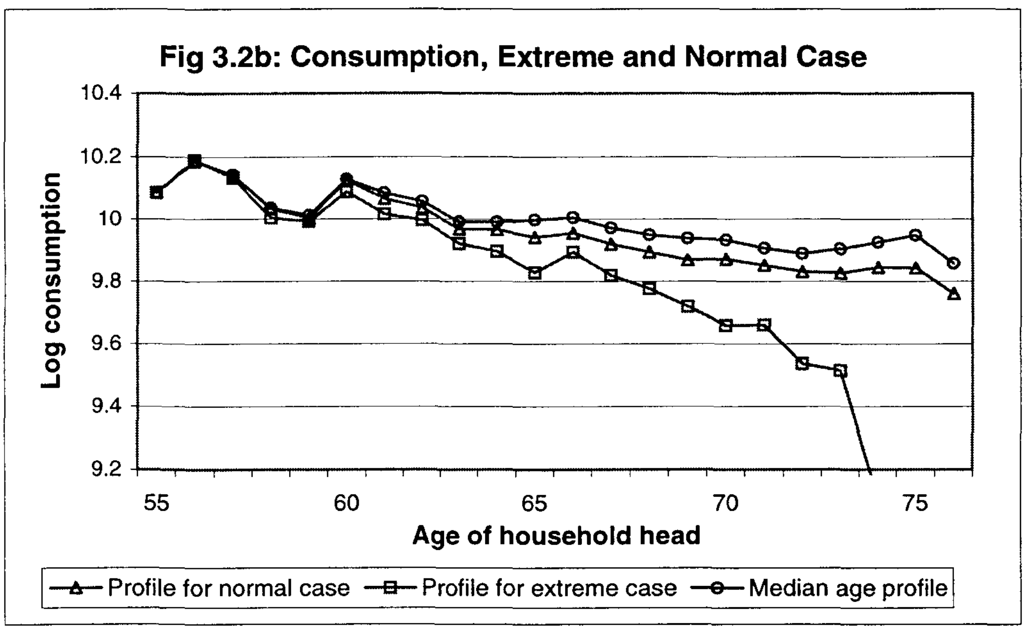


Fig 3.2b: Consumption, Extreme and Normal Case
Log consumption
10.4
10.2
10
9.8
9.6
9.4
9.2
55
60
65
70
75
Age of household head
Profile for normal case
Profile for extreme case
Median age profile

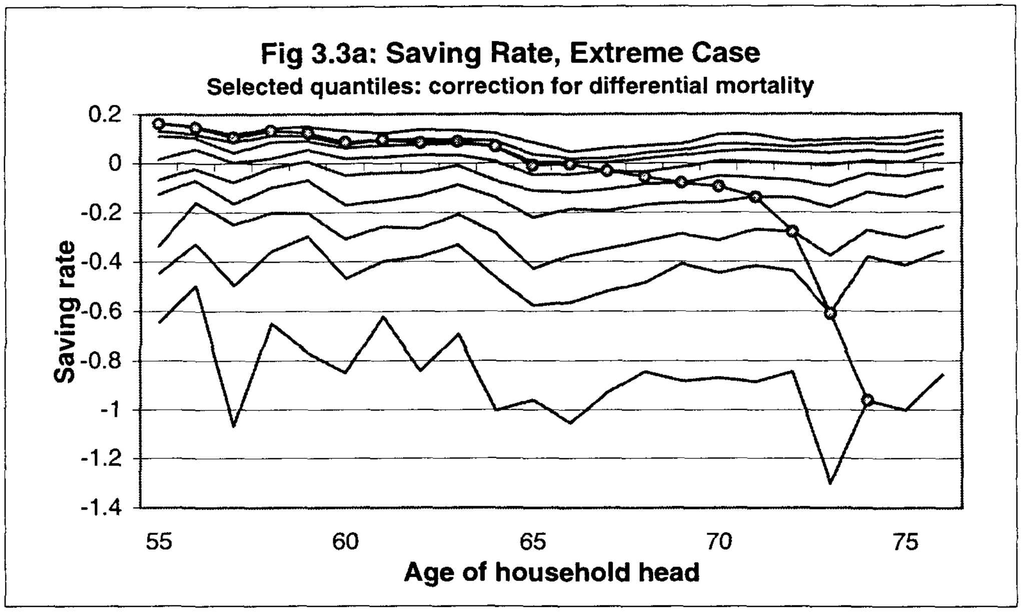


Fig 3.3a: Saving Rate, Extreme Case
Selected quantiles: correction for differential mortality
Saving rate
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
-1.2
-1.4
55
60
65
70
75
Age of household head

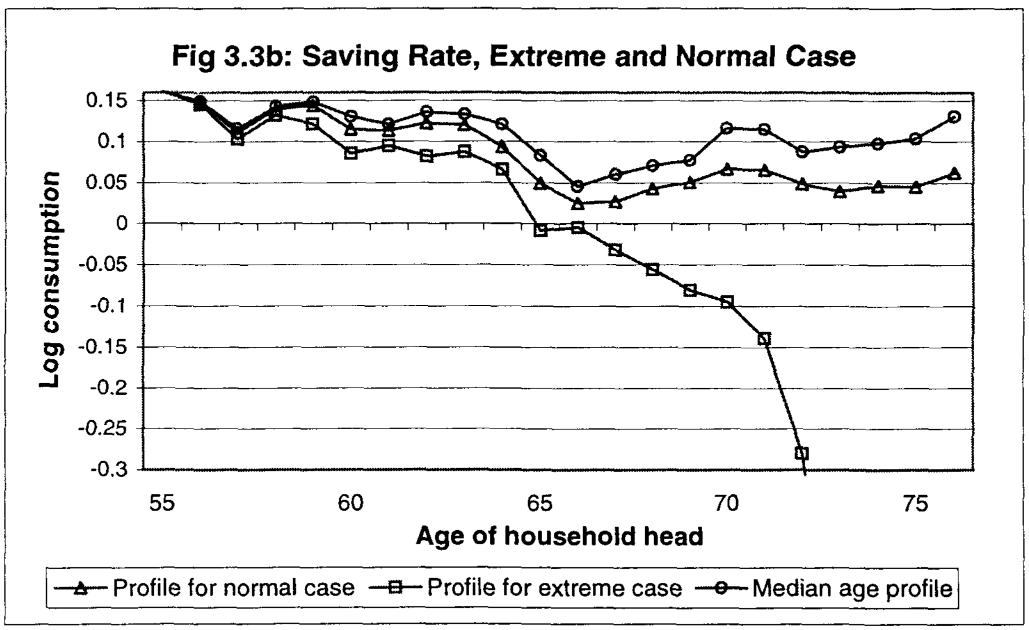
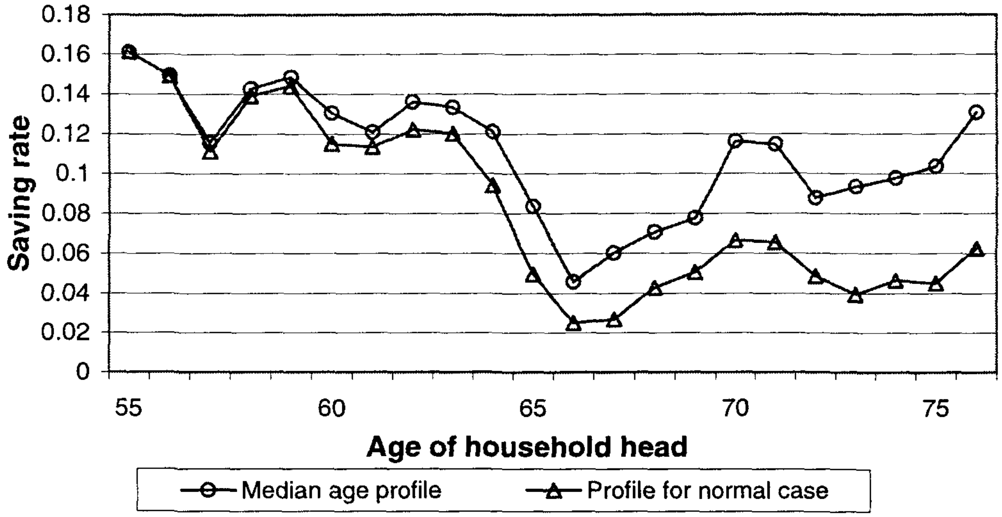


Fig 3.3b: Saving Rate, Extreme and Normal Case
Log consumption
0.15
0.1
0.05
0
-0.05
-0.1
-0.15
-0.2
-0.25
-0.3
55
60
65
70
75
Age of household head
Profile for normal case
Profile for extreme case
Median age profile

Fig 3.4: Age Profiles of Saving Rate: Before and After Correction for Differential Mortality



Essay 2:

Saving and Income

1 Introduction

This essay analyzes saving behaviour of Canadian married-couple households just before and after-retirement, focusing on estimation of age pattern of the saving rate as functions of various income sources, measured both in levels and in shares, and their implications. This study extends from my first essay in several ways, which are motivated by the following observations.

First, we have shown, in my first essay, that the age pattern of the saving rate has a 'dip' at around retirement age, i.e., the saving rate falls sharply at reaching retirement age, and then rises again thereafter. Even if we corrected the profile to take into account the possible distortion caused by differential mortality between the rich and the poor, there is still no sign of decline in the saving rate after retirement. This rising trend in the late ages is certainly in contradiction to the prediction of the life-cycle model of consumption. However, because we have only examined the age pattern of the saving rate controlling for cohort and year, we do not know whether this age pattern is due entirely to age, or to other factors, most likely incomes, because when transiting from work to retirement, the households in our sample would also experience a dramatic change in composition as well as in level of their total incomes. We even do not know whether the age pattern of the saving rate will still pick up this 'dip' at retirement age if we also relate the saving rate to various income sources as well as age, cohort and year. One of the main themes of this essay, therefore, is to explore these unknowns to find, via the relationship of the saving rate and income sources over the age span, what is causing the observed life-cycle saving behaviour.

Second, according to permanent income hypothesis, consumers will alter their consumption by a smaller amount if they perceive the income change as temporary rather than permanent. To examine the impact of income change on consumption, therefore, requires the knowledge of consumers' perceptions of its permanence. It follows that, if consumers have different perception of permanence about different income sources, they would react differently to different income changes, too. By examining the responses of the saving rate to the change of each income source over time along the way, we may uncover some important characteristics that will help us to better understand the observed saving behaviour of the elderly couples in their late years. Because most empirical studies on the issue of permanent income hypothesis often examine the sensitivity of consumption to income as a whole, this attempt to study the saving reactions to different sources of income over the life-cycle is a new addition to the literature.

Third, we have seen, in my first essay, that the age profile of income has a sharp drop when reaching the retirement age, and maintains at about the same level throughout the late life. However, as we mentioned earlier, as households transit from work to retirement, their income composition will change too. Thus, it is also helpful to examine the age patterns of various income sources for the elderly household, which, in turn, provide important inputs to the analysis of the observed life-cycle saving behaviour of the elderly.

We have several important findings in this study. We find that, whether the income variables are specified in levels or in shares, the predicted age profile of the saving rate from all regression coefficients always exhibits a 'dip' at the retirement age.

However, neither income effect nor age effect alone gives this 'dip'. It is the combined effect of the two that counts. More importantly, the rising pure age effect after retirement is solely responsible for the rising trend of the saving rate in that period. We also find that, in the before-retirement period, the saving rate would increase only if the share of capital income increases, given total income level; in the after-retirement period, an increase in the share of pension income would result in a significantly higher saving rate, while an increase in the share of transfer income would tend to encourage more consumption, the older the consumers. The life-cycle/permanent income theory may be well suited to give interpretations of these saving behaviour.

The structure of this essay is as follows. In section 2, we examine the income composition of the households, both in cross-sections and in cohorts, over the age span covered by our sample. We also review the basic forward-looking theory of consumption in section 3 in preparation for the main analysis. Section 4 addresses and analyzes the main issues in this essay: what is the age profile of the saving rate, what factor gives this profile, and if and how the saving rate responds to different income sources over the life-cycle. These analyses are carried out for both regression specifications, that for the levels of income sources and that for the shares of income sources controlling for gross income. Section 5 concludes.

2 Income and Its Components

To examine saving behaviour of the elderly couples over the life-cycle, and to relate this saving path with various income sources, it is necessary to be familiar with the changing patterns of these sources over the years and over the life-cycle. The income components in the FAMEX data include wage income,[1] government transfer income (which includes unemployment insurance receipts, welfare receipts, Canada and Quebec Pension Plan [C/QPP] benefits, Old Age Security [OAS] and Guaranteed Income Supplement [GIS] payments), investment income (which includes interest and dividends, net rent on owned property, trust and estate income and other investment income), pension income (which are pensions arising out of previous employment, individually purchased annuities and other miscellaneous income[2]), and other money income (which includes receipts from money gifts, inheritance and lump sum settlements, etc.[3]). Unlike prime aged households, whose incomes consist mainly of earnings, the households in our sample have income component shares that differ greatly over the age span. The transition from work to retirement causes the household incomes to change from being mainly composed of wage income to mainly consisting of transfer income from the government. In the meantime, private pension income also rises as households ages.

---

[1] Note, self-employment income is not included here because those observations are dropped from our sample. Detailed sample selection criteria can be found in my first essay.

[2] Note, this income source is categorized in the FAMEX as "Miscellaneous Income". As it primarily consists of private pensions, it is renamed as "Pension Income" here.

[3] This income category is not included in "Income before Taxes" in the FAMEX data set. It is an independent entry as "Other Money Receipts".

For compatibility purpose, the data and selection criteria for the sample under study are exactly the same as that applied in my first essay except that the 1978 FAMEX sample is not used here due to missing information on income components. All observations are for couple-only households whose heads were at least 55 years of age.[4] All income variables are in real terms (in 1986 dollars) and measured in 1000s. In this section, we first give cross-section descriptions for each income component for the sample years 1969, 1982 and 1992 to examine the income pattern over the years in our sample. We then give longitudinal age profiles for each component to examine the evolving income composition over the life span.

2.1 Cross Sectional Descriptions

Figures 1.1-1.6 present cross-section sample means for all 5 components as well as gross income by age group and year. Year 1969 and 1992 are the two endpoints in the whole data set, while year 1982 serves as a midpoint to clarify the long-run trends. Note also that year 1982 was during a big recession when both inflation and interest rates are very high compared to the more recent recession of 1990-1991. The households in the first two age groups, ages 56-59 and 60-63, can be thought of as being predominantly in their pre-retirement stage. The group aged 64-67 is in a transition period from work to retirement. The last three age groups thus consist of households mainly in their retirement stage.

[4] For later cohort analysis, the age is 53 and older in order to form cohorts.

Figure 1.1 gives an all-inclusive income pattern: the means of gross income by age and year. As expected, gross income is decreasing with age for all three years. It should also be noted that after the transition period (age 64-67), its rate of decrease with age is much smaller than it is in the pre-retirement stage. Remember that the figures are the *cross-section* means, and so we are comparing different generations at the same time. Whether gross income is decreasing with age after the transition period for a particular generation is not answered from figure 1.1; this has to wait until we give the results from a cohort analysis. Another notable feature from the graph is that, for all ages, the growth of income from 1969 to 1982 is much higher than that from 1982 to 1992.

Figure 1.2 shows the mean wage income by age and year. Because wage income is directly related to working status of the household members, a sharp decrease from pre-retirement stage to retirement stage is expected for all three years. However, wage income does not grow after 1982, and even does not grow since 1969 after the pre-retirement stage. This phenomenon is consistent with two well known facts that have been noted elsewhere: the declining labor force participation rate of males over the past two decades and the low or even negative growth rate of real wages since the middle of 70's.

Turning to government transfer income, we observe a rather different story. Figure 1.3 presents mean transfer income by age and year. Transfer income is increasing with age in all years because it is also directly related to working status but moves in the opposite direction from earnings. The growth rate of transfer income over the years, however, is very pronounced compared to either gross income or earnings. It seems likely that the positive growth of gross income from 1982 to 1992 is due largely to this high growth rate of transfer income in the same period, which overcomes the decline in real earnings.

Mean investment income is presented in figure 1.4. We remind the reader here that the order that years 1982 and 1992 figure displayed in the picture has been reversed because it will be very difficult to see the 1992 figure clearly if the usual order is applied. This odd arrangement is also indicative of the main feature of the growth in investment income over the years. As the interest rate was shooting up during 1981-82, investment income was also at its peak. It is also conceivable that if we control for the interest rate, there might not be much growth in investment income. Except in 1969, there is some evidence that investment income is increasing with age.

Figure 1.5 looks at mean pension income by age and year. The most impressive feature about pension income is its high growth over time, especially after 1982, although its level is still moderate and below that of transfer income. Another interesting observation is that the peak of the pension income seems to be moving towards younger ages as time passes, from peaking in ages 68-71 in 1969 to ages 60-63 in 1992. After the peak, pension income declines as age advances. But as we already stated earlier, the cross-section results may not correspond to the life-cycle path of a particular cohort.

The last figure for income components, Figure 1.6, shows means for other income by age and year. This income category includes lump sum payments, inheritance and other money receipts or gifts. It can be regarded as windfalls, so we do not expect it to have any strong pattern, except that the younger households in our sample may have higher chances of receiving an inheritance. The pattern in the figure matches this perception. Except for the higher levels at the first age group in years 82 and 92, there is no particular pattern either by age or year. As the means are all small compared to other sources of income, this category is relatively unimportant for most purposes.

Because all above figures are displayed with different scales on the vertical axis and so do not give an indication of relative sizes of the income sources, figures 2.1-2.3 look at the mean shares of the different sources of income by age group for each chosen survey year. The shares of each component within an age group are stacked together to total to 100%. By comparing the three years, we first notice that the major sources of income (more than 70% in total) are always wages plus government transfers, with the latter replacing the former at later stages of life. These two sources are the main components of income. We also see that wage share is shrinking with year at every age group, especially at younger groups. Meanwhile, the share of transfer income is expanding too, but again mainly in the younger age groups. The shares of investment and pension incomes are the other two sources that make a non-negligible contribution to the gross income (around 30% in total). We may call them 'supplemental components'. The share of investment income does not change much except for the rise in 1982, which was related to the high interest rate in that year. The share of pension income does expand, and expands much faster between 1982 and 1992. Finally, the share of other income is barely visible in all three years, confirming its unimportant role in gross income.

2.2 Cohort Age-Profiles

Cross-sectional patterns of income we observed so far give a rough picture of what was happening to various income sources when household members become older, and we do observe the time trends in these sources over the sample years. However, for the sake of analyzing in the perspective of life-long behaviour, from here on we use a cohort analysis. By cohort analysis, we mean that we follow the same year of birth cohort over time. The data set is reorganized to better suit this purpose. Cohorts that are in the sample for only a short period are dropped. The time of birth defining a cohort is set to a two-year range. All specifications for the definition of a cohort in this analysis are the same as in my first essay, where the reader is referred to for a detailed explanation.

Table 1 gives the results of OLS regressions for gross income as well as its five main components. The specifications of regression equations on age, cohort and year effects are essentially the same as that in my first essay except that now a fourth order polynomial is used to capture the age effect. Because the head age variable is top-coded at 76 for ages 76 and over, the inclusion of these observations as is may result in a distorted age profile. But because this age group accounts for over 13% of total sample households, dropping them altogether would lose valuable information, especially given that our sample size is already reduced by dropping the year 1978 survey because of the missing information on incomes. The way we treat this problem is that we include these top-coded observations in the regression and use an age spline variable at age 76+. We restrict the resulting age spline function to be continuous and smooth from age 75 and to have a zero slope at age 76+.[5] The year effect is captured using three macro variables: the inflation rate, the interest rate and the unemployment rate for each sample year. Cohort dummies are used to control for the cohort effect (cohort 1 is the oldest cohort born in 1905-06, and cohort 10 is the youngest born in 1923-24). The other variables are all dummy variables and are self-explanatory. The reference group is thus defined as: cohort 10; both working; elementary school; English language; Atlantic provinces; big city; owning home.

To get around the mass of numbers in the table and see clearly the main results, it is better to predict the incomes against age or cohort and show the profiles in a visual form. We can get the predicted age profile for a particular cohort using the regression results by varying age while fixing cohort and other dummies. We can also get the predicted cohort profile at a particular age by varying cohort dummies while fixing the age variable at some particular point, continuing to fix the other dummies. The average inflation rate, average interest rate and average unemployment rate over the sample years can always be used to fix the year effect (giving a constant macro atmosphere). Only one complication arises here that deserves to be carefully considered. Look at the various categories of dummy variables in Table 1: does it make sense for all of them that they be fixed while age is varying? Yes for all but one category: the working status of the household members. It does not make sense that we fix the dummy, e.g., Head work

[5] Let f(x) be a function of age denoted as x, then the age spline function is specified as:

$$f(x) = \beta_0 + \beta_1 x + \beta_2 x^2 + \beta_3 x^3 + \beta_4 x^4 + \beta_5 (x^*)^4$$

where: $x^* = 0$ if $x <= 22$ (i.e., age 75),
$= (x - 22)$ if $x = 23$ (i.e., age 76+),
and restricted so that: $\partial f(x)/\partial x = 0$ at $x = 23$ (i.e., at age 76+).

only, to 1 from age 55 all the way through age 76+. We have to let them vary whenever age varies. To deal with this problem, the fractions of four working status by age averaged over all sample years are calculated, and the results are also presented in visual form in Figure 3.1. The 'both not working' fraction is rapidly rising after age 65 while the 'both working' and 'head working only' fractions are falling quickly at the same time. The 'wife working only' group is not important throughout the age span. These fractions are used in conjunction with age to predict the age profiles for various incomes.

The predicted life-cycle age profiles for mean gross income and its components for a particular cohort are shown in Figure 3.2. The lines from top to bottom are for gross income, wage income, transfer income, capital income, pension income and other income.[6] The profiles differ from the ones for the cross-sections in several ways. Gross income does not decrease after the transition period until around age 74, when it starts falling slightly. Pension income is increasing with age until reaching the transition period and then remains at the same level most of time during retirement with a slight increase in the oldest ages. Capital income remains very flat during most of age span with an interesting shallow dip after age 70 and then a slight rise in the oldest ages. As before, wage income and transfer income are the main components of gross income before and after the work/retirement transition period, respectively. We also notice that the mean of other income remains at very low level at all ages.

---

[6] To predict the profiles, the dummy variables that are fixed at 1 throughout age span are: cohort 6, high school, English language, Ontario, big city and homeowner. It does not matter which dummy is fixed to one since it won't change the shape of the profiles. Macro variables are set at their averages over the sample years. Working status dummies are set at different fractions at each age according to Figure 3.1 and age is simply set from 2 to 23 (i.e., age 55-76+).

Figure 3.3 looks at income profiles from a different direction. It gives the predicted mean incomes at a particular age for each cohort.[7] The figure reveals how income levels have changed from older to younger cohorts. Are the younger cohorts more affluent than their predecessors? And if yes, through which channel or channels? In the figure, the lines from top to bottom (from the right half of the figure) are the cohort profiles for gross income, transfer income, pension income, wage income, capital income and other income. Notice that the X-axis is labeled 'Year head was born'. The increasing direction in X-axis thus reflects younger cohorts. From the top line, it is clear that the younger a cohort, the higher their total incomes. A cohort born in 1923-24, say, appears to have about $7,000 higher in annual real mean income than a cohort born in 1907-08. When we look down at other lines, it is evident that this increased total income is attributable to only two factors: the increased government transfer income and the increased private pension income for the younger cohorts. Wage income has not contributed to the increased affluence of younger cohorts, and capital income is actually falling down slightly, especially for more recent cohorts.

Finally, it is convenient at this point to give a brief overview of how the distributions of these income sources evolve over the life cycle, because the mean profiles we studied above may be affected by the skew in distributions of the incomes. Figures 4.1-4.6 give such descriptions. Each figure shows a set of different quantiles of income at every age for a particular cohort. These quantiles are predicted from quantile regressions.

---

[7] To predict the cohort profile, age now is fixed at 68 (arbitrarily), and so is the average composition of four working status (also at their age 68 values). Cohort dummies are set one or zero, one by one, to reflect the different levels for different cohorts. Other dummies and macro variables are treated the same as in the age profiles.

The specification of the regression is exactly the same as in Table 1. The first three figures are for gross income, wage income and transfer income. Gross income has high dispersion at the upper tail of the distribution throughout the age span while the gap between quantiles in the lower tail is narrowed over the ages.[8] The wage distribution is very symmetric over the entire age range for the quantiles up to .9, and the quantiles are increasingly close to each other after the transition period. However, a high dispersion in the upper tail of the distribution is also evidenced by the high level of the .99 quantile, especially at younger ages. Transfer income is very evenly distributed along the median in most ages for the quantiles from .1 to .9, even during the transition period. A high dispersion in both tails is observed during retirement, and the quantiles start to fan out at the oldest ages, indicating a higher inequality in receiving transfer income when the cohort members reach the oldest ages. The quantiles of the remaining three income sources are displayed in the last three figures. Because each of these components has a large fraction of observations equaling zero, the lower quantiles are chopped at different points. The upper quantiles of capital income have an interesting dip after age 70 and rise gradually afterwards, and the dispersion of the income is higher in younger ages.[9] The .9, .75 and .5 quantiles for pension income are quite evenly distributed across age, although a divergence with age is present at the .99 quantile. Finally, because up to 75% of the sample are zeros, the pattern in 'other income' does not have any importance even for the

---

[8] The .99 quantile for gross income is omitted from the figure because it is far too high to fit in with the other quantiles. It is everywhere about two times as high as the .9 quantile.

[9] This 'dip' may be related to the saving 'dip' found in my earlier work, but the timing here is somewhat occurred several years later. However, because investment income also depends on market conditions (for dividends, property income) and the interest rate, it is not necessary that it has the same shape as savings.

.9 quantile. However, the .99 quantile suggests that younger households are likely to have higher 'other income'.

We have examined the income and its components of the elderly couples in our sample by both cross-sectional and longitudinal analyses. We have seen that, because of the transition from work to retirement, their income sources and income composition also change in fundamental ways. Wage earnings are replaced by government transfers and pensions, and the total income fall to a lower level after retirement. We also see that younger cohorts are richer than their predecessors are in that they have higher total income. The higher total income is attributable to higher transfers and pensions, not to earnings and capital income. Knowing these income facts is the first step towards our understanding of how household saving behaviour is related to different sources and composition of income. We shall explore these issues in the rest of the chapter.

3 Theory and Implications

Before we start empirical examination on saving behaviour of our sample households given the above description of their income sources, it is helpful to have a brief review on the theories of consumers, from the earlier Keynesian consumption function to modern forward-looking theory of consumers. First, consider the following proposition from Keynes' (1936) *General Theory*:

> We shall therefore define what we shall call the propensity to consume as the functional relationship X between Y, a given level of income and C the expenditure on consumption out of that level of income, so that $C = X(Y)$. ...
>
> The fundamental Psychological law... is that men are disposed, as a rule and on the average, to increase their consumption as their income increases, but not by as much as the increase in their income. That is...dC/dY is positive and less than unity.
>
> But, apart from short-period changes in the level of income, it is also obvious that a higher absolute level of income will tend as a rule to widen the gap between income and consumption.... These reasons will lead, as a rule, to a greater proportion of income being saved as real income increases.

The theory posits a stable relationship between consumption and income:

(1) $$C = f(Y)$$

and claims in the second paragraph that the marginal propensity to consume (*MPC*) is between 0 and 1:

(2) $$0 < \frac{dC}{dY} < 1.$$

The final paragraph states that the average propensity to consume (*APC*), that is, the ratio of consumption to income, falls as income rises, or

(3) $$\frac{d(APC)}{dY} = \frac{d(C/Y)}{dY} = \frac{(MPC - APC)}{Y} < 0.$$

It follows that $MPC < APC$.

Income in the above expression, Y, is disposable income and, because saving is measured as disposable income minus consumption, all above implications can also be derived if we replace consumption with saving, except that the direction now has to be mirroring that of consumption. Thus, we expect that the marginal propensity to save, dS/dY, is also positive and less than unity, and that the ratio of saving to income rises as income rises, ie, $d(S/Y)/dY > 0$.

However, the Keynesian consumption function is based only on the simple notion that individuals' consumption behaviour in a given period is related to their income in that period. It sees consumers as largely passive agents, and assumes that changes in real incomes are translated quickly and fully into changes in consumption. According to this view, income changes brought about by tax changes are a powerful way to increase consumer spending, thereby increasing aggregate demand. Though it fits macro time series data reasonably well, there have been significant deviations from the simple consumption function in recessions, booms and war periods. It seems that consumers are much more sophisticated than the Keynesian model postulates. They do not simply consume in accord with their current income. Their expectations about the future income enter the decision. This is the main contribution of the modern theory of consumption: the forward-looking theory of consumption.

The forward-looking theory of consumption jointly refers to the two most durable and celebrated consumption theories: the permanent-income theory, developed in the 1950s by Milton Friedman, and the life-cycle theory, developed independently at about the same time by Franco Modigliani of the Massachusetts Institute of Technology. The theory embodies the basic idea that individual consumers are forward-looking decision-makers. They plan their lifetime consumption in accord with their total expected lifetime resources in such a way that their lifetime utility is maximized. The consumption plan is constantly updated at each point in time to take account of all new information that has become available to the consumer in an attempt to have a smooth stream of consumption throughout the life horizon.

The life-cycle theory gets its name from its emphasis on a family looking ahead over its entire lifetime. Savings are thus viewed as resulting mainly from individuals' desires to provide consumption in their old age. They build assets during working life, and spend down their assets during retirement. The permanent-income theory is named for its distinction between permanent income, which a family expects to be long lasting, and transitory income, which a family expects to disappear shortly. Rather than responding passively to every change in income, consumers will alter their consumption by a smaller amount if they perceive the income change as temporary rather than permanent. Thus, consumers cannot be relied on to react quickly when a policy-induced income change occurs. To examine the impact of income change on consumption, therefore, requires the knowledge of consumers' perceptions of its permanence. The difference between the marginal propensities to consume out of a temporary change in income and out of a permanent change in income is the single most important feature of the newer theories of consumption based on a forward-looking consumer.

To gain more insight on this issue, consider the following formulation of the problem which is routinely used in the literature [Flavin, 1981; Hall and Mishkin, 1982;

Zeldes, 1989]. The consumer's problem is to choose an optimal consumption path to maximize the expected value of a lifetime time-separable utility function in each period t ($t = 1,\ldots,T$, where $T < \infty$):

(4) $$\max\ E_t \sum_{j=0}^{T-t} \left(\frac{1}{1+\delta}\right)^j U(C_{t+j}),$$

subject to

(5) $$A_{t+1} = (A_t + Y_t - C_t)(1+r)$$

(6) $$C_t \geq 0$$

(7) $$A_T \geq 0,$$

where E_t represents the expectation conditional on all information available at time t; T represents the time of death; C_t is consumption, Y_t income, and A_t assets, all in period t; r is the (assumed) constant real interest rate and δ represents the time preference rate, which is also assumed to be constant. Utility is additive over time and concave, and income is uncertain.

The first order condition for this problem, assuming an interior solution, is:

(8) $$U'(C_t) = \left(\frac{1+r}{1+\delta}\right) E_t[U'(C_{t+1})].$$

If we assume r equals δ, and utility is quadratic (and so marginal utility is linear in C), (8) implies that $C_t = E_t(C_{t+1})$, which in turn implies that $C_t = C_{t+j}$, for all $j \geq 0$, i.e., the optimal path of consumption is such that consumption is expected to be constant over the remainder of the lifetime. If r exceeds (is less than) δ, consumption will be observed to increase (decrease) with age. This age profile of consumption is emphasized by the life-cycle hypothesis.

Turning to the budget constraint (5)-(7), we integrate it forward in time from 1 to T and discount it back to time 1, taking expectations and setting A_T=0, resulting in the following expression:

$$E_t \sum_{j=0}^{T-t} (1+r)^{-j} \cdot C_{t+j} = A_t + E_t \sum_{j=0}^{T-t} (1+r)^{-j} \cdot Y_{t+j} \; . \tag{9}$$

This is an expected value budget constraint, which says that the expected present discounted value of lifetime total consumption as of time t should be equal to current assets plus the expected present discounted value as of time t of future lifetime total income. Using the first order condition (8), which implies C_t is constant over time (under certainty or certainty equivalence), we can now express C as a function of A and Y, using the notation similar to that of Zeldes (1989):

$$C_{CEQ,t} = k_{T-t+1}(A_t + H_t) \, , \tag{10}$$

where $$k_{T-t+1} = \left(\frac{r}{1+r}\right)\left[\frac{1}{1-(1/(1+r))^{T-t+1}}\right]$$

and $$H_t = E_t \sum_{j=0}^{T-t} (1+r)^{-j} \cdot Y_{t+j} \; .$$

The subscript CEQ on C indicates that this consumption level is the solution in a certainty equivalent model, which is only true if utility is quadratic so that the marginal utility is linear in C. Consumption is proportional to the expected present value of lifetime resources, which consists of existing assets and the expected present value of future income. The constant of proportionality k_{T-t+1} is equal to the annual payment on a

T-t+1 period \$1 annuity. If $r = 0$, k_{T-t+1} is simply equal to $1/(T-t+1)$, the inverse of the number of periods left in life.[10]

Equation (10) is the consumption function derived from forward-looking theory under certainty equivalence. It expresses the optimal level of consumption at a given point in time as a function of perceived existing total lifetime resources. As a function of assets, consumption is an upward sloping line with slope ($\partial C_t/\partial A_t$) equal to k_{T-t+1}. If we give the consumer one extra dollar of assets, k_{T-t+1} of it will be spent today. Given assets, the marginal propensity to consume (*MPC*) out of current income is:

$$\frac{dC_{CEQ,t}}{dY_t} = k_{T-t+1}\left[\sum_{j=0}^{T-t}(1+r)^{-j}\cdot\frac{\partial E_t Y_{t+j}}{\partial Y_t}\right]. \tag{11}$$

Thus, *MPC* depends on the extent to which current income signal changes in expected future income in every period. For the case of i.i.d. income, at one extreme, that is, if the consumer perceives that the change in current income will only last within current period (100% temporary), his *MPC* is simply equal to k_{T-t+1}, because all $\partial E_t Y_{t+j}/\partial Y_t$ for $j > 0$ will be equal to 0. In this case, the consumer reacts to an extra dollar of income the same way as he reacts to an extra dollar of wealth. At the other extreme, if he perceives that his current income will last until time T (100% permanent), his *MPC* will be equal to 1. He reacts to an extra dollar of income by increasing his consumption by the full amount of one dollar. These implications lie at the heart of the permanent-income hypothesis.

The simplest version of a consumption function under the forward-looking theory for empirical study, therefore, can be written as:

[10] This can be seen by applying L'Hôpital's rule to the formula for k. Also note that if T goes to infinity, k

(12) $$C_t = b_1\, Y_t + b_2\, A_t,$$

where Y is disposable income, A is assets, and b_1 and b_2 are coefficients. If a change in current income, given the value of current assets, is assumed to be indicative of a permanent change in income, we would expect that b_1 would be close to 1. However, if current income is known to be different from likely future income, the equation would have to be made more complicated, and the coefficient b_1 would not be close to 1. On the other hand, the marginal propensity to consume from a change in the value of assets, b_2, would tend to be close to k, which is also close to the real interest rate. This formulation can fit the macro data strikingly well[11] and solves some of the shortcomings of the simple Keynesian consumption function we noted earlier.

Various extensions to the forward-looking theory of consumption have been postulated and studied in order to explain certain empirical findings that do not match the predictions from the basic forward-looking model above. One such extension is the precautionary motive for saving (e.g., Leland 1968; Skinner 1988; Zeldes 1989; Kimball 1990). Precautionary savings arise when individuals consume less (and hence save more) than the level that would be predicted by forward-looking theory under certainty (or certainty equivalence) to guard against possible uncertain events later in life. Other extensions on consumption theory are also widely used and examined. In a recent paper, Deaton (1991) analyzes the implications of liquidity constraints for optimal saving under different assumptions about the dynamics of lifetime income. Kotlikoff and Summers (1981) have argued that most wealth is not accumulated to smooth consumption over the

---

is equal to $r / (1+r)$, a little less than r if r is small.

life cycle but rather to provide bequests. The requirement that wealth be positive on the date of death (to leave a bequest) entails a lower level of consumption at each age during retirement,[12] but it does not change the basic implications for the rate of change of consumption (Hamermesh, 1984). Uncertain lifetime can produce a reduction in consumption large enough to explain much of the lack of decumulation by the elderly (Davies, 1981),[13] but it may also have an opposite effect: to increase consumption to enjoy what one may not be around to enjoy later (Levhari and Mirman, 1977). It is also worth noting that as one leaves the workforce, one's work-related expenses will typically be reduced, resulting in a lower level of measured consumption.

The theory of consumption is also of course a theory of saving. Given the above basic theoretical foundations for consumer behaviour, we will investigate empirically the life-cycle path of savings and its response to income sources and other characteristics, which is a natural extension to my first essay on the savings of the elderly couples. One of the major themes in this essay, in addition to examine the life-cycle path of the saving rate, is to also identify the factors shaping the saving path. Unlike most empirical studies in the literature, which often examine the sensitivity of consumption to income as a whole, we will also examine saving reactions to different sources of income over the life cycle. For this reason, we shall mostly refer to the basic implications of the permanent income hypothesis. If the theory is correct, then consumers will react differently to different sources of income depending on their perceptions about its permanence or the

---

[11] Hall, Taylor and Rudin, Macro Economics: the Canadian Economy, 1995, 2nd Ed., p. 275.

[12] Hence, information on consumption during retirement does not allow us to distinguish from a bequest motive and risk-averse behaviour, which also results in a lower level of consumption.

[13] In essence, it is just one of many aspects of a theory of precautionary savings.

degree of uncertainty. With the empirical evidence on the life-cycle behaviour of the saving rate and its different degrees of sensitivity to different income sources over the ages, it is hoped that we can better understand some empirical puzzles such as the 'dip' in the saving rate at retirement age found in my earlier work, and have better insight into whether and how the various income sources play in affecting the saving rate over ages.

4 Empirical Study on Saving Behaviour

Having reviewed the basic forward-looking consumer theories and examined the changing income composition over the ages for our sample households, we now turn to our empirical study to see if and to what degree the saving behaviour of the elderly couples matches what theory predicts. As in my first essay, the main interest in this chapter is still in the life-cycle pattern of saving behaviour, only now saving behaviour will be studied in relation to various sources of income, both in levels and in shares, in addition to age, cohort, year and location. This complicates matters in that we now have more to explore than just to see the age pattern of the savings. We want to ask whether the saving rate still has a 'dip' in the retirement age as in my first essay and, if so, is the 'dip' of the saving rate due to income composition changes, or to other effects? In answering these questions, we are also interested in the relationship between the saving rate and various components of income. Whether or not the changes in income components contribute to the 'dip' in the saving rate, they must contribute to whatever the saving behaviour that is due to incomes. By analyzing this relationship, we attempt to sort out the potential different reactions of saving rate to different sources of income at different stages of consumers' life-cycle. This in turn may help us to better understand the saving behaviour of our elderly couples in their late years.

Ideally, we would require, according to equations (8) or (10), that the data set includes such variables as current total assets, consumption and incomes from previous periods (i.e., genuine panel data), but this information is not available in the FAMEX data set. Of these variables, only current income components and consumption variables are available for use in our study. However, there are two variables, 'house value' and 'investment income', which contain some information on total assets. The two variables are then used to form an approximate 'assets' variable by the formula: 'assets' = house value + investment income/interest rate. Thus, throughout, we will assume the simplest version of consumption function as in equation (12) as our base model, plus other terms to incorporate age, cohort and year effects.

Another problem concerns the endogeneity of income when income is the major independent variable in the equation. If we treat it as exogenous, the estimated function may be distorted. Though in principle simultaneous-equations econometric techniques can be used to estimate the parameters in the equation, these techniques rest on the availability of instruments that are truly exogenous in the saving equation yet have an influence on income. Furthermore, because our study involves having a set of income component variables (five of them) and their cross terms on the right-hand-side of the equation, a large number of such instruments would be required, and finding them becomes just short of impossible. In the rest of the study, therefore, we assume that incomes are given and exogenous. Such treatment can also be found in other studies (e.g., Skinner, 1988). A related issue is the measurement errors in both incomes and saving, which can lead to biased estimates of coefficients in the regression. Even among the components of total income, there may be different degrees on measurement errors. For example, capital income may have higher error components than wages and transfers. Because a large number of variables in the right-hand-side of our regression equation may have measurement errors, the sign and magnitude of the bias of coefficients become unknown and, presumably, unknowable.[14] In principle, as in the endogeneity problem, bringing in outside information may solve the problem; however, the amount of information necessary is too large to be a promising approach. Once again, we will not take into account this problem into our study. However, we recognize the potential effects of income endogeneity and measurement errors in the variables on the results, and all the inferences made from the results should be interpreted as conditional on the income exogeneity and no measurement errors.

In general, the study in this section may only be regarded as an empirical investigation on observed saving behaviour of the elderly couples in their life-cycle and in response to various income components at different ages. Theories on consumption behaviour are used as a guide to give possible interpretations for the results. To formally establish a theoretical model and to predict how consumers would behave under specific circumstances is beyond the scope of this study and is definitely a topic for future research.

This section is divided into two major subsections. In section 4.1, we analyze saving behaviour using regression specification consisting of the levels of various sources of income and their interactions as well as assets, controlling for age, cohort, year and geographic location. The regression specification consisting of the shares of income sources is studied in section 4.2. In both subsections, we study the pattern of life-cycle

[14] If there is only one independent variable measured with error, the coefficient on the badly measured variable is biased toward zero, and all other coefficients in the regression are biased as well, though in unknown directions.

saving rate, the contributing factors of this saving pattern, and the response of the saving rate to various income sources over the ages.

4.1 Saving Rate and the components of income

We begin this section with the specification of our regressions and the regression results. We will then use the regression results to analyze saving behaviour in several directions including life-cycle pattern and the saving rate as functions of various income components.

4.1.1 The Regression Specification and Its Result

As specified in equation (12), consumption is a function of income and assets. Income here is defined as disposable income, which is measured in the FAMEX as gross income minus income taxes (i.e., net income). Because saving is defined as disposable income minus consumption, equation (12) is equally applicable to saving. To catch the potential non-linearity of the saving response to income, as stated in Keynes' (1936) quotation, we first run a simpler regression specifying a quadratic gross income in the equation because gross income is directly related to the five components of income we will use in the main study below. Table 2.1 gives the coefficients from median regressions of both saving and the saving rate on gross income.[15] The high t-ratios on the coefficients of the square terms of gross income in both regressions confirm the non-

[15] The regressions also include other variables not shown on the table. They are: a fourth order polynomial for age, an age 76+ spline variable restricted to have a zero slope and continuous and smooth from age 75,

linearity of the saving and saving rate as functions of incomes. We also see that saving is convex in income while the saving rate is concave in income. Notice that although the (absolute) coefficients on assets in saving equations are far less than the interest rate in any year,[16] the sign of the coefficient is consistent with what theory predicts. In addition, the estimated propensity to consume out of a change in wealth is much smaller than out of a change in permanent income. Finally, the positive coefficients on linear income terms for the saving rate regression with a very small negative coefficient on squared term of income also confirm Keynes' prediction that $d(S/Y)/dy > 0$ for the range when income is under $100,000, which is true for most households in our sample.

The main equations we will study in this section are specified according to the regressions in Table 2.1 but incorporate all five components of income instead of only gross income. By replacing gross income with its five components and interacting the terms, we allow the components to have different effects on saving and the saving rate. The regression with only gross income in the right-hand-side can be considered as a restricted version of this, since it restricts all of its components to have the same effect on the dependent variable. The complete specification and the regression results are reported in Table 2.2.

As before, we control for age, cohort, year and location effects. Joint F-tests on the null hypothesis that the variables within the various groups all have zero coefficients were performed and the P-values are shown in Table 2.3. The macro effect, which

---

9 cohort dummies, 3 macro variables (inflation rate, interest rate and unemployment rate), 4 province dummies and 2 area dummies. These control variables will stay the same in all regressions below.

approximates the year effect, and the province effect are significant in both saving and saving rate regressions, while age and area effects are not significant (at the 5% level), also in both regressions. The cohort effect is significant in the saving regression but is not for saving rate. This is consistent with the results of my first essay, which also found that the pattern of saving rate over the life-cycle is the same across cohorts. The level of saving differs across cohort (younger cohorts have higher level of saving) but because younger cohorts also have a higher level of income, the result is an unchanged saving rate across cohorts. What is different from the result of my first essay is the non-significance of the age effect here. My earlier work, which did not have income variables on the right-hand-side in the saving rate regression, found a significant age effect, controlling for cohort, year and location. Therefore, it seems likely at first that it is the change of income and its composition, not age, that causes the change in saving rate across the later life span. But further investigation will reveal a different story. We provide the details of the investigation in next subsection.

4.1.2 Life-cycle Path of Saving Behaviour

In this section, we try to answer two questions: (1) does the saving rate regression in Table 2.2 pick up the dip in the saving rate at retirement age as it did when no income variables were involved? (2) if so, what is the reason, age, or income sources?

As mentioned above, in my first essay where the saving rate regression included only age, cohort, year and location variables, the life-cycle profile of saving rate has a

---

[16] And so, as saving is equal to income minus consumption, the coefficient on wealth from saving equation should be close to the negative of that from consumption equation. Notice too that this small value may

sharp drop from pre-retirement stage to around age 66, the age when the majority of household members are retired. Afterwards, the saving rate rises steadily as the household members age further, leaving a 'dip' in the saving rate profile at retirement age. F-tests on the hypotheses that (1) the saving rates are equal between pre-retirement and retirement age, (2) the saving rates are equal between retirement age and older ages, and (3) the effect of age variables are zero are all strongly rejected,[17] confirming the 'dip' in the age profile of the saving rate.

To see if the saving rate regression in Table 2.2 picks up this 'dip', we do the following. First, we predict the median saving rate for each observation in our sample using the complete regression result in Table 2.2. We then group these predicted saving rates by age and take the medians of each age group. A 95% confidence band for these predicted age-specific median saving rate is also calculated at each age group.[18] We do this both for the saving level and the saving rate regressions in Table 2.2 and plot the results in Figures 5.1a and 5.2a, respectively. In the before retirement period, both figures exhibit a similar pattern: saving and the saving rate are higher and more varied at ages less than 60, but from 60 to the usual retirement age at around 66-68, both saving level and the saving rate decreased substantially. Also, both pictures show an increasing trend after retirement, but this increase is much less so for the saving level in Figure 5.1a.

---

also reflect the measurement error in assets variable, resulting in a bigger bias toward zero.

[17] These results are presented in Tables 3.2, 3.3 and in figure 1.3b in my first essay.

[18] The procedure used in these calculations is: get the predicted dependent variable; regress the predicted dependent variable on a set of age dummies (less one) using median regression; take the coefficient on each age dummy (plus the constant term), these are just the medians of age-specific predictions; calculate the standard errors for each coefficient (plus constant term), which involve a series of tests that the sum of the coefficient and the constant term is zero, and form the 95% confidence band for the medians at each age.

This is no surprise given that income levels have a little decline at the end of age range, and so combined with the small increase in saving level the result is a larger change in the saving rate. Figure 5.2a, the predicted profile for the saving rate, clearly shows that there is a 'dip', too, at the ages when most household members start retiring.

It is worth noting that, because the profile in Figure 5.2a is formed by using all the regression coefficients, it includes the combined effects of all the variables in the regression. Inspecting Table 2.2 also reveals that the major groups of the variables that are capable of affecting the age profile of dependent variable are income components and, of cause, age. Thus, we reason that the 'dip' in the age profile for the saving rate comes either from income sources or from age (or from both, or neither?), assuming no big compositional effects form other variables.[19] Given this, we can decompose the age profile of the saving rate into two parts: one comes purely from the income composition effect, the other comes purely from the age effect. Once we have these two partial age profiles, the answer to the second question may become clearer.

To construct an age profile in the saving rate that is purely from the effect of income composition, we make use of only those regression coefficients corresponding to income variables, including all their square terms and interacting terms in Table 2.2. These coefficients measure the change in the saving rate that occur for the individual attributable to the changing income components only. We use the same procedure as in the construction of Figures 5.1a and 5.2a, only now those non-income coefficients are

[19] The 'assets' variable is also a possible factor influencing age pattern, but it play little role relative to this two groups. We will say more about this later. Other groups of variables could affect the height, but not the shape of the age profile.

omitted when we predict the median saving level and saving rate for each observation in the sample. Figures 5.1b and 5.2b plot these predicted median saving and saving rate for each age group that is purely from the effect of income components.[20] We emphasize here that, although we show these predictions by age, these predictions are abstracted from any influences of aging and reflect only the saving level or saving rate that is resulted from those income component levels associated with a particular age group. The results are striking. In both figures, the increasing trend in the retirement period disappears completely (if not to say it is declining) while the pattern in the pre-retirement stage is hardly changed. The two profiles are now almost the same. If there were no aging effects, the saving profile would not exhibit a saving 'dip' at the age of retirement, i.e., the profiles in later ages are at the best very flat, or even slipping down, but definitely not going up again.[21]

The saving pattern due to pure age effect is formed the same way as above: only the age coefficients are used to predict the dependent variable for each observation. However, as each age group has only one age value for every observation in the group, the above procedure is then reduced to a much simpler one: just using age values from 55 to 76 to predict the age profile using the coefficients of age variables only. Because every observation in an age group has the same predicted median saving or saving rate, there is no confidence band for the predicted group medians. Figures 5.1c and 5.2c give the pure

---

[20] We note that the vertical axis and scales do not mean the level of the trend in the figures, and also the figures below, which is determined by the other explanatory variables in the regression. Only the shape is important here.

[21] We also examined 'assets' variable in the same way to see if the pure asset effect on the saving rate gives the 'dip' in the retirement age. The predicted profile shows the same pattern as that from incomes: it decreases with age at all ages, and its effect is very small compared to that of income.

age profiles for the saving and saving rate, respectively. The shapes of the two profiles are now different. There are a peak around age 60 and a trough around age 69 in Figure 5.1c for the saving level. It seems that saving is decreasing with age from around 60 to around 69, and then starts to rise at later ages. However, the age profile for the saving rate in Figure 5.2c presents another picture. The profile is very flat before retirement, and it rises with age after retirement. Combining this pure age effect with the pure income effect in Figure 5.2b, and compare them with the total effect in Figure 5.2a, we discover a very interesting pattern which is likely to be the answer to the question of what gives the saving 'dip': in the before-retirement period, the pattern of the saving rate in Figure 5.2a is very similar to the saving rate pattern resulted from pure income component effect in Figure 5.2b, while the age effect in Figure 5.2c is flat throughout; in the period after retirement, the effect of income components in Figure 5.2b is flat, and the saving pattern in Figure 5.2a is very much the same as the age profile in Figure 5.2c. In other words, separately, neither income components nor age gives the 'dip' in the saving rate at retirement age, but once the two effects are combined, the 'dip' shows up.

However, one can still argue that, because the joint F-tests in Table 2.3 show the insignificance of the coefficients of age polynomials for both regressions, the age profile in Figure 5.2c may actually be flat throughout after all, and the increasing saving rate after retirement in Figure 5.2a may be due to some other effects but not to age. But the matching of the patterns after retirement between Figures 5.2a and 5.2c is too real to be disregarded, and the F-test that all coefficients of the age polynomial be zero may miss out some significant age effect in certain age ranges, that is, the 4^{th} order age polynomial itself may not be suitable for a test to detect the significance of the age effect in a subset of the age span. To make sure if this is the case, we rerun the two regressions in Table 2.2 with linear splines for the age variable instead of an age polynomial, allowing us to test the significance of the age effect within different age ranges explicitly. For the saving level regression, the knot locations are ages 60 and 69, which are around the peak and the trough of the age profile shown in Figure 5.1c. For the saving rate regression, Figure 5.2c shows that only one knot is needed for testing the significance of age effect within two age regimes: before and after retirement. We choose two possible knot locations: at age 66 and at age 69. The former location is chosen because the majority of the household members start formal retirement at this age, while the choice of latter location reflects the age from which the saving rate begins to rise in Figure 5.2a. Table 2.4 reports the regression coefficients and their t-ratios of the linear age splines for the saving level and the saving rate regressions in the first two panels.[22] We also report the F-ratios for tests of the null hypotheses that the age effects within a specific range as well as the whole range are zero.

In the first panel for the saving level regression in Table 2.4, all tests as well as all the t-ratios of the coefficients are insignificant, so we cannot reject the hypothesis that the age profile of the saving level in Figure 5.1c is flat throughout all ages. But because saving level is only the numerator of the saving rate, the non-significance of the age effect on saving level after retirement does not mean a non-significance of the age effect on the saving rate. Let us now concentrate on the second panel, the saving rate

[22] Other coefficients from the regressions are omitted from the table. They are almost the same to that in

regression, in Table 2.4. For the case that the knot is at age 66, the slope of the age profile before 66 (coefficient of age(a1)) is indeed zero (from the t-ratio) while the change of the slope in the after-66 period from the period before (coefficient of a2) is now very significant. The F-test that the age effect (the slope) after age 66 is zero (a1+a2=0) is also strongly rejected, so is the test that both slopes in the two periods are zeros (a1=a2=0). For the case that the knot is at age 69, the same results are obtained, except that the change of the slope in the second period (coefficient of a2) is not significant at the 5% level (but is at the 10%). According to these test results, we confirm that the age effect on the saving rate is different between the two periods: it is zero before retirement while it is significantly not zero in the after-retirement period. The results from both choices of the age knot give this conclusion with the knot at age 66 having a higher significance level. Using this result, together with the apparent fact that the age profile of the predicted median saving rate from the pure income component effect in the after-retirement period is at most flat (see Figure 5.2b), we can now safely state that the rising saving rate after-retirement in Figure 5.2a, which is the key step to form the saving 'dip' at the retirement age, is caused by the pure age effect, not the effect of income components.

In my first essay, it was demonstrated that the rising saving rate after-retirement is not due to differential mortality rates between the rich and the poor. Now we further give evidence that it is not due to income either, but is due to pure aging or pure aging related factors. This is another important finding. It reinforces the observation that, whether

---

Table 2.2. The third panel in the table will be studied in a later section.

aware of it or not, individuals who once permanently leave the work force and enter their retirement stage also enter a life stage which is very dependent on age or age related issues. While they might try to maintain consistent consumption or saving rules with respect to various kinds of incomes throughout their lifetime, on average the saving rate drifts upward due to age effects. Although we have not been able to identify the factors the pure age effect comes from, they could be the uncertainty about the length of lifetime, bequest motive, health limitations to consume, and so on. The finding is important in the empirical investigation of the basic life-cycle model. It implies that the evidence of increasing saving rate profile of the elderly couples after retirement is not necessarily damaging to the implication of the basic life-cycle model, because the pure aging effect is not a presumption built into the model. By considering the pure income effect only, the empirical evidence shows no sign of increasing saving rate after retirement. Second, it also suggests that, in modeling consumer behaviour, it may be necessary that either we model the before- and after-retirement periods separately to capture the difference in behaviour between different life stages, or we explicitly build into the lifetime utility function different preferences in the working stage and in the retirement stage.

In this section, we have shown that when we relate the saving rate to various income components as well as age, cohort, year and location, the age profile of the saving rate still exhibit a ‘dip’ around the retirement age. Further investigation shows that, separately, neither income components nor age can give rise to this phenomenon, but when these two effects are combined, the ‘dip’ shows up. The key finding is that the rising saving rate after retirement is entirely due to a pure age effect, not to the effect of income components. If there were only a pure income component effect, we would have an age profile of the saving rate that is similar to the age profile of gross income, that is, a decrease until just after retirement, and then about the same level throughout the late ages. It is, therefore, also interesting to examine the relationship between the saving rate and various components of income over the ages. In previous sections , we have given the age profiles of various income components and how the composition changes from work to retirement. We have also reviewed the forward-looking theory of consumption. In the following section, we attempt to sort out the potential different reactions of the saving rate to different sources of income, and at different stages of life cycle. This in turn may help us to better understand the saving behaviour of the elderly couples in their late years.

4.1.3 Saving Rate as Functions of Different Components of Income

Figure 5.2b above gives only a combined effect of income components on the saving rate at each age. From the specification of the saving rate regression in Table 2.2, it is apparent that the effect of each source of income depends not only on the level of itself, but also on the levels of the other sources as well. There are interweaving relationships among the five components such that no effect of any single source can be examined without considering the effects of the other. Moreover, as we have already shown, the households in our sample have income compositions that differ greatly over the age span. Also, considering that the main consequences of income components on saving rate is reflected in the slopes (as opposed to the heights) of the saving rate functions with respect to each source, to make the presentation concise, we will analyze these slopes directly. Taking into account the changing composition over the ages, we use the following procedure. First, we pick up two points within the two stages on the age span: age 60 in pre-retirement stage and age 73 in retirement stage. We then use the two different mean compositions of income (from figure 3.2 in Section 2) at the two age points as inputs, using the regression result in Table 2.2, to calculate the slopes for the saving rate as a function of each separate income source within a reasonable range. For example, if we examine how the saving rate changes in response to a small change of wage income at age 60, we vary the wage variable over a reasonable range, but fix all other income variables at their age 60 levels.[23] The same procedure is used for all five sources at both chosen ages.

In Table 2.5, we report these slopes for the saving rate functions with respect to wages, transfers, capital income and pensions, omitting 'other income' slopes in the table for brevity because of its negligible share in gross income. Standard errors for these slopes are also calculated using the corresponding covariance matrix of coefficients from the saving rate regression. These slopes are calculated for the income range 0-45k, but only selected (even) numbers in the range 0-30k are shown in the table, separately for ages 60 and 73. Remember that the slopes here measure the marginal change of the saving rate out of a unit change in the indicated income source, given all other income

---

[23] According to Table 2.2, the slope from a particular income source, for example, wages, is calculated as:

$$dS/dW = a1 + 2\times a2\times wage + a3\times wt + a4\times wc + a5\times wp + a6\times wo,$$

where a1 and a2 are the coefficients of wage and wage squared, respectively, a3-a6 are the coefficients of the interacting terms involving wages. By varying wage and fixing the other four income components at particular levels, say at their age 60 levels, the slope can be calculated over the wage range. Note that whenever the wage changes, the interacting terms will change too, and that the fixed levels of the other four incomes will affect the height of dS/dW over the wage range. The slopes for other sources of income can be calculated in the same way, as long as we give the levels of the other income variables.

levels at ages 60 or 73. The higher the values of the slopes, the steeper the saving rate functions. Because the functions are quadratic in income, the slopes are linear in each income source, as can be verified in the table. At age 60, when wage income is dominant (see Figure 3.2) and transfer income is very low, the slope from the wages is higher than that from transfers over the income range. The slope from capital income is the highest among the four. The other two slopes, that of from transfers and pensions, seems about in the same level and are the lowest among the four. Notice that, from the standard errors listed in the table, these two slopes are actually not significantly different from zero in the range after 18k. At age 73, however, as income composition changed dramatically, the slopes seem also different from that of at age 60. The slope from transfer income now is higher than that from wage income at every level within the range, and is close to the slope from capital income, which remains the highest. The slope from pension income is the lowest among the four. All slopes are positive except the one from pensions at the very end of income range.

Are there any differences in saving reactions to different sources of income, and at different life stages? Table 2.5 alone is not sufficient to answer these questions. For this purpose, we also provide, in Table 2.6, the F-ratios on pair-wise and joint tests that the two, three and all four slopes indicated are equal, at ages 60 and 73, along with the critical F-ratios at the 95th percentiles of the F distribution with the corresponding degrees of freedom. At age 60, we cannot reject the equality for only one pair of the slopes, that of transfers (T) and pensions (P), over the income range. Equality of slopes for wages (W) and transfers cannot be rejected only around 24k and up. Besides these equalities, all tests are rejected at the 5% level and better. At age 70, there is still only one pair of slopes for which the null hypothesis of equality cannot be rejected in entire range: that of from transfers and from capital income. We cannot reject equality for the pair of slopes for wages and pensions in the lower half of the range, and for the pair of slopes for wages and transfers in the ranges below 6k and above 16k. The test that all three slopes for wages, transfers and pensions are equal cannot be rejected in the below 6k range.

Combining these test results with the slope information in Table 2.5, we have several observations. First of all, the slope from capital income appears to be among the steepest in both before- and after-retirement periods. It may reflect that capital income is to be regarded by the households as transitory component, because both intuition and using the theory would give this prediction.[24] Second, the slope from pension income remains among the lowest in both periods. Thus, pension income may be regarded one of the most predictable and stable sources, so an increase in pension income results in a lowest increase in the saving rate. Third, the slope from transfer income is among the lowest in the pre-retirement period (equal to that from pensions), yet it is among the highest in the after-retirement period (equal to that from capital income). Because the magnitude of the slope change between the two ages is affected by the other income levels between the two periods, so the dramatic reduction in wages from pre- to after-retirement period without dramatic increase in another (as capital income and pension income do) may largely contribute to this observation. Finally, the slope from wages is

[24] However, we should also aware that households with different sources of income are likely different as well. For example, some one with a larger portion of capital income may be, by nature, a saver, and people with pensions from their employers may well be more affluent, in the sense that they had better jobs, than those without.

higher than that from transfer at age 60 but is about the same or even lower at age 73. This change may still reflect the major structural change in the income composition between the pre- and after-retirement periods. Therefore, it is conceivable that the slopes of the two from wages and transfers would otherwise be about the same, and that the steepness of the two slopes may lie in between that of from capital income and that of from pensions, with a higher probability towards the latter one. At least we cannot reject that the three slopes from wages, transfers and pensions are equal at the lower range (less than 8k) of income.

4.1.4 The Marginal Effects of Income Components on Saving Rate Over the Ages

The above analysis focuses on saving behaviour as a function of each income component at a given point in time. We now wish to examine how the effect of income composition change on the saving rate for a typical consumer over his life span. We choose to input a series of five income levels equal to the averages at every age over the entire age span from Figure 3.2, and then calculate the marginal effects of the five incomes on the saving rate over the age span at these averages along with their standard errors. These results are reported in Table 2.7. As before, the 'other income' category is omitted from the table for simplicity.

The message from Table 2.7 is very clear. Although the effect of wages hardly changes in the entire age span while the effects of transfers and pensions rise with age, these three effects seem to be very similar in magnitudes with each other. However, the effect of capital income stays the highest over the ages despite its declining trend with age. All marginal effects in the table are significantly different from zero, as can be seen from their standard errors. To confirm these observations, we also performed the pair-wise and joint F-tests on the hypothesis of equality of marginal effects over the age span, and the results are reported in Table 2.8. As expected, for every pair of effects involving only wages (W), transfers (T) and pensions (P), the pair-wise equality F-tests all do not reject, so is the joint F-test of these three effects. On the other hand, all tests involving the effect of capital income (I) are strongly rejected. It is clear then that, for a typical consumer with the averages of each income source at every age over the age span, the increase in the saving rate in response to a unit increase in income source is the same whether the increase in income is from wages, transfers or pensions, but is definitely higher if the increase is from capital income.

The whole study above is based on the regression results in Table 2.2, in which income components and their cross terms can be freely examined from low to high levels without restriction, allowing us to be able to estimate the marginal change in saving rate to an extra unit increase of a particular source of income. These effects thus can be thought of as those from a one unit increase from consumers' budget. However, this form may omit some important issues. For example, total income is lower after retirement, but because we did not take into account this issue, the above results may also included the effect of lower total income on the saving rate. For these reasons, we turn to a different specification for the regression in the following section to examine the effect of income shares on saving rate, controlling for gross income.

4.2 Saving Rate and the Shares of Income Components

To study the effect of income sources on saving rate free from having the effect of changing level of total income mixed in, we specify the new saving rate regression to have a set of income share variables and their cross-terms[25] plus gross income and its squared term in the right-hand-side instead of levels of income components. Other variables are exactly the same as before. The complete specification and the regression result are displayed in Table 3.1 along with the p-values from a usual joint F-tests for the different control categories. With this specification, all coefficients of share variables and the estimated marginal effects of income shares on the saving rate, which will be presented later, would be based on a equal footing, that is, holding total income level constant.[26]

In this section, we first examine the life path of the saving rate, identifying again the pure income effect and the pure age effect on shaping saving behaviour, as in the previous section. We then directly go on to see the marginal effects of income shares on the saving rate over the life-cycle.

[25] Because the problem of perfect collinearity, one of five income share variables has to be dropped, which is chosen to be the wage share. For the same reason, the square terms of each share variable are also not included in the regression.

[26] It could have been thought that, even if we did not include gross income in regression, the specification using share variables 'controls' for total income. However, if the total income variables were absent from the regression, we could still not be sure of whether the share effects on saving rate were also affected by the level of total income.

4.2.1 Life-Cycle Path of Saving Behaviour

Table 3.1 reports the regression result which relate saving rate to the shares of income components and their cross terms, controlling for gross income. Other control variables in the regression are the same as before, and their coefficients are displayed on the right panel of the table. From the results on joint F-tests on the bottom of the table, we see that age and cohort effects are not significant at the 5% level, while others are. These are in essence the same as in saving rate regression on income component levels in the previous section.

We now try to answer the same questions as in the previous section: does the new saving rate regression in Table 3.1 pick up the 'dip' in the saving rate at retirement age as well, and if so, what is giving it? We use the same procedure as in the previous section. The picture in Figure 6.1a is obtained by first obtaining the predicted dependent variable, the saving rate, from the regression result in Table 3.1, and then grouping these predicted saving rates by age. We plot the medians of each age group over the ages, and the vertical bars are the 95% confidence bands for these age specific predicted medians. Thus, Figure 6.1a shows the total effect of all the right-hand-side variables in the regression on the saving rate over the ages. The shape in the figure is almost indistinguishable from that in Figure 5.2a of previous section, exhibiting a clear 'dip' at the retirement age. That is, the saving rate falls down when reaching retirement age, and then goes up again after retirement.

To examine what is giving the 'dip', we plot separately the age specific medians of the saving rate that is purely from the effect of three possible components: gross income, age and income shares.[27] They are shown in Figures 6.1b, 6.1c and 6.1d, respectively. These figures are obtained using the same procedure as before except that only the respective coefficients are used in the prediction. It is interesting to observe that the figures for pure gross income and for pure age are very similar to their counterparts in the previous section. The age profile from gross income declines with age, faster in the pre-retirement stage and never goes up, while the profile from pure age effect has a sharp rise only until after retirement. As to the effect of income shares, which is plotted in Figure 6.1d using all the coefficients of the share variables and their interaction terms, before the retirement age, it is virtually zero, while after retirement, it is negative throughout, although its value is very small at only around -.015%. It is very clear that the share effect alone does not give rise the 'dip' in the saving rate either. Thus, if we can be sure that the sharp rise in the late ages of the pure age effect is statistically significant, we can conclude that it is again the age effect that causes the rising saving rate after retirement, thereby forming the 'dip'.

As before, to assess whether the rise in the late ages of the pure age effect is significant, we run the regression again specifying a linear spline function for the age effect instead of fourth order polynomial. Two knot locations, the same as before at ages 66 and 69, are examined and their coefficients and test results are displayed in the bottom panel of Table 2.4. We note that the two choices of knot locations give almost the same results. The slope before age 66 (or 69) is not significantly different from zero (the t-ratio

[27] Assets is another possible variable affecting age profile of the saving rate. We examined an age profile derived purely from the assets coefficient, but the result indicates no any sign of giving an 'dip'. It is always decreasing with age, and the value is negative and very small (near zero). As noted before, other groups of variables may affect the height, but not the shape of the age profile.

on a1). The change of the slope after age 66 (or 69) from the slope before the age is not significant (the t-ratio on a2). The joint F-test that both slopes over the two age regimes are jointly zero (a1=a2=0) is also accepted. However, the most important test to our purpose, that the slope after age 66 (or 69) is zero (a1+a2=0) is clearly rejected. Thus, we can be sure that it is still the pure age effect that brings the saving rate to rise after the retirement age, which is the key step that gives rise to the 'dip' around the retirement age.

4.2.2 The Marginal Effect of Income Shares over the Life-Cycle

We have seen, in Figure 6.1d, that the combined effect of income shares and their interactions on the saving rate, net of any effects from gross income, age and the other control variables in the regression, has a distinct pattern: it is completely flat in the pre-retirement period, falls down right after retirement by a small amount and stays flat again until the end of age range.[28] It is also shown before that the income shares differ greatly between before and after retirement period. It is, therefore, interesting to see, controlling for gross income, if the saving rate still responds differently for different income portfolios, or different income component shares over the life cycle.

Because the income components are now expressed as fractions of gross income, more complications arise in calculating the marginal effect. The marginal effect of each individual share of component depends on all the other shares of components as before, and so a set of all five income shares at every age is still needed as inputs to predict the results. We also have to consider that, to increase a small fraction, say 1%, of a particular income to examine its effect on saving rate, the total shares of the other incomes have to be decreased by the same amount. We do this by decreasing each remaining income share by a fraction of the amount of increase, which depends on its own share out of remaining total shares. For example, if transfer share is increased by 1% from its 50% level in order to examine its marginal effect, there must be a decrease of 1% from the remaining 50% of the gross income. If it is also known that the share of pensions is 20%, of capital income, 15%, of wages, 10% and of other income, 5% at a particular age, then the shares of pensions, capital income, wages and other income will be assigned to decrease by (20/50)×1%, (15/50)×1%, (10/50)×1% and (5/50)×1%, respectively. Using this rule, for every given portfolio of income at a certain age, a set of five marginal effects for each share of income can be calculated using the regression results from Table 3.1. Note that, because saving rate and income components are positively correlated as can be seen in the previous section, the increase of one income component will generate a positive saving while the decrease the same amount of the other components will generate a negative saving. As a consequence, the marginal effect of any income share on the saving rate calculated using the above rule can be either positive, negative or zero,[29] depending on which force is dominant.

For convenience, we use raw average shares of income components for every age from the data set as the input to calculate the marginal effect over lifetime. Figure 6.2

---

[28] We note again that the vertical axis and scales do not measure the level of the curve in the figure, which is determined by the other explanatory variables in the regression. Only the shape is important here. The 95% confidence bands for these age specific medians is almost the same as the medians themselves, so they are omitted in the figure.

[29] This is different from the marginal effect in the previous section where an extra unit of income always results in a positive saving rate.

plots these averages of the income shares over the entire age range. As before, wage share and transfer share are by far the most important component during pre- and after-retirement periods, respectively. Pension and capital income shares both have non-negligible contributions to the total income, with pension share increased more from pre- to post- retirement than that of capital income share. The share of 'other income' is always very small throughout the age span. We will again focus our analysis on the first four income components and omit the 'other income' effect in the figures below, though its shares over the ages are always used for calculating all the marginal effects of the other income shares.

Figure 6.3 shows the main results on the marginal effect of income shares on the saving rate, controlling for gross income. The vertical axis in the figure gives the percentage change in the saving rate resulting from a 1% increase in the indicated share of income and 1% decrease in the remaining share of all the other incomes. The change of saving rate thus can be either positive, negative, or zero. The effect of wage share is again very flat at around zero all the way until reaching the retirement age, then falls to a negative value around half of a one tenth percent and stays there afterwards. The marginal effect of transfer share is always negative at all ages, but is nevertheless increasing until reaching retirement age, where it joins the same level as the marginal effect of wage share afterwards. The marginal effect of capital income share is positive throughout the ages and very high before retirement; it then falls sharply and remains at low level over the retirement period. The most interesting observation from the figure is the marginal effect of pension share. Remember that, in the previous section, the effect of pension income remains the lowest among all components at all ages for an extra unit of income. Although it is still low (and negative) in the ages before retirement in the present case, but starting in age 64 when the transfer share started climbing higher (see Figure 6.2), the marginal effect of pension share also increases sharply, from negative to positive and remains the highest in the later ages. This feature is surely attributable to the high and positive (and significant) correlation between the effects of the two shares as is evidenced by the coefficient and its significance level on their cross-term in Table 3.

Figure 6.4 also plots the t-ratios for the tests of significance on marginal effects of income shares over the ages. Notice that the marginal effect of each income share at a given age is a linear function of the coefficients of the share variables, and each share of income component at that age act as known parameters in that function. Because different composition of income is used in the calculation of the marginal effect at different ages, the t-ratios would also be different at each age, although we use only one variance-covariance matrix of coefficients available from the regression output. As the figure reveals, in the pre-retirement period, only the effect of capital income share is statistically significant within ages 59 to 65. Consumers would save more only if the share of capital income is higher, but not the shares of the other incomes, given the total income level (i.e., given what is already saved according to the level of total income). In the after-retirement period, however, the share of capital income is no longer significant while the t-ratio on pension share starts shooting up, climbing toward 2 and later exceeding 2. At the same time, the t-ratio for the effect of transfer share is also increasing (in absolute value) and later almost reaching -2. The effect of wage share remains insignificant throughout. Thus, the message from Figure 6.3 is that, an increase in the share of pension income during the retirement period would result in more saving while an increase in the share of transfers would tend to encourage more consumption, given total income level. These patterns are more likely the older the consumers. The shares of capital income and wages do not have any influence on the saving behaviour once consumers are retired.

In Table 3.2, we also provide the results on pair-wise and joint F-tests on the equality of the indicated marginal effects. The two columns on the right of the table tells us that, collectively, we accept the hypothesis that the effects of all four shares are equal, and that the effects of wage, transfer and pension shares are equal over the age span. However, these joint tests may miss some subtle differences within different pairs of the marginal effects. From the F-ratios on the pair-wise tests of equality, two observations deserve our attention. We see that, before retirement, the saving rate responds differently between the increases in share of transfers and share of capital income, while in the after retirement period, it differentiates between share of transfers and share of pensions.

These results are certainly different from the results in Tables 2.7 and 2.8 where we do not control for gross income. The main differences are: (1) in the previous case, the effect of capital income is very high and is not equal to any one of the other income sources over the entire age span, while in this case when we control for gross income, its effect loses much of the ground, and only in the pre-retirement period does its effect show up and is different only to that of transfers; (2) in the previous case, transfers and pensions both have the same effects on the saving rate over the age span, while in the present case, although the two effects are still the same in the pre-retirement period, they are significantly different in the period after-retirement. An increase in the share of pensions would result in a significantly higher (and the highest among the four) saving rate, while an increase in the share of transfers would tend to encourage more consumption, the older the consumers. These differences uncover an important characteristics of saving behaviour for the elderly: in transition from work to retirement when income composition undergoes a major change, consumers' preferences, given their total income, will change too.

With respect to the large and significant effect of the share of capital income in the pre-retirement period, one explanation is simply that capital income itself reflects the intensity of the desire by the consumers for savings to prepare for their retirement while they are still working but already expecting retirement. This interpretation is in accordance with the standard life-cycle motive for saving. It may also reflect that the higher share of capital income increases the risk of the income portfolio, thereby increasing the saving rate. However, in the after-retirement period, the uncertainty in capital income does not matter any more. Instead, the saving rate increases whenever the share of pensions increases, and tends to decrease whenever the share of transfers increases during the retirement period. One reason can be that because transfer income is indexed while pensions do not, so an increase in the share of pensions increases the risk of income portfolio and induces saving, and vise versa for transfers. But again, if only the uncertainty aspect is the cause, this interpretation cannot answer why the uncertainty matters in pensions and transfers, and does not matter in capital income. A more plausible one can be that, while government transfers include ingredients that often benefit both spouses (C/QPP, OAS, GIS or welfare receipts), pension income is more often accompanying only one spouse (usually the head) for as long as he/she lives. In other words, transfer income is perceived as relatively more permanent than pension income by the elderly couples as a whole. As a consequence, a higher share of transfers gives more security feelings and confidence to both spouses and so tends to encourage consumption. A higher share of pensions, on the other hand, may reinforce the desire to leave enough assets for the survival spouse in the case that one of the spouses (more often the head, too) dies earlier, and so produce a positive and significant effect on saving. This pattern of the saving response to the two income sources becomes more apparent the older the couples. This may explain the observed responses of savings to transfer and pension income in their older ages.

5 Conclusions

Because of the transition from work to retirement, income sources and income composition of the elderly couples in our sample change in fundamental ways. Wage earnings are replaced by government transfers and pensions, and their total incomes fall to a lower level after retirement, although capital income remains at about the same level over the age span. Given these income composition profiles, the behaviour of the saving rate is analyzed over the life cycle, both as a function of income sources and as a function of the shares of income components controlling for total income. There are several important findings.

First, we have shown that, whether we relate the saving rate to income component levels or component shares, we both see a 'dip' at retirement on the age profile of the saving rate predicted using all the regression coefficients. This is the same pattern shown on my first essay where income variables were not included in the saving rate regression.

Second, further investigation reveals that neither the effect of income sources nor the effect of age alone gives rise to this 'dip'. The saving rate profile originating from the pure income effect declines from the pre-retirement stage to just after retirement, but flattens out thereafter. The saving rate profile from the pure age effect is very flat in the pre-retirement period, and rises sharply after retirement. The test that the age effect after retirement is zero is clearly rejected, giving the conclusion that it is the combined effect of both income sources and age that gives rise to this saving 'dip' at retirement. The rising pure age effect after retirement is the key step to shape the rising trend of the observed saving rate after retirement for the elderly, which contradicts an implication of the pure life-cycle hypothesis.

Third, from the regression where income sources are measured as levels and gross income is not controlled for, for a typical consumer with the averages of each income source at every age over the age span, the increase in the saving rate in response to a unit increase in income source over the life-cycle is the same whether the increase in income is from wages, transfers or pensions, but is definitely higher if the increase is from capital income.

Fourth, when the regression is specified to include the shares of income components given the gross income, for a typical consumer with the averages of each share of income source at every age over the age span, the saving rate responds differently between the increases in share of transfers and share of capital income in the pre-retirement stage, while it differentiates between share of transfers and share of pensions in the after-retirement stage. Test results also show that, in the pre-retirement stage, the saving rate would increase only if the share of capital income increases; in the after-retirement stage, an increase in the share of pensions would result in a significantly higher saving rate, while an increase in the share of transfers would tend to encourage more consumption, the older the consumers.

Our interpretation for this saving behaviour is that, in the pre-retirement period, the positive and significant effect of capital income on the saving rate may simply reflect the life-cycle motive of saving, i.e., save for retirement; in the after-retirement period, the different response of the saving rate to transfers and pensions may best be attributed to households' perceptions about the permanence of the two income sources, in the sense that, while transfer income accompanies both spouses, pension income may exist for (mostly) only one spouse for as long as he/she lives. The desire to leave enough assets for the survival spouse may lead to the observed positive and significant effect of pensions on the saving rate in the late ages.

The above findings also uncover an important characteristic about saving behaviour for the elderly couples: in transition from work to retirement when income composition undergoes a major change, consumers' preferences, given their total income, will change too. Therefore, maximizing the sum of the same instantaneous utility functions for all ages spanning two or more major life-turning stages to derive the optimal consumption policy may not be a suitable model for elderly couples, and the theoretical results so derived may well not match the empirical evidence.

Table 1: OLS Regressions for Gross Income and Its Components

	Gross Income	Wage Income	Transfer Income	Capital Income	Pension Income	Other Income
Age	1.4378	2.908**	-.9564**	-.5565	-.3169	.3593
Age^2	-.2628	-.5866**	.1559**	.1150	.1236	-.0707
Age^3	.0168	.0343**	-.0037	-.0089	-.0092*	.0043
Age^4	-.0003	-.0006**	-.00002	.0002	-.0002*	-.0001
Age76+ spline	.1194	.1429	.2261**	-.2037*	.1018	.0558
Inflation rate	-.0587	.3139**	-.0599*	-.1368*	-.2010**	.0251
Interest rate	.1885	-.2021*	.0221	.2195**	.1883**	-.0394
Unempl't rate	.3177	.3051*	-.1477**	.3872**	-.3022**	.0754
Cohort 1	-5.434**	-.5712	-4.420**	2.495**	-2.777**	-.1601
Cohort 2	-6.639**	-1.847	-3.530**	2.002*	-2.926**	-.3376
Cohort 3	-5.432**	-1.112	-3.438**	2.034*	-2.370**	-.5458
Cohort 4	-4.104**	-1.141	-2.754**	2.408**	-1.802**	-.8152
Cohort 5	-2.051	.3556	-2.032**	1.667*	-1.966**	-.0753
Cohort 6	-3.197**	-.1118	-1.299**	.9551	-2.076**	-.6644
Cohort 7	-1.235	-.2205	-1.192**	1.031**	-.4018	-.4513
Cohort 8	-1.412	-.0599	-.6967*	.4181	-.4349	-.6388
Cohort 9	-.8291	.1640	-.8449**	.2802	.1422	-.5706
Head work only	-7.530**	-9.764**	.5809**	.2882	1.191**	.1741
Wife work only	-9.129**	-16.47**	1.360**	1.920**	4.023**	.0009
Both not work	-17.64**	-28.65**	3.358**	1.957**	5.104**	.5899
High school	4.469**	1.627**	-.1798	1.085**	1.591**	.3455
College	9.618**	2.983**	-.4551*	2.910**	4.020**	.1609
University	31.64**	13.19**	-.5168*	6.822**	10.66**	1.487**
French language	-3.153**	-1.705*	.0782	-1.410*	-.4242	.3080
Other language	-3.631**	-.8038	-.3400*	-.6540	-1.761**	-.0718
Quebec	4.759**	2.795**	-.2500	2.691**	-.3633	-.1139
Ontario	4.623**	2.347**	-.3886*	1.624**	.8621**	.1781
Prairie	3.179**	.8410	-.2540	2.221**	.3557	.0154
British Columbia	3.747**	.4787	-.1470	2.294**	.7929*	.3277
In small city	-2.714**	-.8821*	.0368	-.5419	-.9738**	-.3535
In rural area	-4.917**	-1.702**	.3575	-1.171*	-1.908**	-.4932
Not own home	-2.204**	.2074	.3176*	-1.745**	-.7250**	-.2593
_Constant	30.00**	27.98**	4.115**	-3.570**	1.321	.1491
Pseudo R-square	.3638	.6354	.6216	.0888	.2546	.0048
No. obs.	4018	4018	4018	4018	4018	4018

1. The dependent variables are measured in 1000s. Age is measured as (head age - 53).
2. Age76+ Spline is restricted to: continuous and smooth from age 75; having zero slope at 76+.
3. *: significant at 5% level; **: significant at 1% level.

Table 2.1: Median Regression: Saving and Gross Income.

	Saving		Saving Rate	
	Coef.	t	Coef.	t
Gross inc.	.2233	19.83	.0119	20.62
Gross inc. sq.	.0012	13.56	-.00006	-12.11
Assets	-.0020	-2.28	-.00004	-0.86

Table 2.3: P-Values on Joint F-Tests in Table 2.3

	Saving	Saving rate
Age effect (4)	.6233	.2205
Macro effect (3)	.0010	.0002
Cohort effect (9)	.0235	.0997
Province effect (4)	.0253	.0189
Area effect (2)	.0553	.0529

Table 2.4: Tests on Age Effect Using Linear Splines

	Coef	T	Test Null:	F-ratio	F*(95%)
Saving Regression:					
a1: Age	.1532	1.00	a1+a2 = 0	1.24	3.84
a2: Age spline (58)	-.2135	-1.22	a1+a2+a3 = 0	1.72	3.84
a3: Age spline (69)	.1308	1.69	a1= a2 = a3 = 0	1.06	2.60
Saving Rate Regression: (income sources)					
Knot at age 66:					
a1: Age	-.0011	-0.47	a1+a2 = 0	7.28	3.84
a2: Age spline (66)	.0064	2.26	a1 = a2 = 0	4.00	3.00
Knot at age 69:					
a1: Age	.0002	0.10	a1+a2 = 0	6.25	3.84
a2: Age spline (69)	.0057	1.88	a1 = a2 = 0	3.12	3.00
Saving Rate Regression: (income shares)					
Knot at age 66:					
a1: Age	.0004	0.15	a1+a2 = 0	4.67	3.84
a2: Age spline (66)	.0043	1.39	a1 = a2 = 0	2.34	3.00
Knot at age 69:					
a1: Age	.0007	0.31	a1+a2 = 0	4.29	3.84
a2: Age spline (69)	.0050	1.44	a1 = a2 = 0	2.16	3.00

Table 2.2: Median Regressions: Saving and Income Components.

	Saving		Saving Rate	
	Coef.	t	Coef.	t
Wage	.2748	16.61	.0140	16.72
Wage sq.	.0001	0.78	-.00008	-9.45
Transfer	.3370	6.18	.0164	6.15
Transfer sq.	-.0001	-0.07	-.00009	-.958
Capital	.4449	13.24	.0188	11.53
Capital sq.	-.0017	-5.71	-.0001	-8.24
Pension	.3186	9.47	.0138	8.65
Pension sq.	-.0033	-5.35	-.0001	-4.74
Other	.6450	14.17	.0129	5.97
Other sq.	.0017	4.10	-.00005	-1.92
wage×transfer	-.0001	-0.11	-.0003	-4.08
wage×capital	.0068	10.59	-.00005	-1.73
wage×pension	-.0024	-2.19	-.0002	-3.83
wage×other	.0037	7.44	-.00007	-3.06
transfer×capital	-.0029	-1.60	-.0004	-4.11
transfer×pension	-.0012	-0.52	-.0003	-2.78
transfer×other	.0053	2.25	.0002	1.04
capital×pension	.0073	7.69	1.74e-7	0.004
capital×other	-.0010	-0.56	-.00002	-0.14
pension×other	-.0025	-4.31	-.0001	-2.00
Assets	-.0054	-3.61	-.0002	-3.13
Age	.2063	0.55	.0041	0.23
Age^2	-.0315	-0.52	-.0008	-0.26
Age^3	.0014	0.39	.0005	0.26
Age^4	-.00002	-0.26	-7.49e-7	-0.21
Age76+ Spline	-.0299	-0.54	-.0018	-0.65
Inflation rate	.0664	1.45	.0043	1.95
Interest rate	-.0382	-0.70	-.0021	-0.79
Unempl. Rate	.1915	2.68	.0089	2.55
Cohort 1	2.288	3.72	.1047	3.49
Cohort 2	2.144	3.79	.0816	2.96
Cohort 3	1.856	3.42	.0753	2.85
Cohort 4	1.188	2.29	.0429	1.70
Cohort 5	1.574	3.25	.0586	2.49
Cohort 6	1.425	3.19	.0608	2.80
Cohort 7	.8270	1.89	.0441	2.07
Cohort 8	1.023	2.51	.0366	1.84
Cohort 9	.8192	2.01	.0281	1.41
Quebec	-.9012	-3.10	-.0378	-2.67
Ontario	-.6401	-2.39	-.0327	-2.51
Prairie provinces	-.3725	-1.43	-.0076	-0.60
British Columbia	-.5032	-1.71	-.0127	-0.89
Small city	-.1883	-0.85	-.0029	-0.27
Rural area	.5900	1.99	.0328	2.28
_cons	-6.683	-6.84	-.3048	-6.38
Pseudo R-square	.2234		.0945	
No. obs.	4018		4013	

1. Income variables are measured in 1000s. Age is measured as (head age - 53).
2. Age76+ Spline is restricted to: continuous and smooth from age 75; having zero slope at 76+.

Table 2.5: Slopes (%) of the Saving Rate Functions of Incomes

$1000s	Wage	s.e*	Transfer	s.e	Capital	s.e	Pension	s.e
At Age 60:								
0	1.29	*0.08*	0.72	*0.26*	1.69	*0.16*	0.75	*0.16*
2	1.26	*0.07*	0.69	*0.24*	1.65	*0.15*	0.70	*0.16*
4	1.22	*0.07*	0.66	*0.22*	1.61	*0.15*	0.64	*0.15*
6	1.19	*0.07*	0.62	*0.20*	1.57	*0.14*	0.59	*0.15*
8	1.16	*0.07*	0.59	*0.19*	1.53	*0.14*	0.54	*0.15*
10	1.12	*0.06*	0.55	*0.18*	1.49	*0.14*	0.49	*0.14*
12	1.09	*0.06*	0.52	*0.18*	1.45	*0.13*	0.44	*0.14*
14	1.06	*0.06*	0.49	*0.19*	1.41	*0.13*	0.39	*0.14*
16	1.02	*0.05*	0.45	*0.20*	1.37	*0.13*	0.34	*0.14*
18	0.99	*0.05*	0.42	*0.22*	1.32	*0.12*	0.29	*0.14*
20	0.96	*0.05*	0.38	*0.24*	1.28	*0.12*	0.23	*0.14*
22	0.92	*0.05*	0.35	*0.27*	1.24	*0.12*	0.18	*0.14*
24	0.89	*0.05*	0.32	*0.30*	1.20	*0.12*	0.13	*0.15*
26	0.86	*0.04*	0.28	*0.32*	1.16	*0.11*	0.08	*0.15*
28	0.83	*0.04*	0.25	*0.35*	1.12	*0.11*	0.03	*0.15*
30	0.79	*0.04*	0.21	*0.39*	1.08	*0.11*	-0.02	*0.16*
At Age 73:								
0	0.92	*0.09*	1.20	*0.25*	1.38	*0.13*	0.86	*0.12*
2	0.89	*0.08*	1.17	*0.22*	1.34	*0.13*	0.81	*0.12*
4	0.85	*0.08*	1.14	*0.19*	1.29	*0.12*	0.76	*0.11*
6	0.82	*0.08*	1.10	*0.16*	1.25	*0.12*	0.70	*0.10*
8	0.79	*0.08*	1.07	*0.14*	1.21	*0.12*	0.65	*0.09*
10	0.75	*0.08*	1.03	*0.13*	1.17	*0.12*	0.60	*0.09*
12	0.72	*0.08*	1.00	*0.12*	1.13	*0.11*	0.55	*0.08*
14	0.69	*0.08*	0.97	*0.12*	1.09	*0.11*	0.50	*0.08*
16	0.65	*0.07*	0.93	*0.14*	1.05	*0.11*	0.45	*0.08*
18	0.62	*0.07*	0.90	*0.16*	1.01	*0.11*	0.40	*0.08*
20	0.59	*0.07*	0.86	*0.18*	0.97	*0.11*	0.35	*0.08*
22	0.55	*0.07*	0.83	*0.21*	0.93	*0.11*	0.29	*0.08*
24	0.52	*0.07*	0.79	*0.24*	0.89	*0.10*	0.24	*0.09*
26	0.49	*0.07*	0.76	*0.27*	0.85	*0.10*	0.19	*0.09*
28	0.46	*0.07*	0.73	*0.31*	0.81	*0.10*	0.14	*0.10*
30	0.42	*0.07*	0.69	*0.34*	0.76	*0.10*	0.09	*0.10*

* standard errors (%) of the slopes.

Table 2.6: F-ratios on Pairwise and Joint Tests of Equality of Slopes

$1000s	W=T	W=I	W=P	T=I	T=P	I=P	All Eq.	W=T=P
At Age 60:								
0	4.78	6.13	10.01	9.64	0.01	17.28	7.16	7.30
2	5.75	6.21	11.47	11.11	0.00	18.76	8.00	8.43
4	6.84	6.30	13.06	12.70	0.00	20.31	8.91	9.63
6	7.90	6.38	14.76	14.28	0.01	21.92	9.86	10.84
8	8.72	6.45	16.54	15.62	0.04	23.56	10.76	11.94
10	9.06	6.53	18.36	16.45	0.07	25.21	11.52	12.82
12	8.79	6.59	20.14	16.54	0.12	26.82	12.07	13.44
14	8.02	6.65	21.83	15.83	0.17	28.36	12.43	13.83
16	6.99	6.69	23.35	14.48	0.21	29.78	12.65	14.09
18	5.93	6.72	24.64	12.77	0.25	31.03	12.77	14.27
20	4.96	6.74	25.66	10.99	0.28	32.07	12.81	14.38
22	4.14	6.73	26.38	9.32	0.29	32.88	12.79	14.43
24	3.46	6.71	26.79	7.85	0.30	33.41	12.71	14.40
26	2.91	6.66	26.90	6.61	0.31	33.67	12.55	14.27
28	2.47	6.58	26.75	5.57	0.31	33.66	12.34	14.06
30	2.11	6.48	26.38	4.72	0.31	33.39	12.06	13.77
At Age 73:								
0	1.35	8.82	0.18	0.40	1.69	8.09	3.69	0.85
2	1.73	8.88	0.34	0.46	2.38	9.21	4.00	1.19
4	2.26	8.92	0.57	0.53	3.38	10.47	4.42	1.69
6	2.97	8.95	0.90	0.60	4.82	11.86	4.98	2.41
8	3.85	8.96	1.32	0.66	6.74	13.38	5.72	3.38
10	4.69	8.94	1.86	0.68	8.91	14.98	6.60	4.47
12	5.05	8.91	2.52	0.65	10.56	16.65	7.43	5.29
14	4.67	8.84	3.26	0.56	10.89	18.30	8.01	5.48
16	3.81	8.75	4.07	0.44	9.92	19.86	8.33	5.21
18	2.91	8.63	4.89	0.33	8.39	21.25	8.52	4.87
20	2.18	8.48	5.65	0.23	6.89	22.37	8.64	4.63
22	1.64	8.29	6.32	0.16	5.64	23.15	8.69	4.49
24	1.26	8.08	6.85	0.12	4.67	23.57	8.65	4.42
26	0.99	7.84	7.23	0.08	3.93	23.61	8.50	4.37
28	0.79	7.56	7.48	0.06	3.36	23.30	8.27	4.31
30	0.64	7.27	7.60	0.04	2.91	22.70	7.98	4.24
F*(95%)	3.84	3.84	3.84	3.84	3.84	3.84	2.60	3.00

Note: W=wage income, T=transfer income, I=capital income, P=pension income.

Table 2.7: Marginal Effect (%) of Incomes on Saving Rate

Age	Wage	s.e*	Transfer	s.e	Capital	s.e	Pension	s.e
55	0.83	*0.04*	0.66	*0.28*	1.62	*0.16*	0.66	*0.18*
56	0.83	*0.05*	0.66	*0.28*	1.63	*0.16*	0.66	*0.18*
57	0.84	*0.05*	0.68	*0.28*	1.63	*0.16*	0.67	*0.18*
58	0.84	*0.04*	0.68	*0.27*	1.63	*0.15*	0.68	*0.17*
59	0.85	*0.04*	0.69	*0.26*	1.62	*0.15*	0.68	*0.16*
60	0.84	*0.04*	0.70	*0.25*	1.60	*0.15*	0.69	*0.16*
61	0.85	*0.04*	0.72	*0.23*	1.58	*0.14*	0.70	*0.15*
62	0.84	*0.04*	0.74	*0.22*	1.56	*0.14*	0.70	*0.14*
63	0.85	*0.04*	0.77	*0.20*	1.53	*0.13*	0.71	*0.13*
64	0.85	*0.05*	0.80	*0.18*	1.50	*0.13*	0.72	*0.12*
65	0.86	*0.05*	0.85	*0.16*	1.47	*0.13*	0.74	*0.11*
66	0.87	*0.06*	0.91	*0.14*	1.44	*0.12*	0.77	*0.09*
67	0.87	*0.07*	0.94	*0.13*	1.41	*0.12*	0.77	*0.09*
68	0.86	*0.07*	0.95	*0.12*	1.38	*0.12*	0.76	*0.09*
69	0.85	*0.07*	0.96	*0.12*	1.36	*0.12*	0.75	*0.09*
70	0.84	*0.08*	0.98	*0.12*	1.34	*0.12*	0.74	*0.10*
71	0.83	*0.08*	0.98	*0.12*	1.32	*0.12*	0.73	*0.10*
72	0.83	*0.08*	0.98	*0.12*	1.31	*0.12*	0.72	*0.10*
73	0.82	*0.08*	0.98	*0.12*	1.30	*0.12*	0.72	*0.10*
74	0.83	*0.08*	0.98	*0.12*	1.30	*0.12*	0.72	*0.10*
75	0.84	*0.08*	0.98	*0.12*	1.31	*0.12*	0.75	*0.10*
76	0.86	*0.08*	0.98	*0.12*	1.32	*0.12*	0.77	*0.09*

* Standard errors (%) of the marginal effects.

Table 2.8: F-ratios on Tests of Equality of Marginal Effects Over Ages

Age	W=T	W=I	W=P	T=I	T=P	I=P	All Eq.	W=T=P
55	0.39	25.24	0.88	8.63	0.00	15.70	8.76	0.63
56	0.39	25.56	0.90	8.72	0.00	16.01	8.85	0.64
57	0.37	25.66	0.92	8.76	0.00	16.39	8.86	0.64
58	0.36	25.91	0.96	8.93	0.00	16.80	8.93	0.66
59	0.35	26.07	1.00	9.11	0.00	17.28	8.96	0.68
60	0.33	26.22	1.05	9.36	0.00	17.82	9.00	0.71
61	0.30	26.10	1.11	9.59	0.01	18.45	8.96	0.74
62	0.25	25.84	1.18	9.78	0.03	18.92	8.90	0.76
63	0.17	24.95	1.25	9.93	0.07	19.56	8.66	0.76
64	0.08	23.71	1.31	9.94	0.16	19.91	8.36	0.73
65	0.01	21.65	1.29	9.59	0.34	19.89	7.85	0.66
66	0.08	18.29	1.09	8.43	0.77	18.88	7.02	0.60
67	0.30	16.22	0.97	7.46	1.26	17.75	6.52	0.72
68	0.60	14.70	0.91	6.54	1.79	16.69	6.15	0.92
69	0.92	13.37	0.85	5.61	2.30	15.61	5.82	1.15
70	1.23	12.17	0.80	4.68	2.75	14.53	5.50	1.38
71	1.43	11.42	0.78	4.08	3.01	13.80	5.30	1.52
72	1.55	10.82	0.75	3.65	3.15	13.19	5.12	1.59
73	1.56	10.54	0.74	3.50	3.13	12.87	5.01	1.59
74	1.44	10.45	0.71	3.60	2.98	12.74	4.93	1.51
75	1.21	10.31	0.63	3.77	2.70	12.52	4.77	1.35
76	0.95	10.32	0.55	4.07	2.30	12.41	4.66	1.15
F*(95%)	3.84	3.84	3.84	3.84	3.84	3.84	2.60	3.00

Note: W=wage income, T=transfer income, I=capital income, P=pension income.

Table 3.1: Median Regression:
Saving Rate and the Shares of Income Components

	Coeff.	t		Coeff.	t
shTransfer	-.0285	-1.16	Age	-.0003	-0.02
shCapital	.0244	0.52	Age^2	.0002	0.08
shPension	-.1121	-2.82	Age^3	-.00002	-0.12
shOther	.4785	3.22	Age^4	7.71e-7	0.20
shWage×shTrans	-.0846	-0.91	Age76+ spline	-.0029	-1.04
shWage×shCapital	.1924	1.36	Inflation rate	.0045	1.92
shWage×shPension	.0036	0.02	Interest rate	-.0030	-1.10
shWage×shOther	-.5582	-1.50	Unempl.t rate	.0117	3.21
shTrans×shCapital	-.0696	-0.65	Cohort 1	.1103	3.54
shTrans×shPension	.2307	2.46	Cohort 2	.1021	3.56
shTrans×shOther	-.7691	-2.15	Cohort 3	.0835	3.03
shCapital×shPension	.2764	1.64	Cohort 4	.0510	1.93
shCapital×shOther	-.3928	-0.72	Cohort 5	.0724	2.95
shPension×shOther	-.1278	-0.24	Cohort 6	.0617	2.71
Gross income	.0110	14.68	Cohort 7	.0471	2.11
Gross income^2	-.00005	-9.18	Cohort 8	.0511	246
Assets	-.00008	-1.37	Cohort 9	.0380	1.84
			Quebec	-.0430	-2.90
			Ontario	-.0418	-3.18
			Prairie provinces	-.0129	-0.97
			British Columbia	-.0250	-1.68
			Small city	-.0050	-0.45
Pseudo R-square:	.0885		Rural area	.0459	3.05
No. Observations:	4013		_Constant	-.2580	-5.11

P-Values from Joint F-tests:

Age effect (4)	.2392	Province effect (4)	.0066
Macro effect (3)	.0000	Area effect (2)	.0048
Cohort effect (9)	.0547		

1. Income variables are measured in 1000s. Age is measured as (head age - 53).
2. Age76+ spline is restricted to: continuous and smooth from age 75; having zero slope at 76+.

Table 3.2: F-ratios on Tests of Equality of Marginal Effects of Income Shares

Age	W=T	W=I	W=P	T=I	T=P	I=P	All Eq.	W=T=P
55	0.86	1.30	0.48	3.98	0.03	2.58	1.52	0.50
56	0.75	1.61	0.35	4.04	0.01	2.78	1.55	0.42
57	0.61	2.12	0.11	4.26	0.08	2.56	1.56	0.31
58	0.97	1.84	0.32	4.18	0.05	2.62	1.56	0.53
59	1.31	2.37	0.26	4.44	0.13	2.53	1.60	0.72
60	1.14	2.59	0.31	4.55	0.06	2.81	1.66	0.65
61	1.03	2.51	0.41	4.32	0.02	2.96	1.64	0.64
62	1.04	2.83	0.42	4.34	0.02	3.00	1.65	0.70
63	1.04	3.53	0.39	4.54	0.04	3.10	1.70	0.77
64	0.63	4.04	0.37	4.39	0.01	3.36	1.72	0.65
65	0.88	3.28	0.16	4.70	1.01	1.50	1.63	0.57
66	0.00	2.03	1.40	2.47	1.62	0.29	1.25	1.07
67	0.00	1.41	1.82	2.00	2.74	0.00	1.41	1.64
68	0.04	1.40	1.96	1.41	2.28	0.00	1.27	1.53
69	0.01	1.08	2.44	1.76	4.14	0.12	1.77	2.36
70	0.01	0.93	2.35	1.60	4.15	0.17	1.73	2.35
71	0.00	0.97	2.43	1.27	3.79	0.16	1.64	2.26
72	0.04	0.77	2.53	1.58	4.76	0.35	1.88	2.62
73	0.01	0.97	2.50	1.14	3.65	0.18	1.60	2.21
74	0.00	0.84	2.49	1.17	3.98	0.26	1.66	2.33
75	0.20	0.30	2.82	1.22	5.84	1.13	2.09	3.09
76	0.16	0.36	2.68	1.23	5.47	0.95	1.99	2.92
F*(95%)	3.84	3.84	3.84	3.84	3.84	3.84	2.60	3.00

Note: W=wage income, T=transfer income, I=capital income, P=pension income.

Fig. 1.1: Mean Gross Income by Age and Year

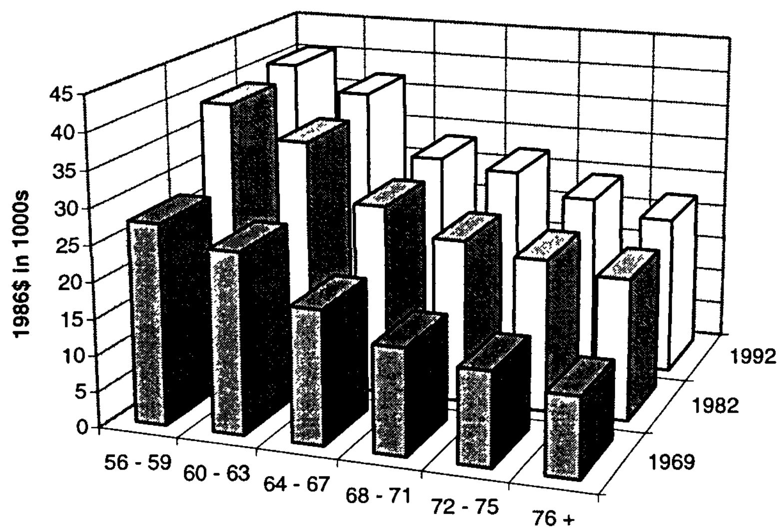


Fig. 1.2: Mean Wage Income by Age and Year

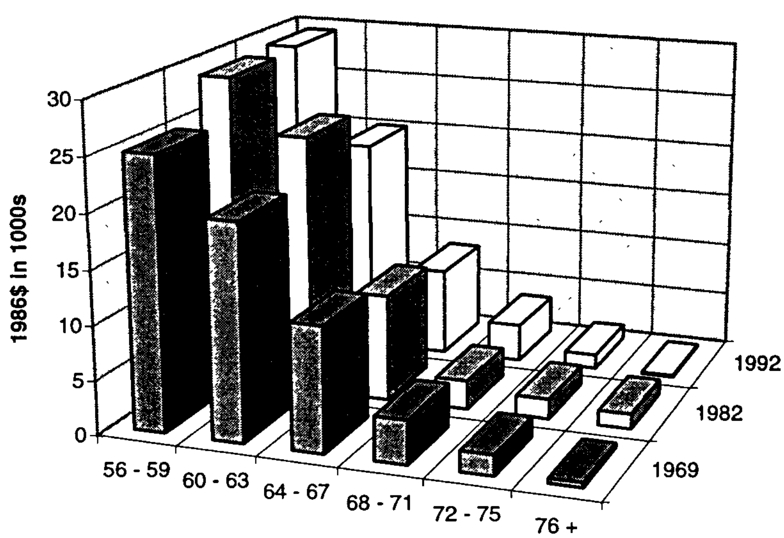


Fig. 1.3: Mean Transfer Income by Age and Year

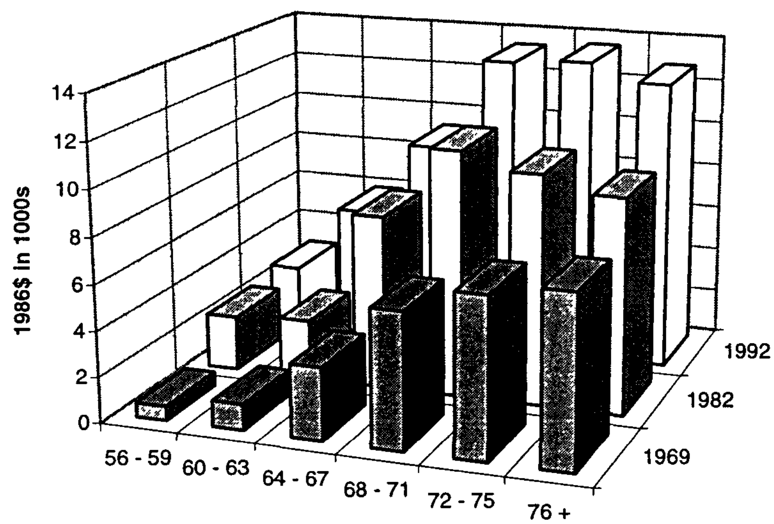


Fig. 1.4: Mean Investment Income by Age and Year

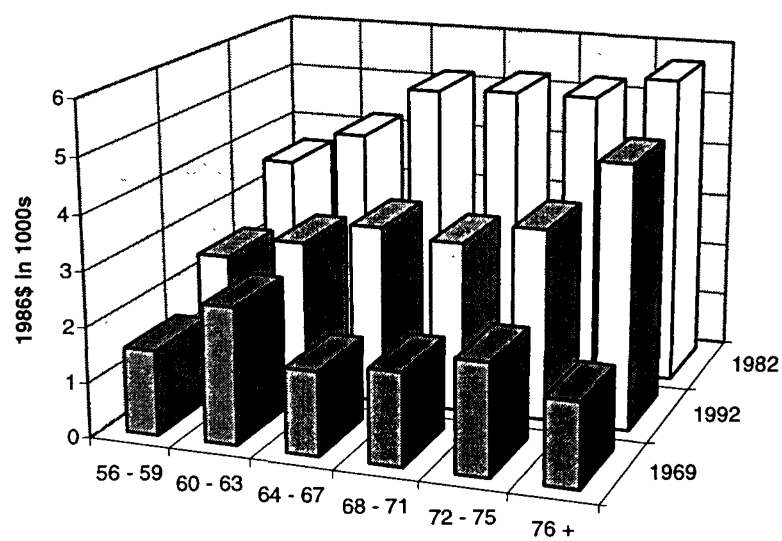


Fig. 1.5: Mean Pension Income by Age and Year

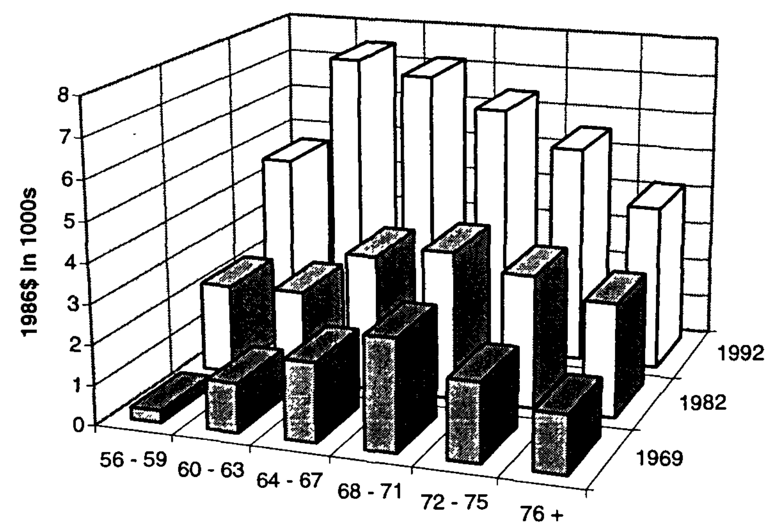


Fig. 1.6: Mean Other Income by Age and Year

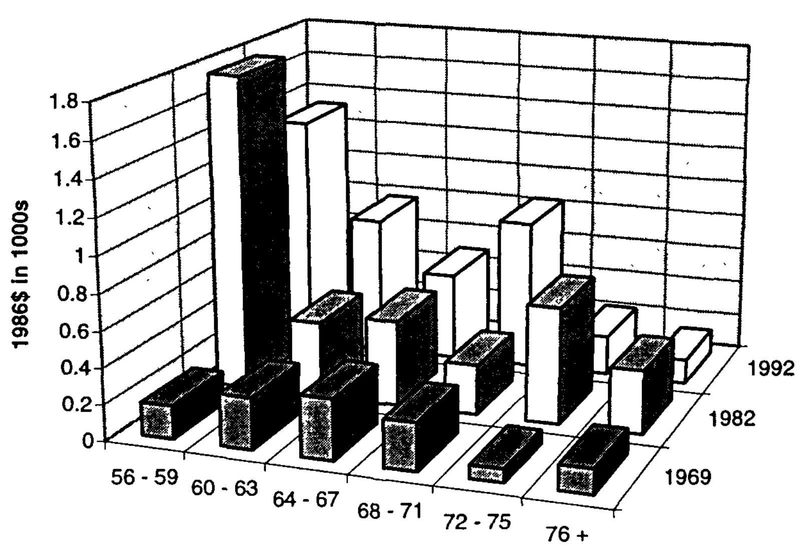


Fig. 2.1: Mean Shares of Income Components, Year 1969

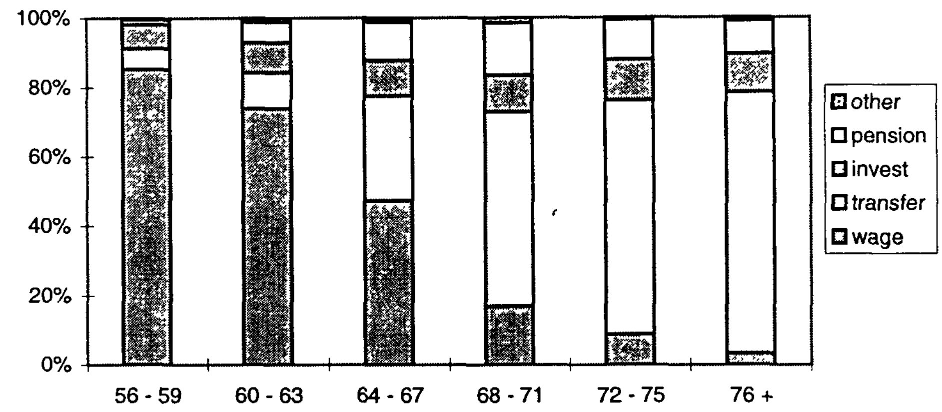


Fig. 2.2: Mean Shares of Income Components, Year 1982

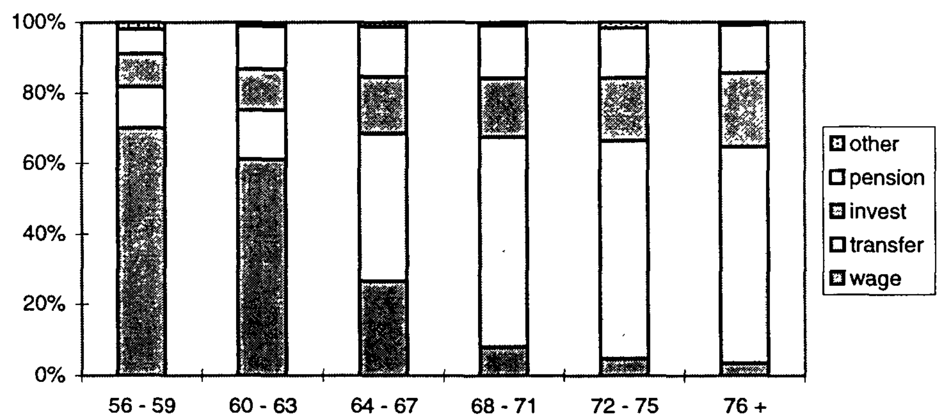
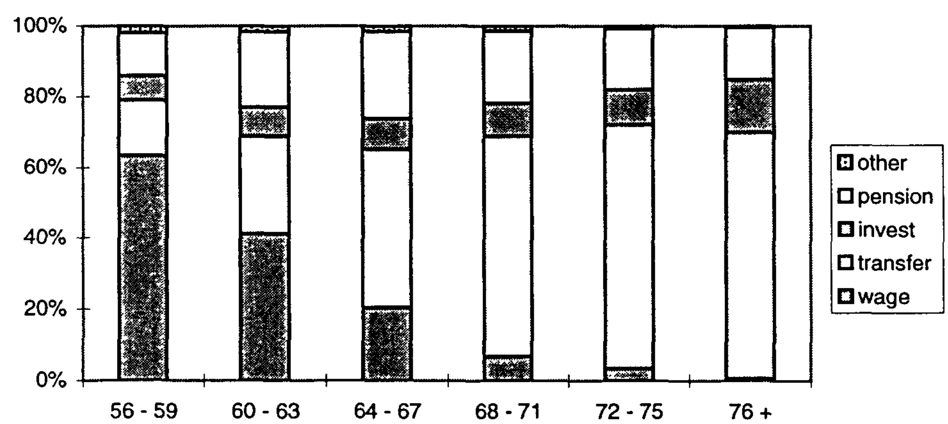


Fig. 2.3: Mean Shares of Income Components, Year 1992



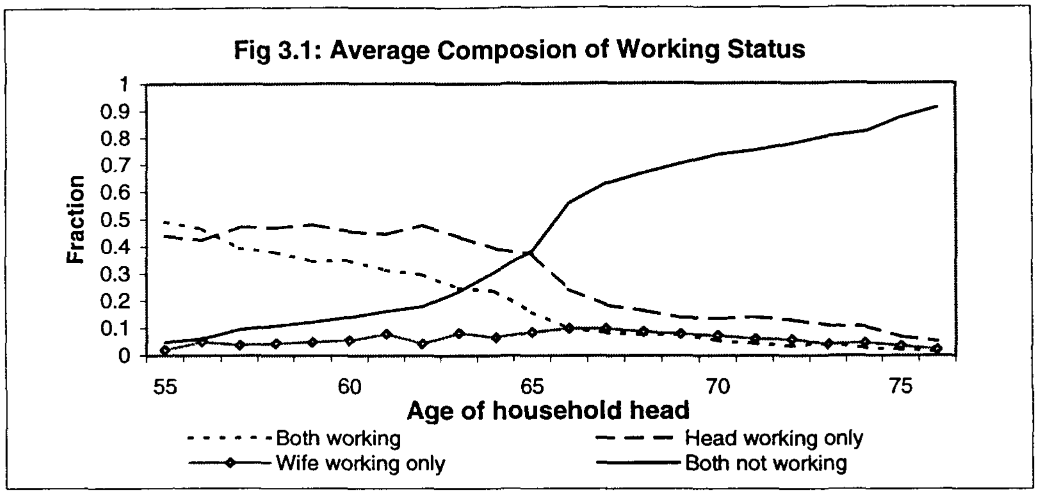


Fig 3.1: Average Composion of Working Status
Fraction
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
55
60
65
70
75
Age of household head
Both working
Head working only
Wife working only
Both not working

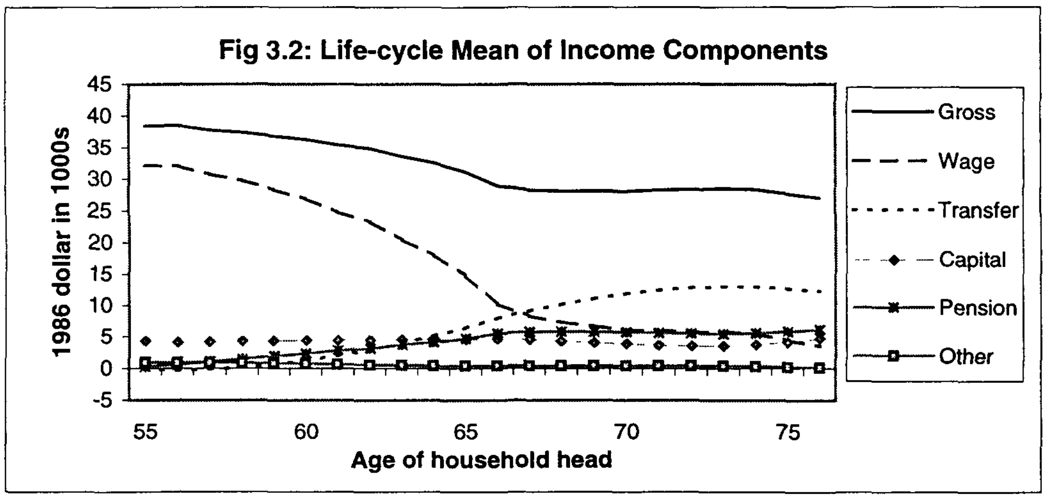


Fig 3.2: Life-cycle Mean of Income Components
1986 dollar in 1000s
45
40
35
30
25
20
15
10
5
0
-5
55
60
65
70
75
Age of household head
Gross
Wage
Transfer
Capital
Pension
Other

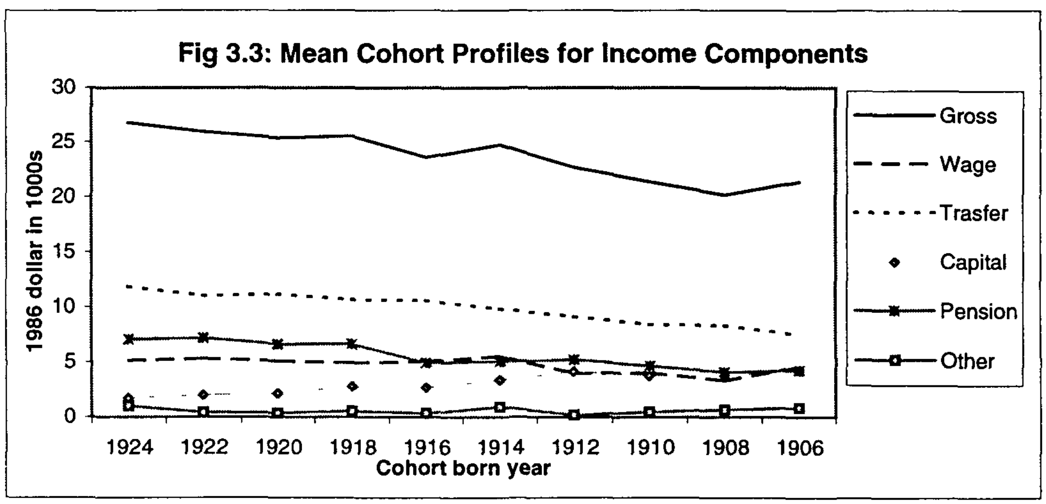


Fig 3.3: Mean Cohort Profiles for Income Components
1986 dollar in 1000s
30
25
20
15
10
5
0
1924
1922
1920
1918
1916
1914
1912
1910
1908
1906
Cohort born year
Gross
Wage
Trasfer
Capital
Pension
Other

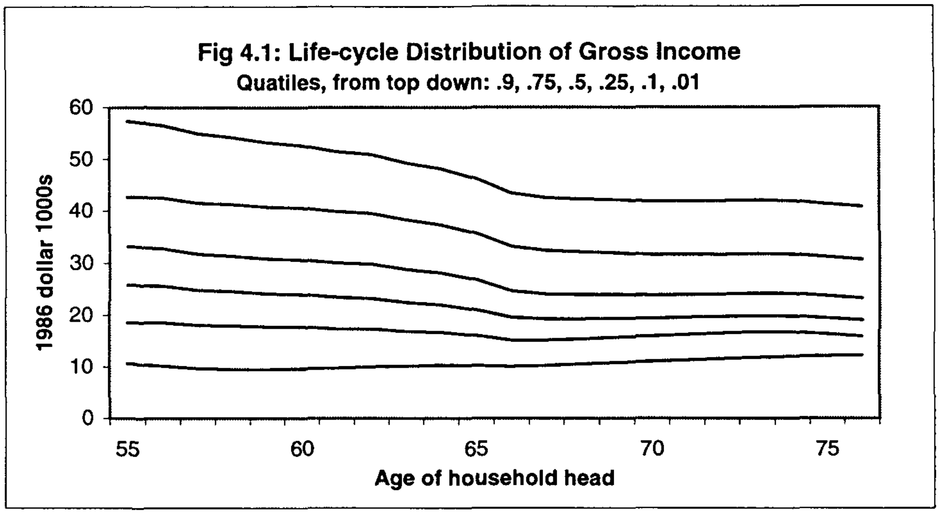


Fig 4.1: Life-cycle Distribution of Gross Income
Quatiles, from top down: .9, .75, .5, .25, .1, .01
1986 dollar 1000s
60
50
40
30
20
10
0
55
60
65
70
75
Age of household head

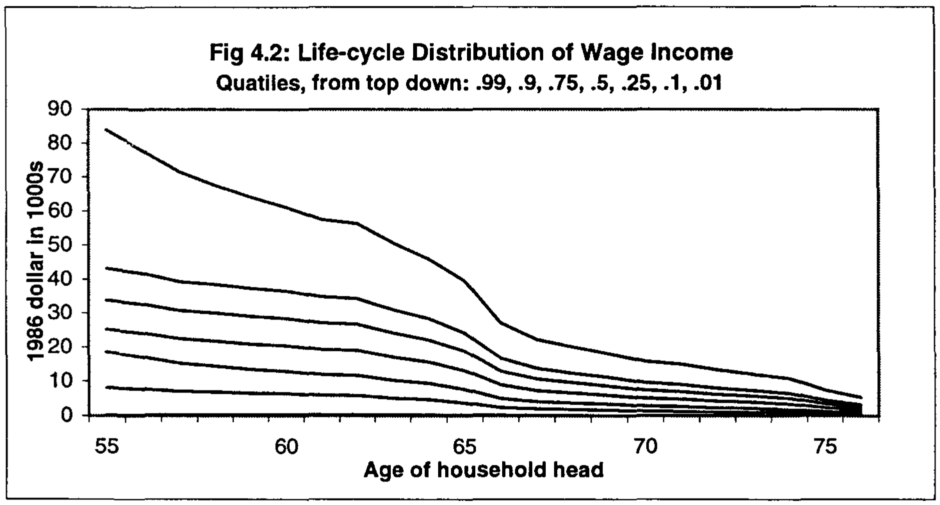


Fig 4.2: Life-cycle Distribution of Wage Income
Quatiles, from top down: .99, .9, .75, .5, .25, .1, .01
1986 dollar in 1000s
90
80
70
60
50
40
30
20
10
0
55
60
65
70
75
Age of household head

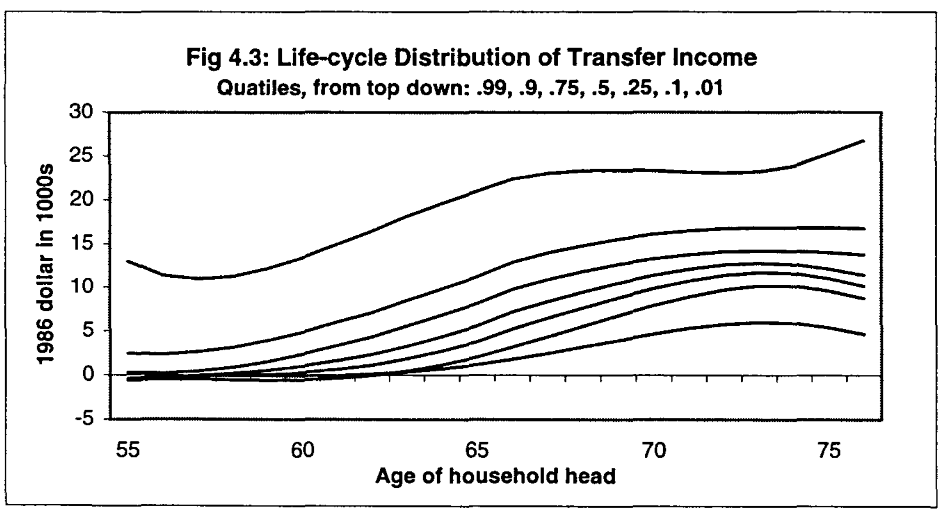


Fig 4.3: Life-cycle Distribution of Transfer Income
Quatiles, from top down: .99, .9, .75, .5, .25, .1, .01
1986 dollar in 1000s
30
25
20
15
10
5
0
-5
55
60
65
70
75
Age of household head

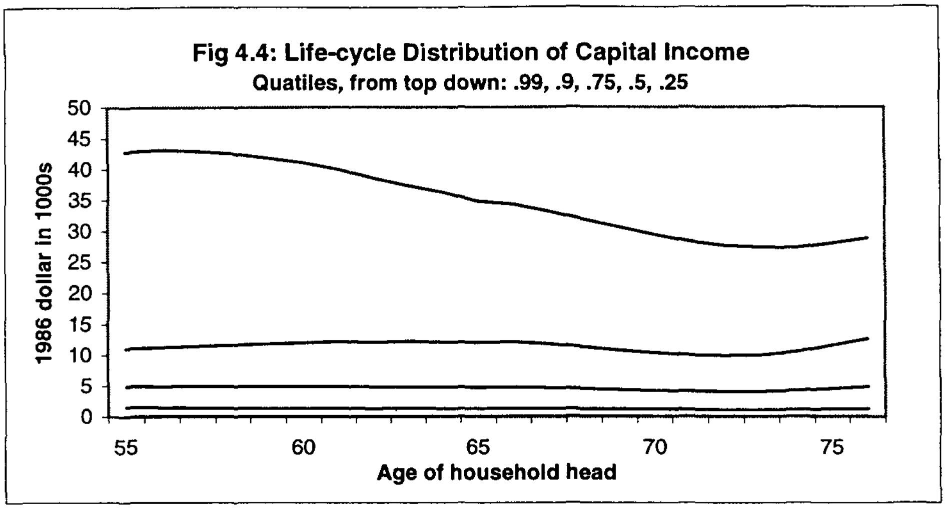


Fig 4.4: Life-cycle Distribution of Capital Income
Quatiles, from top down: .99, .9, .75, .5, .25
1986 dollar in 1000s
50
45
40
35
30
25
20
15
10
5
0
55
60
65
70
75
Age of household head

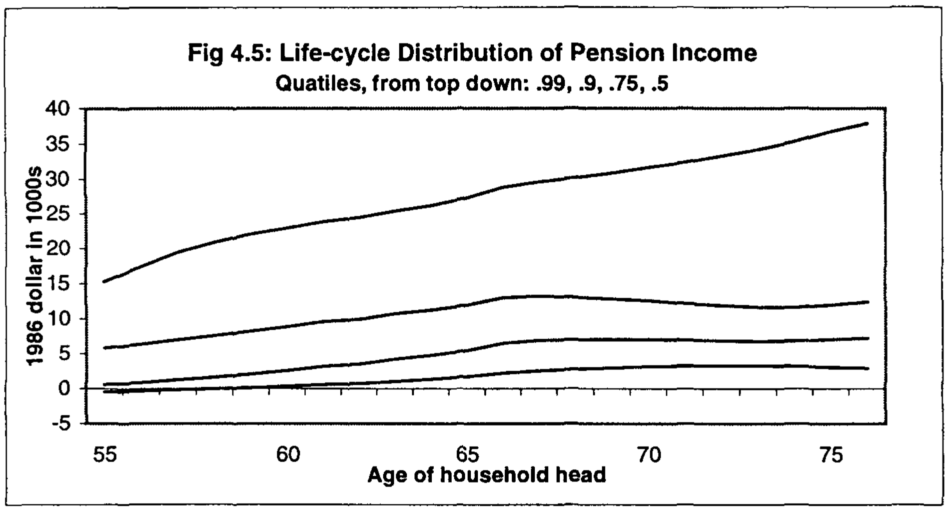


Fig 4.5: Life-cycle Distribution of Pension Income
Quatiles, from top down: .99, .9, .75, .5
1986 dollar in 1000s
40
35
30
25
20
15
10
5
0
-5
55
60
65
70
75
Age of household head

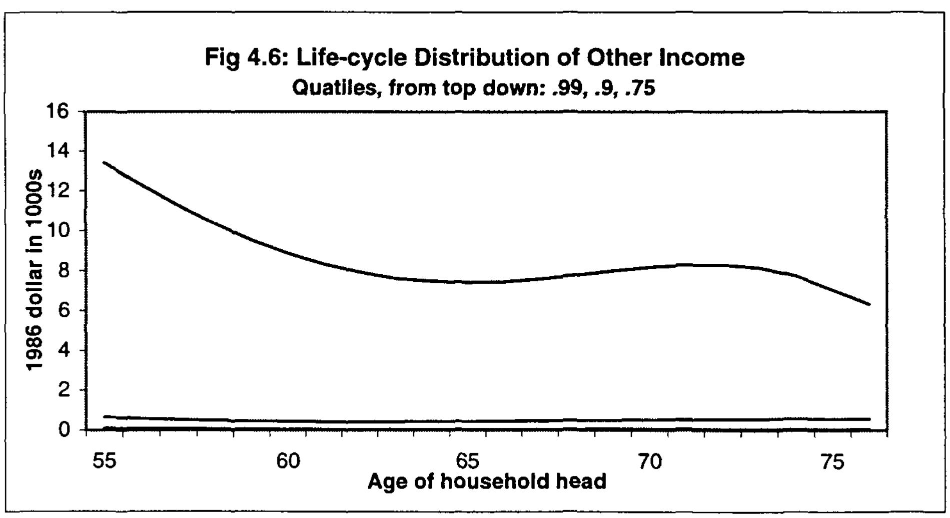


Fig 4.6: Life-cycle Distribution of Other Income
Quatiles, from top down: .99, .9, .75
1986 dollar in 1000s
16
14
12
10
8
6
4
2
0
55
60
65
70
75
Age of household head

Fig. 5.1a: Predicted Life-Cycle Saving
(with 95% Confidence Intervals)

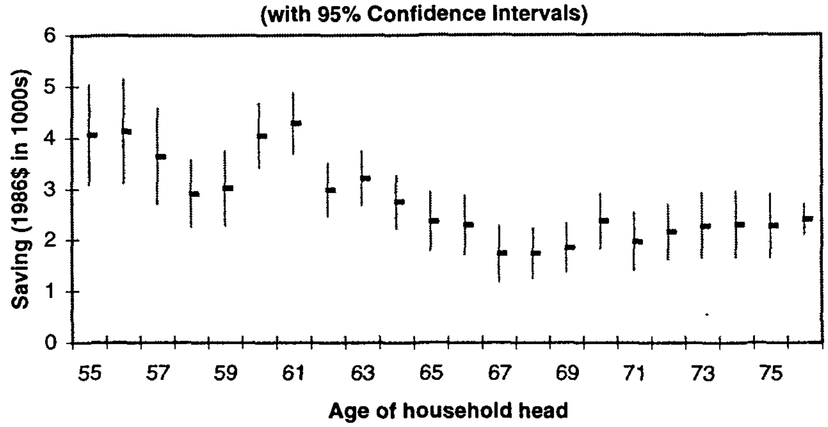


Fig. 5.1b: Predicted Saving from Income
(with 95% Confidence Intervals)

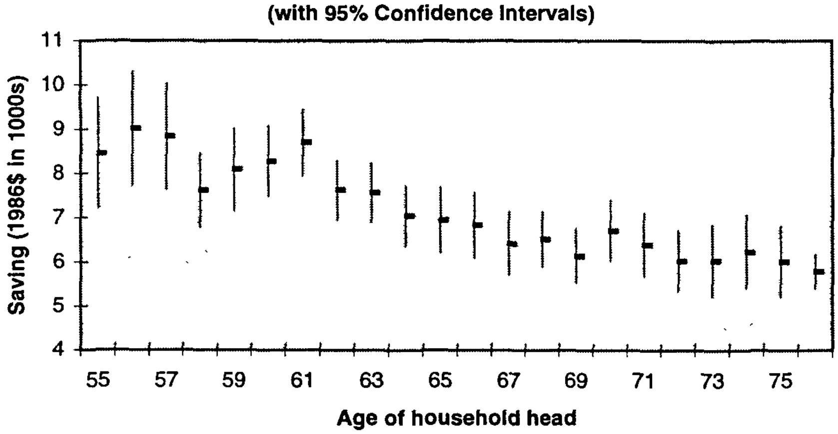


Fig. 5.1c: Predicted Saving from Age

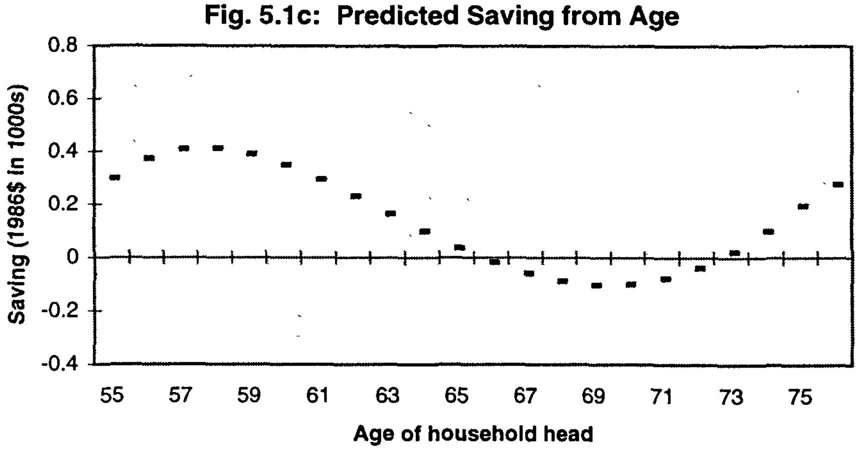


Fig. 5.2a Predicted Life-Cycle Saving Rate
(with 95% Confidence Intervals)

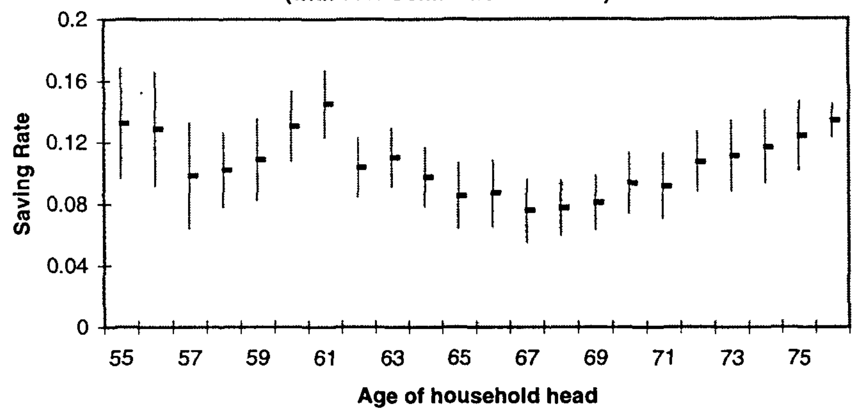


Fig. 5.2b Predicted Saving Rate from Income
(with 95% Confidence Intervals)

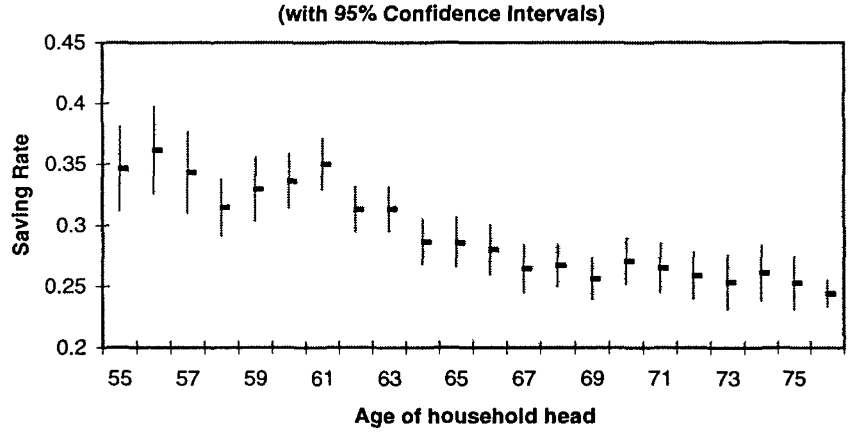
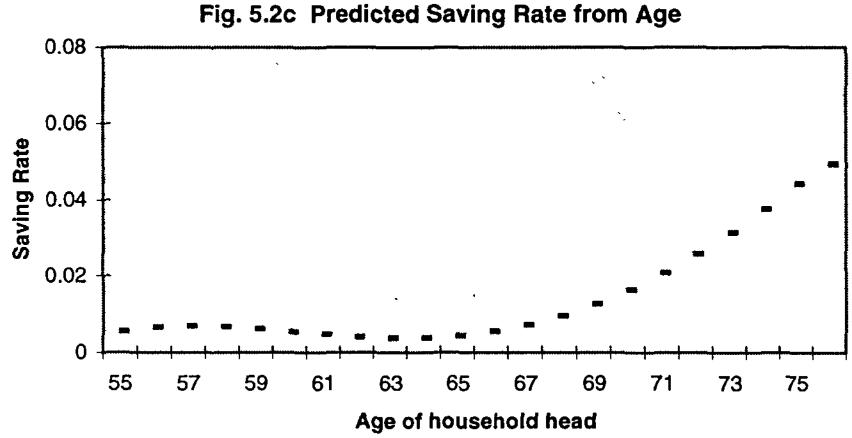


Fig. 5.2c Predicted Saving Rate from Age



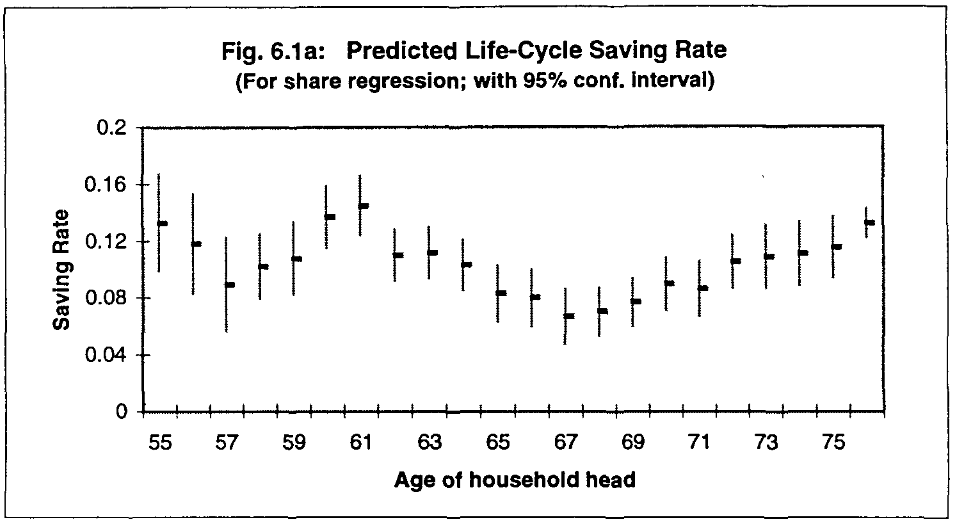


Fig. 6.1a: Predicted Life-Cycle Saving Rate
(For share regression; with 95% conf. interval)
Saving Rate
0.2
0.16
0.12
0.08
0.04
0
55
57
59
61
63
65
67
69
71
73
75
Age of household head

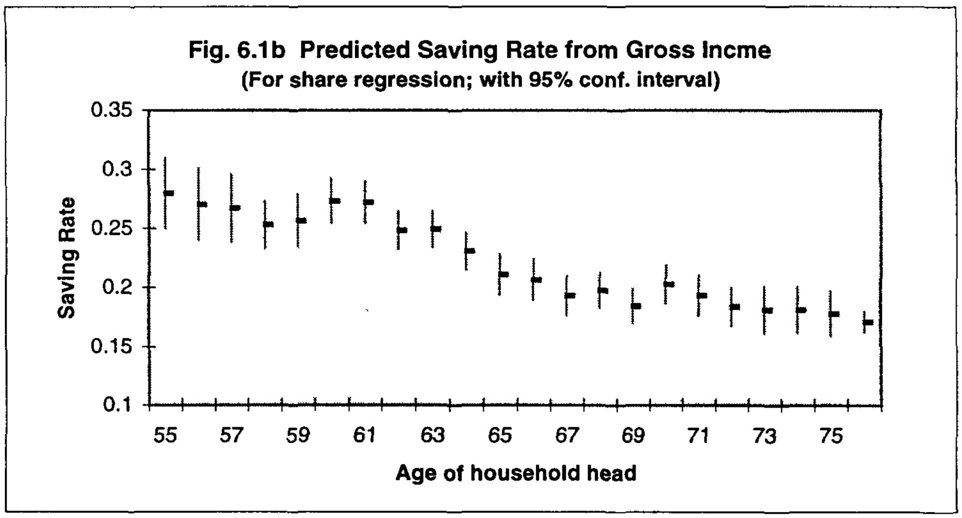


Fig. 6.1b Predicted Saving Rate from Gross Incme
(For share regression; with 95% conf. interval)
Saving Rate
0.35
0.3
0.25
0.2
0.15
0.1
55
57
59
61
63
65
67
69
71
73
75
Age of household head

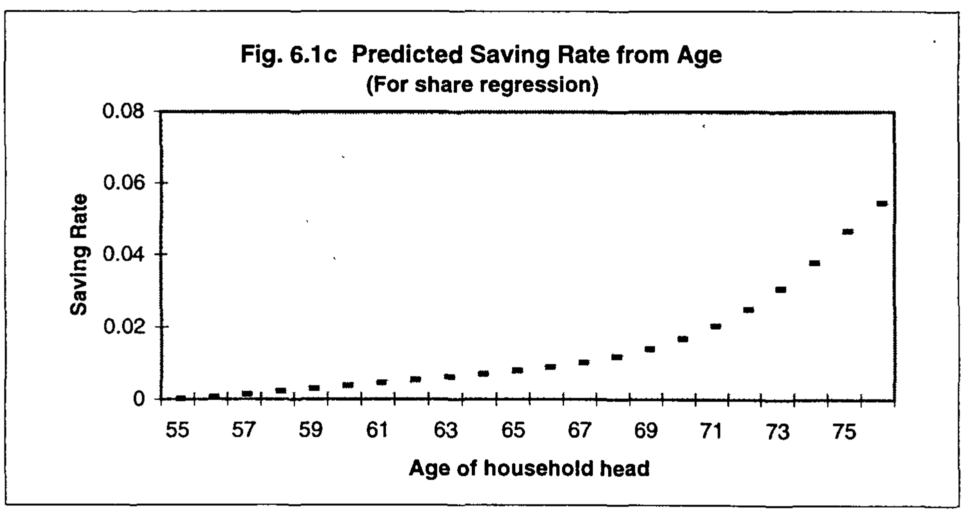


Fig. 6.1c Predicted Saving Rate from Age
(For share regression)
Saving Rate
0.08
0.06
0.04
0.02
0
55
57
59
61
63
65
67
69
71
73
75
Age of household head

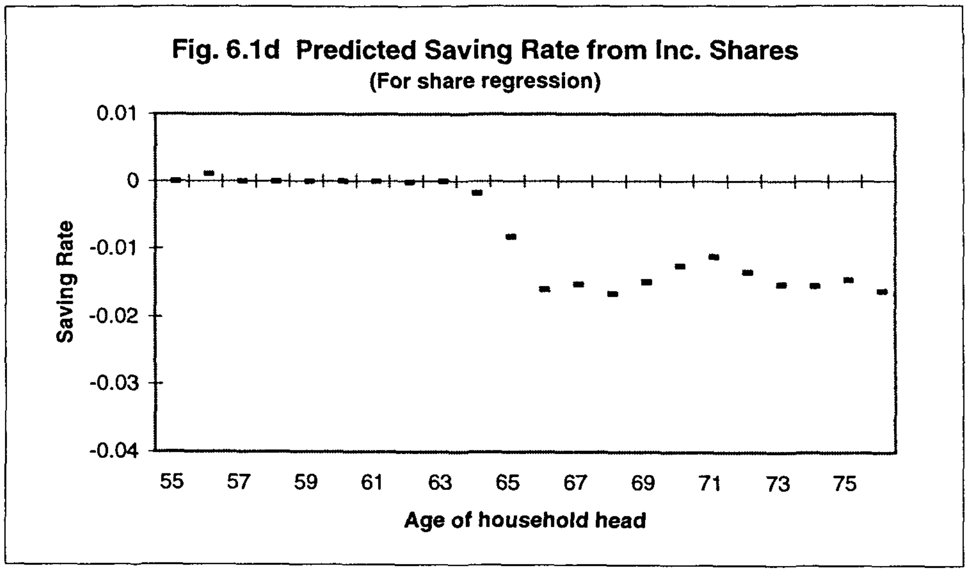


Fig. 6.1d Predicted Saving Rate from Inc. Shares
(For share regression)
Saving Rate
0.01
0
-0.01
-0.02
-0.03
-0.04
55
57
59
61
63
65
67
69
71
73
75
Age of household head

Fig. 6.2: Average Composition of Income by Age

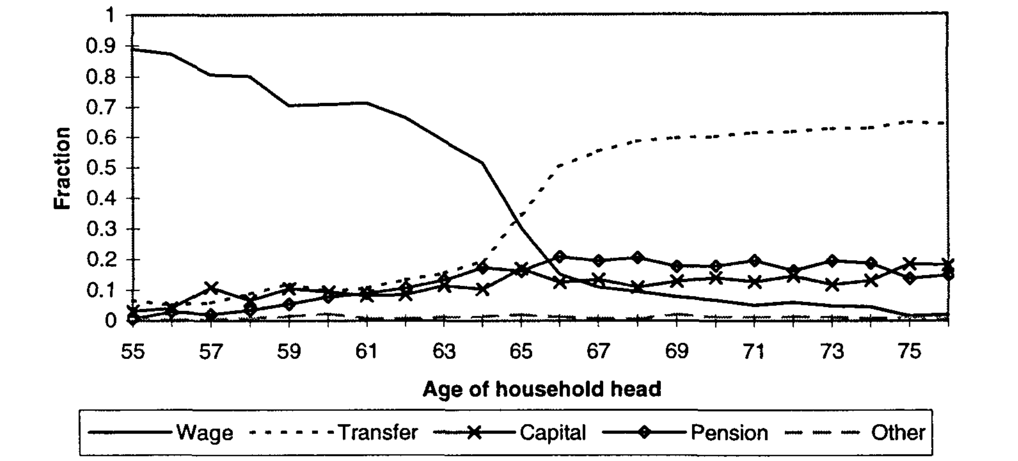


Fig. 6.3: Marginal Effect of Income Shares on Saving Rate
(Controlling for gross income)

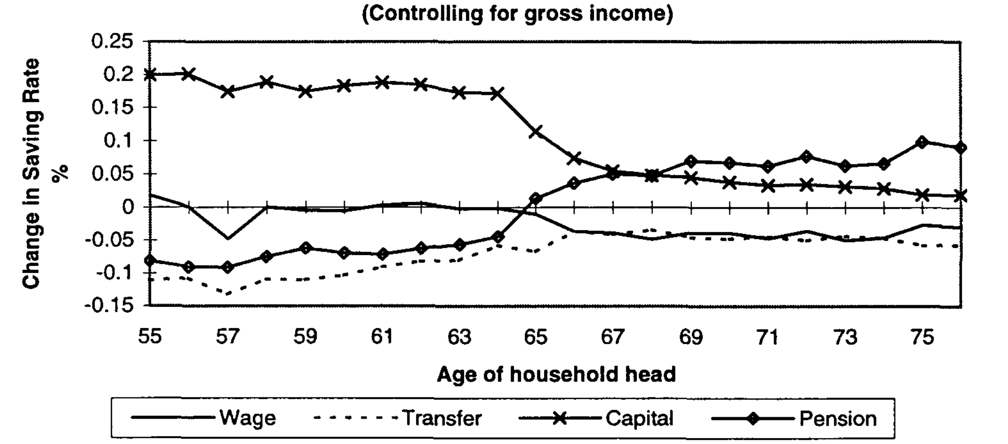
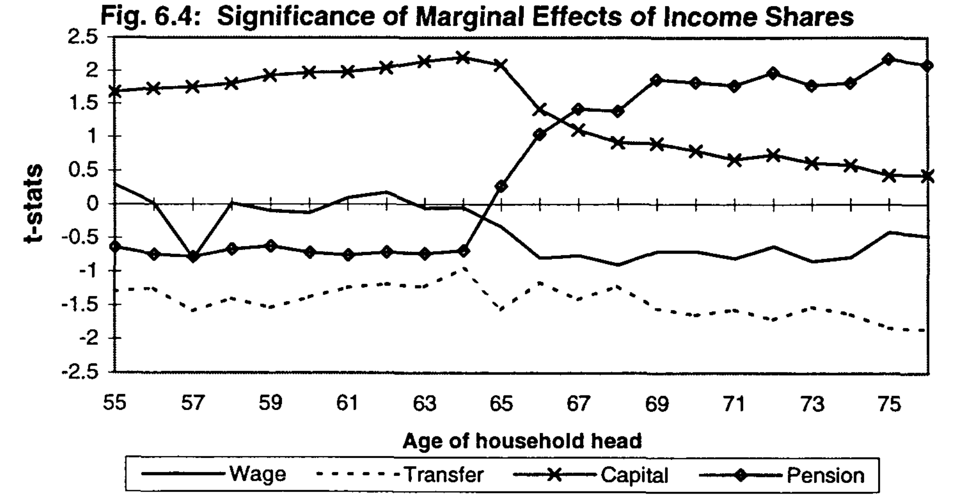


Fig. 6.4: Significance of Marginal Effects of Income Shares



Essay 3:

Saving and Consumption

1 Introduction

As the third of a series of studies on the saving and consumption behaviour of the elderly in Canada, this essay is all consumption demand. The study on the demand behaviour of the elderly is warranted on several grounds. First of all, because saving here is defined as the residual of the net income less consumption expenditure, the total expenditure plays a direct role in shaping the observed savings and the saving rates of the elderly. The simplest version of the life cycle model predicts that consumers accumulate assets up to retirement and then start decumulating. Yet substantial evidence appears to point at a continuation of the savings by the elderly, as documented in my previous essays as well as many other studies. Because net income does not increase with age for the elderly couples (and absolutely decreases with age when viewed from cross sections), positive saving and the saving rate with age is generated entirely by a decrease in total consumption with age (or a faster decrease in consumption than in net income). It is therefore very useful to study the change in the composition of consumption of the elderly over their later ages, thereby providing valuable suggestions on why the elderly continue to save. A study on the composition of consumption by Alessie et. al. (1997) found that, using the 1990 and 1995 Consumer Expenditure Survey data from The Netherlands, the fall in consumption is mainly located in leisure activities and transportation, suggesting support to the finding of Börsch-Supan (1992) that at older age people tend to be constrained by their health conditions in their consumption possibilities.

We also note that the change in the composition of consumption observed at older ages is the result of not only the effect of aging process itself, but also the effects of other factors, such as a drop in the spending power (the income effect), and a permanent leave from the labour force (the retirement effect). It is therefore equally important to sort out separate contributions by these factors to the total change in consumption observed from the data. The decomposition of the factor effects will provide us further insight into the saving behaviour of the elderly.

Although it aids in understanding saving by the elderly, the demand analysis for elderly couples is by itself an important issue. As more and more baby boomers will enter their retirement stage at the beginning of the next century, knowing well the demand patterns by the elderly in the past and present may help policy analysis regarding the wellbeing of the elderly in Canada in the future.

As such, this essay is divided mainly into two parts. The first part (Section 2) is a broad descriptive analysis on the age patterns of various variables from the data, including net income, total expenditure and total non-durable expenditure, along with a detailed break down of the age patterns of the components of durable and non-durable expenditure items. On the ground established from the first part, the second part (Section 3 and 4) then aims to decompose the age patterns into three major factors: age, total expenditure and retirement, to examine their separate effects for each consumption item. The decomposition is conducted by using the estimates from the estimation of an econometric model of a demand system for the 14 non-durable consumption goods. We include only non-durable goods in the demand system to keep the demand patterns relatively homogenous within a system. Conclusions are provided in Section 5.

2 Age Patterns of Expenditures: An Overview

The main goal in this section is to provide an overview of descriptions from the raw data, on the age patterns of various expenditure items. Expenditures can be broadly divided into two major categories: durable consumption, such as housing and cars, and non-durable consumption, such as food and recreation. In addition, housing stocks and expenditure on home improvements are included. The descriptive results for non-durable goods (fourteen of them in total) in this section provide a foundation to be used as a bench mark comparison for the subsequent study to be presented in sections 3 and 4. The descriptions for durable expenditures and housing contribute to our knowledge by answering questions such as: Do the elderly couples run down their housing assets? Are they less likely to buy cars? Do they spend less on housing, as they age?

This section also covers topics comparing expenditures, durable and non-durable, between homeowners and non-homeowners and between smokers and non-smokers.[1] Because one may believe that homeowners and non-homeowners may have very different saving/consumption behaviour, to make a comparison at the outset can inform the reader of any such differences, thereby helping the reader to make a better interpretation later in the demand analysis.[2] A comparison of expenditure patterns between smokers and non-smokers is of interest by itself, because a lifetime consumption theory with uncertainty

[1] The difference in expenditure patterns between retired and not retired groups will be analyzed extensively in conjunction with age and income (or expenditure) effects in later sections.

[2] Ideally, the demand system to be estimated in the following sections could be split into two separate systems, one for homeowners and one for non-homeowners. However, because of the sheer number of equations in the system (14 in total), the analysis based on two large demand systems would become extremely difficult to organize and may obscuring the major theme of the study. Therefore, only one demand system is estimated with the difference between home ownership status being captured by a homeowner dummy variable in each equation.

would predict that smokers would save less (because they expect to live shorter lives), given other things. The comparison can also give us a better understanding of the age pattern of the consumption goods in our sample, because it is likely that the proportion of non-smokers in the sample would increase with age due to shorter lives of smokers, among other things. Although there is no treatment of this sort in the estimation procedure of this study, it is to our advantage to know beforehand how different the consumption patterns are between smokers and non-smokers.

The data used in this study are the same as the data used in my previous two essays, i.e., Canadian FAMEX data for the years 1969, 1974, 1978, 1982, 1984, 1986, 1990 and 1992, for all couples with head's age reaching 50 and over. All observations for the eight years and within the age range are used. The cohort concept is dropped in this study mainly because the demand system, which will be studied in latter sections, includes year and age variables, and therefore an identification problem arises if cohort variables are also included. Because the demand equations have year dummies (to pick up the price effect) and age dummies, the reader need to be aware that part of the year (price) effects and the age effects might in fact be a cohort effect. Hopefully, the part of the age effects or the year effects capturing the cohort effect would be less important compared to the age and the year effects themselves. As for the descriptive study presented in this section, using pooled time series of cross section data can only enhance the reliability of the estimates because the pooling washes out part of the cohort effect.

Section 2.1 first examines some fractions on selected characteristics, i.e., retirement, owning home, purchasing cars and smoking, followed by the descriptions on such variables as net income, total expenditure, non-durable expenditure and several components of durable expenditures. Non-durable expenditures are then further divided into its components, presented both in dollars and in shares. Section 2.2 and 2.3 are much the same concept as Section 2.1, but are devoted specifically for comparisons between homeowners and non-homeowners in the former, between smokers and non-smokers in the latter.

2.1 The Basic Facts from the Data

Table 2.1 displays several fractions on selected characteristics for the population of elderly couples by age group (head's age). The data are pooled over all the available years and this practice prevails throughout section 2. The number of observations in each age group is large enough (over 1000) to justify the reliability of the fractions calculated. The fractions on four selected characteristics are for both retired, owning home, buying cars and smoking. Both-retired is the same as both-not-working, either full time or part time. Owning home is defined as owning a home without outstanding mortgage. Buying cars is for those reporting non-zero number (there are negative numbers in the sample that means selling cars) for car or recreational vehicle purchases. We define a smoking household as one spending greater than ten dollars annually on tobacco consumption.[3]

[3] Strictly speaking, the fraction of those with tobacco spending of greater than ten dollars is not the same as the fraction of couples with at least one smoker. For one thing, we cannot observe couples who became non-smokers during the year. Also, perhaps some couples may spend a little on tobacco only for entertaining their guests. We use this definition for smokers in what follows just for convenience.

Together, the four fractions draw a distinct picture of the changing trend for the elderly couples.

The most dramatic change over the ages is the increase in the fraction of both retired couples, as one would expect. Starting at near 7% at age 50-55, the proportion reaches 93% at the oldest age group. The largest jump among age groups occurs at age 66-70, at which the proportion has increased more than 40% (to reach 73%) from only 30% at the previous age group of 61-65. The fraction of couples owning homes also increases with age, although at a slower pace than for retirements. The largest increase in the fraction of homeownership is 11% from age 50-55 to age 56-60, at which the fraction first breaks the 50% level. It increases further at age 66-70, to reach 65%. However, this fraction is more or less maintained within the rest of the age groups. Along with the trend in the fraction of retirement, this information tells us that most couples own homes mortgage free before and at their retirement, and own their homes throughout their retirement life.

The fractions of elderly couples buying cars and smoking both shrink with age. From over 30% of the couples buying cars at ages 50-55, the fraction decreases very steadily, to reach the lowest of just little over 10% at age 76+. The older the age, the less likely couples would buy (or sell) cars or recreational vehicles. The decrease in the proportion of smokers with age groups is to be expected, if only because the sample contains relatively more non-smokers in older age groups as a consequence of the shorter lives of smokers. But this is not to exclude the possibility that older persons smoke less (people quit smoking as they age) controlling for the mortality effect. Returning to Table

2.1, the two larger decreases in the proportion of smokers are observed at the two ends of the age groups. While the large drop at the younger end is a little puzzling (down near 8%), the largest drop of a further 10% from age 71-75 to age 76+ is of no surprise as the oldest ages in the sample can be well beyond 80 or even 90. As the result, the fraction of couples with at least one smoker is cut in half over the age span, from around two-thirds at age 50-55 to only one third at ages 76+.

Tables 2.2a (mean) and 2.2b (median) also provide general information on the income and expenditures of the elderly. The age pattern of net income and total expenditure are already examined in my previous essays. From the columns that give the information on percentage changes, the familiar patterns are still present: the drop of net income accelerates until age 66-70 and slows down thereafter, while the drop of total expenditure at each age group is very steady and firm until the oldest ages. It is this combined income and expenditure path that generated the distinct age pattern of saving rate for the elderly, which I studied in previous essays. Total expenditure includes durable and non-durable expenditures. The age pattern for non-durable expenditures is much the same as that for total expenditure, albeit at a smaller amount for each age group. The total percentage decrease of mean non-durable consumption is near 46%, 2% less than the total percentage decrease of mean total expenditure. The changing patterns for net income, total expenditure and non-durable expenditures are almost the same between mean and median measures, although higher absolute figures are observed for the means in Table 2.2a than that in Table 2.2b.

Shelter expenses (excluding water, fuel and electricity, which are part of non-durables), car purchase and furniture and equipment are three components of durable expenditures. From the mean table, both car purchase and furniture and equipment expenses drop quickly with age. From the median table, furniture and equipment drops at a more rapid pace while car purchase is completely out of the picture, because, as Table 2.1 already showed, even at age 50-55, only about a third of couples buy cars in any given year. Shelter expense exhibits a more consistent age pattern whether measured in means or medians. It drops with age, quickly at younger ages, and then more slowly at older ages. Like the other variables, the values of shelter expense at each age group are higher in means than in medians.

Table 2.3 further breaks down non-durable expenditures into 14 components to examine in more detail their mean values and shares by age. The 14 goods are food at home, food away from home (food restaurant, for short), water-fuel-electricity, household operation, clothing, private transportation (excluding car purchase), public transportation, medical care, personal care, recreation, tobacco, alcohol, gifts-contributions, and other miscellaneous spending. These expenditure items are the major target for the study in this essay. The information in Table 2.3 also lays a foundation for the demand analysis in Sections 3 and Section 4.

The patterns in consumption by age are very diverse among the 14 goods. Although the total percentage changes from age 50-55 to age 76+ for the mean expenses are negative for all goods, the range of the percentage decrease can be as low as 5% (e.g. gifts-contributions) or as high as 79% (e.g. tobacco). While most goods have seen a steady decrease in dollar values at each age group, some show an increase in expenditure at the oldest ages (e.g. medical care and gifts-contributions). Naturally, when the expenses are converted to shares of total non-durable expenditure, for some goods their shares of the pie go up at each higher age bracket, at the expense of the other goods, that is. To make all these ups and downs clear, two charts are prepared to give an easy overview of the information in Table 2.3. Chart 2.1 displays the budget shares of the 14 goods for the two ends of age groups: age 50-55 and age 76+. Chart 2.2 compares the corresponding dollar amounts of these goods for the same two age groups. In both charts, the goods in the lists are ordered by their values (dollars or shares) in the age 50-55 group.

From the two charts, we first observe that food at home has the single largest share among all goods and at both age groups. It accounts for about 20% of total budget at age 50-55 and reaches 29% at age 76+, albeit its absolute amount falls (by about $900) over the ages. Notice that because its share is large, a small adjustment in its share will have a relatively large impact on the age pattern of the total consumption expenditure. Private transportation, clothing and recreation are the next three large share goods with their combined share of more than 31% at age 50-55. However, because they are also the three goods with the largest decrease in absolute amount ($1000-1500 each) over the ages, their combined share falls to 21% at age 76+, and they are no longer among the top four expenditure share goods at this age group. Instead, gifts-contributions, water-fuel-electricity and household operation increase their shares from age 50-55 to age 76+, when their combined share reaches 31%, compared to only 21% at age 50-55. And we see that the declines of the absolute amounts for their goods with ages are negligible, especially for gifts-contributions and water-fuel-electricity. Another consumption good with a negligible fall in dollar amount over the ages is medical care. As the result, its share increases by two percentage points over the ages to reach 6%. Food restaurant is also a good worth noting. At about the same share as that of water-fuel-electricity at 6% at age 50-55, food restaurant see its share cut in half at age 76+ group, due to its large absolute decrease in dollars over the ages. All other goods have relatively small shares and therefore, the adjustments of their shares over the ages have limited influence on shaping the age pattern of the total consumption expenditure.

What can we learn from these observations? The changes of the shares of non-durable goods show clearly how elderly couples re-allocate their budget among the goods as they age, as they spend a lesser total amount on consumption goods and as the fraction of retired couples grow larger. We see that most of the goods exhibiting increased shares over the ages are those absolutely necessary for sustaining a basic life standard by any definition in our society (food home, water-fuel-electricity, household operation, and medical care). However, gifts-contributions is among these growing-share goods too: a spending item that is absolutely not necessary and yet grows fastest in its share among other goods in relative terms. On the other hand, the shrinking-share goods are those either working related or leisure related, or even hobby related ones: private transportation, clothing, recreation, food restaurant, alcohol and tobacco. It seems that, when getting older, the elderly couples simply "go to the basics", shrugging off all that things that once spiced their daily lives. When every thing is measured in dollar amounts as those displayed in Chart 2.2, the story is simpler and direct, although it tells the same story but from a different angle. Of the large reduction in average total non-durable expenditure over the ages (about $8600), 44% of which ($3800) is from the reductions in spending on three goods: private transportation, clothing and recreation. Another 20% ($1700) is from the reduction of spending on the two food items: food at home and restaurant meals. These are mostly the goods with relatively large shares at age 50-55. Their large reductions in dollar amounts, whether result in an increase or decrease in the shares when reach age 76+, are the leading force in shaping the downward age pattern in total non-durable expenditure of the elderly couples.

The changing patterns of the expenditure items over ages may seem reasonable for many goods, as one might expect the shares of luxuries would decrease and necessities would increase. However, this explanation oversimplifies the whole story and misses many aspects that need to be uncovered. The most obvious exception is the increasing share of gifts-contributions. Of course it does not meet any sensible description as a necessity. This leads to another possible explanation of the aging effect; aging may lead to restricted physical activity and induce a decrease in the share of private transportation and recreation on one hand, an increase in the share of gifts-contributions on the other. But some of these effects may also be due to the fall in income or to the retirement effect. For example, if working is no longer the way of life, the shares in work-related items such as clothing and transportation should decrease while those in leisure related items such as recreation should increase. The problem is that all these effects are possible and none of these effects can be identified given the information in all the above tables and charts. What is available to us up to now is the combined result of these three main effects (plus many others of course). What will be done here is to separate the age, income (expenditure) and retirement effects, to estimate the contribution (qualitative and/or quantitative, if any) of each of these three factors on the total increase or decrease of the shares of each good. Sections 3 and 4 will deal exclusively with this issue by analyzing the results from the estimation of a demand system for the 14 non-durable goods.

Before turning to a demand analysis, however, there are several points that the reader may need to be aware of and keep in mind when going through the analysis later. First of all, because of the universal health care system in Canada, expenditure on medical care is not a true reflection of the health care consumption by the elderly. And seniors in Canada who once reach age 65 can enjoy the benefit of price discounts on many goods and services including public transportation and medicine, which are possibly reflected in Table 2.3 by a noticeable drop in both these two shares in the age 66-70 group.

Second, the consumption behaviour between those couples who own their own homes and those who don't may differ, because, at the least, a house is by itself an evidence of accumulated savings by its owner in most cases. Section 2.2 will be devoted to showing these differences.

Finally, there is the issue of smoking. The well established fact that smoking related diseases cause shorter lives means that the sample data used in this study may include more non-smokers at older ages. Thus, if the preferences of the smokers are different than that of non-smokers, the estimated demands based on the sample could be more on the non-smoker's side. Theoretically, smokers may save less (consume more) on the grounds that they expect to live a shorter lives. It is therefore of interest to compare the expenditure patterns, durable and non-durable, between smokers and non-smokers. This is the topic covered in Section 2.3.

2.2 Expenditure Patterns between Homeowners and Non-homeowners

Table 2.4a lists net income, total expenditure and non-durable expenditures by age separately by homeowners and non-homeowners. The three components of durable expenditures are also provided in the lower panel of the table. For each variable listed, there is an additional column headed "equal?" that provides the P-values (in %) of the test of the equality of the owners and non-owners. For homeowners only, the house values and expenditures on home improvement (home additions and renovations) by age are also provided in Table 2.4b.

Several facts are revealed in Table 2.4a. The differences in net incomes for owners and non-owners seem small: in three of the six age groups (two in the younger half) they are not statistically different. The differences in total expenditure seem even smaller: in four of the six age groups they are not statistically different. But for non-durable expenditure, only for the youngest age group is the test accepted that the owners and non-owners are equal. In all the three variables, the values are always higher for homeowners than for non-homeowners, with one exception in total expenditure for the first age group. Further details on the three components of durable expenditures show more distinct patterns. The expenditure on shelter (excluding water fuel electricity) is decidedly higher, at least twice as much, for non-homeowners than for homeowners at all age groups. Non-homeowners include those renting and those owning a home but still paying mortgages (a very small portion), while homeowners have their houses already paid for. On the other hand, furniture and equipment expenses are not significantly different between the two parties at any age. Homeowners spend more on cars than non-homeowners do, especially at younger ages.

For homeowners, Table 2.4b also provides information on house values and expenses on home additions and renovations. Average house values remain fairly stable at the range of 81,000-89,000 dollars until the oldest age group, where the value decreases to around 75,000 dollars. The average expenses on home improvement clearly decreases with age starting at age 61-65, and the rate of decrease is as high as that for buying cars. A quick measure of the average value for home improvement spending as a percentage of the average house value also reveals that this percentage, too, decreases with age, from about 1% at the first age group down to as little as 0.4% at the last age group. Perhaps this is another reason why the average house value in this age group is the lowest. The evidence suggests that, although the elderly do not run down their housing assets in general, they do spend less on maintaining their house and improving their house values, as well as spend less on other durable items such as cars and furniture, as they age.

More is revealed when non-durable expenditures are broken down into each of 14 components, which are shown in Table 2.4c. Judging from the test that all ages are equal between owners and non-owners, six out of fourteen goods have no difference in age patterns between the two groups. They are: food at home, food restaurant, clothing, public transportation, medical care and alcohol. Water fuel electricity and private transportation are the two at the other end: not even one age group appears to have the same expenditure level in the two groups. For these two types of expenditures, homeowners spend considerably more than non-homeowners, especially for water fuel electricity, and at older ages. Household operation, recreation and gifts-contributions share the similar result that the expenditures are the same for owners and non-owners for both the young and the old age groups, but are significantly different in the middle groups with higher values for owners. Tobacco and personal care also share some similarities. They both tend to have a different level between owners and non-owners when young and the same level when old, with non-owners spending more than owners wherever there is a difference.

In general, the most dramatic difference in spending between owners and non-owners is observed in water-fuel-electricity, followed by private transportation. Other than these two items, the older the age, the smaller the difference in spending. The middle two age groups are the most likely to exhibit different spending patterns between owners and non-owners if differences do occur. And owners and non-owners do have a lot in common in spending patterns in many key items like food, clothing and medical care. These general points give useful background on the different expenditure patterns between owners and non-owners from the raw data. We will revisit this topic in the demand analysis in later sections.

2.3 Expenditure Patterns between Smokers and Non-smokers

The comparison of expenditure patterns between smokers and non-smokers is of interest on its own because, as would be predicted by lifetime consumption theory, smokers would likely save less since they expect shorter lives. To qualify the direction of potential difference in consumption patterns between smokers and non-smokers, therefore, is also advantageous to us in the analysis of the demands for the elderly because the data may have higher proportions of non-smokers at older ages.

As before, the comparisons are given in two tables, Table 2.5a and 2.5b, one for income and expenditures and its durable components, the other for detailed non-durable goods. From Table 2.5a, net income and total expenditure are the two variables that are significantly different between smokers and non-smokers for all ages as well as in each age group, with smokers having significantly lower values, especially in net income, and in younger ages. This conforms to the results of many other studies that have found more smokers were in lower income categories. For non-durable expenditures, however, although the test on all-ages-are-equal is rejected, five out of six age groups exhibit no difference in their expenditure levels. When the durable expenditure is split into three components, it is clear that most differences are due to the much lower expense of smokers on shelter and cars. However, while the difference in shelter expenses between smokers and non-smokers increase with age, there is no difference in car purchases at older ages. The difference in expenditures on furniture and equipment is small where it is observed, and 3 out of 6 age groups have the same patterns.

Table 2.5b has details on non-durable goods. On the basis of the tests on "all ages equal", household operation, personal care and other miscellaneous exhibit no differences in spending patterns between smokers and non-smokers. From age-by-age test results, expenses on food restaurant, private transportation, recreation, alcohol and gifts-contributions are significantly different between smokers and non-smokers in five or more age groups out of six. Four of these goods (except alcohol) have lower expenses by smokers. It is interesting to observe that smokers also consume more alcohol in absolute values than non-smokers. The other goods: food home, water fuel electricity, clothing, public transportation and medical care, have the same expenditures between smokers and non-smokers at least in three age groups or more out of six. Except for food at home, smokers spend less on these goods where there is difference. Two interesting facts deserve notice here. One is that, although smoking is associated with health problems, smokers spend about the same on medical care as non-smokers. The other is that smokers spend a little more on food at home and little less on food at restaurants than non-smokers.

The total non-durable expenditures between smokers and non-smokers are nearly the same for all ages (with only one exception, see Table 2.5a). Smokers reallocate their expenditures to consume tobacco mainly at the expense of gifts-contributions, recreation and private transportation. Therefore, as the proportion of non-smokers in the sample increases with age, this will lead to higher demand in the sample for these three goods, and of course relatively less demand for tobacco consumption. This is a message that the reader may want to keep in mind throughout the rest of this essay.

3 Estimate Demands for Non-Durable Goods

To accomplish the major task of identifying the age effect, income/expenditure effect and retirement effect on the demands of the elderly couples in the sample, this section is devoted exclusively to the estimation of a demand system over the fourteen non-durable goods. Section 3.1 gives a brief description of the concept of a conditional demand system and why it is preferred to the alternatives. Section 3.2 specifies the econometric model of the conditional demand system in this study. Estimation and testing results will be presented in Section 3.3. Detailed analysis of the results is left for Section 4.

3.1 About the Conditional Demand System

Most empirical investigations of demand and consumption either assume that preferences over goods are separable from labour supply or estimate an unconditional joint commodity demand and labour supply system. However, the assumption of the separability of demands and labour supply is unwarranted, as demonstrated in Browning and Meghir (1991, Econometrica). An alternative to the unconditional joint demand and labour supply system is the conditional one, which has several advantages, especially in its simplicity and convenience and yet it still accounts for the labour supply effect on demands (again see Browning and Meghir, 1991, Econometrica).

To make it easy for the reader, we provide a brief description of a general conditional demand system. To start with, all goods are divided into two exclusive classes. For "the goods of interest", their quantity and price vectors are denoted by *q* and *p*, respectively. In the demand system in our analysis, these are the non-durable goods. Then there are "conditioning goods"--they may affect preferences over the goods of interest but are not themselves of primary interest. In our system, only one such good is included, which is the retirement dummy (in place of labour supply, say). Denote the quantity and price vectors of these goods by *h* and *r* respectively. In addition, there are some "demographic variables", denoted by vector *a*, that may also affect preferences over the goods of interest. They will be age and area of residence.

If preferences over all goods are represented by the utility function $U(q, h, a)$, then the conditional cost function is defined as

$$c(p,h,a,u) = \min_{q}(pq|U(q,h,a)=u) ,$$

comparing with the (unconditional) cost function which is defined on (p, r, a, u). Given the conditional cost function, the conditional demand function can be derived as

$$q_i = f_i(p,h,a,x) \qquad (i = 1, 2...m)$$

where x is the total expenditure on the goods of interest q, comparing with the (unconditional) demand

$$q_i = g_i(p,r,a,x^*) \qquad (i = 1, 2...m)$$

where x^* is the total expenditure on (q, h).

Under weak separability, conditioning goods have only income effects (details see Browning and Meghir, 1991, Econometrica). This result has the corollary that under weak separability the conditional demand system for the goods of interest has the form:

$$q_i = f_i(p, a, x) \qquad (i = 1, 2 \ldots m)$$

Hence a simple test of weak separability consists of testing whether the demands q_1 depend on the quantities of goods *h*, given the prices of goods of interest *p*, the total expenditure on these goods, *x*, and *a*.

There are several reasons (see more detail in the above-cited work) why the conditional demand system is chosen in much empirical demand analysis. First, if some good is rationed, then it is appropriate to put the level of that good on the right-hand side. Second, it makes testing for weak separability very easy. All we need to do is to test whether a particular set of variables should be excluded from the right-hand side of a regression. The third advantage is that the conditional demand function is valid whether or not the conditioning variable is equal to zero. Thus corner solutions in the conditioning goods will not affect the demand system. The fourth advantage is that it does not require an explicit structural model for the conditioning goods at all, and the demand system will be correctly specified whether or not the conditioning goods are chosen optimally. This provides an important methodological advantage: we may study consumer demand without having to model things such as the decision to retire, while at the same time accounting for its possible influence on demand.

Because a main purpose of this essay is to examine whether and how age, retirement and income/expenditure affect preferences of elderly couples over non-durable goods, in light of the many advantages just listed, the conditional demand approach is thus adopted for our analysis. Ideally, the hours of work should be the number one choice for the conditioning good coupled with a participation (retirement) dummy to capture the effect of fixed costs of work. However, hours information is not available in the data set. This left the retirement dummy as the only choice for the conditioning variable in our demand system, which will be specified below.

3.2 The Empirical Specifications

Within a conditional demand system framework with the retirement dummy as the conditioning variable in the demand system, the empirical demand function for the budget share of good *i* is:

$$(3.1)\quad w_i = \alpha_i(const, age, ret, age \times ret, OtherControls) + \gamma_i(year, prov, year \times prov) \\ + \beta_i(const, ret)\ln y + \lambda_i(\ln y)^2$$

The *OtherControls* variables include two area dummies, one for living in a small city and one for living in a rural area (AREA2, AREA3); one dummy for not owning a home (NO_HOME). The *age* variables are five age dummies from the second age group to the oldest one (AGE2-AGE6). The *ret* variable is also a dummy, which is equal to 1 if the couple are both-not-working (RET). The set of cross product of age and ret variables (AGE2*RET-AGE6*RET) in the system captures the observation that (see my first essay) the age pattern of the saving rate is very different between the both-retired group and at-least-one-is-working group. The usual price variables in the demand system are now replaced with a set of year dummies, a set of province dummies and a set of cross products of the two dummies. This is to recognize the fact that all available price differences are differences between successive years and among provinces. By replacing prices with year, province and their cross-product dummies, we can abstract from the complication of price analysis and yet still control for the change of the prices while studying age, retirement and total expenditure effects on demands. The $\ln y$ variable is the natural log of real total expenditure (LEXP), which is the nominal expenditure deflated by CPI of the corresponding provinces. It has also been crossed with the conditioning variable *ret* as specified in the original conditioning demand system (LEXP*RET). The square of $\ln y$ is added to account for the possible nonlinear effect of total expenditure on budget share (LEXP_SQR).

3.3 Estimation and Testing

To estimate such a conditional demand system, we must confront the issue that endogenous variables are included on the right-hand side (i.e. there may be right-hand-side variables that are correlated with the error terms of the budget share equations). The total-expenditure variable, $\ln y$, has been commonly treated in empirical work as endogenous in the system, and so are variables like the product of *ret* and $\ln y$, and $(\ln y)^2$. Several attempts have been made to find instrumentals for $\ln y$. The final choice is to use log income, log income squared, product of ret and log income, plus a set of three head education dummies for high school, college and university. Hausman tests of exogeneity indicate that the total expenditure variables are indeed endogenous (the results and discussions will be found below after regression results are presented). But tests of over-identifying restrictions,[4] for every possible choice of instrument variables and inclusion or exclusion of certain variables in the regression, persistently reject the null hypothesis that the exclusion restrictions are true. This situation is not uncommon in empirical work: for example, it is true in Browning and Meghir (1991).

There is also a possibility that the dummy variable *ret*, which is also equivalent to a labour force participation dummy, is endogenous. And if *ret* is endogenous, so are the *age-ret* cross dummies in the system. However, on the following grounds, the final decision is to treat the retirement dummy as exogenous to our system. Firstly, my previous work not reported here, which also studied the demands of the elderly using the same survey data (but with fewer years), found the ret dummy to be exogenous. Secondly, preliminary work for the current system without *ret-age* cross dummies showed the results that, individually (equation by equation), the exogeneity assumption was not rejected; jointly (for the whole system), the test was significant at only the 10% level. Third, it is next to impossible to find enough variables as instruments for all of these potentially endogenous variables. In their work, Browning and Meghir (1991) found that hours and participation variables in their conditional demand system are endogenous. However, their work was based on married couples (with or without children) in their working ages (between 20 and the retirement age). It is understandable that, with so many activities going on (career advancement, family formation, child rearing) within this age range, labour force participation and hours of work decisions are very much related to the otherwise unpredictable ups and downs of their consumption

[4] A simple test, due to Hausman (Handbook of Econometrics, 1983), is used.

demands, among other things. On the other hand, it is also conceivable that, for the majority of the elderly couples, labour force participation is not a conscious choice but an acknowledged reality (either because of employer behaviour or because the retirement age is a strong social norm). Therefore, it may not be strongly related to the fluctuations in demands for the various types of goods and services.

Against the background one may view the estimation procedure in this study as a standard one with allowance for general form of heteroskedasticity in the error terms among equations (similar to that of Browning and Meghir, 1991). The demand system including the conditioning retirement effects can be written as:

(3.2) $$w_k = f(a_k, r_k, p_k, x_k \mid \theta) + u_k,$$

where w_k is the vector of budget shares for the k th household, r_k is the retirement status, a_k is a vector of demographics including age, p_k is the vector for year and province (in place of prices), and x_k is the vector of log total expenditure. θ is the vector of unknown parameters to be estimated. Denote z as the available instruments, which we have described above, such that $E(u \mid z) = 0$ and such that $\text{plim}(N^{-1}\Sigma_k z_k \, \partial f_k(.) / \partial\theta) = M$, where N is the total sample size and M is a matrix with rank equal to the number of elements in θ. In our system, because the function $f(.)$ is linear in parameters, $\partial f(.) / \partial\theta$ is just the matrix consisting of the right-hand-side variables in the system. The consistent estimator for the parameter θ is obtained by minimizing $u'(I \otimes P)u$ where u is the stacked vector of error terms and $P = Z(Z'Z)^{-1}Z'$ (Z being the matrix of instruments). The asymptotic variance-covariance matrix of this estimator is

$$(3.3) \qquad V(\hat{\theta}) = (G'(I \otimes P)G)^{-1} G'(I \otimes P)\Omega(I \otimes P)G(G'(I \otimes P)\ G)^{-1},$$

where Ω is the error covariance matrix and G is the stacked matrix of the right-hand-side of variables for all observations. However, because Ω is unknown in (3.3), it has to be estimated first. The estimation of Ω is carried out by first obtaining the coefficients in each demand equation in the system, and then Ω is estimated by the outer product of the estimated residual vector from the instrumental estimation in the first stage with all cross terms set to zero. This also allows for general forms of heteroskedasticity in the model.

To focus attention on the parameters of interest and also to save some space, Table 3.1 presents only the estimates of the coefficients on a_k, r_k, and x_k variables in (3.2) (excluding year and province). The complete set of parameters is provided in the Appendix. Note that all parameter estimates in the table have been multiplied by 100 (i.e., expressed as if the dependent variables were measured as a percentage), and t-statistics instead of standard errors are provided.

Because of the mass of information in the table and also due to a large number of core variables having either cross product or quadratic forms, it is difficult to judge the results just by looking at them. Thus any discussion of the implications of these estimates regarding age, expenditure and retirement effects are postponed for the moment until next section. The rest of this section examines some test results, which are based on the coefficient estimates and the estimated variance-covariance matrix, as well as parameter estimates for the other control variables (area and homeownership dummies) in the system.

In general, the parameter estimates for NO_HOME (not owning a home) are in agreement with the message of Table 2.4c in Section 2.2, where the unconditional differences in expenditures between homeowners and non-owners for all the non-durable goods are given. First, the two goods, food at home and alcohol, with their parameters having non-significant t-values in Table 3.1 are also the two goods with the largest P-values (over 60%) in Table 2.4c for the "All equal?" test. Second, the NO_HOME parameter in the water-fuel-electricity equation in Table 3.1, which is the most significant one in terms of both t-value and magnitude among all goods, is also the one with the largest difference in expenditures between owners and non-owners with a 0% P-value for the testing results in every age in Table 2.4c. Non-owners spend significantly less on water-fuel-electricity than owners. Many parameter estimates from the equations such as household operation, private transportation, personal care, recreation, tobacco and gifts-contributions also have the same sign and t-values that are conformable with those inferred from Table 2.4c. Only for four goods, namely food restaurant, clothing, public transportation and medical care, do the two tables yield different answers. In Table 3.1, the parameter estimates for these goods are all significant, whilst in Table 2.4c, they tested "the same" in the "All equal?" test.

There are also differences in the demands among those living in different areas. In comparison with those living in larger cities, couples living in small cities (AREA2) and in rural areas (AREA3) have less budget shares on food at home, public transportation and alcohol, and more shares on water-fuel-electricity, household operation, private transportation and gifts-contributions. Moreover, couples living in rural areas spend less on personal care and recreation, and those living in small cities spend less on food restaurant and tobacco, than those living in larger cities. There is no apparent difference in preferences on clothing and medical care among those living in different areas.

Various test results for the demand system in equation (3.1) are presented in Table 3.2. The first test listed is the standard Hausman exogeneity test focusing on the parameters of total expenditure variable. The Hausman test approach is to take an IV estimator of a vector of coefficients, say β^A, and compare it to an estimator that is consistent and efficient under the null of exogeneity, β^0, and then, $(\beta^A - \beta^0) \sim N(0, V^A - V^0)$, V^A and V^0 being the covariance matrices of the respective estimators. The χ^2 statistics and P-values for each single equation and for the whole system are shown in the table. As can be seen, all tests reject the null hypothesis that the total expenditure variable is exogenous. Note that the test result is not available for the personal care equation because, as has often been reported as a problem with the Hausman test in empirical work, the estimate of covariance matrix, $(V^A - V^0)$, turns out not to be positive definite. Nevertheless, there is already sufficient evidence to accept that the Total Expenditure variable is endogenous to the system, and we treat it accordingly using an IV estimator as stated before.

The following three tests listed in Table 3.2 give the test statistic (Wald type test, χ^2 statistic) for the null hypothesis that the parameters of the indicated variables (Age, Retirement and Total Expenditure) in the equation and in the whole system are all zeros. This is equivalent to testing whether the indicated variables have no effect on demand decisions. Note that the test for the retirement effect is also a test of weak separability of the commodity demands and retirement, as explained in section 3.1.

Age has significant effects on demands for most goods, including food at home, clothing, private transportation, public transportation, medical care, personal care, tobacco, alcohol, and gifts-contributions at the 5% level and food at restaurant and household operation at the 10% level. However, age does not enter the picture when it comes to the demand for water-fuel-electricity and recreation. We will discuss in more detail later in the next section whether these consumption items are increasing or decreasing with age and by how much, if any. Finally, as evidenced by a system-wide joint test, age has a high level of significance in the system as a whole.

Retirement status is also statistically significant for most goods. The group of goods having a significant retirement effect at the 5% level are food at home, water fuel electricity, clothing, private transportation, medical care, recreation, tobacco, alcohol, and gifts-contributions. The retirement effect on food at restaurants is significant only at the 10% level. Household operation, public transportation and personal care do not show any significance of the retirement effect. However, the joint test shows a high significance level of the retirement effect for the system as a whole. These tests also reject the weak separability assumption between preferences over goods and retirement. Detailed discussion of the retirement effect on each good is provided in the next section.

Lastly, we give the test results for the effect of total expenditure on demands. As always, the total expenditure effect has high statistical significance in every equation as well as in the whole system. However, in terms of the test statistic (those with a test statistic less than 100), the expenditure effect is less significant for household operation, public transportation, medical care, personal care and alcohol than the rest of goods. We will have more detail on the effect of total expenditure on demands in the next section.

4 Analysis of the Results on Non-Durable Consumption

Given the estimates of the demand system, now is the time to focus attention on the effects of age, income/expenditure and retirement on the preferences over the goods. We have already learned the age patterns of the shares and dollar amounts for the 14 non-durable goods in Section 2.1 that are the results of the total effect of these three factors (as well as other causes). In this section, we will also give estimates of the age patterns that are due to age increase only, due to expenditure decrease only and due to retirement only, in comparison with the age patterns resulting from the total effect. By doing this, we will be in a better position to tackle questions such as what factor(s) are mainly responsible for the observed non-durable consumption at various ages, and therefore have a better understanding on why most elderly couples in our sample continue to save, as found in my previous essays.

In what follows, section 4.1 provides the estimates of income/expenditure elasticities for each good and discusses its role in categorizing goods into necessities or luxuries, as it will be often referred to at later section. Section 4.2 then begins the main task of analysis on the factor decomposition for each consumer good, one-by-one, with a brief section summary provided at the end of the section.

4.1 The Income/Expenditure Elasticities

An important concern in demand analysis is the explanation of behavioral differences between households with different levels of total expenditure, which can be expressed in the form of income/expenditure elasticities of consumer goods. Also, because the concept of income/expenditure elasticity will be often referred to when we do factor decomposition analysis for each good, we provide in this section the estimates of income/expenditure elasticities and the implications for the demand behavior of our sample households.

From the demand equations in (3.1), the expenditure effect for good *i* can be shown as:

$$\partial w_i / \partial (\ln y) = \beta_i(const) + \beta_i(ret \times \ln y) \times ret + 2 \times \lambda_i \times (\ln y) \ ,$$

where $\beta\,(const)$ is the parameter of variable $\ln y$; $\beta\,(ret \times \ln y)$ is the parameter of the variable $(ret \times \ln y)$; and λ is the parameter of variable $(\ln y)^2$. By turning on and off the retirement dummy in the above expression combined with a given $\ln y$, we can calculate the expenditure effect for both retired and working groups.

Income/expenditure elasticity is the percentage change of the quantities of the good in response to a one percentage change of the income/expenditure. According to convention, a good is said to be a luxury if its expenditure elasticity is greater than one, to be a necessity if its expenditure elasticity is less than one but still positive. Both luxury and necessity goods are normal goods. However, if elasticity goes negative, the good is said to be an inferior good, because as income/expenditure goes up, the demand for the good actually goes down. It can be demonstrated that, from the demand equation in

(3.1), the expenditure elasticity for good i, call it e_i, can be expressed in terms of $\partial w_i/\partial(\ln y)$ and the budget share of good i, w_i:

$$e_i = (\partial w_i/\partial(\ln y) + w_i)/w_i \, .$$

As the expenditure elasticity here depends on $\partial w_i/\partial(\ln y)$, which can be examined by retirement status as discussed above, it can also be examined separately for both retired and working groups. Notice also that the sign of $\partial w_i/\partial(\ln y)$ also gives indication of whether the good is necessity (negative) or luxury (positive), as long as its absolute value is less than the share of budget of the good. Thus, as a convenient way to convey message, in what follows, a necessity means share declines with income and a luxury means share increases with income, and this classification of words "necessity" and "luxury" need not coincide with everyday use.

Chart 4.0 shows the estimated elasticities at means, which are calculated by using log of mean total expenditure and means of budget shares from the raw data, for both retirement statuses. There are six goods having elasticities above unity: gifts and contributions, food restaurant, recreation, public transportation, clothing and alcohol, in descending order. Three are around unity: private transportation, personal care and household operation. And the rest are under unity: medical care, water fuel electricity, food at home and tobacco. These elasticities are all significantly different from zero except for tobacco in the Ret=1 (not working) group.

The results for most goods accord with what we usually would consider. For example, gifts and contributions, food at restaurant, recreation, clothing and alcohol are luxuries while medical care, water-fuel-electricity and food home are necessities. However, for some goods, a conventional categorization of necessities and luxuries does not apply. Tobacco is not a necessity in any sense, yet its expenditure elasticity for working group is quite low, and for the not working group, it may be zero if not negative. It says that the demand for tobacco does not respond to the change in total expenditure at all. Private transportation is commonly considered more of a luxury than is public transportation, yet the elasticity for public transportation is much higher (between 1.3 and 1.7) than that for private transportation, which is around 1 for both groups.

In general, for goods with elasticities above unity, the retired group almost always has higher elasticities (about 0.5 higher) than that of the working group, and the higher the elasticity, the higher the difference in elasticities between the two groups. On the other hand, for goods with elasticities around or under unity, there seems no difference between working and retired.

Although Alcohol and Tobacco have nearly the same age pattern in their shares observed from the raw data (see Table 2.3), their expenditure elasticities are totally different. A one percent increase in total expenditure would result in a more than one percent increase in alcohol consumption, and more so for the retired group. The same one percent increase in total expenditure would only result in a fifth of a one percent increase in tobacco consumption for the working group, and no increase (perhaps even a decrease) for the retired group.

4.2 The Decomposition of The Total Change in Budget Shares

In this section, we are to examine how the three factors contribute individually to the observed change in budget shares from age 50-55 to age 76+ group for each good (total effect), which we have already looked at in Section 2.1. In other words, we are to decompose the total change in demand observed from the raw data to the three major factors to examine their separate contributions.

To start with, the age patterns of the shares due to each of the three factors separately need to be predicted first. These are made possible given the estimated regression coefficients from the demand system presented in Table 3.1. To predict the budget shares due to age increase only, the retirement dummy is set to 0.5 throughout (it is like having 50% retirees at all age groups). The log expenditure variable is set to the log of mean total expenditure from the raw data (=9.5623) for all age groups. All other variables (except the constant term) in the system are set to zero. When predicting the budget shares due to expenditure decrease only, we vary only the log of mean total expenditure by age group (also from the raw data), setting all age dummies to Age=(66-70), the retirement dummy to 0.5 and all other variables (except the constant term) to zero.

There is a little difficulty when it comes to predict the budget shares due to retirement only. As before, log expenditure variable can still be set at the log of total non-durable expenditure from the raw data at an all-age average. But we notice that: 1) retirement dummy is crossed with all age dummies, and so the retirement effect is different at each age group, 2) the fraction of the retirees also varies considerably among age groups. If we were to fix within an age group, the information on the retirement effects at all other age groups would be lost. If we were to always account for a full retirement effect (from 0 to 1), for some age groups (e.g. age 50-55, with only 7% retirees), this would not be representative of the population structure with respect to retirement effect for that age group. In compromising among all desired requirements, therefore, the age patterns of the shares due to retirement are calculated as the sum of two parts. The first part calculates the shares with retirement dummy set to zero (when working), Age=(66-70) and the same log expenditure of an all-age average. By doing this, we get the same base shares for each age group when retirement does not occur, holding age and expenditure fixed. The second part calculates the retirement effect by age group, that is, when retirement does occur, by how much the average share would change at each age group. This is done by yet another two-step calculation. The first step is to calculate the full retirement effect at each age, which is equal to the first derivative of each share equation with respect to the retirement dummy (a function of age dummies and $\ln y$). By switching age dummies on and off one by one and holding the same log mean total expenditure fixed as before, we get the shares at each age group that is due to the effect of from working to full retirement. The next step then weighs these shares by their corresponding proportion of retirement at each age group.

The decomposition of the total change of demand for each good is best presented in a visual form, and best presented for each good individually. Chart 4.1 to Chart 4.13 show all these decompositions for the 13 goods (the one left is the miscellaneous good).

Before we start looking into what these charts tell us, however, some housekeeping duties need to be cleared first. In the attempt to put the shares due to various factors together on an equal footing for comparison, all age patterns are centered at the first age group (i.e., the shares in the first age group are subtracted from the shares of all age groups). Thus, the shares for the first age groups are always zero, and the vertical scales in the charts simply measure the difference of the share in each age group from that of the first age group. It is therefore required that Chart 2.1 and 2.2, where the level of shares and dollars at the first age group observed from the raw data, are to be referenced at all times. In all charts from Chart 4.1 to Chart 4.13, the solid line is the age pattern observed from the raw data (the total effect), the longer dashed line is the age pattern that is due to age increase only, and the shorter dashed line is the age pattern that is due to total expenditure decrease only. To avoid overlapping with other lines, the gray dots without connection line at each age category are used to represent the age pattern that is due to retirement only. For all the charts, the vertical scale is usually from -3% to +4%, but is lower and/or higher if needed. This is to facilitate a relatively uniform scale across all charts and also suit the diverse range of shares for different goods.

Food at Home

As we have seen in Section 2 and Chart 2.1, food at home has the largest budget share among all goods in both the first and the last age groups. Estimated from the raw data, the average share (total effect) of food at home in age 76+ group is near 29%, up more than eight percentage points from the level at age 50-55 group. We find that this sharp increase in the share is due entirely (or more) to expenditure decrease, as shown in Chart 4.1. Share of food at home would have had an increase in its share by more than eleven percentage points, instead of eight, over the age span if we account only for the income/expenditure effect. There seems little change in the shares due to age and retirement in the first three age groups. The retirement effect starts driving the share a little higher in age 66-70, then a little lower in age 71-75, both by around 1%, and returns to zero at age 76+. The age effect shows some small decrease in share (by less than one percentage point) in the middle age groups, and then a visible drop (by around 1.7 percentage point) at the oldest age group.

There is no doubt that food home is a necessity, both in the usual sense that it is a good for surviving and in the sense that as total expenditure goes down, its share goes up. What we have also learned is that, given total expenditure, the age effect alone or the retirement effect alone would not make much difference to the age pattern of the share. That is, we would not have seen an increase in the share of food home over the ages. Remember that the share of food at home is the largest among all goods and that the observed total non-durable expenditure shrinks with age. A direct consequence of the 'no effect' of the age effect (actually, a decease in share at oldest age) would be that, in contrast to the total decrease in dollar amount of only about $900 observed from the raw data, the amount of decrease in spending would have been much larger, by approximate

\$2600.[5] If it were not for the counter effect of total expenditure that pushed up the share of food at home, the reduction of food home in dollar amount would have accounted for a much larger part in the total reduction of non-durable expenditure over the ages.

Food Away From Home

The share of food away from home is much smaller compared to the share of food at home (6% vs. 20%, respectively) at age 50-55, and even smaller (3% vs. 29%, respectively) at age 76+ as its observed share decreases with age. Chart 4.2 further shows that, while the age-only and retirement-only shares remained neutral (no effect), the expenditure-only effect is again the major factor (accounted for about 80%) affecting the change in total share but in the opposite direction as that of food at home. Here we see a decrease in total expenditure over the ages would lead to a decrease in the share of restaurant meals by about three percentage points. Undoubtedly, restaurant meals are considered a luxury, as it is mostly discretionary based on affordability as well as on preference. The observed decrease of \$800 (Chart 2.2) is mostly driven by the total expenditure effect. If we only accounted for the age or retirement effect, the decrease would be much smaller, at approximate \$200.

[5] These dollar amounts can be recovered easily from the set of estimated shares due to age only (or other factors only) and the set of log of mean total expenditures by age group from the raw data, which is also the base total expenditure in calculating the observed shares. As a result, if an estimated age pattern (say due-to-age-only share) is around the zero line (no change), its corresponding age pattern of dollar amount will be downward sloped because the underlying total expenditure pie shrinks with age.

Water-Fuel-Electricity

By our standards, water-fuel-electricity is a basic good for surviving, like food at home. Indeed, the estimates for water-fuel-electricity tell us a similar story like that for food at home, albeit at a smaller scale. At a little over 6% of the budget at age 50-55, the observed share of water-fuel-electricity reaches near 10% at age 76+, a near four percentage points increase over the ages. Of the total increase in its share, the effect of total expenditure decease contributed nearly 90% (Chart 4.3). Age and retirement again have little to do with the total increase of the share; their age patterns are almost identical and completely flat around zero line. As a consequence therefore, the absolute amount that would have spent on water-fuel-electricity due to the age or the retirement effects would have been a much larger decrease, at approximate $1000, instead of just the observed $200. On the other hand, it is the effect of decrease expenditure that helps keeping the spending from falling further.

Household Operation

The budget share of household operation is rather stable over the ages, as one would expect. The observed share increased by only one percentage point (from about 7% to 8%), of which two thirds of the increase was in the last two age categories. The retirement effect seems to show a decrease trend over the later three age groups, with the lowest (around half a percentage point drop) in the last age group (Chart 4.4). The age effect is very flat, with a slight decrease in middle groups and a slight increase in the last age group. The total expenditure effect, too, is rather neutral throughout, with a little increase at older ages. But in general, all these effects are quantitatively negligible.

Clothing

The age pattern of clothing share is of interest on many accounts. As far as income/total expenditure is concerned, clothing is viewed as luxuries rather than necessities despite its basic indispensable role for all ages. If working/retirement is concerned, clothing is often viewed as a part of working expenses. And, strictly speaking, clothing is a semi-non-durable good (or semi-durable, for the other matter) because its wearable period can be longer than a year, say.

At near 11% (the third largest) in the first age group, the share of clothing observed from the raw data (the total effect) falls by more than three percentage points over the ages to reach just a little over 7%. Chart 4.5 further shows how the total decline of the share is affected by the three factors. The effect of total expenditure is still the driving force for the total decrease in clothing share: about 80% of the total drop can be attributed to the decrease total expenditure alone. On the other hand, somewhat unexpectedly, aging alone would lead to an increase in the share of clothing, by as much as one percentage point, and more than 85% of the increase is in the younger age groups including age 66-70. Led only by gifts-contributions and medical care, clothing is one of a few goods having a noticeable upward sloping age pattern of its share due to aging only. There may be two reasons (among many) that can explain the increase of its share due to aging. First, clothing is indispensable and there is no reason that age matters, so at least the share of clothing would be unchanged over the ages. On top of that, the 'easy to consume' and 'look good and feel good' nature of clothing consumption may be more attractive to the elderly. When work/retirement is concerned, we see that the retirement effect shows up noticeably only at age 66-70 group, at which clothing share falls by more than half a percentage point. Because this age group is the most popular for starting retirement and thus most typical of representing the effect, we assume that the drop in the share of clothing at this age group shows the size of the work expense for clothing.

Private Transportation

Like clothing, private transportation (along with public transportation) is also considered a part of working expense for most people. And as far as income is considered, private transportation is often viewed more as a luxury than a necessity. Unlike clothing, however, private transportation may be not that 'easy' to consume for seniors, at least for safety reasons. What do our data and our estimates say regarding these commonly held views?

With its second largest share of over 12% of the budget at age 50-55 observed from the data (Chart 2.1 and 2.2), private transportation sees its share drop by four percentage points at age 76+, the largest absolute decline in shares among all goods. Chart 4.6 further shows the age pattern of the share from the total effect, along with the predicted age patterns due to the three factors. The total-effect age pattern has a distinctive shape: flat until age 61-65, then decreases at an increased rate afterwards. We find that the age pattern due to aging traces this shape very closely except at the oldest age group. That is, the large drop in the share of over 4% over the ages can be attributed almost entirely to age increase, except at the last age group when retirement effect kicks in. When considering work/retirement, we see that the share due to retirement drops in the two middle age groups by about half a percentage point, with a further larger decrease of over one percentage point in the last age group. Unexpectedly, the income/expenditure effects are not large. If anything, as total expenditure decreases, the share of private transportation due only to expenditure decrease increases slightly at the middle age groups, by less than half a percentage point, and returns to zero at the last age group. The message is that, contrary to what most of us would consider, private transportation is more a necessity than a luxury good. For a given age and given retirement status, income/expenditure does not matter when it comes to the non-durable expenditure aspect of using private transport.

Public Transportation

As an alternative to private transportation, public transportation is also considered a part of working expenses. Yet, its share at age 50-55 is the smallest of all goods, at only 2.5%, and it remains at almost exactly the same share at the oldest age group. From the age patterns shown on Chart 4.7, we see only one slight dip of the total share at age 66-70. This age pattern is followed almost exactly by the age pattern due to retirement only, which also see a small dip at this age group. We can say that this is because of the relief of the working expense. But remember also that, when reach age 65, seniors are also eligible for various public subsidies including bus fare and drugs. Chart 4.7 also reveals that, although small, the age effect and the expenditure effect operate in the opposite directions and at about the same size (by less than one percentage point) over the ages. Aging leads to increased dependence on public transportation while decreasing in total expenditure leads to a decrease in using public transportation. The two factors offset each other, leaving unaffected the observed age pattern of the total share. The increased demand for public transportation due to aging may reflect the fact that, where possible, some individuals choose public instead of private transportation when their health conditions would not allow them to operate their own transportation safely. However, somewhat unexpectedly, public transportation is classified by expenditure response as a luxury good instead of a necessity.

Medical Care

Like public transportation, medical care expenditure also does not include various benefits to seniors, in addition to the universal health care system in Canada, when they reach age 65. At close to 4% share at age 50-55, the observed share of medical care (the total effect) reaches about 6% at age 76+, a two percentage point increase over the ages. The age pattern of this total increase (Chart 4.8) shows that, after a steady increase in the share until age 61-65, the share drops markedly at age 66-70 and resumes its increasing trend thereafter. In particular, the increase trend accelerates at the oldest ages. Clearly, the drop in the share at age 66-70 is because those senior benefits are in effect. But the share pattern itself after that age (increasing with age) should reflect the demand pattern by seniors.

Further breaking down of this age pattern shows that the share due to age only follows the total-effect age pattern closely until the last age group when the retirement effect appears. Although the total expenditure effect reinforces the upward age pattern (classifying the good as a necessity), its magnitude is not that important (an increase of only half a percentage point over the ages) compared to that of aging. In general, the retirement effect is higher at older ages. It shows markedly at the last age group with an increase of over one percentage point, shows modestly at age 66-70 and 71-75, and is almost flat at the younger ages.

These observations send us important messages. Medical care demand in our sample depends mostly on how old one is. The older the age, hence the poorer health, the higher will be the share of medical care. Income/expenditure does not play a big role, although medical care can be deemed a necessity. Retirement shows a marked increase in share only at the oldest age group because at that age, a person who is still working must be unusually fit than their retired counterparts. Clearly, this is a health-related issue: we have to acknowledge that older people tend to have poorer health, and this will have profound influence on their consumption possibilities over their later ages, as we have already found much evidence of so far.

Personal Care

Personal care observed from the raw data only accounts for 3% of the budget at age 50-55, and it stays at this level throughout the ages. As is also clear from Chart 4.9, all three factors have the same story of 'no change' as that of from the raw data. The share of personal care is the most stable (also the most boring one) among all goods we study.

Recreation

The activities included in recreation are very wide, consisting such things as photographic goods and services, home entertainment equipment and services, recreation services, spectator entertainment performances, package travel tours, reading materials and printed matter, education suppliers, tuition, textbooks and services, etc. At nearly 9% of the budget share at age 50-55 observed from the raw data, recreation is one of a few large share items, following only food home, private transportation and clothing. At age 76+, however, its share falls to below 6%, a decrease of over three percentage points. According to the nature of activity included in recreation, one would speculate that the income/expenditure effect should dominate in shaping this age pattern, and the retirement effect should be in the opposite direction because most activities need time to consume and therefore should increase in share for the retirees. It is also tempting to expect a decrease in share due to aging, but let us first examine what our estimates reveal.

Chart 4.10 gives the separate effects of three factors as well as the total effect for the age patterns of recreation share. A close scrutiny of the shape of these lines suggests that: 1) the effect of decrease in total expenditure dominates in the total decrease of the recreation share, 2) the effect of retirement, although opposite in direction, contributes in shaping the age pattern of the total share, especially in the middle age groups. The shape of the total-effect line follows the hump shaped retirement-only age pattern closely, with a flattened-out period (instead of straight downward) in the middle groups. And when the retirement effect returns to zero at the last age group, the total effect falls down sharply as well. These are very much the results that we have expected. However, we also notice that, in contrast to our expectation, aging has little effect on the share of recreation. The broad range of activities included in the definition of recreation in our data seems to enable the elderly substitute or complement one type of recreation for another without any decrease in its share due only to aging.

Tobacco

One of a few small-share items, tobacco consumption accounts only a little over 3% of the total budget at age 50-55. Over the ages, we see a full two percentage points decrease in its share, reaching only a little over 1% at age 76+ (Chart 2.1). Chart 4.11 further reveals that nearly half of the decrease is within the last age group. The decomposition tells us that aging leads to a dramatic decrease in tobacco share by near five percentage points in total, and half of the drop is from the first to the second age group. This marked drop in the young age group suggests that most observed decline in the share of tobacco with age is truly because of more people quitting smoking when they age since it is unlikely that smoking related mortality would be so high at such a young age. And the second marked decrease occurring at the last age group is more likely the result of our sample having a higher proportion of non-smokers at older ages. Chart 7.11 also shows that the decrease of total expenditure leads to an increase in tobacco share by about one and half percentage points. This may reflect the finding from many other studies that more smokers are in lower income groups. Compared to the age and expenditure effect, the retirement effect is small, especially at the younger ages. Nonetheless, its effect seems to show a decline trend in tobacco share with age, especially at the oldest ages.

Alcohol

Like tobacco, alcohol is also a small-share item, and its overall consumption pattern from the raw data more or less resembles that of tobacco. At about 3.5% of the total budget at age 50-55, alcohol share also drops by two percentage points over the ages. However, the decomposition of the total effect on alcohol share reveals a totally different story as that for tobacco (Chart 4.12). Of the total drop in alcohol share of two percentage points, half of which is within the last two age groups. Aging leads to a decrease in the share starting in the two older age groups, by over one percentage point. On the other hand, retirement leads to an increase in the share also starting in the two older age groups, by almost the same amount as the decrease from aging. That is, aging and retirement show their effect on alcohol consumption only at later ages (after age 70), and their effects go in opposite directions. Poorer health may be a factor towards consuming less alcohol while more time at home when retired (compared to younger retirees who may have more time outdoors) may lead to higher consumption of more alcohol. When it comes to the effect of total expenditure, although it is small, we notice that as total expenditure decreases, the alcohol share would also decrease.

Gifts-Contributions

Finally, we discuss the share of Gifts-Contributions. It is the one category that exhibits the most interesting and unexpected spending pattern over the ages. Unlike all other goods, gifts-contributions is all about giving not consuming. One might expect a downward age pattern in the share of gifts-contributions for the elderly couples, considering that, as described in Section 2.1, the elderly are facing a decline in net income, a decline in total expenditure as well as a decline in total non-durable expenditure. Yet, as also described in Section 2.1, we observe an upward sloped age pattern from the data. At over 7% of the total budget at age 50-55 (ranked the fifth), its share rises with age at an increasing rate and reaches over 13% at age 76+, second only to food at home.

Now let us examine how the three factors affect this total change in its share (Chart 4.13). We find that aging factor alone would have caused the share to climb by as much as eight percentage points, two percentage points more than what we observe. In contrast, decreased expenditure alone would have caused the share to slide as much as six percentage points, the same size as the increase in share we observe. The retirement effect shows little until at the last age group, when it helps sending the share two percentage points higher, reinforcing the positive aging effect at the last age group.

Clearly, aging is the driving force in shaping the age pattern we observed from the data. Perhaps individuals who have the desire and economic ability to spend but do not have as much physical ability to consume shift expenditures towards gift giving or donations. Even healthy individuals, with capacity to consume, can decide to give gifts or donations as they approach the end of life. Perhaps as individuals age, they need more help and/or more frequent visit/contact by their offspring and the gift giving is an effective way of getting these 'services'. The list of possibilities can go on and on. Clearly, more studies are needed in this subject in the future. But the basic message here is clear: the elderly do shift some resources to gifts from other consumption despite facing a decline in net income/total expenditure.

Section Summary

We have examined how the three factors separately affect the observed age patterns of the shares for each good in the demand system. Simple summaries of these effects are provided in three charts. Chart 4.14 and Chart 4.15 display the differences in the shares from age 50-55 to age 76+ that are due to age increase and expenditure decrease, respectively, for all the goods examined. Chart 4.16 shows the retirement effects converted to the weighted averages of those age-by-age effects with the sum of the proportion of retirement over the ages as the total weight. Notice that all three charts are in the same horizontal scale.

Aging leads to a marked decrease in the shares of tobacco, private transportation, food home and alcohol, and a marked increase in the shares of gifts-contributions, medical care, clothing and public transportation. Of the decrease-share goods, food home and private transportation are the two goods having the largest budget shares at the first age group and they both need good health to consume. The decrease in these two shares could explain a large part in observed fall in total expenditure. Their fall in shares coupled with the increase in the share of medical care and public transportation points to a state where the health of the elderly deteriorate, and their weaker condition could restrict them to consume certain goods. On the other hand, the increase in the shares of clothing and gifts-contributions uncovers a new dimension of consumption behaviour of the elderly. It suggests that, for some goods that are ‘easy’ to consume (spend) and yet can make the elderly feel good, the shares of these goods would also increase.

The effect of expenditure decrease over the ages also drives the shares of some goods to increase and some to decrease. Food home, water-fuel-electricity, tobacco and medical care all have a visible increase in the shares with food home increasing markedly. Most of these goods are the basics for the elderly except tobacco, which is a different matter. And most goods in the decreased-share category are, to any definition, considered luxuries: gifts-contributions, recreation, clothing and food restaurant. The effect of total expenditure on most goods conforms to what we would expect.

Given the age effect and the expenditure effect, the retirement effects are relatively small, as can be seen in Chart 4.16. Nevertheless, most of findings conform to our expectations. Retirement would lead to a visible increase in the shares of gifts-contributions, recreation and medical care, a visible decrease in the shares of private transportation and clothing. Of these changes, only the increase in gifts-contributions is somewhat unexpected. All other shares have minor changes and therefore limited influence on the total expenditure pattern.

In general, the analysis from the demand system suggests that, for some reason, older individuals largely "obey" the cross-section income/expenditure elasticities for most goods as their incomes fall with age. The "savings puzzle" comes largely because reductions in food at home, private transportation, and perhaps tobacco/alcohol due to age alone are larger than the offsetting age effect associated with an increase in gifts-contributions.

5 Conclusions

As a part of the study on saving behaviour of the elderly couples, this essay has investigated the age patterns of consumption demands and its decomposition into three factors affecting the observed changes in demand over the ages.

The ground level study that describes the observed age patterns of the consumption goods directly from the raw data uncovers many important facts. We find that most of the goods exhibiting an increase in the shares (though not necessarily an increase in dollar amounts) over the ages are the very basics of life: food home, water-fuel-electricity, household operation, and medical care. However, gifts-contributions is among these growing-share goods too, and grows the fastest. On the other hand, the shrinking-share goods are those either working related or leisure related, or even hobby related ones: private transportation, clothing, recreation, food restaurant, alcohol and tobacco. It seems that, aging alone, decreasing total expenditure alone, or retirement alone cannot explain fully all these facts at this stage.

The decomposition analysis provides more insight into the causes of these observed facts. The result on the effect of total expenditures suggests that, for some reason, older individuals largely "obey" the cross-section income/expenditure elasticities for most goods as their incomes fall with age. The shares of those considered luxuries would fall, and of those necessities would rise, as a response to the fall in total expenditure.

Likewise, the retirement effect is also more or less in accord with our expectations regarding a decrease in work related, and an increase in leisure related expenses, albeit its effect is small compared to that of the other two factors.

Aging lead to a marked decrease in the shares of private transportation and food home, and a marked increase in the shares of gifts-contributions, medical care, clothing and public transportation. Food home and private transportation are the two goods having the largest budget shares at the first age group and they both need good health to consume. The decrease in these two shares due to aging could explain a large part in observed fall in total expenditure. Their fall in shares coupled with the increase in the shares of medical care and public transportation due to aging point to a state where the health of the elderly deteriorates, and the weaker condition could restrict their consumption of certain goods. The increase in the shares of clothing and gifts-contributions due to aging uncovers a new dimension of consumption behaviour of the elderly. It suggests that, for goods that are 'easy' to consume (spend) and yet can make the elderly feel good, the shares of these goods would also increase.

Combining all the results from the three effects above, it suggests that the "savings puzzle" comes largely because reductions in food at home, private transportation, and perhaps tobacco/alcohol due to age alone are larger than the offsetting age effect associated with an increase in gifts-contributions.

Table 2.1: Basic facts - fractions on selected characteristics

		Both retired		Owning home		Buying cars		Smoking	
Head Age	Obs.	%	Diff (%)	%	Diff (%)	%	Diff (%)	%	Diff (%)
50-55	1003	6.6		42.2		32.5		64.2	
56-60	1341	13.8	7.2	53.6	11.4	29.5	-3.0	56.4	-7.8
61-65	1639	30.1	16.3	57.2	3.6	25.1	-4.4	54.5	-1.9
66-70	1693	72.6	42.5	65.2	8.0	21.0	-4.1	48.7	-5.8
71-75	1345	85.9	13.4	66.5	1.3	15.2	-5.8	43.7	-5.0
76+	1328	92.9	7.0	63.1	-3.4	10.6	-4.6	33.7	-10.0
Tot Diff (%)			86.3		20.9		-21.9		-30.5

Table 2.2a: Mean income and expenditures (in 1986$s)

Head Age	Net income	change (%)	Total expenditure	change (%)	Non-durable expenditure	change (%)
50-55	31,999		25,944		18,863	
56-60	29,210	-8.7	23,365	-9.9	17,148	-9.1
61-65	24,746	-15.3	20,384	-12.8	15,177	-11.5
66-70	20,224	-18.3	17,713	-13.1	13,188	-13.1
71-75	18,163	-10.2	15,567	-12.1	11,869	-10.0
76+	16,638	-8.4	13,443	-13.6	10,258	-13.6
Tot % change		-48.0		-48.2		-45.6

Head Age	Shelter (exclude wfe*)	change (%)	Car purchase	change (%)	Furniture & equipment	change (%)
50-55	3,590		2,171		1,321	
56-60	2,886	-19.6	2,170	0.0	1,160	-12.2
61-65	2,449	-15.1	1,759	-18.9	999	-13.9
66-70	2,231	-8.9	1,440	-18.1	854	-14.5
71-75	1,922	-13.9	1,065	-26.0	711	-16.7
76+	1,910	-0.6	689	-35.3	586	-17.6
Tot % change		-46.8		-68.3		-55.6

* wfe = water fuel electricity

Table 2.2b: Median income and expenditures (in 1986$s)

Head Age	Net income	change (%)	Total expenditure	change (%)	Non-durable expenditure	change (%)
50-55	29,474		23,384		17,446	
56-60	25,557	-13.3	20,640	-11.7	15,650	-10.3
61-65	21,507	-15.8	18,180	-11.9	13,834	-11.6
66-70	16,826	-21.8	15,218	-16.3	11,664	-15.7
71-75	15,395	-8.5	13,466	-11.5	10,420	-10.7
76+	13,981	-9.2	11,767	-12.6	9,139	-12.3
Tot % change		-52.6		-49.7		-47.6

Head Age	Shelter (exclude wfe)	change (%)	Car purchase	change (%)	Furniture & equipment	change (%)
50-55	2,858		0.00		797	
56-60	2,290	-19.9	0.00	-	637	-20.1
61-65	1,877	-18.0	0.00	-	587	-7.8
66-70	1,721	-8.3	0.00	-	479	-18.4
71-75	1,544	-10.3	0.00	-	374	-21.9
76+	1,514	-1.9	0.00	-	250	-33.2
Tot % change		-47.0		-		-68.6

Table 2.3: Details on mean non-durable expenditures, in values (1986$s) and in shares (%)*

Head Age	Food home	Change (%)	Share (%)	Food restaurant	Change (%)	Share (%)	Water fuel elec.	Change (%)	Share (%)	Household operation	Change (%)	Share (%)	Clothing	Change (%)	Share (%)
50-55	3,833		20.3	1,120		5.9	1,161		6.2	1,262		6.7	1,997		10.6
56-60	3,697	-3.5	21.6	932	-16.8	5.4	1,211	4.3	7.1	1,190	-5.7	6.9	1,671	-16.3	9.7
61-65	3,529	-4.5	23.3	698	-25.1	4.6	1,171	-3.3	7.7	1,068	-10.3	7.0	1,386	-17.1	9.1
66-70	3,317	-6.0	25.2	505	-27.7	3.8	1,140	-2.6	8.6	926	-13.3	7.0	1,099	-20.7	8.3
71-75	3,143	-5.2	26.5	382	-24.4	3.2	1,100	-3.5	9.3	852	-8.0	7.2	929	-15.5	7.8
76+	2,919	-7.1	28.5	303	-20.7	3.0	990	-10.0	9.7	788	-7.5	7.7	753	-18.9	7.3
Tot diff	-914		8.1	-817		-3.0	-171		3.5	-474		1.0	-1244		-3.2
Tot % change		-23.8	40.0		-72.9	-50.3		-14.7	56.8		-37.6	14.8		-62.3	-30.7

Head Age	Private transp.	Change (%)	Share (%)	Public transp.	Change (%)	Share (%)	Medical care	Change (%)	Share (%)	Personal care	Change (%)	Share (%)	Recreation	Change (%)	Share (%)
50-55	2,328		12.3	470		2.5	730		3.9	617		3.3	1,665		8.8
56-60	2,105	-9.6	12.3	439	-6.6	2.6	738	1.1	4.3	541	-12.3	3.2	1,368	-17.8	8.0
61-65	1,861	-11.6	12.3	390	-11.2	2.6	720	-2.4	4.7	477	-11.8	3.1	1,193	-12.8	7.9
66-70	1,513	-18.7	11.5	302	-22.6	2.3	573	-20.4	4.3	408	-14.5	3.1	1,002	-16.0	7.6
71-75	1,197	-20.9	10.1	305	1.0	2.6	580	1.2	4.9	368	-9.8	3.1	836	-16.6	7.0
76+	852	-28.8	8.3	265	-13.1	2.6	602	3.8	5.9	317	-13.9	3.1	587	-29.8	5.7
Tot diff	-1476		-4.0	-205		0.1	-128		2.0	-300		-0.2	-1078		-3.1
Tot % change		-63.4	-32.7		-43.6	3.7		-17.5	51.6		-48.6	-5.5		-64.7	-35.2

Head Age	Tobacco	Change (%)	Share (%)	Alcohol	Change (%)	Share (%)	Gifts	Change (%)	Share (%)	Other	Change (%)	Share (%)	Non-durable Expenditure
50-55	637		3.4	698		3.7	1,452		7.7	892		4.7	18,863
56-60	481	-24.5	2.8	594	-14.9	3.5	1,428	-1.7	8.3	752	-15.7	4.4	17,148
61-65	385	-20.0	2.5	473	-20.4	3.1	1,314	-8.0	8.7	512	-31.9	3.4	15,177
66-70	325	-15.6	2.5	375	-20.7	2.8	1,348	2 6	10.2	355	-30.7	2.7	13,188
71-75	257	-20.9	2.2	277	-26.1	2.3	1,331	-1.3	11.2	312	-12.1	2.6	11,869
76+	135	-47.5	1.3	171	-38.3	1.7	1,378	3.5	13.4	200	-35.9	1.9	10,258
Tot diff	-502		-2.1	-527		-2.0	-74		5.7	-692		-2.8	-8,605
Tot % change		-78.8	-61.0		-75.5	-55.0		-5.1	74.5		-77.6	-58.8	-45.6

* Test results on the equality of all ages indicate only Public transportation and Personal care for budget shares are non-significant (P-values are 0.61 and 0.23, respectively).

Table 2.4a: Differences between owning and not-owning a home

	Net income			Total expenditure			Non-durable expenditure		
Head Age	Owner	Non-owner	equal?*	Owner	Non-owner	equal?	Owner	Non-owner	equal?
50-55	31,931	32,049	89.6	24,763	26,806	0.3	18,929	18,814	80.2
56-60	30,030	28,263	2.2	23,173	23,587	48.0	17,522	16,716	4.2
61-65	24,976	24,438	44.6	20,322	20,467	78.7	15,501	14,745	3.6
66-70	21,062	18,653	0.1	18,213	16,777	0.9	13,930	11,798	0.0
71-75	18,870	16,757	1.0	15,681	15,341	58.3	12,480	10,655	0.0
76+	17,105	15,837	11.5	13,450	13,432	97.7	10,705	9,492	0.3
All equal?*			0.02			1.05			0.00
Tot % chg	-46.4	-50.6		-45.7	-49.9		-43.4	-49.5	

	Shelter			Furniture & equipment			Car purchase		
Head Age	Owner	Non-owner	equal?	Owner	Non-owner	equal?*	Owner	Non-owner	equal?
50-55	2,030	4,728	0.0	1,283	1,349	42.7	2,521	1,915	2.1
56-60	1,994	3,917	0.0	1,206	1,106	15.9	2,451	1,848	0.7
61-65	1,794	3,326	0.0	1,048	933	7.5	1,980	1,463	1.2
66-70	1,703	3,223	0.0	881	803	24.1	1,700	953	0.0
71-75	1,319	3,119	0.0	745	644	19.0	1,136	923	36.8
76+	1,238	3,060	0.0	638	499	6.0	869	381	3.6
All equal?*			0.00			5.19			0.00
Tot % chg	-39.0	-35.3		-50.3	-63.0		-65.5	-80.1	

* P-value (in %) from the test on the equality of the owner and non-owner.

Table 2.4b: House value and home improvement for homeowners

	House value		Home improvement		
Head Age	Value	% change	Value	% change	%house value
50-55	87,715		844		0.96
56-60	89,506	2.0	881	4.4	0.98
61-65	84,404	-5.7	711	-19.3	0.84
66-70	81,897	-3.0	620	-12.8	0.76
71-75	85,356	4.2	476	-23.2	0.56
76+	74,682	-12.5	326	-31.5	0.44
Tot % chg		-14.9		-61.4	

Table 2.4c: Details on the differences between home owners (Own) and non-owners (Not) of non-durable expenditures

Head Age	Food home			Food restaurant			Water fuel electricity			Household operation			Clothing		
	Own	Not	equal?*	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?
50-55	3,828	3,837	90.0	1,107	1,129	70.3	1,282	1,072	0.0	1,201	1,307	3.5	1,911	2,060	6.5
56-60	3,660	3,739	24.0	908	961	28.7	1,387	1,009	0.0	1,173	1,211	37.7	1,639	1,708	32.4
61-65	3,514	3,547	59.8	678	724	31.3	1,324	966	0.0	1,107	1,015	1.9	1,322	1,470	2.0
66-70	3,332	3,288	48.9	539	443	3.7	1,333	779	0.0	976	833	0.0	1,094	1,109	81.6
71-75	3,161	3,108	45.6	380	386	90.3	1,323	655	0.0	887	783	2.1	949	889	41.5
76+	2,935	2,891	52.2	297	312	78.3	1,264	520	0.0	817	739	8.2	732	788	22.0
All equal?*			79.36			34.67			0.00			0.00			8.42
Tot % chng	-23.3	-24.7		-73.2	-72.4		-1.4	-51.5		-32.0	-43.5		-61.7	-61.7	

Head Age	Private transportation			Public transportation			Medical care			Personal care			Recreation		
	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?
50-55	2,453	2,237	0.5	459	478	68.7	725	734	85.0	579	645	0.2	1,695	1,644	60.2
56-60	2,194	2,003	0.4	419	463	28.7	762	711	17.8	524	561	4.1	1,436	1,290	7.8
61-65	1,935	1,763	0.4	350	444	1.2	716	725	80.2	464	494	6.3	1,283	1,074	0.6
66-70	1,649	1,258	0.0	284	335	19.0	575	569	7.9	404	415	51.0	1,101	816	0.0
71-75	1,326	940	0.0	291	332	34.1	562	616	17.3	366	372	75.3	900	710	3.0
76+	956	673	0.0	245	298	21.0	577	646	7.7	309	331	23.7	619	532	30.8
All equal?			0.00			6.61			32.93			0.38			0.00
Tot % chng	-61.0	-69.9		-46.6	-37.7		-20.4	-12.0		-46.6	-48.7		-63.5	-67.6	

Head Age	Tobacco			Alcohol			Gifts and contributions			Other		
	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?	Own	Not	equal?
50-55	536	710	0.0	692	703	79.0	1,681	1,285	8.1	783	972	0.2
56-60	406	568	0.0	612	573	29.5	1,704	1,108	0.2	699	812	2.9
61-65	327	463	0.0	471	476	88.2	1,500	1,066	1.4	509	517	87.4
66-70	293	386	0.1	390	346	19.5	1,610	858	0.0	350	364	78.1
71-75	236	299	5.5	266	299	39.5	1,513	970	0.8	321	296	64.6
76+	116	167	11.4	184	149	35.7	1,472	1,215	20.4	181	231	35.7
All equal?			0.00			61.7			0.00			1.53
Tot % chng	-78.4	-76.5		-73.4	-78.8		-12.4	-5.4		-76.9	-76.2	

* P-values (in %) from the test on the equality of the owner and non-owner.

Table 2.5a: Differences between smoker and non-smoker

Head Age	Net income			Total expenditure			Non-durable expenditure		
	Smoker	Non-smoker	equal?*	Smoker	Non-smoker	equal?	Smoker	Non-smoker	equal?
50-55	30,260	35,119	0.0	25,399	26,922	3.1	18,654	19,237	22.2
56-60	27,572	31,328	0.0	22,814	24,077	3.2	17,008	17,329	42.1
61-65	23,203	26,593	0.0	19,394	21,569	0.0	14,764	15,673	1.2
66-70	18,927	21,457	0.0	16,917	18,471	0.3	12,918	13,444	13.6
71-75	16,476	19,474	0.0	14,686	16,252	0.8	11,532	12,131	13.2
76+	15,503	17,213	3.6	12,348	13,999	0.8	9,727	10,527	5.7
All equal?*			0.00			0.00			1.08
Tot % chg	-48.8	-51.0		-51.4	-48.0		-47.9	-45.3	

Head Age	Shelter			Furniture & equipment			Car purchase		
	Smoker	Non-smoker	equal?	Smoker	Non-smoker	equal?	Smoker	Non-smoker	equal?
50-55	3,308	4,097	0.0	1,243	1,461	1.1	2,195	2,128	80.4
56-60	2,855	2,925	67.4	1,115	1,218	15.2	1,836	2,605	0.1
61-65	2,207	2,738	0.0	915	1,098	0.4	1,507	2,060	0.7
66-70	1,973	2,478	0.1	779	925	2.0	1,247	1,624	5.9
71-75	1,574	2,192	0.0	638	768	6.7	942	1,160	33.4
76+	1,440	2,149	0.0	555	602	52.7	626	720	69.2
All equal?			0.00			0.02			0.06
Tot % chg	-56.5	-47.5		-55.3	-58.8		-71.5	-66.2	

* P-value (in %) from the test on the equality of the smoker and non-smoker.

Table 2.5b: Details on the differences between smokers (Smoke) and non-smokers (Not) of mean non-durable expenditures

	Food home			Food restaurant			Water fuel electricity			Household operation			Clothing		
Head Age	Smoke	Not	equal?*	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?
50-55	3,863	3,779	29.7	1,032	1,278	0.0	1,142	1,195	21.8	1,252	1,280	59.8	1,937	2,105	4.4
56-60	3,748	3,631	8.3	872	1,011	0.5	1,156	1,283	0.1	1,181	1,202	61.9	1,591	1,774	0.9
61-65	3,570	3,479	13.3	622	789	0.0	1,132	1,217	0.9	1,030	1,113	3.2	1,333	1,449	6.5
66-70	3,381	3,255	3.4	410	596	0.0	1,087	1,190	0.1	924	928	90.5	1,070	1,127	34.7
71-75	3,202	3,097	11.8	326	426	4.4	1,090	1,107	62.7	844	858	73.1	851	989	4.7
76+	3,019	2,868	3.3	271	318	36.9	995	987	84.3	749	808	19.6	749	755	93.4
All equal?			0.68			0.00			0.00			32.66			0.39
Tot % chng	-21.8	-24.1		-73.7	-75.1		-12.9	-17.4		-40.2	-36.9		-61.3	-64.1	

	Private transportation			Public transportation			Medical care			Personal care			Recreation		
Head Age	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?
50-55	2,211	2,539	0.0	454	499	35.6	716	760	31.0	610	629	37.7	1,556	1,851	0.2
56-60	1,992	2,252	0.0	387	507	0.4	733	745	74.4	540	542	88.7	1,250	1,520	0.1
61-65	1,727	2,022	0.0	340	451	0.3	659	792	0.0	468	487	23.0	1,045	1,371	0.0
66-70	1,376	1,643	0.0	286	316	41.0	566	579	71.3	402	414	46.8	874	1,124	0.1
71-75	1,084	1,285	0.3	273	329	17.3	568	589	56.5	359	375	39.1	743	908	4.7
76+	682	938	0.0	250	272	61.2	575	616	30.5	303	324	25.8	458	652	2.7
All equal?			0.00			0.20			0.71			57.18			0.00
Tot % chng	-69.2	-63.1		-44.9	-45.5		-19.7	-18.9		-50.3	-48.5		-70.6	-64.8	

	Tobacco			Alcohol			Gifts and contributions			Other		
Head Age	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?	Smoke	Not	equal?
50-55	992	-	0.0	780	552	0.0	1,233	1,845	0.9	880	914	57.8
56-60	854	-	0.0	653	517	0.0	1,265	1,638	5.6	786	707	12.9
61-65	707	-	0.0	554	377	0.0	1,102	1,568	0.8	474	558	7.7
66-70	667	-	0.0	449	303	0.0	1,050	1,632	0.7	375	336	39.0
71-75	588	-	0.0	326	239	1.9	985	1,600	0.2	293	328	50.3
76+	401	-	0.0	220	146	5.4	882	1,629	0.0	173	213	46.7
All equal?			0.00			0.00			0.00			28.00
Tot % chng	-59.6			-71.8	-73.6		-28.5	-11.7		-80.3	-76.7	

* P-values (in %) from the test on the equality of the smoker and non-smoker.

Table 3.1: Parameter estimates (excluding year and province)

	Food home		Food rest.		W.F.E.		Household oper.		Clothing		Private transp.		Public transpl	
	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value
AREA2	-1.4	-5.3	-0.3	-2.9	0.6	4.5	0.3	3.4	0.3	1.8	1.2	5.7	-1.0	-9.4
AREA3	-1.7	-5.3	-0.2	-1.1	0.7	4.1	0.4	3.4	-0.2	-1.1	3.2	11.7	-1.0	-7.1
NO_HOME	0.0	0.1	0.7	7.1	-4.1	-34.1	0.3	3.0	0.8	6.6	-0.4	-2.2	0.4	4.4
AGE2	0.0	-0.1	-0.2	-0.9	0.0	0.3	0.2	1.3	-0.1	-0.5	0.0	0.0	0.1	0.6
AGE3	-0.2	-0.5	-0.5	-2.3	0.2	1.0	0.3	2.0	0.1	0.4	-0.1	-0.2	0.2	1.4
AGE4	-1.3	-2.9	-0.3	-1.0	-0.1	-0.3	0.4	2.4	0.6	2.0	-0.9	-2.2	0.5	2.2
AGE5	0.2	0.3	-0.8	-2.5	0.0	-0.1	0.6	2.1	0.2	0.4	-3.0	-5.6	0.6	2.0
AGE6	-1.5	-1.5	0.0	0.0	-0.1	-0.2	1.0	2.0	0.4	0.7	-3.1	-4.2	1.0	1.9
AGE2*RET	-0.5	-0.4	1.2	2.5	0.6	0.7	-0.9	-1.6	1.1	1.5	-0.2	-0.2	-0.6	-1.2
AGE3*RET	-0.8	-0.6	1.0	2.4	0.0	-0.1	-0.9	-1.7	0.8	1.1	-0.3	-0.3	-0.2	-0.4
AGE4*RET	1.0	0.8	0.9	1.8	0.1	0.1	-1.4	-2.4	0.5	0.7	0.8	0.8	-0.6	-1.1
AGE5*RET	-1.5	-1.1	1.4	2.8	0.0	-0.1	-1.4	-2.3	1.3	1.7	1.8	1.8	-0.3	-0.5
AGE6*RET	-0.3	-0.2	0.7	1.3	-0.2	-0.2	-1.6	-2.2	1.2	1.3	0.2	0.2	-0.6	-0.8
RET	20.4	2.7	3.3	0.9	17.5	4.0	4.7	1.4	15.0	3.0	-11.5	-1.9	-6.9	-2.0
LEXP	-66.5	-4.2	-1.5	-0.2	-20.9	-2.1	-20.3	-2.3	21.5	2.2	107.4	8.9	-27.7	-3.6
LEXP*RET	-2.1	-2.7	-0.5	-1.3	-1.8	-4.1	-0.4	-1.0	-1.7	-3.3	1.0	1.7	0.8	2.1
LEXP_SQR	2.6	3.2	0.3	0.8	0.9	1.7	1.0	2.3	-0.9	-1.7	-5.6	-9.2	1.5	3.8

	Medical care		Personal care		Recreation		Tobacco		Alcohol		Gifts	
	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value	coeff	t-value
AREA2	0.3	1.9	-0.1	-1.4	0.0	0.1	-0.3	-2.6	-0.4	-3.8	0.8	3.3
AREA3	-0.1	-0.5	-0.5	-8.7	-0.9	-4.2	-0.2	-1.2	-0.5	-4.0	1.0	3.2
NO_HOME	0.3	2.3	0.5	11.0	0.4	2.8	0.9	9.3	0.1	1.2	-0.7	-3.8
AGE2	0.4	2.3	0.0	-0.4	-0.2	-0.7	-0.7	-3.7	-0.2	-1.2	1.0	3.1
AGE3	0.6	3.5	0.0	-0.1	-0.1	-0.3	-1.1	-6.1	-0.5	-2.9	1.8	5.6
AGE4	-0.1	-0.4	0.3	2.5	0.3	0.7	-1.4	-5.8	-0.6	-2.3	3.8	7.8
AGE5	0.4	1.3	0.1	0.5	0.4	0.7	-1.9	-6.1	-1.4	-4.9	6.0	6.9
AGE6	0.4	0.7	0.3	1.2	1.0	1.3	-2.7	-8.5	-2.2	-8.7	7.3	7.1
AGE2*RET	0.6	0.8	0.0	-0.1	0.2	0.2	-3.1	-2.5	0.4	0.7	0.6	0.7
AGE3*RET	0.8	1.2	-0.2	-0.6	0.4	0.3	-3.6	-3.1	0.6	1.3	1.0	1.4
AGE4*RET	1.1	1.7	-0.4	-1.5	-0.3	-0.3	-3.8	-3.2	0.7	1.3	-0.3	-0.4
AGE5*RET	0.9	1.3	0.0	-0.1	-0.6	-0.5	-3.7	-3.1	1.3	2.5	-0.9	-0.8
AGE6*RET	1.7	2.1	-0.1	-0.2	-1.4	-1.1	-4.0	-3.4	1.7	3.4	0.9	0.8
RET	-0.3	-0.1	1.4	0.9	-10.7	-1.7	6.2	1.7	-4.1	-1.3	-45.1	-5.3
LEXP	-8.4	-0.9	20.6	6.7	-1.2	-0.1	26.5	4.1	12.7	2.1	-59.7	-4.1
LEXP*RET	0.0	-0.1	-0.1	-0.8	1.3	2.0	-0.3	-0.8	0.3	1.1	4.8	5.4
LEXP_SQR	0.4	0.8	-1.1	-6.8	0.3	0.6	-1.5	-4.6	-0.6	-2.0	3.5	4.6

Table 3.2: Test results

Exogeneity Test on the Parameters of Total Expenditure
(chi-square statistics; dgf: 3 for individual equations; 39 for joint.)

	Food-H	Food-Rest.	WFE	HH-Oper.	Clothing	Priv-Trans	Pub-Trans
Test Statistic	138.04	88.50	25.71	11.22	42.49	24.66	19.08
P-Value(%)	0.00	0.00	0.00	1.06	0.00	0.00	0.03
	Medic	**Care**	**Recreation**	**Tobacco**	**Alcohol**	**Gifts**	**Joint Test**
Test Statistic	11.53	...	39.00	138.39	16.59	110.19	328.13
P-Value(%)	0.91	...	0.00	0.00	0.86	0.00	0.00

Test Null: All Parameters of Ages are zero
(Chi-square statistics; dgf: 10 for individual equations; 130 for joint.)

	Food-H	Food-Rest.	WFE	HH-Oper.	Clothing	Priv-Trans	Pub-Trans
Test Statistic	28.07	16.71	6.76	17.09	23.59	141.03	2.85
P-Value(%)	0.18	8.11	74.79	7.23	0.87	0.00	0.01
	Medic	**Care**	**Recreation**	**Tobacco**	**Alcohol**	**Gifts**	**Joint Test**
Test Statistic	48.24	31.34	9.17	260.48	114.57	407.60	1147.80
P-Value(%)	0.00	0.05	51.60	0.00	0.00	0.00	0.00

Test Null: All Parameters of Retirement are zero
(Chi-square statistics; dgf: 7 for individual equations; 91 for joint.)

	Food-H	Food-Rest.	WFE	HH-Oper.	Clothing	Priv-Trans	Pub-Trans
Test Statistic	21.86	12.76	18.13	9.52	26.29	41.48	8.48
P-Value(%)	0.27	7.81	1.14	21.72	0.04	0.00	29.25
	Medic	**Care**	**Recreation**	**Tobacco**	**Alcohol**	**Gifts**	**Joint Test**
Test Statistic	14.37	10.36	40.10	14.37	30.04	48.42	379.24
P-Value(%)	4.47	16.91	0.00	4.49	0.01	0.00	0.00

Test Null: All Parameters of Total Expenditure are zero
(Chi-square statistics; dgf: 3 for individual equations; 39 for joint.)

	Food-H	Food-Rest.	WFE	HH-Oper.	Clothing	Priv-Trans	Pub-Trans
Test Statistic	2583.60	465.96	666.54	22.37	380.88	154.73	53.31
P-Value(%)	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	Medic	**Care**	**Recreation**	**Tobacco**	**Alcohol**	**Gifts**	**Joint Test**
Test Statistic	25.51	61.42	412.14	251.78	45.12	689.72	4579.30
P-Value(%)	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Chart 2.1

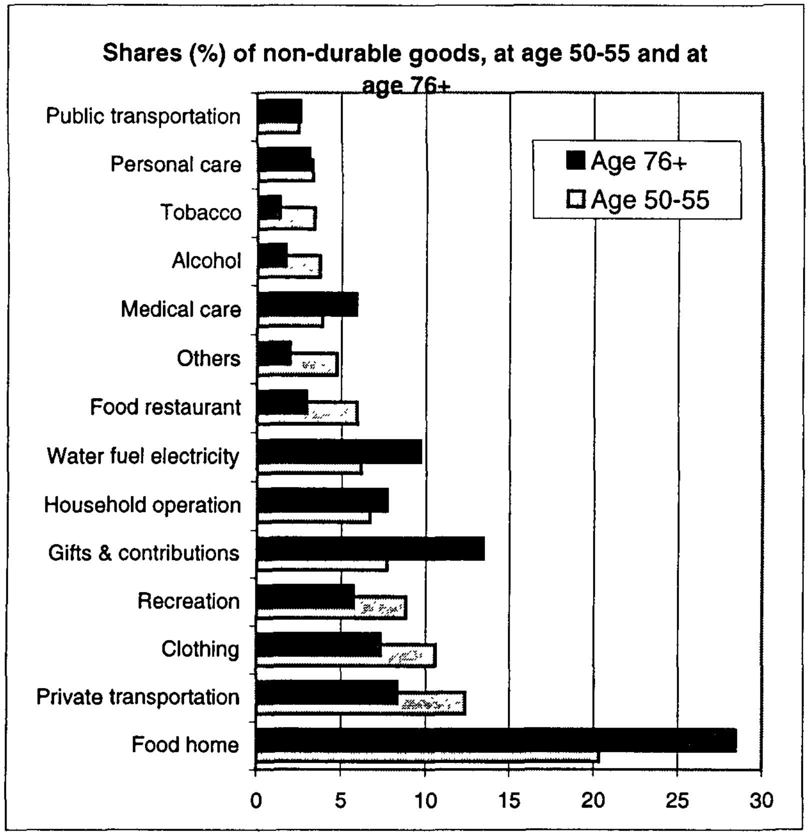


Chart 2.2

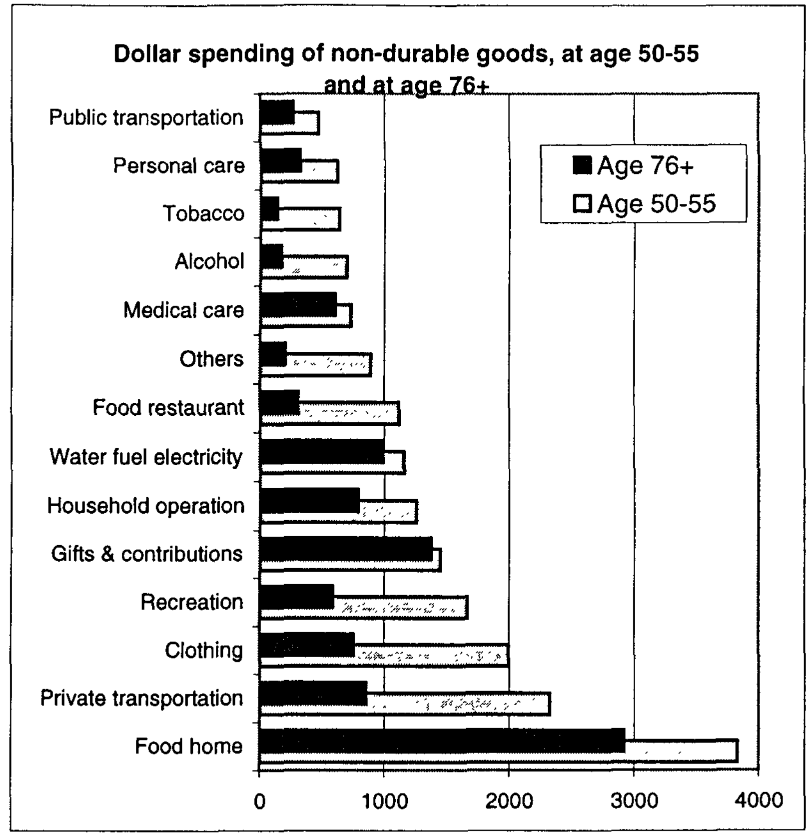


Chart 4.0

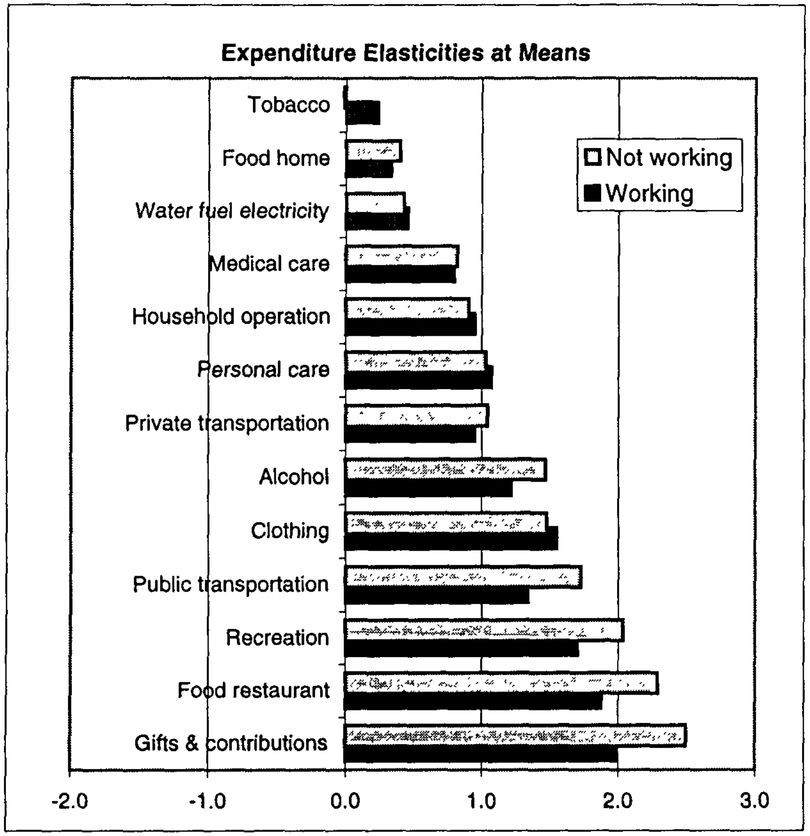

Expenditure Elasticities at Means
Tobacco
Food home
Water fuel electricity
Medical care
Household operation
Personal care
Private transportation
Alcohol
Clothing
Public transportation
Recreation
Food restaurant
Gifts & contributions
Not working
Working
-2.0
-1.0
0.0
1.0
2.0
3.0

Chart 4.1

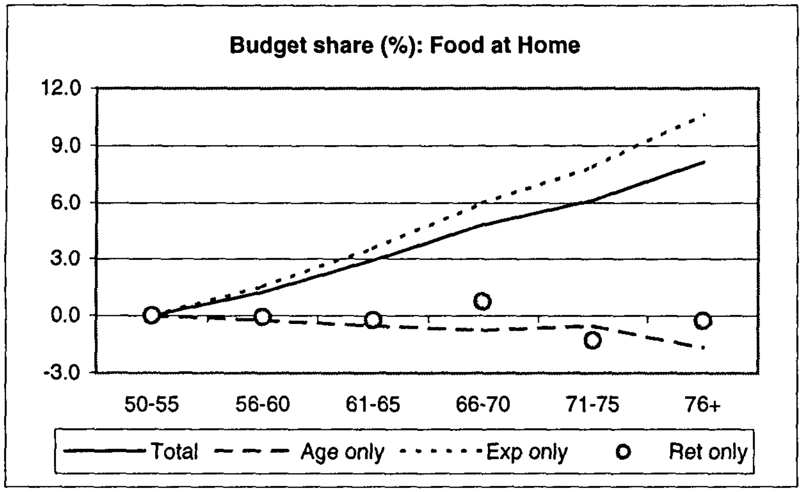


Chart 4.2

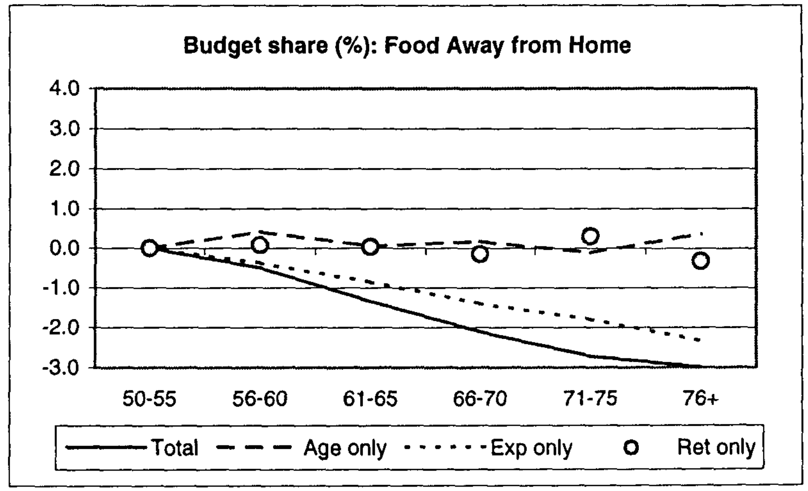


Chart 4.3

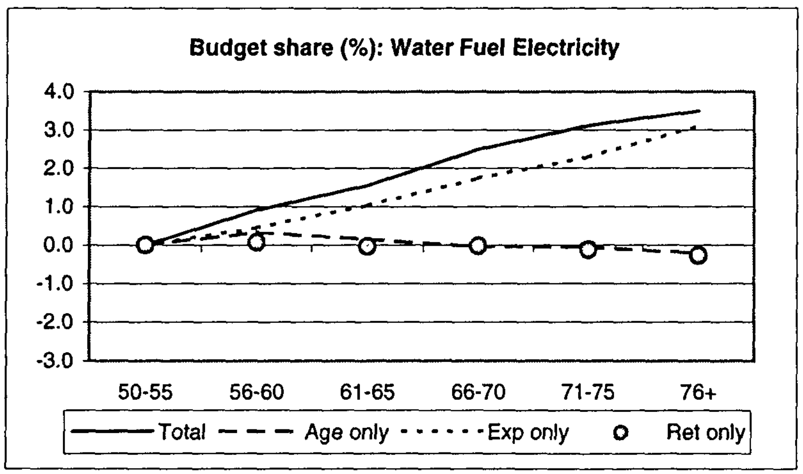


Chart 4.4

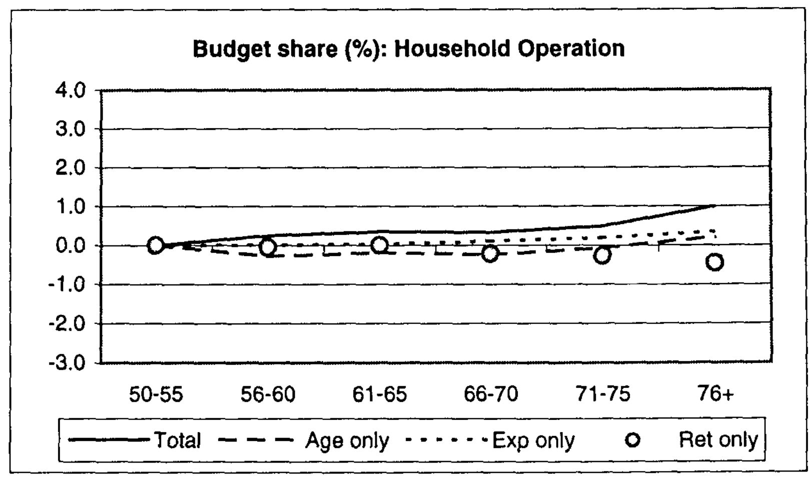


Chart 4.5

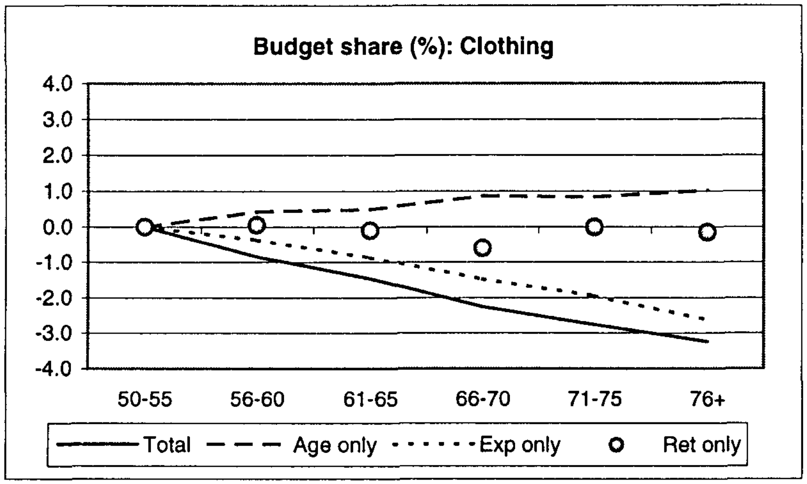


Chart 4.6

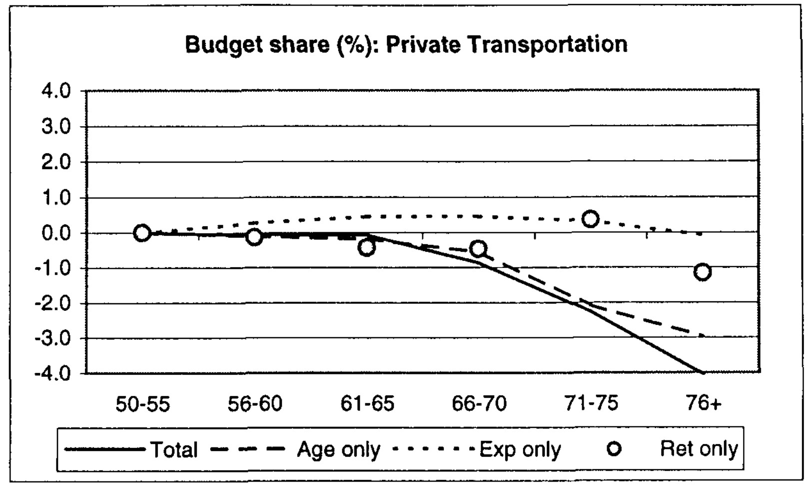


Chart 4.7

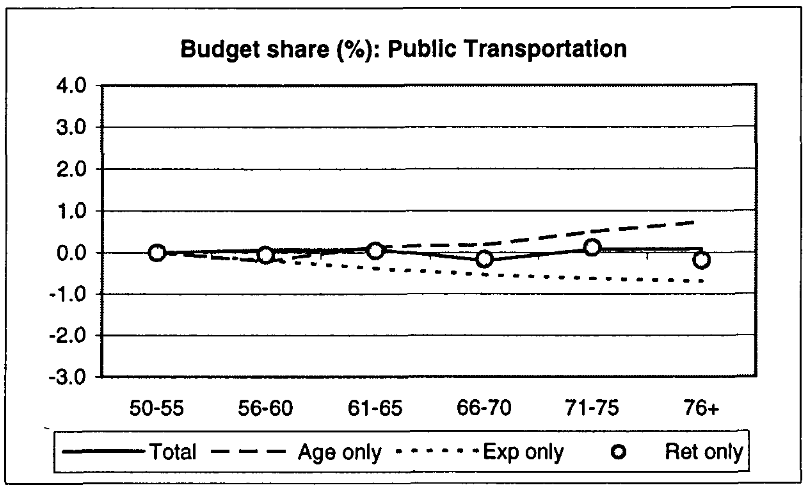


Chart 4.8

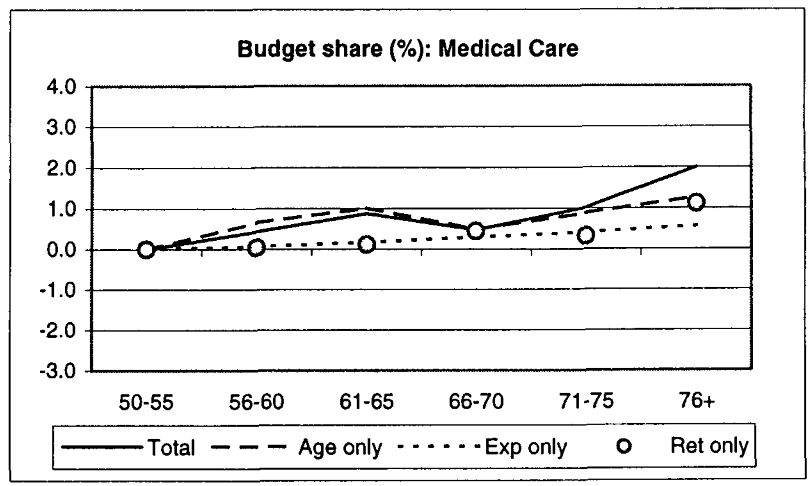


Chart 4.9

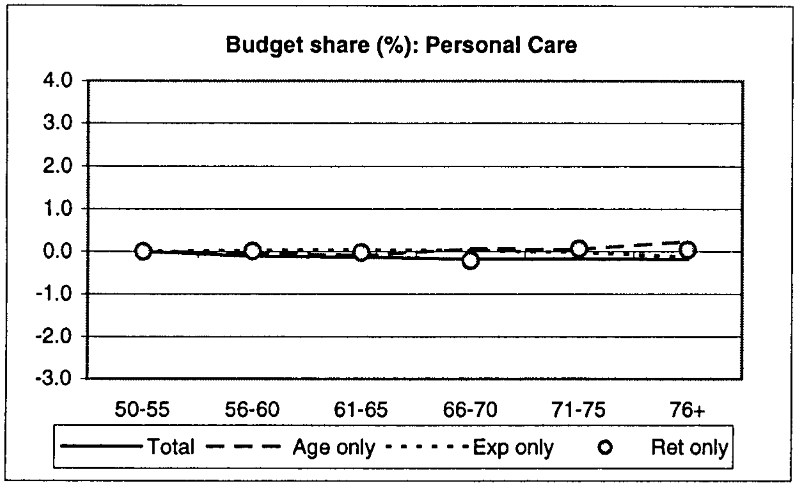


Chart 4.10

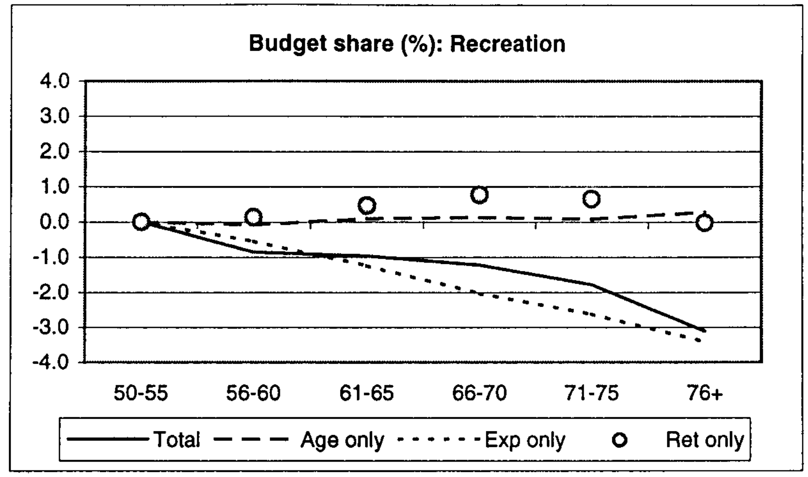


Chart 4.11

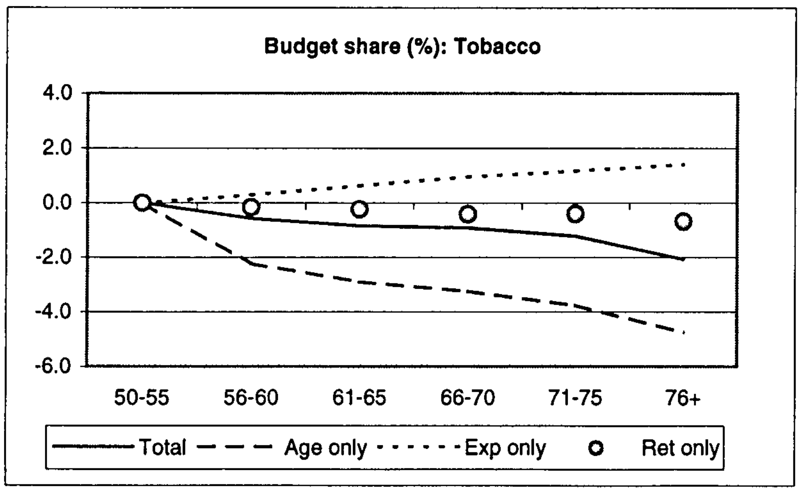


Chart 4.12

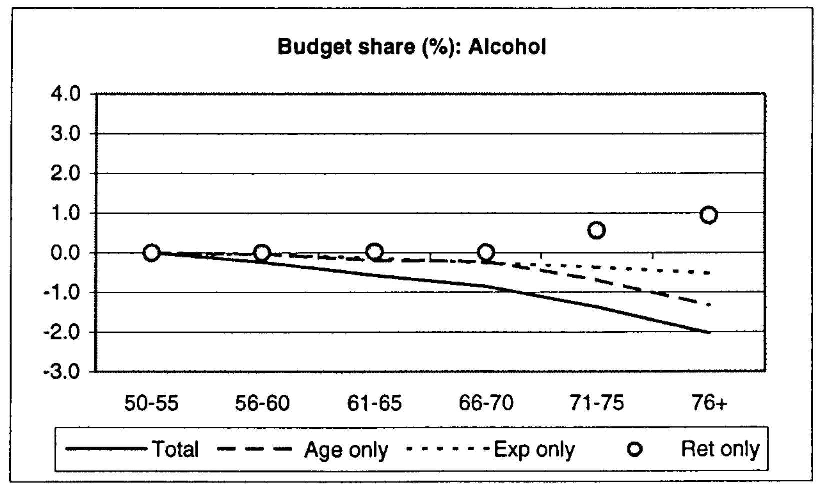


Chart 4.13

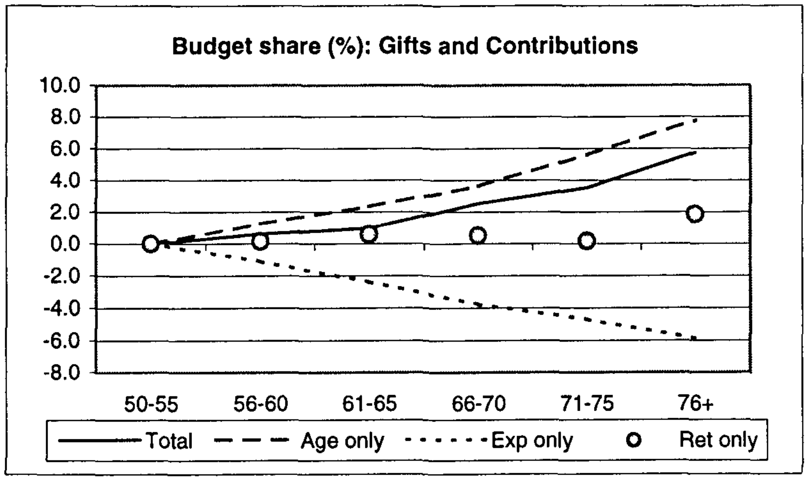

Budget share (%): Gifts and Contributions
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
50-55
56-60
61-65
66-70
71-75
76+
Total
Age only
Exp only
Ret only

Chart 4.14

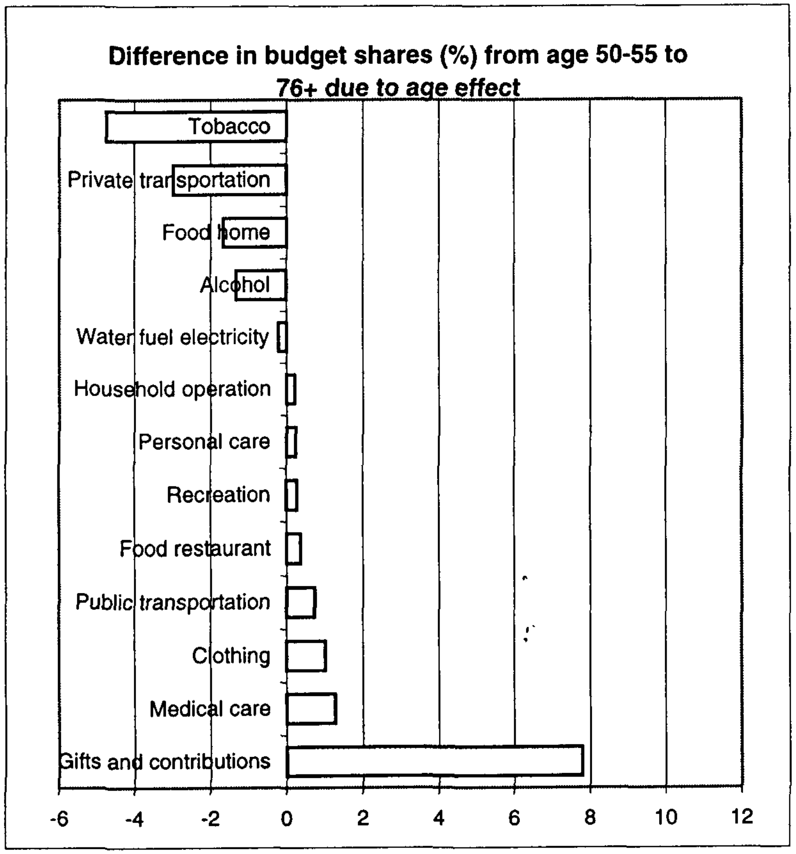


Chart 4.15

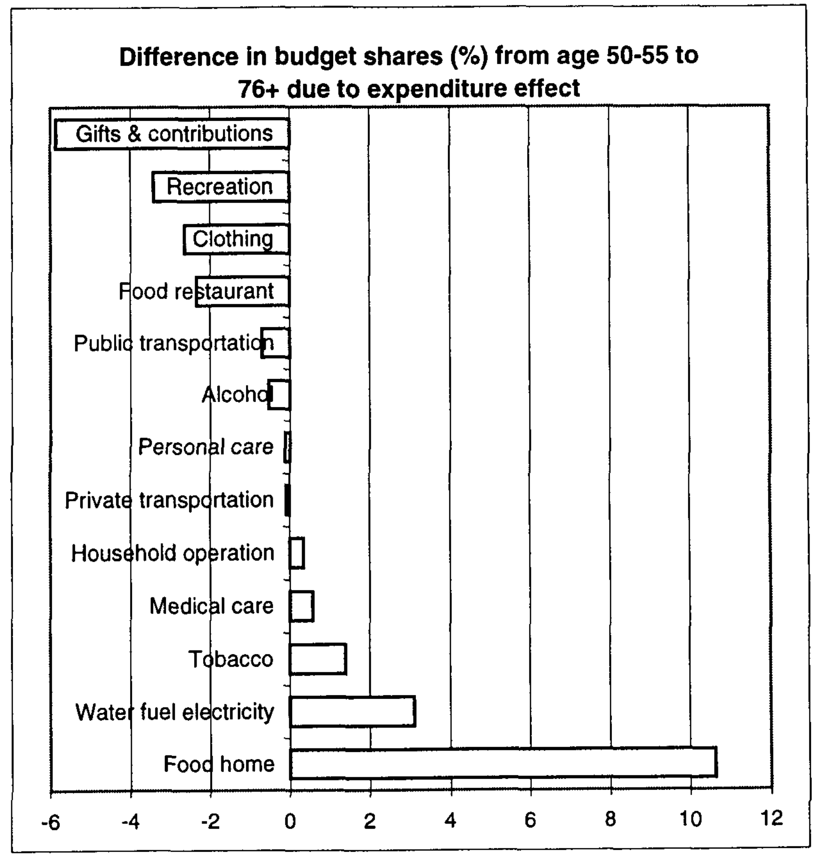
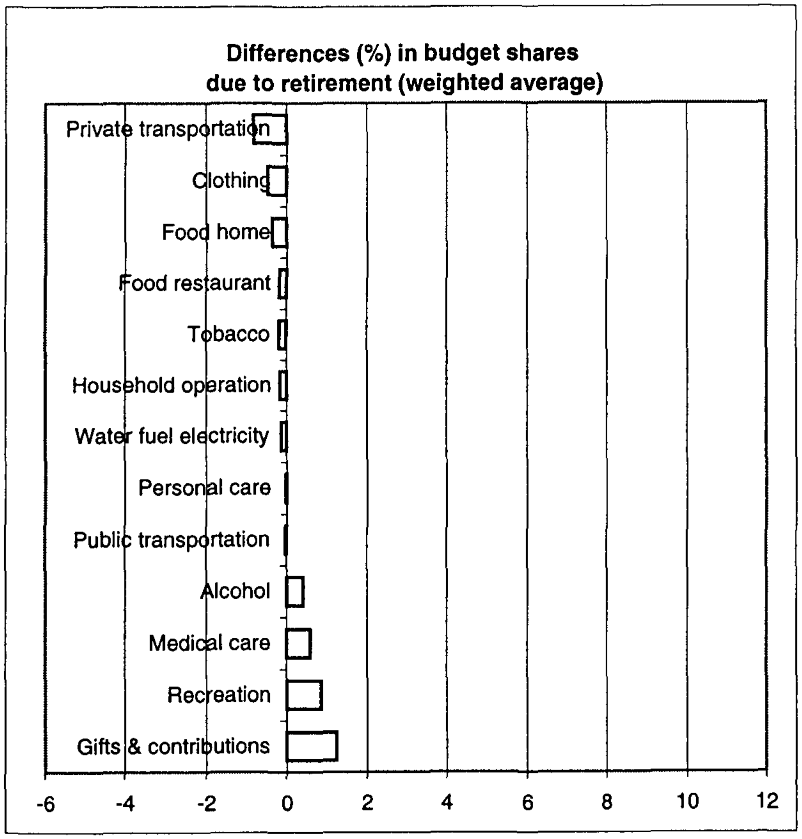


Chart 4.16


Differences (%) in budget shares
due to retirement (weighted average)
Private transportation
Clothing
Food home
Food restaurant
Tobacco
Household operation
Water fuel electricity
Personal care
Public transportation
Alcohol
Medical care
Recreation
Gifts & contributions
-6
-4
-2
0
2
4
6
8
10
12

Appendix

(Regression results for Essay 3)

	Food at home		Food restaurant		Water fuel electricity	
	Coeff	t-value	Coeff	t-value	Coeff	t-value
CONST	424.209	5.515	-9.127	-0.281	130.88	2.669
AREA2	-1.354	-5.295	-0.33	-2.851	0.638	4.526
AREA3	-1.714	-5.283	-0.15	-1.134	0.748	4.147
NO_HOME	0.014	0.069	0.681	7.089	-4.065	-34.088
AGE2	-0.024	-0.076	-0.183	-0.902	0.045	0.278
AGE3	-0.15	-0.453	-0.472	-2.345	0.167	1.026
AGE4	-1.27	-2.862	-0.256	-0.968	-0.062	-0.26
AGE5	0.203	0.315	-0.833	-2.494	-0.033	-0.082
AGE6	-1.528	-1.51	-0.004	-0.011	-0.112	-0.218
AGE2*RET	-0.472	-0.35	1.203	2.453	0.557	0.655
AGE3*RET	-0.768	-0.609	1.044	2.354	-0.046	-0.059
AGE4*RET	1.029	0.818	0.855	1.835	0.055	0.071
AGE5*RET	-1.503	-1.119	1.437	2.819	-0.047	-0.055
AGE6*RET	-0.297	-0.192	0.739	1.313	-0.207	-0.229
RET	20.416	2.691	3.345	0.931	17.501	3.963
Y2	0.64	0.678	-0.714	-2.348	0.437	0.653
Y3	-0.467	-0.635	0.004	0.016	1.48	3.162
Y4	-3.173	-4.141	-0.251	-1.097	2.047	3.725
Y5	-5.54	-5.881	-0.512	-1.262	2.595	3.295
Y6	-3.565	-4.638	0.139	0.516	1.93	3.38
Y7	-6.172	-5.978	0.097	0.218	0.387	0.643
Y8	-5.757	-7.824	-0.037	-0.147	1.167	2.325
P2	0.824	1.052	0.286	0.956	-2.435	-5.9
P3	-0.58	-0.86	0.389	1.702	-2.747	-6.952
P4	-2.589	-3.911	0.663	2.519	-2.64	-6.824
P5	-0.951	-1.322	0.466	1.722	-2.513	-5.967
Y2*P2	4.336	3.045	0.424	0.797	-0.259	-0.328
Y2*P3	0.562	0.46	1.206	2.577	-0.817	-1.037
Y2*P4	1.926	1.644	0.805	1.901	-2.547	-3.529
Y2*P5	3.65	2.521	1.601	2.87	-1.475	-1.88
Y3*P2	2.162	1.842	0.033	0.069	-0.498	-0.802
Y3*P3	0.409	0.412	0.302	0.758	-0.158	-0.269
Y3*P4	0.904	0.939	0.561	1.429	-1.186	-2.172
Y3*P5	-1.069	-0.943	1.253	2.619	-1.757	-2.791
Y4*P2	0.785	0.675	0.301	0.706	-0.059	-0.086
Y4*P3	0.532	0.516	0.942	2.573	-0.954	-1.476
Y4*P4	0.76	0.742	1.393	3.461	-1.484	-2.394
Y4*P5	1.067	0.939	1.269	3.084	-2.669	-3.979
Y5*P2	2.14	1.645	1.683	2.575	-1.985	-2.135
Y5*P3	2.956	2.221	0.792	1.457	-0.772	-0.809
Y5*P4	3.75	3.056	0.327	0.589	-0.892	-1.023
Y5*P5	1.299	0.918	1.429	2.347	-2.169	-2.294
Y6*P2	-0.581	-0.499	0.705	1.415	-1.116	-1.534
Y6*P3	-0.248	-0.248	0.866	2.027	-0.692	-1.036
Y6*P4	1.841	1.839	1.08	2.436	-1.795	-2.832
Y6*P5	0.809	0.771	1.095	2.437	-2.32	-3.512
Y7*P2	2.305	1.396	0.876	1.211	0.82	1.046
Y7*P3	1.233	0.96	0.54	0.889	0.374	0.484
Y7*P4	2.457	1.923	1.103	1.758	0.753	1.044
Y7*P5	1.359	1.014	1.022	1.602	-0.82	-1.103
Y8*P2	0.557	0.544	0.992	2.262	-0.075	-0.121
Y8*P3	-0.237	-0.24	1.257	3.143	0.264	0.425
Y8*P4	-0.26	-0.264	0.954	2.346	-1.2	-2.075
Y8*P5	0.27	0.257	1.6	3.29	-2.781	-4.564
LEXP	-66.461	-4.201	-1.469	-0.218	-20.912	-2.071
LEXP*RET	-2.135	-2.729	-0.473	-1.263	-1.84	-4.08
LEXP_SQR	2.625	3.233	0.29	0.832	0.877	1.693

Note: Y1-Y8 = 1969, 74, 78, 82, 84, 86, 90, 92; P1-P5 = Atlantic, Quebec, Ontario, Prairie, BC

	Household operation		Clothing		Private transportation	
	Coeff	t-value	Coeff	t-value	Coeff	t-value
CONST	103.852	2.419	-117.699	-2.451	-500.15	-8.565
AREA2	0.339	3.35	0.265	1.839	1.162	5.677
AREA3	0.441	3.405	-0.202	-1.146	3.189	11.708
NO_HOME	0.259	3.046	0.825	6.563	-0.379	-2.193
AGE2	0.18	1.321	-0.119	-0.516	-0.006	-0.02
AGE3	0.273	1.976	0.093	0.395	-0.073	-0.232
AGE4	0.432	2.377	0.622	2.018	-0.936	-2.236
AGE5	0.632	2.136	0.174	0.41	-3.011	-5.571
AGE6	0.999	1.984	0.438	0.727	-3.067	-4.205
AGE2*RET	-0.919	-1.569	1.087	1.471	-0.195	-0.192
AGE3*RET	-0.926	-1.657	0.784	1.124	-0.256	-0.273
AGE4*RET	-1.361	-2.443	0.475	0.666	0.751	0.783
AGE5*RET	-1.402	-2.315	1.319	1.713	1.842	1.808
AGE6*RET	-1.585	-2.171	1.162	1.33	0.193	0.173
RET	4.728	1.379	14.993	3.039	-11.467	-1.911
Y2	1.008	2.756	-0.553	-1.042	0.549	0.738
Y3	1.267	4.91	-1.558	-3.796	2.155	3.702
Y4	1.696	5.49	-2.258	-5.493	3.379	5.592
Y5	1.759	3.237	-2.66	-4.292	5.991	6.13
Y6	1.851	6.227	-2.351	-5.575	2.987	4.802
Y7	2.743	4.93	-3.36	-6.036	5.264	6.321
Y8	2.475	8.025	-3.946	-10.496	4.648	7.484
P2	-0.496	-1.727	0.932	2.056	-1.017	-1.702
P3	-0.218	-0.885	-0.225	-0.594	1.477	2.898
P4	-0.382	-1.695	1.062	2.766	1.629	3.259
P5	0.475	1.666	0.334	0.785	1.816	3.214
Y2*P2	-0.62	-1.33	0.575	0.713	-0.713	-0.683
Y2*P3	0.125	0.224	0.823	1.085	-0.623	-0.637
Y2*P4	-0.423	-1.009	0.544	0.8	-0.123	-0.136
Y2*P5	-1.546	-3.176	0.129	0.17	-0.264	-0.249
Y3*P2	-0.755	-1.954	1.288	1.734	0.637	0.681
Y3*P3	0.094	0.268	-0.039	-0.069	-0.801	-1.003
Y3*P4	0.235	0.705	-0.246	-0.441	-1.344	-1.827
Y3*P5	-0.523	-1.307	-1.241	-2.087	-1.161	-1.275
Y4*P2	-0.315	-0.722	1.422	2.004	0.551	0.577
Y4*P3	0.277	0.686	0.16	0.293	-0.339	-0.424
Y4*P4	-0.51	-1.3	0.31	0.552	-0.504	-0.637
Y4*P5	-1.149	-2.709	-0.713	-1.212	0.161	0.182
Y5*P2	-0.86	-1.256	0.742	0.816	-0.262	-0.183
Y5*P3	-0.031	-0.048	1.499	1.738	-3.291	-2.657
Y5*P4	-0.7	-1.169	-0.29	-0.375	-3.033	-2.62
Y5*P5	-0.998	-1.549	0.067	0.076	-2.391	-1.902
Y6*P2	-0.38	-0.822	1.846	2.633	1.516	1.687
Y6*P3	-0.342	-0.876	-0.008	-0.014	0.229	0.281
Y6*P4	-0.728	-2.042	-0.848	-1.523	-0.345	-0.425
Y6*P5	-0.559	-1.326	-1.707	-2.949	-0.903	-1.063
Y7*P2	-1.525	-2.004	1.827	1.99	-0.986	-0.79
Y7*P3	-1.93	-2.956	0.059	0.075	-0.036	-0.032
Y7*P4	-0.978	-1.557	-0.67	-0.916	-2.016	-1.958
Y7*P5	-0.912	-1.219	-0.28	-0.361	-2.331	-2.075
Y8*P2	-0.886	-1.97	2.005	3.194	1.725	1.933
Y8*P3	-0.931	-2.375	0.984	1.841	-0.851	-1.055
Y8*P4	-0.775	-2.032	-0.803	-1.564	-0.409	-0.513
Y8*P5	-1.64	-3.434	-1.1	-1.941	-0.246	-0.267
LEXP	-20.271	-2.279	21.543	2.171	107.404	8.936
LEXP*RET	-0.371	-1.046	-1.719	-3.346	1.037	1.685
LEXP_SQR	1.043	2.27	-0.857	-1.675	-5.648	-9.151

Note: Y1-Y8 = 1969, 74, 78, 82, 84, 86, 90, 92; P1-P5 = Atlantic, Quebec, Ontario, Prairie, BC

	Public transportation		Medical care		Personal care	
	Coeff	t-value	Coeff	t-value	Coeff	t-value
CONST	130.202	3.555	49.678	1.131	-96.337	-6.465
AREA2	-0.977	-9.355	0.256	1.861	-0.077	-1.383
AREA3	-1.012	-7.085	-0.09	-0.521	-0.543	-8.722
NO_HOME	0.448	4.398	0.262	2.329	0.5	10.952
AGE2	0.11	0.641	0.369	2.311	-0.028	-0.373
AGE3	0.241	1.396	0.598	3.488	-0.006	-0.079
AGE4	0.499	2.218	-0.078	-0.371	0.264	2.501
AGE5	0.63	2.03	0.424	1.342	0.067	0.485
AGE6	1.038	1.859	0.394	0.737	0.266	1.166
AGE2*RET	-0.641	-1.155	0.572	0.803	-0.017	-0.062
AGE3*RET	-0.193	-0.357	0.822	1.246	-0.167	-0.646
AGE4*RET	-0.632	-1.145	1.141	1.736	-0.394	-1.502
AGE5*RET	-0.274	-0.465	0.919	1.32	-0.021	-0.074
AGE6*RET	-0.613	-0.813	1.747	2.128	-0.056	-0.169
RET	-6.888	-1.968	-0.271	-0.064	1.381	0.855
Y2	0.576	1.25	-1.932	-3.886	-0.446	-2.35
Y3	0.205	0.698	-2.644	-6.778	-0.346	-2.38
Y4	0.132	0.464	-2.304	-5.536	-0.017	-0.115
Y5	-0.331	-0.729	-2.308	-4.84	-0.213	-1.07
Y6	-0.344	-1.237	-2.406	-5.865	-0.009	-0.055
Y7	-0.656	-1.601	-1.517	-2.82	0.006	0.025
Y8	-0.369	-1.316	-1.2	-2.911	0.094	0.611
P2	0.721	2.251	3.167	5.124	0.004	0.024
P3	0.493	1.62	2.241	4.966	0.026	0.19
P4	0.345	1.221	1.57	3.611	-0.309	-2.35
P5	0.676	1.961	0.351	0.745	0.039	0.25
Y2*P2	-1.268	-2.02	-2.321	-2.775	0.198	0.713
Y2*P3	-0.292	-0.474	-2.158	-3.317	0.537	2.087
Y2*P4	0.28	0.458	-1.817	-2.98	0.701	3.042
Y2*P5	0.102	0.133	-0.927	-1.359	0.069	0.248
Y3*P2	-0.624	-1.273	-3.312	-4.682	0.078	0.337
Y3*P3	-0.901	-2.098	-0.973	-1.7	0.036	0.187
Y3*P4	-0.11	-0.269	-1.233	-2.414	0.434	2.313
Y3*P5	-0.018	-0.029	0.14	0.253	-0.314	-1.446
Y4*P2	-0.947	-2.077	-2.567	-3.507	0.207	0.86
Y4*P3	0.062	0.145	-2.06	-3.788	-0.098	-0.498
Y4*P4	0.259	0.558	-1.131	-2.111	0.207	1.046
Y4*P5	-0.448	-0.943	0.762	1.234	-0.364	-1.626
Y5*P2	-0.905	-1.485	-2.066	-2.524	-0.09	-0.309
Y5*P3	-0.402	-0.667	-1.415	-2.072	0.238	0.891
Y5*P4	0.043	0.072	-0.78	-1.24	0.459	1.816
Y5*P5	0.843	1.074	1.304	1.859	-0.313	-1.12
Y6*P2	-1.053	-2.478	-2.496	-3.547	0.511	2.05
Y6*P3	-0.153	-0.381	-1.942	-3.4	-0.008	-0.04
Y6*P4	-0.278	-0.73	-1.108	-2.026	0.193	0.967
Y6*P5	-0.231	-0.493	1.467	2.459	-0.339	-1.518
Y7*P2	-0.801	-1.314	-2.714	-3.011	1.103	2.947
Y7*P3	-0.133	-0.217	-2.991	-4.354	-0.012	-0.038
Y7*P4	-0.324	-0.605	-1.476	-2.207	0.345	1.211
Y7*P5	0.226	0.333	3.067	3.137	-0.088	-0.27
Y8*P2	-1.396	-3.573	-2.75	-3.699	0.579	2.551
Y8*P3	-0.154	-0.355	-2.978	-5.262	0.079	0.38
Y8*P4	-0.681	-1.803	-0.504	-0.881	0.222	0.96
Y8*P5	0.189	0.375	1.169	1.899	-0.132	-0.517
LEXP	-27.695	-3.641	-8.441	-0.933	20.613	6.733
LEXP*RET	0.766	2.088	-0.034	-0.077	-0.133	-0.799
LEXP_SQR	1.492	3.787	0.394	0.848	-1.066	-6.793

Note: Y1-Y8 = 1969, 74, 78, 82, 84, 86, 90, 92; P1-P5 = Atlantic, Quebec, Ontario, Prairie, BC

	Recreation		Tobacco		Alcohol	
	Coeff	t-value	Coeff	t-value	Coeff	t-value
CONST	-12.604	-0.251	-111.866	-3.592	-60.959	-2.074
AREA2	0.012	0.065	-0.306	-2.632	-0.41	-3.775
AREA3	-0.886	-4.202	-0.191	-1.172	-0.504	-4.019
NO_HOME	0.419	2.835	0.935	9.273	0.111	1.177
AGE2	-0.199	-0.737	-0.678	-3.656	-0.22	-1.178
AGE3	-0.091	-0.326	-1.115	-6.063	-0.519	-2.871
AGE4	0.273	0.735	-1.357	-5.799	-0.562	-2.285
AGE5	0.393	0.677	-1.897	-6.148	-1.356	-4.891
AGE6	0.982	1.307	-2.735	-8.466	-2.177	-8.698
AGE2*RET	0.248	0.225	-3.121	-2.546	0.378	0.715
AGE3*RET	0.369	0.341	-3.578	-3.056	0.645	1.296
AGE4*RET	-0.286	-0.264	-3.795	-3.241	0.676	1.328
AGE5*RET	-0.613	-0.523	-3.734	-3.141	1.332	2.536
AGE6*RET	-1.408	-1.117	-4.014	-3.377	1.696	3.374
RET	-10.733	-1.726	6.176	1.685	-4.06	-1.343
Y2	0.487	0.917	-0.753	-1.836	0.405	0.862
Y3	0.035	0.084	-0.825	-2.667	0.042	0.166
Y4	-0.927	-2.448	-0.593	-1.74	0.308	1.056
Y5	-0.044	-0.05	-0.716	-1.615	0.69	1.232
Y6	-0.097	-0.23	0.131	0.296	-0.278	-1.006
Y7	0.608	0.824	0.106	0.178	-0.048	-0.075
Y8	0.283	0.705	0.267	0.567	-0.363	-1.366
P2	-0.475	-1.228	-0.013	-0.038	0.662	2.572
P3	0.866	2.368	-0.395	-1.265	0.6	2.407
P4	1.313	3.191	-0.809	-2.646	0.587	2.409
P5	1.954	4.128	-0.944	-2.868	0.766	2.49
Y2*P2	-0.118	-0.154	0.448	0.788	-0.532	-0.935
Y2*P3	0.437	0.557	0.449	0.86	-0.368	-0.645
Y2*P4	-0.392	-0.555	0.569	1.182	0.341	0.568
Y2*P5	-0.475	-0.522	0.253	0.489	-0.592	-0.854
Y3*P2	0.971	1.297	0.178	0.388	1.154	2.254
Y3*P3	0.211	0.322	0.428	1.024	0.075	0.196
Y3*P4	0.897	1.307	0.35	0.921	0.347	0.844
Y3*P5	0.856	0.937	1.177	2.533	0.121	0.247
Y4*P2	1.779	2.88	0.558	1.116	-0.672	-1.699
Y4*P3	-0.113	-0.203	0.525	1.226	0.489	1.155
Y4*P4	0.477	0.786	0.238	0.576	-0.559	-1.469
Y4*P5	0.993	1.302	0.315	0.702	-0.708	-1.631
Y5*P2	0.792	0.637	0.39	0.558	-0.203	-0.284
Y5*P3	-1.121	-1.063	0.291	0.5	-0.322	-0.474
Y5*P4	0.385	0.353	0.72	1.392	-0.609	-0.909
Y5*P5	0.198	0.151	0.366	0.626	-1.09	-1.575
Y6*P2	1.354	2.055	0.736	1.24	0.818	1.794
Y6*P3	0.328	0.518	-0.239	-0.467	0.093	0.25
Y6*P4	0.427	0.65	0.209	0.404	0.354	0.89
Y6*P5	0.823	1.042	-0.332	-0.624	-0.059	-0.133
Y7*P2	0.556	0.523	-0.141	-0.15	-0.331	-0.413
Y7*P3	0.262	0.251	0.077	0.099	-0.789	-1.094
Y7*P4	-0.505	-0.501	0.328	0.475	-0.974	-1.357
Y7*P5	1.123	0.91	0.372	0.508	-0.724	-0.992
Y8*P2	1.225	2.068	0.154	0.236	-0.314	-0.874
Y8*P3	0.898	1.514	0.443	0.726	0.051	0.132
Y8*P4	-0.055	-0.085	0.855	1.453	-0.444	-1.303
Y8*P5	0.818	1.024	0.87	1.362	-0.399	-0.913
LEXP	-1.201	-0.115	26.532	4.142	12.743	2.099
LEXP*RET	1.278	1.966	-0.276	-0.771	0.347	1.111
LEXP_SQR	0.323	0.597	-1.504	-4.576	-0.631	-2.019

Note: Y1-Y8 = 1969, 74, 78, 82, 84, 86, 90, 92; P1-P5 = Atlantic, Quebec, Ontario, Prairie, BC

Gifts-contributions

	Coeff	t-value
CONST	255.776	3.695
AREA2	0.786	3.299
AREA3	0.95	3.154
NO_HOME	-0.717	-3.782
AGE2	0.977	3.14
AGE3	1.826	5.611
AGE4	3.784	7.765
AGE5	6.045	6.935
AGE6	7.321	7.102
AGE2*RET	0.557	0.698
AGE3*RET	1.027	1.393
AGE4*RET	-0.334	-0.426
AGE5*RET	-0.87	-0.814
AGE6*RET	0.917	0.752
RET	-45.136	-5.277
Y2	-0.223	-0.313
Y3	-1.06	-2.094
Y4	0.816	1.359
Y5	0.002	0.002
Y6	-0.062	-0.091
Y7	-0.268	-0.279
Y8	-0.155	-0.252
P2	-1.742	-2.807
P3	-2.018	-4.484
P4	-0.904	-1.779
P5	-2.593	-5.458
Y2*P2	-0.612	-0.635
Y2*P3	0.455	0.479
Y2*P4	0.293	0.331
Y2*P5	-0.264	-0.277
Y3*P2	-1.103	-1.196
Y3*P3	1.89	2.495
Y3*P4	1.397	1.827
Y3*P5	2.625	2.871
Y4*P2	-2.529	-2.879
Y4*P3	-0.115	-0.143
Y4*P4	0.78	0.888
Y4*P5	1.08	1.221
Y5*P2	-1.282	-0.858
Y5*P3	1.37	0.948
Y5*P4	0.956	0.671
Y5*P5	0.855	0.597
Y6*P2	-2.61	-2.75
Y6*P3	2.798	2.948
Y6*P4	0.911	0.928
Y6*P5	1.787	1.845
Y7*P2	-0.49	-0.328
Y7*P3	3.688	2.564
Y7*P4	2.717	2.134
Y7*P5	-0.562	-0.392
Y8*P2	-1.939	-2.206
Y8*P3	1.463	1.671
Y8*P4	3.353	3.307
Y8*P5	1.455	1.393
LEXP	-59.695	-4.121
LEXP*RET	4.841	5.354
LEXP_SQR	3.506	4.637

Note: Y1-Y8 = 1969, 74, 78, 82, 84, 86, 90, 92; P1-P5 = Atlantic, Quebec, Ontario, Prairie, BC

References

References

Alessie, Rob, Annamaria Lusardi and Arie Kapteyn (1997), 'Saving After Retirement: Evidence Based on Three Different Measures', Progress Report 50, CentER for Economic Research, Tilburg University.

Attanasio, Orazio P. (1993), 'A Cohort Analysis of Saving Behaviour by US Households', NBER Working Paper No. 4454.

Attanasio, Orazio P. and Martin Browning (1994), 'Consumption Over the Life Cycle and Over the Business Cycle', *forthcoming, American Economic Review.*

Attanasio, Orazio P. (1994), 'Personal Saving in the United States', in James M. Poterba, (eds), *International Comparisons of Household Saving,* Chicago: University of Chicago Press.

Attanasio, Orazio P. and Hilary W. Hoynes (1995), 'Differential Mortality and Wealth Accumulation', NBER Working Paper No. 5126.

Baker, Michael and Dwayne Benjamin (1995), 'The Economics of Aging in Canada: A Survey of Some Issues and Preliminary Evidence', Preliminary Draft, University of Toronto.

Banks, James, Richard Blundell and Sarah Tanner (1994), 'Is There a Retirement-Saving Puzzle? Evidence from UK Micro-Data', Preliminary Draft, Institute for Fiscal Studies, UK.

Banks, James and Richard Blundell (1994), 'Household Saving Behaviour in the United Kingdom', in James M. Poterba (eds), *International Comparisons of Household Saving,* Chicago: University of Chicago Press.

Bőrsch-Supan, Axel and Konrad Stahl (1991), 'Life Cycle Savings and Consumption Constrains', *Journal of Population Economics*, 4, pp. 233-255.

Bőrsch-Supan, Axel (1992), 'Saving and Consumption Patterns of the Elderly: The German Case', *Journal of Population Economics,* 5, pp. 289-303.

Browning, Martin, Angus Deaton and Margaret Irish (1985), 'A Profitable Approach to Labour Supply and Commodity Demand Over the Life-Cycle', *Econometrica*, 53, pp. 503-543.

Browning, Martin and Costas Meghir (1994), ' The Effects of Male and Female Labour Supply on Commodity Demands', *Econometrica*, 59, pp. 925-951.

Browning, Martin and Annamaria Lusardi (1996), 'Household Saving: Micro Theories and Micro Facts', *Journal of Economic Literature*, 34, pp. 1797-1855.

Burbidge, John B. and A. Leslie Robb (1985), 'Evidence on Wealth-Age Profiles in Canadian Cross-Section Data', *Canadian Journal of economics*, 18, pp. 854-875.

Burbidge, John B. and James B. Davies (1994), 'Household Data on Saving Behaviour in Canada', in James M. Poterba (eds) *International Comparisons of Household Saving*, Chicago: University of Chicago Press.

Danziger, Sheldon, Jacques Van Der Gaag, Eugene Smolensky and Michael K. Taussig (1983), 'The Life-Cycle Hypothesis and the Consumption Behaviour of the Elderly', *Journal of Post Keynesian Economics*, Winter 1982-1983, 5, pp. 208-227.

Davies, James B. (1981), 'Uncertain Lifetime, Consumption and Dissaving in Retirement', *Journal of Political Economy,* 89, pp. 561-577.

Deaton, Angus S. (1991), 'Saving and Liquidity Constraints', *Econometrica*, 59, pp. 1221-1248.

Deaton, Angus S. and Christina H. Paxson (1994), 'Saving, Growth, and Aging in Taiwan', in D. Wise (eds), *Studies in the Economics of Aging,* Chicago: University of Chicago Press.

Diamond, Peter and Jerry Hausman (1984), 'Individual Retirement and Savings Behaviour', *Journal of Public Economics*, 23, pp. 81-114.

Disney, Richard (Ed.) (1996), *Can We Afford to Grow Older? : A Perspective on the Economics of Aging*, The MIT Press.

Flavin, M. (1981), 'The Adjustment of Consumption to Changing Expectations About Future Income', *Journal of Political Economy*, 89, pp. 974-1009.

Fuchs, Victor R. (1984), '"Though Much is Taken": Reflections on Aging, Health, and Medical Care', *Milbank Memorial Fund Quarterly*, 62, pp. 143-165.

Gosling, Amanda, Stephen Machin and Costas Meghir (1994), 'The Changing Distribution of Male Wages in the UK, 1966-1992', mimeo, Institute for Fiscal Studies and University College London, UK.

Hall, Robert E. and Frederic S. Mishkin (1982), 'The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households', *Econometrica*, 50, pp. 462-481.

Hamermesh, Daniel S. (1984), 'Consumption During Retirement: The Missing Link in the Life Cycle', *Review of Economics and Statistics*, 66, pp. 1-7.

Hurd, Michael (1990a), 'Research on the Elderly: Economic Status, Retirement, and Consumption and Saving', *Journal of Economic Literature*, 28, pp. 565-637.

Hurd, Michael (1990b), 'Wealth Depletion and Life Cycle Consumption by the Elderly', NBER Working Paper No. 3472.

Jappelli, Tullio (1995), 'The Age-Wealth Profile and The Life-Cycle Hypotheses: A Cohort Analysis with a Time Series of Cross-Sections of Italian Households', Istituto Universitario Navale, Napoli and CEPR.

Kimball, Miles S. (1990), 'Precautionary Saving in the Small and in the Large', *Econometrica*, 58, pp. 53-73.

Kotlikoff, L. J. and L. H. Summers (1981), 'The Role of Intergenerational Transfers in Aggregate Capital Accumulation', *Journal of Political Economy*, 89, pp. 706-732.

Levhari, David and Leonard J. Mirman (1977), 'Savings and Consumption with an Uncertain Horizon', *Journal of Political Economy*, 85, pp. 265-281.

Leland, Hayne E. (1968), 'Saving and Uncertainty: The Precautionary Demand for Saving', *Quarterly Journal of Economics*, LXXXII, pp. 465-473

Modigliani, Franco and Richard Brumberg (1954), 'Utility Analysis and the Consumption Function: An Interpretation of the Cross-Section Evidence', in Kenneth Kurihara (ed.), *Post-Keynesian Economics,* New Brunswick, Rutgers University Press.

Poterba, James M. (Ed.) (1994), *International Comparisons of Household Saving*, Chicago: University of Chicago Press.

Robb, A. Leslie and John B. Burbidge (1989), 'Consumption, Income, and Retirement', *Canadian Journal of Economics*, 22, pp. 522-542.

Shorrocks, Anthony (1975), 'The Age-Wealth Relationship: A Cross-Section and Cohort Analysis', *Review of Economics and Statistics,* 57, pp. 155-163.

Skinner, Jonathan (1988), 'Risky Income, Life Cycle Consumption, and Precautionary Savings', *Journal of Monetary Economics*, 22, pp. 237-255.

Statistics Canada, Famex Public Use Micro Tape documentation, various years.

Venti, Steven F. and David A. Wise (1994), 'RRSPs and Saving in Canada', mimeo, Dartmouth College and Harvard University.

Wolfson, Michael C., Geoff Rowe, Jane F. Gentleman and Monica Tomiak (1991), 'Career Earnings and Death: A Longitudinal Analysis of Older Canadian Men', Canadian Institute for Advanced Research (CIAR), Population Health Working Paper No. 12.

Zeldes, Stephen P. (1989), 'Optimal Consumption with Stochastic Income: Deviation from Certainty Equivalence', *Quarterly Journal of Economics*, 104, pp. 275-298.

"The Determinants of Health", Program in Population Health, the Canadian Institute for Advanced Research (CIAR) Publication No. 5, August 1991.