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## Transitions to Retirement: Determinants of Age of Social Security Take Up

**Emile Tompa**

**SEDAP Research Paper No. 6**

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## Abstract

Prior to 1987, retirement benefits under the Canada Pension Plan (CPP) were payable only at age 65. Amendments to the CPP in 1987 allowed benefits to be claimed at any time between the ages of 60 and 70, with actuarial adjustments for early or late take up. The focus of this paper is the health and welfare implications of these flexible retirement provisions, but the paper also investigates the labour-market characteristics of individuals prior to exit. Characteristics such as health status, demographics, employment prospects, labour-force attachment, and income sources are investigated in order to develop a profile of individuals who take up early.

The principal contribution of this paper is that it investigates the dynamics of transition from labour force to retirement in the Canadian context. Investigating the factors influencing the retirement decision has been a popular research agenda in the U.S. labour economics and public finance literature, but is not frequently addressed in the Canadian context due to the lack of longitudinal data sets. This paper employs a large longitudinal data set from Statistics Canada called the Longitudinal Administrative Databank (LAD) to examine the factors influencing the age at which an individual begins to draw benefits from the CPP. The LAD is a longitudinal sample of Canadians that spans the period from 1982 to 1994.

The results of the analysis indicate that income amounts from various sources have a significant impact on take up, as do family characteristics and markers of health status. Unattached individuals are less likely to exit to retired-worker benefits at each age than are married individuals, though the larger the family size, the less likely is exit. It appears that early exit to retired-worker benefits is more likely for: 1) low labour income earners and individuals currently out of the labour force, 2) unemployed individuals, 3) individuals receiving a private pension, and 4) individuals with spouses who are retired. There is also a significant secular trend towards early exit. The probability of exit to disability benefits is more likely for: 1) low labour income earners, 2) individuals with a disability deduction in the current year, and 3) individuals who pay union or professional dues.

Overall, it appears that many individuals who pick up retired-worker benefits prior to age 65 are individuals who have higher lifetime earnings, have already exited their career jobs, are receiving private pensions, and are making a joint retirement decision with their spouse. There are also some individuals who cycle through unemployment benefits prior to pick up. These individuals may be doing so voluntarily or involuntarily due to job displacement. For men, there is indication that lack of job prospects is an incentive for exit.

## Introduction

The post-war trend of decreasing labour-force participation of older individuals, concurrent with substantial increases in life-expectancy, has spawned interest in understanding the factors influencing the retirement decision. The literature on this subject has considered several factors as possibly having important bearing, most notably financial constraints/incentives and health status. One policy issue frequently addressed in the literature is the labour market exit incentives created by social security benefits. The concern is that many of these programmes were designed on a pay-as-you-go system at a time when economic growth was quite high, but faced with slower growth and an ageing population, coupled with increases in life expectancy, the viability of such programmes is being questioned. Related and equally pertinent are the health and welfare implications of social security provision associated with involuntary exit due to career displacement or poor health. Understanding the determinants of the retirement decision can assist in designing programmes that balance these two concerns such that they have minimal market distortions but provide adequately for the groups that would benefit from them most. To support this latter agenda, this paper investigates the characteristics of individuals who take up social security early.

The investigation of the factors influencing the retirement decision has been a popular research agenda in the United States labour economics and public finance literature. A number of American studies have focused on the impact of changes to the social security system on labour-force participation. Some researchers such as Hurd (1990) attribute the trend of decreasing labour-force participation rates to the generosity of the social security benefits (in particular to the availability of retired worker benefits from age 62), yet others find that social security amendments can explain only a fraction of the changes in participation rates (Hausman and Wise, 1985; Burtless, 1986). Gaining insight into the relationship between social security and labour-force participation is critical, particularly given recent attempts to control costs, such as the amendment to the U.S. programme in the early 1980s in which the age of full benefits availability has been changed from 65 to 67. If exit is due primarily to factors such as health or lack of job prospects, such amendments will result in only small increases in labour-force participation rates, but may cause hardship for individuals exiting involuntarily.

Understanding the nature of the retirement decision is equally relevant for the Canadian policy arena, particularly in light of cost-saving measures proposed for the Canada Pension Plan, which include decreasing the death benefit maximum (Debates of the Senate, December 17, 1997), combining survivor and retirement/disability benefit calculation[1] (Debates of the Senate, December 17, 1997), tougher rules for disability benefit eligibility (Globe and Mail, October 30, 1997) and a decrease in the drop-out provision for years with low earnings (McDonald, Donahue, and Moor, 1998). These cost-saving measures will disproportionately affect women because they earn less, retire earlier, live longer, and are less likely to have a private pension than men. Further, there is indication that a larger proportion of older women than men suffer from chronic

[1] These first two proposals have been enacted into law on February 8, 1998 (Canada Gazette, February 2, 1998).

health conditions (Wilkins and Park, 1996), which can further limit the possibility of continued work effort for many older women.

Little analysis on the factors influencing the retirement decision has been done in Canada due to the lack of availability of longitudinal data sets. A recent Canadian study by Baker and Benjamin (1997) focuses on the labour-force participation incentives created by early retirement provisions implemented under the Quebec Pension Plan (QPP) and Canada Pension Plan (CPP). The authors find that early retirement provisions have only a small immediate impact on labour-force participation rates. They conclude that individuals who take up social security early are either loosely attached to the labour force prior to claiming, or would have retired at the age that they did regardless of the social security provisions. As the authors note, these results do not rule out the possibility that the social security amendments have a lagged effect, singly or in conjunction with other institutional changes.

The present study investigates the health and welfare implications of the early retirement provisions of the CPP that were instituted in 1987. Prior to 1987, retirement benefits under the CPP were payable only at age 65. Amendments to the CPP in 1987, and to the QPP in 1984, allowed benefits to be claimed at any time between the ages of 60 and 70, with actuarial adjustments for early or late take up. This paper is an investigation into the determinants of age of social security take up. Particularly, it investigates the sociodemographic, health and labour market characteristics of individuals exiting early to retired-worker social security benefits.

A recurring theme in the literature on retirement is the difficulty of defining the concept. Traditionally it has been thought of as a discrete event entailing a permanent exit from the paid labour force at an older age. In reality, exit patterns can be quite varied, thus identifying an operational definition is not straightforward. A variety of definitions have been employed in the literature-- weeks worked in a year, hours worked in an average week, declared retired, unwilling or unable to work, etc. Several common themes underlie most definitions employed in the literature, namely: 1) older age, 2) reduced paid labour-force activity, 3) income substitution from labour to pension income, and 4) subjective perceptions versus objective measures of retirement. The event of interest in this study, CPP take up, involves many of these elements (note that early take up requires complete or substantial withdrawal from the labour force in the year of take up). In general, there may be substantial delays between exit from the labour force and CPP take up, particularly for individuals exiting prior to age 59. However, in cases of early retirement, CPP take up is one of the latter stages in the transition from labour force to retirement, and so it is a conservative way of defining retirement.

To better appreciate the policy relevance of the current study, it may be of value to consider the possible reasons for providing a public pension plan. The objective of the CPP, as stated in the Review of the Objectives of the CPP (1978), is to ensure that people can retire in dignity. This statement can be interpreted in many ways. A public plan could be motivated by paternalism, but also by the fact that market imperfections and uncertainty can make it difficult to plan optimally at the individual level. One critical market imperfection is that social security wealth is not marketable. Thus, flexible age of take up can facilitate both voluntary and

involuntary exit from the labour force at ages younger than 65, particularly for individuals who are liquidity constrained or have little savings.

Modelling the time to take up can provide insight into the relative importance of different factors that have bearing on this decision. Key factors to consider include individual and family demographics, levels and source of individual and family income, labour market characteristics, and the health status of self and other family members. The statistical methodology employed in this study is the hazard model. The duration of interest is the time from age 59 to the age at which Canada Pension is taken up. The hazard approach is particularly appropriate for modelling transitions with panel data when uncertainty is a critical element of the process. This statistical approach accommodates censoring and permits both constant and time-varying covariates. Techniques have also been developed to account for the discrete nature of many data sets, and for the possibility of multiple exit states. All the above characteristics are pertinent to the current study.

## History of the CPP and QPP

The CPP and the QPP are parallel, universal and publicly-administered programmes providing retirement and disability benefits to everyone in the paid labour force, and survivor pensions to their opposite sex spouses and their children. Together these two programmes form what is described as the second tier of a three-tiered pension system in a CPP advisory committee report (1978) (see Appendix I for details).

The history of the QPP parallels that of the CPP. The objectives of the CPP programme were not presented or discussed in the initial parliamentary proceedings, but were outlined in a White Paper tabled in 1964 (see Appendix II for details). Quebec wanted a more comprehensive plan that provided coverage for contributors who became disabled, as well as for the widows and orphans of deceased contributors, so the province decided to develop a programme of its own. Subsequently, the Federal Government announced a plan to create a full programme of social insurance that included not only retirement pensions but also coverage for the disabled, widows, and orphans. Both the CPP and QPP became law in 1965 (the CPP on May 5, 1965 and the QPP on July 15, 1965). The CPP was instituted January 1, 1966 and full benefits were first available after a 10-year phase-in period (full benefits were first available in Quebec in 1977), though some benefits began to be paid out from 1967.

Both the CPP and QPP are portable, compulsory and contributory for every person over the age of 18 earning pensionable income. Contributions are based on earnings with an income threshold (called the basic exemption) and an income ceiling. The ceiling is defined as the Year's Maximum Pensionable Earnings (YMPE) and is based on the average industrial wage. Individuals pay a percentage of their income that is above the threshold (originally the threshold was 12% then 10% of YMPE, and currently fixed at $3,500) and up to the YMPE. Employers and employees contribute an equal amount to the plan based on the employees' pensionable earnings, with the exception of the self-employed, who contribute both the employer and employee portions.

The maximum retirement pension is 25% of the four-year[2] average of YMPE in the year of application and the previous three years (see Appendix III for details). An individual receives 25% of the average proportion of the YMPE contributed since the age of 18 (or the start of the programme) to retirement (proportion calculations are made on a monthly basis for the entire contributory period). In calculating the base, a dropout provision of 15% is allowed, to reduce the impact of low earnings resulting from school attendance after age 18, sickness, unemployment, and low earnings in general. In addition to the 15% dropout provision, years spent rearing children under the age of 7 can also be excluded from the calculation.

Initially the YMPE was equal to the average industrial wage, but a 2% ceiling on year-to-year increases resulted in the YMPE falling substantially below the average wage. Beginning in 1975, a new formula was applied for calculating the YMPE that allowed for increases of 12.5% each year until it was equal to the Industrial Composite of weekly wages and salaries published by Statistics Canada. By 1986, the increase needed to catch up to the average wage was less than 12.5% (see Appendix IV for details). Since that time, the Statistics Canada series used as a benchmark has been revised, and so the YMPE appears to be above the average industrial wage.

The CPP is administered by the Federal Government through Human Resources and Development Canada (HRDC), but any changes to the programme must be approved by the provinces. Initially, the programme had a surplus of funds that were loaned out to the provinces in proportion to the amount paid into the plan by contributors in each province. In Quebec, the fund is managed by the Régie des rentes du Québec, and excess funds are paid to the Caisse de dépot et placement du Québec for investment. It was known from the outset of the programme that, at the initial contribution rates, payouts would exceed contributions before the year 2000. By 1981 contributions were almost equal to payments, but progressive increases in the contribution rates were such that it was not until 1994 that contributions first fell short of benefit payments. New CPP contribution rates were implement in 1992 in which contributions would be increased from 4.8% to 10.1% over a 25 year schedule to 2016. In 1997 the contribution rate increase schedule was modified such that the rate would rise in steps over six years to a maximum of 9.9% and then remain constant.

The Review of Objectives of the CPP (1978) briefly discusses the notion of an appropriate retirement age. Initially, CPP and Old Age Security (OAS) were payable at age 70, but this age was progressively reduced to 65. At the time the report was being written, there was already pressure to lower CPP retired-worker eligibility below age 65, but it was felt that doing so would present problems with regards to financing. The report also mentions that Human Rights legislation might eventually eliminate the right of employers to establish a mandatory retirement age.

In May 1983 the Quebec government announced plans to allow QPP contributors to claim benefits at any time between the ages of 60 and 70 with an actuarial adjustment for early and late take up. The actuarial adjustment was meant to keep the net present value of benefits constant

[2] Previously it was a three-year average of YMPE—the year of application and the two preceding years.

for benefits commencing at different ages so that there would be no additional costs to the programme. Further, it was hoped that this early retirement provision would open some 20,000 jobs for younger individuals and would reduce the unemployment rate (Globe and Mail, May 30, 1983, R7). At the time of the proposed changes, both the QPP and CPP programmes were due to experience an inevitable cash flow problem in the near future. Reports indicated that QPP reserves would be exhausted by 2002 if premiums were not increased (Globe and Mail, May 31, 1982, R3). The early retirement amendments were tabled in the Quebec legislature to take effect in January 1984. To be eligible for early receipt of benefits, an individual must be fully or substantially retired, defined as annual earnings less than the maximum retirement pension payable at age 65. This condition is imposed only for the year in which benefits are first claimed. No subsequent checks are made on labour-force participation and payments are not deducted from labour earnings after the commencement of benefit receipt.

Similar early retirement provisions under the CPP programme were instituted in January 1987. At the time of the CPP changes, unemployment rates in Canada were much lower than they were in the early 1980s, so these amendments were clearly not implemented for the purpose of alleviating high unemployment rates as were the QPP amendments. They were more of a catch-up to its sister programme, the QPP. At the same time, the CPP disability benefits were also increased to be in line with the QPP rates. These amendments may also have been motivated by public pressure for early retirement provisions that had existed for some time, as noted in the Review of Objectives of the CPP (1978).

The actuarial adjustment for early receipt of both the CPP and QPP programmes is a 0.5% reduction of benefits for each month between the age first commencing benefits and age 65 (6% per year). The adjustment of late receipt is a 0.5% increase for each month over age 65 that benefits are first received. The adjustment is based on the benefit amount that would have been received if the recipient were age 65. Whether the adjustment is actuarially fair depends on interest rates and life expectancy. Further, the time between exiting the labour force and taking up CPP is calculated into the formula. Delaying benefit take up for some time after exiting the labour force could lower the pre-actuarial adjustment benefit amount.

## Behavioural Model

### Optimal Timing of CPP Take Up

Appendix V[3] provides a graphical presentation of optimal timing of take up based on income maximization and a number of assumptions, principally that the individual has decided to exit the labour force at age 60. These graphs provide a means of visually identifying the optimal return from a stream of payments given different life expectancies and the certainty of exit at age 60. Two scenarios are presented. The first uses a 3% interest rate and the second a 6% rate to

[3] This presentation deals with pre-tax amounts and does not consider other income sources. Taxes and other income sources complicate the picture. For example, if the Guaranteed Income Supplement (GIS), OAS and CPP (or QPP) are the only income sources, then the reduced pension received at age 60 is partially offset by higher GIS benefits at age 65 (Baker and Benjamin, 1997) and possibly Spousal Allowance (SPA) between the ages of 60-64.

calculate the future value of the stream of benefits that commence at different ages. Both scenarios assume that the individual has contributed the maximum to the programme each month from the time the programme began in 1966 to age 60 in 1987. The time between labour-force exit and age of take up reduces the benefit amount according to the table in Appendix V. In the first scenario claiming immediately provides an optimal stream of benefits up to a life expectancy of approximately 19 years (final age of 79). In the second scenario, claiming immediately provides an optimal stream up to a life expectancy of approximately 28 years (final age of 88). At interest rates above 6%, claiming immediately becomes optimal for even longer life expectancies.

Appendix V provides charts of life expectancy for females and males from Statistics Canada life tables. In the mid 1980s, life expectancy at age 60 for female was 23 years, for a final age of 83, and male life expectancy was 18 years for a final age of 78. Given the first (second) scenario, income would be maximized for a woman of average life expectancy if she claimed CPP at 63 (between 60-61[4]) years of age, and for a man of average life expectancy if he claimed between 60-61 years of age in both scenarios. Note that these scenarios assume the individual has made the maximum contributions from the beginning of the programme to age 60. If the person had low or no earnings in some years prior to age 60, then delaying take up past age 60 could be even less financially rewarding relative to claiming immediately because years out of the labour force prior to age 65 and prior to claiming are factored into the benefits eligibility calculation. In many cases it is optimal to claim immediately upon exiting the labour force.

The insight to be drawn from this graphical presentation is that optimal timing of CPP take up, based on income maximization and the decision to retire at a particular age, will depend on interest rates and the individual's life expectancy. The discount factor frequently employed in pension calculations is 6% (CPP Advisory Committee, 1980; Baker and Benjamin, 1997). Life expectancy at the individual level can vary dramatically from the average. Private information about family history and health to date will provide a better estimate at the individual level than the standard life tables. An individual who behaves optimally will incorporate such private information into her/his CPP take-up decision[5]. A study by Hamermesh (1985) found that individuals do consider family history in evaluating their own life expectancy, but that too much weight is given to this information. Clearly, other factors come into play in the retirement and CPP take-up decisions. Preferences for leisure, personal time preferences for consumption, and liquidity constraints are additional factors that play a critical role. Liquidity constraints are frequently given as an explanation for a spike in the proportion of males retiring at 62 in the United States (the age at which early retirement is available under the American Social Security system) (Hurd, 1990). Further, uncertainty about job prospects, financial requirements, and the health of self and other family members suggest that individuals are continuously re-evaluating their retirement plans as new information becomes available.

[4] The difference in future value given claim commencement at age 60 or 61 is minimal.

[5] Self-selection of this sort will inevitably result in a larger burden to the programme than with the single age of take up at 65.

Health Stock Model

The theoretical framework employed in this analysis is a synthesis of the traditional life cycle model and the Grossman type health investment model (Grossman, 1972). The age of retirement and age of CPP take up are different but related events, so the modeling relies largely on the economics literature on retirement. CPP take up might be viewed as a conservative marker of the transition from labour force to retirement. The model is a framework for empirical analysis, but is not a full-fledged behavioural model from which a reduced form statistical model will be derived. The actual retirement and CPP take-up decisions faced by individual are much more complex; the framework is simply a stylized presentation to give insight into the impact of factors important to these decisions.

In the Grossman framework, health is considered a form of human capital that depreciates over time. Muurinen (1982) describes it as one of three stocks available for utility creation, the three being health, skills/knowledge, and wealth[6]. The first two constitute human capital. The three stacks are considered interchangeable, though the first two are hypothesized to be close substitutes. The flow of health from health stock provides utility directly in the form of healthy time, and indirectly by making possible other activities linked to utility, such as working and investing in human capital. Utility is defined over consumption of a composite good Z(t) and healthy time h(t) as follows:

$$U = {}_0\int^T U[Z(t), h(t)]e^{-\delta t}dt$$

where T represents time to death, or life expectancy, and $\delta$ the subjective discount factor. T is modeled as variable dependent on an essential minimum of heath stock $\underline{K}^h$ required to stay alive.

$$T=\min\{t:K^h(t) \leq \underline{K}^h\}.$$

Health flow and health stock changes are defined respectively as:

$$h(t) = \phi[K^h(t)], \text{ where } \phi'>0 \text{ and } \phi''<0$$

$$K^h(t+1)-K^h(t) = I^h(t)- \delta^h[t, x(t)]K^h(t), \text{ with } I^h(t) = f(t)M(t).$$

where f(t) represents the productivity of medical care inputs and M(t) the quantity of these inputs. $\delta^h[t, x(t)]$ is the rate of depreciation of health stock, which increases with time t, and is affected by exogenous factors x(t) such as environment and education. The budget constraint can be expressed in terms of increases in the stock of wealth as follows:

$$K^w(t+1)-K^w(t) = rK^w(t) + Y[h(t), M(t), R(t)] - [P^zZ(t) + P^mM(t)]$$

[6] The model presented here employs Muurinen's (1982) variations of the Grossman (1972) model.

where R(t) represents variables impacting earnings and may included variables found in x(t), principally education. $P^z$ and $P^m$ are the prices of the composite good and medical care respectively.

The principal comparative statics of interest in the Grossman model and Murrinen's extension are the effects of age, education and wealth. Age affects both the rate of depreciation and the productivity of medical care in producing health. It is assumed that the former increases and the latter decreases with age. The model predicts that the desired level of health stock will decrease with age, but that the amount of medical care demanded will increase. Education has an effect through the vector of exogenous variables denoted as x(t). In this model, education is assumed to affect lifestyle choices which result in lower use intensity (Muurinen, 1982) rather than increasing the productivity of health production as in the Grossman model. Both approaches result in a positive relation between education and the demand for health. The effects of initial wealth on the demand for health are less clear. Grossman proposes two models, the first a pure health consumption model in which the relationship is positive, and the second, a pure investment model in which wealth has no effect. These two models can be described as polar cases of the above model, in which wealth affects the demand for health through two avenues. The first is through a decrease in the shadow price of health, which in turn increases the demand for health. The second is through a decrease in the value of the income earnings potential of health improvements, which decreases the demand for health.

Retirement Model

In this section the Grossman framework is integrated with a retirement model proposed by Diamond and Hausman (1984). The model includes a variable age of retirement, the outcome of which is partially influenced by the probability of not being able to work. This probability is represented by the cumulative function F(t) with F(0)=0 and F(T)=1. The density function f(t)=F'(t)>0 for t>0. As before, utility is derived from both consumption of a composite good and healthy time, but in this case, healthy time is consumed only after retirement. In effect, the model is similar to Grossman's investment model prior to retirement, and the consumption model after retirement. The utility function is as follows:

$$U = {}_0\int^R U[Z(t)]e^{-\delta t}dt + {}_R\int^T U[Z(t), h(t)]e^{-\delta t}dt$$

where R denotes the planned retirement date. Integrating the risk of involuntary retirement and, for simplicity, assuming a zero subjective discount rate, the utility function can be written as:

$$U = {}_0\int^R U_1[G_1(t)][1-F(t)]dt + {}_0\int^R (T-t)U_2[G_2(t), h(t)]f(t)dt + (T-R)U_2[G_2(R), h(R)][1-F(R)]$$

where $G_1(t)$ represents the consumption rate at age t of a person retiring after age t and $G_2(t)$ the consumption rate of a man retiring at age t. The utility function is further simplified by assuming that utility is separable in consumption and leisure, that is $\partial^2 U/\partial G\partial h = 0$. In this stylized model with zero discount rates, a consumer who behaves optimally would allocate consumption equally across remaining years of life after retirement. Thus the consumer chooses $G_1$ and R, with $G_2$ being determined residually. The budget constraint is rewritten as follows:

$$K^w(0) + {}_0\int^R Y(t)dt + {}_R\int^T R(t) - {}_0\int^R G_1(t)dt = (T-R)G_2(R)$$

where $K^w(0)$ represents initial wealth, Y(t) income prior to retirement, and R(t) pension after retirement. The price of the consumption good has been normalized to one. As further simplifications, $K^w(0)$ is set to zero, and R(t) normalized to zero. Though R(t) is determined by government retirement policies, additional work is still assumed to increase pension entitlement. The optimal choice of $G_1$ for a chosen retirement age R fulfills the following condition (Diamond and Hausman, 1987):

$$U_1'[G_1(t)]\,[1-F(t)] = {}_t\int^R U_2'[G_2(t)]f(t)dt + U_2'[G_2(R)][1-F(R)].$$

This expression states that the marginal utility of consumption is re-evaluated at each date prior to retirement (i.e. $t<R$) such that it is set equal to the expected marginal utility after retirement (the expectation being taken as of that date).

Borrowing from Baker and Benjamin (1997), the budget constraint ${}_0\int^R Y(t)dt + {}_R\int^T R(t)$ can be graphed according to the diagram in Appendix VI. The present interpretation of the diagram is different from Baker and Benjamin in that it reflects a budget constraint at the individual level, rather than for an average individual. Thus, the early retirement provisions affect an individual's budget constraint in different ways depending on her/his life expectancy. The provisions increase or leave unchanged the net present value of pension wealth. The diagram normalizes wealth at age 59 to zero and assumes that an individual can only collect CPP after exiting the labour force. Further, it is assumed that actuarial adjustment for early take up results in no net gain for an individual with average life. Referring to Diagram 1 to explain the base case of pre-early retirement provisions, the slopes of segment AB and BCD reflect the gains from continued work. Slope AB is lower than BCD because the benefit from continued work after age 65 is offset by forgone pension. The first diagram depicts the budget constraint for an individual with shorter than average life expectancy. For such an individual the budget constraint shifts up by the amount of the gain in pension wealth. Segment C'D' is parallel to CD, because the gain from working between age 58 to 60 is unchanged. Segment A'BC' is higher than ABC but has a lower slope because continued work results in forgone pension. Point C, claiming at 65, is the same for all individuals before and after the amendments. For an individual with average life expectancy, the budget constraint remains unchanged in the relevant segment BCD (represented by Diagram 2). Segment AB shifts up to A'B if take up is after age 65 because a premium is now received for late take up. For an individual with above average life expectancy (Diagram 3), segment BCD remains unchanged but segment AB shifts up to A'B'B. The kink at B' occurs at the age at which the net present value of pension benefits is greatest.

The above retirement model could be extended to include the full complement of factors influencing income (Y[h(t), M(t), R(t)]) and elements found in the consumption bundle (G(t)=Z(t)+M(t)). The comparative statics of this more complex optimal control problem are not investigated in this paper.

## Statistical Methodology

### Basic Framework

In this study the transition from the labour force to retirement is modeled in terms of a particular event, namely CPP take up. The transition of interest is exit from a non-claiming to a claiming state. More specifically, the duration from age 59 to age of first take up is modeled using the failure rate or hazard model specification. This methodology has been used extensively in the biometrics and engineering fields, and has become popular in labour economics for the study of unemployment spells. The approach has also been used in several studies on retirement (Diamond and Hausman, 1984a, 1984b; Hausman and Wise, 1985). The methodology is ideal for analysis of longitudinal data, particularly if uncertainty is an important element of individual behaviour. It readily accommodates censored data and time varying covariates.

The specific methodology employed in this analysis is similar to Kiefer (1990) and has been employed by a number of others (Prentice and Gloecker (1978); Meyer (1990); Han and Hausman (1990)). It is a basic framework used to model hazard functions with grouped data. The framework is similar to the discrete choice models of logit and probit but has a different distribution.

Most longitudinal data sets report information at particular time intervals. If these intervals are short, and large in number, then for most purposes a continuous time hazard model can be employed. If the intervals are long, and few in number, there is likely to be many more exit ties, which are difficult to deal with in the continuous time framework. In such cases, a grouped data method is more appropriate.

The grouped methodology employed in this paper assumes that the underlying nature of the event of interest takes place in continuous time and the grouping of the data is a result of an incompletely observed continuous time process. This grouped data method is often labeled semi-parametric in that the within-period hazard is not specified. The grouped method treats the within-period hazard as constant (exponential), and the baseline across periods can be described as a step function. The estimation of the beta coefficients for time varying covariates is based on the across observation variation in the covariates. If the covariates are measured as deviations from the mean, any variation in the mean of the time varying covariates is reflected in the baseline which is not parameterized[7]. There is some loss of efficiency due to the baseline not being parameterized, but this loss is small. In return, the method ensures consistency, particularly if the covariates vary more across individuals than across time or if there is a time trend in the mean of the covariates (Meyer 1990).

Assume the sample consists of n individuals, subscripted *i*, with information on durations grouped into *K* intervals, subscripted *k*. Durations are said to be grouped into intervals because the exact time of exit within an interval is not known. In the case of the data set being used in this study, each interval is one year or 12 months long. If the beginning of the first interval is

[7] In this paper, the covariates are not measured in terms of deviations from the mean.

identified as $t_0=0$ and the end $t_1$, then intervals can be represented by the following sequence $[t_0, t_1), [t_1, t_2), \ldots [t_{k-1}, t_k), \ldots [t_{K-1}, t_\infty)$. The intervals are closed on the left and open on the right because the end of an interval approaches, but does not overlap with, the beginning of the next. Zero durations can be included in the first interval by recasting the first interval as $[t_{-1}, t_0)$ rather than $[t_0, t_1)$. The final period must have some censored observations. It should be noted that calendar time is irrelevant in this framework; $t_0=0$ at the beginning of the duration for all individuals, regardless of at what calendar date this occurs. Further, no details of within interval exit time are known, therefore everyone who exits in a particular interval is assumed to exit at the same time. Some arbitrary assumption must be made as to what point within an interval individuals exit, i.e. at the beginning, middle, or end. Any assumption is as good as the next.

Assume that the underlying hazard is a function of duration and a set of explanatory variables. If $T$ denotes the time of exit, then the basic functional form of the hazard can be represented as:

$$\begin{aligned}\lambda(t,x) &= \text{Prob}(t<T<t+dt) \,/\, \text{Prob}(T\geq t) \\ &= f(t,x) \,/\, {}_t\int^{\infty} f(u,x)du\end{aligned}$$

where $f(t,x)$ is the density function, or instantaneous probability of exit, and ${}_t\int^{\infty} f(u,x)du$ is the probability of surviving beyond time $t$. This is the standard continuous time hazard function.

With aggregate data, one needs to model the probability of exiting within a particular time interval, rather than the probability of exiting at a particular point in time $t$. This probability is simply the conditional probability of exiting in a particular time interval (conditional on surviving to that period) times the probability of surviving to the beginning of that interval, which can be written as:

$$\Pr(t_{k-1}\leq T<t_k) = \Pr\,(t_{k-1}\leq T<t_k \mid T\geq t_{k-1}\,)\,\Pr\,(T\geq t_{k-1}).$$

The conditional probability of exit in a particular time period can be expressed in terms of the underlying continuous time hazard function. To formulate this expression, begin by specifying the conditional probability of surviving through a particular time, i.e. conditional probability that a duration $T$ is greater than $t_k$ given that it is greater than $t_{k-1}$, which is:

$$\begin{aligned}\text{Prob}\,(T\geq t_k \mid T\geq t_{k-1}) &= \exp[\,-\,{}_{t_{k-1}}\int^{t_k}\lambda(u,x)du] \\ &= \alpha_k(x,\beta)\end{aligned}$$

where $\beta$ represents a set of known parameters. This is simply the basic relationship of the survivor function and integrated hazard function. Employing the above expression, the unconditional probability of surviving to period $k-1$ is simply the probability of surviving through each of the previous time periods, i.e.:

$$\text{Prob}\,(T\geq t_{k-1}) = {}_{j=1}\Pi^{j=k-1}\,\alpha_j(x,\beta)$$

Similarly, the conditional probability of exit in time period $k$ can be written in terms of $\alpha$ as follows:

$$\Pr\left(t_{k-1} \le T < t_k \mid T \ge t_{k-1}\right) = 1 - \alpha_k(x,\beta).$$

Together, these terms provide an expression for the probability of failure in a time interval based on the underlying hazard function, and can be written as:

$$\Pr(t_{k-1} \le T < t_k) = [1 - \alpha_k(x,\beta)] \left[\prod_{j=1}^{j=k-1} \alpha_j(x,\beta)\right].$$

Taking this expression over *n* individuals, indexed by *i*, we get an expression for the likelihood function as follows:

$$l(\beta) = \prod_{i=1}^{i=n} \{[1 - \alpha_{ki}(x_i,\beta)] \left[\prod_{j=1}^{j=k-1} \alpha_j(x_i,\beta)\right]\}$$

This likelihood function can be written in a different form. If an individual's duration is broken down into observation intervals, then each individual contributes $k_i$ observation intervals, where the outcome of each interval is either survival or exit. Thus, the likelihood function has a form similar to discrete choice models such as probit or logit functions and is written as follows:

$$l(\beta) = \prod_{i=1}^{i=N} [1 - \alpha_i(x_i,\beta)]^{1-di} [\alpha_i(x_i,\beta)]^{di}$$

where $N = \sum_{i=1}^{n} k_i$ is the total number of observation intervals in the sample, and $d_i = 1$ if the individual survives the time period and $d_i = 0$ if the individual exits.

Covariates can be explicitly integrated using Cox's (1972) proportional hazard approach as follows:

$$\lambda(t,x) = \lambda_o \exp(x'\beta)$$

where $\lambda_o$ represents the baseline hazard. Incorporating this expression into the expression for the conditional survival through a time period gives:

$$\begin{aligned}
\alpha_k(x,\beta) &= \exp\left[ - \int_{tk-1}^{tk} \lambda(u,x)du\right] \\
&= \exp\left[ - \int_{tk-1}^{tk} \lambda_o(u)\exp(x'\beta)du\right] \\
&= \exp\left[ - \exp(x'\beta) \int_{tk-1}^{tk} \lambda_o(u)du\right] \\
&= \exp[ - \exp(x'\beta + \gamma_k)]
\end{aligned}$$

where the term $\gamma_k = ln \int_{tk-1}^{tk} \lambda_o(u)du$ becomes one of the parameters in $\beta$ to be estimated. Note that the within-period hazard is not parameterized since there is no means of testing such specifications given the data.

Right censoring is easily handled in this framework. Information for periods in which the censored individual survives is kept, whereas information for the period in which the individual is censored is simply dropped. The underlying assumption of this technique is that censored individuals are similar in characteristics to non-censored individuals, i.e. that censoring is random. The validity of this assumption in the context of the database being used will be discussed in detail later in this paper.

As was previously mentioned, the above likelihood function is similar to a probit or logit except that it has a different link function. The logistics model is part of a large class of linear models that are characterized by the assumption that the mean of the dependent variable is linearly related to the explanatory variables through some function. If one begins by defining the dependent variable as *Y*, and assumes that it can take on two values, *Y=1* if an individual survives an interval and *Y=0* if the individual exits. The probability of interest is the probability of exit, given a set of explanatory variables, i.e. $p=Pr(Y=0|x)$. Then, the link between the explanatory variables and the dependent variable can be expressed as:

$$\Phi(p)=\Phi(\Pr(Y=0|x)).$$

In the case of an exponential distribution, this function is the complementary log-log function and its inverse is the cumulative extreme-value function, or the Gompertz function, which is:

$$\begin{aligned}\Phi(p) &= \ln(-\ln(1-p)) = x'\beta \\ p &= F(x'\beta) = 1- \exp(-\exp(x'\beta)) \\ &= 1- \alpha_k(x,\beta)\end{aligned}$$

where $\alpha_k(x,\beta)$ is defined as above, except that the vector *x* has been redefined to include the *K* dummy variables. These *K* variables represent the $\gamma_1$ - $\gamma_K$ time periods and their coefficients represent the *K* integrated baseline hazard values. Thus, no intercept should be included in the model. Note, also, that this framework can easily accommodate time varying covariates. As formulated above, there is no restriction that the *x* variables have the same value in each interval. Further, even coefficients can be varied from interval to interval by interacting them with the *K* dummy variables.

Testing the baseline hazard can be done by imposing restrictions on the *K* dummy variables. To test whether the baseline is exponential, one simply imposes the restriction that $\gamma_1=\gamma_2=...=\gamma_K$. Similarly, a test of a Weibull baseline distribution is possible. One can also test these restrictions graphically. For an exponential baseline hazard, a graph of $_{j=1}\Sigma^k \exp(\gamma_k)$ against the time interval $t_k$ should be linear and intersect the origin. For a Weibull baseline, a graph of $ln[_{j=1}\Sigma^k \exp(\gamma_k)]$ against $ln[t_k]$ should be linear.

A competing risks framework can easily be incorporated into the methodology. With competing risks, exit into one state removes individuals from possible exit into competing states. Each exit state can have its own causal structure, and thus, each can be modeled separately with its own likelihood function. Individuals who exit into alternative states are simply treated as censored.

Unobserved Heterogeneity

Underlying the above specification is the assumption that individuals' exit probabilities are independent across time periods once we control for observable characteristics and the

baseline. This assumption makes it possible to break up the observations of each individual into observation years and treat each year independently. If there are unobservable, person-specific characteristics that affect exit rates, then this assumption is incorrect and the specification must be modified to accommodate these individual effects. In the case of the data set used for this study, two characteristics are missing that are likely important factors in the age of retirement decision, namely education and savings/wealth.

If unobserved heterogeneity is introduced in a multiplicative form to the proportional hazard, then the specification becomes:

$$\lambda(t,x) = \Theta\lambda_o \exp(x'\beta).$$

Following Meyer (1990), to obtain the log-likelihood function one conditions over the random variable $\Theta$ and integrates over its distribution to obtain the following function:

$$L(\gamma, \beta, \mu) = {}_{i=1}\Sigma^{n} \log[\int \exp[ -\Theta {}_{t=0}\Sigma^{ki-1} \exp(x'\beta + \gamma_1 \ldots \gamma_k)]d\mu(\Theta)] - \delta_i \int \exp[ -\Theta {}_{t=0}\Sigma^{ki} \exp(x'\beta + \gamma_1 \ldots \gamma_k)]d\mu(\Theta)].$$

where $\delta_i=1$ if the individual is uncensored $\delta_i=0$ if the individual is censored.[8] Many applications of this approach have specified the distribution of $\mu(\Theta)$ as a gamma distribution. In this paper a semi-parametric method, as proposed by Heckman and Singer (1984), is employed. As noted by Meyer (1990), this type of specification results in a discrete distribution with a finite number of mass points.

If two unobserved characteristics are present, $\theta^e$ and $\theta^s$, and each has two levels, i.e. $\theta^e \in \{\theta^e_1\ \theta^e_2\}$ and $\theta^s \in \{\theta^s_1\ \theta^s_2\}$, then the joint distribution is characterized by four mass or support points and can be represented by $\Theta_s$, with $s$ equal to one through four[9]. If the probability of each mass point is identified as $R_s$ then the likelihood function for the individual can be summarized as:

$$l_i = {}_{s=1}\Sigma^{4} R_s\, l_i\, (\gamma, \beta, \Theta)$$

$$l_i\, (\gamma, \beta, \Theta) = {}_{s=1}\Sigma^{4} R_s\ [1-\exp\{-\exp(x_k'\beta + \gamma_2 \ldots \gamma_k + \ln\Theta_s)\}]^{\delta i} \ {}_{j=1}\Pi^{j=ki-1} \exp\{\exp(x_j'\beta + \gamma_2 \ldots \gamma_k + \ln\Theta_s)\}.$$

Note that there is one less $\gamma$ dummy variable than the number of periods because the unobserved characteristic is modelled in the intercept. The unobserved heterogeneity model in this paper employs one characteristic with two levels, and thus has two mass points estimated.

[8] In this specification censored individuals are present for $k_{i-1}$ periods, and uncensored individuals of $k_i$ periods.
[9] One of the support points can be normalized to zero, which would, in this case, leave three points in the specification.

## Data Set and Sub-sample

### Data Set

This study employs a database resident at Statistics Canada called the Longitudinal Administrative Databank (LAD) which is a subset of the T1 Family File (T1FF). The T1FF is a yearly cross-sectional file of all tax filers and their families. Census families are created from information provided annually to Revenue Canada in personal income tax returns. Both legal and common law spouses are attached by the spousal social insurance number (SIN) listed on the tax form, or by matching based on name, address, age, sex, and marital status. Children are identified through a similar algorithm and supplementary files. Prior to 1993, non-filing children were identified from information on their parents' tax form. Information from the Family Allowance programme was used to assist in the identification of children. Since 1993, information from the Child Tax Benefit programme has been used for this purpose.

The Longitudinal Administrative Databank (LAD) is a random, 10% sample of the T1FF. Selection for LAD is based on an individual's SIN. There is no age restriction, but people without a SIN can only be included in the family component. Once a person is selected for the LAD the individual remains in the sample and is picked up each year from the T1FF if s/he has filed that year. Individuals selected for the LAD are linked across years by their SIN to create a longitudinal profile of each individual. The LAD data are organized into four segments: individual, spouse/parent, family, and children. It contains information on demographics, income, and other taxation data for these individuals and their families from 1982-1994 (see Appendix VII for an overview of LAD variables).

The LAD is topped off each year with a cross-sectional sample of tax filers not already in the database such that it represents 10% of tax filers. There is also a 1% LAD, which is the data set employed for this study. New years of data are added as the information becomes available. The 10% sample has increased from 1,614,150 people in 1982 to 2,115,000 in 1994 (31% increase). This increase reflects increases in the Canadian population and increases in tax filers. The tax filer base has increased as the result of the introduction of the Federal Sales Tax credit in 1986 and the Goods and Services Tax credit in 1989 which encourage low income individuals to file (see Appendix VIII for details on LAD coverage of the Canadian population).

### Sub-sample

Since CPP early take up first began in 1987, and is available only from age 60, the criteria for selection into the sub-sample included turning age 60 between 1987 and 1994, and being eligible for CPP retired-worker benefits.[10] Individuals were considered eligible if they were observed contributing to or receiving benefits from the programme (survivor beneficiaries who were not eligible for retired-worker benefits were not included). Appendix VIII provides details on LAD coverage of the relevant age groups.

[10] Some individuals who were older than 60 in 1987 still had the option of taking up before age 65 and could be accommodated in the model with dummy variables, but they were not included in order to streamline the model.

Tax filers report all CPP benefits on the same line of the T1 form regardless of the type of benefit received.[11] Thus, a number of algorithms were developed, based on various aspects of the programme and information available on the data set, to separate retired-worker, disability and survivor beneficiaries. A critical feature of the programme that proved to be quite useful in this process is that individuals do not make contributions on any employment earnings once they begin receiving retired-worker or disability benefits. This is not the case with survivor benefits. This fact, along with LAD information on the date of death of spouses and CPP information on the maximum benefit amounts for different types of beneficiaries, helped distinguish between the different benefits being received. A number of observations were coded manually. Statistics on the total number of claimants by age and year in the sub-sample can be found in Appendix IX along with other information. Actual CPP take up counts from HRDC can also be found in Appendix IX.

Tables 10.1a to 10.1c in Appendix X identify the presence patterns and censoring patterns in the LAD and the sub-sample respectively. Of the individuals who are present at 60 years of age between 1987 and 1994 (one of the criterion for selection) 89.6% of women and 94.4% of men are present at age 58, 59 and 60 (another criterion for selection). Intermittent filers tend to be lower income earners, but they still may be eligible for CPP retired-worker or disability benefits, so there is likely an upward bias in terms of incomes in the sample selected relative to the population of interest. Tables 10.1b and 10.1c in the same appendix provide information on censoring patterns in the sub-sample. Of the individuals that are censored, 90.7% of women and 90.6% of men are censored in 1994 (the end of the database). Those that are censored before 1994 may be censored for two possible reasons—death or failure to file. The statistical model employed in the subsequent analysis assumes that censoring is random. This is not necessarily the case with LAD sub-samples, but it is less of a problem in the sub-sample selected here, largely because individuals who have filed at age 58, 59 and 60 (a requirement for selection) have already established a pattern of systematic filing.

Specification Details

Based on the behavioural model outlined above and the empirical work in the retirement literature, a number of covariates are included in the CPP take-up model (see Appendix XI for a detailed list). These variables can be categorized as demographic/geographic, financial, health, and labour-market characteristics. Demographic characteristics such as marital status, family size, and number of dependants can play an important role. Financial variables are likely key considerations in the retirement decision. These can be classified into two broad categories, namely: 1) wealth and/or non-labour income from various sources, and 2) labour income. In the case of married individuals, a spouse's financial situation is likely factored into the equation. Health status of self, spouse, and other family members are important considerations. Finally, for individuals involuntarily displaced from their jobs, employment prospects can be a decisive factor.

[11] From 1992 the T1 form requires individuals to identify the amount of disability benefits on a separate line from the total benefits received.

Marital status and family characteristics have a bearing on the retirement decision. It is common for couples to make the retirement decision jointly. This may be due to leisure being of greater value if spent with another individual. It is predicted that if spouse is working, it is less likely that an individual will retire, whereas if the spouse is retired, an individual is more likely to retire. Included in the specification are a spouse's employment, self-employment, private pension plan, and CPP income. These variables serve the dual purpose of being indicators of a spouse's retirement status and sources of income for the family unit.[12] Single individuals may place higher value on the social aspect of the work environment, therefore unattached individuals are predicted to be less likely to retire than married individuals at each age. The presence of dependants also has a bearing on the work/retirement decision. Dependent children increase financial responsibilities and therefore likely encourage continued work effort for both men and women, whereas dependent parents may require someone to fill the role of caregiver. The family component of the LAD is based on the census family; parents are not included in the family unit of married individuals. In our modelling of the family unit we modified the census family concept to include only children 25 years of age and younger.

Financial variables are likely one of the most important factors in the labour-force exit and CPP take-up decisions of older individuals. Wealth and income of various forms not related to labour-force participation are hypothesized to have a negative relationship with continued participation in the labour force (i.e. they increase the probability of take up). Current labour income can have both a positive and negative influence on continued labour-force participation through the substitution and income effects. Individuals with higher employment income have a greater incentive to remain in the labour force because the cost of leisure is higher for them. Concurrently, as income increases leisure becomes more affordable, and more desirable if it is a normal good. Self-employment income will have similar opposing effects, though possibly somewhat different magnitudes. The relationship between permanent income and labour-force participation is less clear. To a large degree it will depend on the principal components of permanent income. If it is largely a reflection of labour income, then it is more likely to have a similar impact as current labour income. Two studies by Diamond and Hausman (1984a, 1984b) found the relationship to be negative, that is, increased permanent income reduces the probability of exit at each age. Conditional on current labour income, permanent income is hypothesized to have a positive effect on exit probability, similar to the impact of wealth.

Own health status is a critical factor in the ability to continue working. The association between good health and participation in the labour force is positive. Particularly debilitating or serious health conditions can cause premature, involuntary exit from the labour force, though minor variations in health status are less likely to have immediate impact. The relationship between spouse's health status and the retirement decision is less clear. On the one hand, there may be a need for someone to fill the role of caregiver, while on the other, financial pressures resulting from the illness of a spouse may encourage continued labour-force participation. These competing forces are likely to play out differently for men and women, though in both cases no clear hypothesis can be forwarded for an association in either direction. Since it is more common

[12] For a spouse, CPP benefits can be any one of death, survivor, disability, or retired-worker benefits, though in most cases it is one of the latter two. For the individual, CPP income can only be death or survivor benefits since individuals in the sample have not exited to disability or retired-worker benefits.

for women to fill the role of caregiver, if a spouse suffers from poor health, it is hypothesized that a woman would be more likely to exit from the labour force. For men, the effect is predicted to be the reverse. Two markers of health status have been included in the specification. The first is a dichotomous variable based on an individual having a disability deduction (not to be confused with CPP disability benefits) in a particular year. This variable is treated as a dichotomous variable because the deduction is a standard amount. The second health marker is medical expenses, which is maintained as a continuous variable. Medical expenses for self and spouse have been aggregated because it is not possible to determine which member of the family unit has received the medical benefits related to these expenses.

Employment prospects are an important consideration for individuals involuntarily displaced from their job. Unemployment rates and size of urban centre are two markers for job prospects included in the specification. It is hypothesized that the higher the unemployment rate, the fewer the job prospects, and the larger the urban centre, the greater the number of job prospects (urban size can be an indicator of many other characteristics). Individuals may cycle through the unemployment insurance (UI) system when displaced from a job before taking up benefits, therefore someone collecting unemployment insurance is predicted to have a higher probability of exit to retirement. Similarly, individuals not in the labour force in the current year are also predicted to be more likely to exit. Two additional labour-force attachment characteristics have been included in the model. These variables are the number of years an individual has collected UI and the number of years s/he has been out of the labour force from age 58 (the latter is defined as receiving no employment, self-employment or UI income in a given year).

Lastly, a set of dichotomous variables replaces an intercept term in order to identify a baseline hazard function for the grouped data specification. The baseline dummies are synonymous with age because all individuals enter the state of interest at the same age. These dummies have been interacted with a time trend in order to identify age specific time trends. It is possible to generate age/interval specific coefficients for other covariates by interacting the baseline variables with these variables, but the number of covariates can become quite large. In most cases, the parameters do not vary markedly between consecutive periods. Keifer (1990) suggests smoothing the pattern of variation in parameters across intervals with a Bayesian approach, though this has not been undertaken in here.

## Results

### Cross-sectional Analysis

Since the LAD spans the CPP amendments of 1987, a cross-sectional time-series analysis of income patterns over the time period 1982-1994 is presented here to provide an overview of the trends before and after these amendments. Appendix XII through XV present different perspectives on income patterns and income sources.

In Appendix XII, graphs of the mean total and labour income for men and women categorized into two age groups provides a baseline view of the relationship between mean total and labour income over this time period. Mean total income for women is similar for the two age groups in 1982 but increases for the younger age group and decreases for the older age group over the 1982-1994 time period. Average labour income also decreases for the 60-64 group but at a slightly faster rate than total income. In 1984 the proportion of labour to total income for this group was 43.7% but drops to 37.9% by 1994. For men, mean total income of the older age group is lower through most of the time period. Business cycle effects are apparent through the peaks in 1989 and 1990 for the younger and older age groups respectively. Both groups experience a decline in real total income. The proportion of labour to total income for men 60-64 decreases by a larger amount than for women of the same age group. In 1982 this proportion is 65.0% but drops to 48.8% by 1994.

Appendices XIII through XV focus specifically on the 60-64 age group. This is the group for which the amendments to the CPP are most salient. Appendix XIII graphs the proportion of total income from different sources for 1982-1994. The relationship between labour to total income commented on above is more apparent here. Also noteworthy is the steady increase of the proportion of total income derived from private pensions and the jump in the proportion from CPP after 1987. This latter proportion drifts slowly upward for both men and women from 1987 through to 1994. The patterns noted here are not specific to a particular income group. Similar patterns of declining total income, declining proportion from labour income, and increasing proportion from CPP exist with the second and fourth quintiles, as seen in Appendix XIV. The exception is a decrease in the proportion of income from private pensions for the lower quintile group. Evidently the trend of decreasing labour income is not specific to a lower income group.

Appendix XV provides the most revealing insights into the changes in labour income over the time period. These graphs show the proportion of the population with different labour to total income ratios for the 60-64 age group. Most remarkable is the marked increase in the proportion of the male population with no labour income and the concurrent decrease of males with 76-100% of their income from labour sources. The change in the proportion of these two groups is so dramatic that their relative magnitude is reversed after 1990. Similar to men, women with no labour income increase as a proportion of the 60-64 population, and those with 76-100% income from labour sources decrease as a proportion. However, the former group is larger than the latter throughout the time period. Some of these patterns may be influenced by the increase in the number of filers during the time frame of the database. To help offset this peculiarity of the database, individuals with less than $1,000 in total income were excluded from the calculations.

To summarize, the pattern of decreasing labour earnings for the 60-64 age group is a trend that is present throughout the 1982-1994 time period. The pattern does not appear to become more pronounced in 1987 with the inception of CPP amendments. There is no marked change in the income from labour sources just prior or subsequent to the amendments. What is noteworthy is the jump in CPP income for both men and women beginning in 1987. Also noteworthy is the staggered jump in private pension income for women and for individuals in the

higher income quintile. It appears that Retirement Pension Plans (RPPs) are being taken up earlier, seemingly after take up of CPP.

Sub-sample Descriptive Statistics

The Kaplan Meier hazards for both men and women (Appendix XVI) reveal peaks at age 60 and age 65 for exit to retired-worker benefits, with a peak at 65 that is larger than at 60. Referring back to Appendix IX (Tables 9.1b and 9.1c) of data from the sub-sample and data from the HRDC files (Tables 9.2a and 9.2b) similar patterns can be seen as with the Kaplan Meier hazard. In both sets of these earlier tables the unconditional hazard peaks at age 60 and 65 for both men and women. Moreover, the peak at 60, though initially lower than the peak at 65, has been increasing over time, whereas the peak at 65 has been decreasing. In fact, the raw counts of exits at 60 for women are larger than those at 65 after 1991 in the HRDC data. Both the unconditional and conditional hazards appear relatively constant for exit to disability benefits.

Table 17.1 in Appendix XVII provides information on the mean income from different sources of individuals in the year prior to exit along with the mean income of their counterparts--those not exiting in the subsequent year. The earliest claimants have a lower mean employment income than their counterparts for both men and women, but the difference decreases with later claimants and ultimately the pattern is reversed at age 64 for both men and women (these individuals exit at age 65). A similar pattern is seen with mean self-employment income and flows from wealth, though the pattern is less regular with this latter income source. The reverse appears to be the case with pension income—those exiting to CPP have higher income from this source at most ages compared to those not exiting. No consistent patterns are apparent with CPP income and medical expenses. In comparison, Appendix XVIII (Tables 18.1e and 18.1f) provide information on average employment and self-employment income for individuals after they have taken up CPP benefits. These individuals are no longer in the sub-sample at this point. Most noteworthy is the large jump in the averages at age 66 and 67. It appears that those who take up early tend to substantially exit from the labour force (and are required to do so to qualify for benefits), whereas those who take up at 65 or later are less likely to do so.

Appendix XVIII (Tables 18.1a-18.1d) provide information of years out of the labour force for individuals in the sub-sample. Being out of the labour force in a particular year is defined as having no employment, self-employment or UI income. The largest categories are zero years and two years. The individuals in the latter category are primarily those who have left the labour force prior to age 58, and most exit at age 60, and are therefore not in the database after the two years out of the labour force. There are a few individuals (more women than men) who are out of the labour force from age 58 but do not take up until age 65 or thereafter.

Model Estimation

Appendix XIX through XXII contain the results of several model specifications.[13] The first set is exits to disability benefits, and the second set exits to retired worker benefits. In each

[13] Note that these estimates do not include unobserved heterogeneity. Also note that continuous and count variables are measured from zero, not the mean.

case, individuals exiting to the competing risk are treated as censored. A number of specifications have been tested, principally: 1) a linear model, 2) a log-linear model in which negative values have been set to zero, 3) a log-linear model in which observations with negative values have been eliminated, and 4) a quadratic model. The first three are presented for both the disability and retired-worker exits.[14] Additionally, a truncated version of the retired-worker exit model is presented in which individuals exiting after age 64 have been censored. The objective of this specification is to confirm that individuals exiting early are driving the results. All specifications display similar magnitudes and significance levels for the variables in common, indicating very little sensitivity to specification variations.

Exit to Disability Benefits

Appendix XIX Tables 19.1-19.3 provides estimates for several specifications of the disability exit model. The intercept terms (STEP60-STEP64) represent the integrated, within-period baseline hazard. These baseline hazard variables are all significant across all specifications.[15] The similarity in their magnitudes suggests that the hazard is constant between the ages of 60 to 64. Graphing the integrated hazard provides insight into the shape of the baseline. Chart 23.1a in Appendix XXIII suggests that the hazards for disability benefit take up are constant to age 64, i.e. the hazards are exponential. After age 64 individuals are not eligible for disability benefits. The hazard is somewhat higher for men than for women, indicating possibly poorer health profiles for men, or at least a higher take-up rate. A time trend variable was included in early specifications but was insignificant and was therefore eliminated in the final versions.

A number of income sources/amounts are significant. Both employment and self-employment income are significant and negative in all specifications. This is as predicted by the Grossman health stock model in which health capital is a determinant of income. The wealth variable is also significant and negative in all specifications, once again consistent with the health stock model. The negative coefficient of the pension income variable can be given a similar interpretation since it reflects pension wealth. The major exception to the predicted results is the significant positive coefficient on permanent income. This result is consistent across all specifications.

The markers of health status had mixed results. The variable indicating a disability deduction in the current year is significant for both men and women in all specifications, and has the largest coefficient of all variables. Clearly, individuals with a disability deduction have serious health impairments and would be the most likely candidates for disability benefits. What is unusual is that the lagged value for this variable is significant and negative for men. Some of these individuals may refrain from exiting until age 65 in order to continue to qualify for company sponsored medical plans. At age 65 these individuals will qualify for publicly funded

[14] The quadratic model is not presented in the appendix. The principal covariates had no sign reversal in this specification, though there was indication of non-linearities with some variables.

[15] In Appendix XIX, Table 19.3 the intercept terms for the various ages of exit are not all significant in the models because a global intercept term has been introduced into the specification-- one for the standard linear model, and two for the unobserved heterogeneity model.

drug benefit plans provided in several provinces. Other individuals may actually recover from their illness. The current medical expenses variable is significant and positive in only one specification—the linear model for men. This is likely due to the fact that medical expenses are a blunt marker of health status. Furthermore, some individuals have full coverage of medical expenses through a company plan, and so information on medical expenses is not consistent across individuals. A third variable indirectly related to health status is the non-taxable income variable, which is positive and significant in all specifications. This variable consists of social assistance and workers' compensation benefits. Individuals on workers' compensation are eligible to apply for CPP disability benefits. It is possibly these individuals who are driving the result, though this cannot be confirmed because the components of non-taxable income are not separately available in the database.

The dummy variables indicating union or professional dues payment is significant and positive. This result is difficult to interpret because of the broad range of jobs held by individuals who have such a deduction. The original intention was to have it serve as a broad marker of job type with the thought that many unionized jobs were physically demanding. But the variable also includes individuals in professional categories. A better interpretation of the positive is that individuals who are members of unions or professional organizations are provided assistance in seeking disability benefits.

Two labour-force attachment variables are consistent across specifications. First, the UI dummy variable is significant and positive, suggesting that many individuals cycle through UI prior to pick up of disability benefits. This might be a planned path or a stop-gap measure undertaken while waiting for a disability application to be approved. Second, the variable indicating the years out of the labour force is significant and negative. Individuals who exit the labour force due to a health impairment are likely to claim for disability benefits shortly after exit or not at all. Those out of the labour force for several years, whether their exit is voluntary or involuntary, likely rely on other sources of income.

Table 19.3 of Append XIX compares estimates for the linear model with and without unobserved heterogeneity. Two mass points are employed in the unobserved heterogeneity model. For women, the probability of each type is significant, suggesting that there may be two groups of women in the data set with different unobserved characteristics and different probabilities of exiting to disability benefits. The hypothesis of two groups of men is not supported-- neither of the probability estimates are significant. Only one mass point is significantly different from zero in both models. Most noteworthy is the fact that, for the most part, the sign and significance of the explanatory variables do not change between the standard and the unobserved heterogeneity estimates.

Appendix XX provides estimates of the predicted probability of exit to disability benefits at different levels of particular variables, holding all other characteristics constant. The base of comparison is an individual with average values for the continuous variables (for details, see Appendix XX Table 20.1). These tables provide insight into those variables that have a marked impact on the probability of survival and exit, rather than just statistical significance. Noteworthy is the fact that the unconditional survival probabilities are quite high, and the

unconditional exit probabilities quite low. Only a few variables have a large impact on the survival and exit relative to an individual with the base characteristics. Particularly, the union/professional dues payment and the disability deduction variables stand out as having a large impact for both women and men, though extreme values of income across some of the income variables also have relatively important effects for both sexes.

Exit to Retired-worker Benefits

In the models of exit to retired-worker benefits (Appendix XXI, Tables 21.1 to 21.3), the intercept terms (STEP60-STEP66) are significant in all specifications,[16] but their magnitudes vary across the different ages. The graph of the integrated hazards in Appendix XXIII (Chart 23.1b) suggests that the hazards are reasonably constant to age 64 for both women and men, i.e. the hazards are exponential. After age 64 they increase substantially. Note also that the hazard for men is similar to that for women, whereas for disability benefits it is somewhat higher for men.

A time trend was entered as a single variable in earlier specifications. It was significant and positive, indicating a secular trend towards early exit. In the specifications that are presented in the appendices, the time trend is interacted with the intercept terms in order to identify age specific time trends. What emerges is that the trend towards early exit appears to predominate at age 60 for both men and women, and additionally, at age 61 for men.[17] There is some indication of a trend at age 61 and 63 for women and 62 for men (at lower levels of significance). The exit trend at 60 is consistent with Kaplan-Meier hazard values. The significant time trend at age 63 for women in the linear specification could reflect a joint retirement decision with spouses who are retiring at age 65 (women are on average two years younger than their spouses).

Several of the demographic variables are significant in the various specifications. The unattached variable is negative, as predicted, indicating single individuals are less likely to exit at each age. Unexpectedly, the own CPP benefits variable for women is significant and negative (these benefits can only be survivor benefits). This result may be driven by factors similar to the unattached variable, i.e. maintaining a job for both financial and social reasons. Another demographic variable that is significant is family size. The larger the family unit, the less likely one is to exit for both women and men. One would imagine that a larger family (suggesting more dependants) would increase financial responsibilities, and in turn decrease the probability of exit. Evidence to the contrary has been found in studies of women (Campione, 1987; Clark, Johnson, and McDermed, 1980; McCarty, 1990; Pozzenbon and Mitchell, 1989) and men (Diamond and Hausman, 1984; Sickles and Taubman, 1986) which have found little or no effect of family size or number of dependants on the retirement decision.

[16] In Appendix XXI, Table 21.3 the intercept terms for the various ages of exit are not all significant in the models because a global intercept term has been introduced into the specification-- one for the standard linear model, and two for the unobserved heterogeneity model.

[17] Because the database identifies an individual's age as of December 31, some individuals are actually a year younger when they take up than is apparent in the data. Thus, for example, the significance at 61 for men might be somewhat influenced by men who actually exit at age 60 but are age 61 at the end of the calendar year.

The model estimates suggest a joint retirement decision is often being made by spouses. In most specifications the spouse's pension and CPP income variables are significant and positive. In addition, the spouse's employment and self-employment income variables are significant and negative in some specifications (both are significant in the unobserved heterogeneity models of Appendix XXI, Table 21.3).

A number of own income sources/amounts are significant. Both employment and self-employment income have negative coefficients, indicating a lower probability of exit the higher these sources of income. This would suggest that the substitution effect dominates the income effect for current labour income sources. Contrary to the predicted sign, returns on wealth is negative and significant, but only in the model for women. Pension income displays the predicted positive sign—individuals with higher pension wealth are more likely to exit. Own permanent income is positive, as predicted, and significant across all specifications. This is in contrast to Diamond and Hausman (1984a, 1984b) who find a negative relationship between permanent income and retirement probability. This difference is likely due to the definition used (they include only after tax employment income).[18] The spouse's permanent income variable has opposite signs for women than for men, though it is significant only in the log-linear specifications. For women, it is positive, and for men negative. In the unobserved heterogeneity models (Appendix XXI, Table 21.3), the spouse's permanent income variable is significant for both women and men.

A number of the job prospect and labour-force attachment variables are significant. The dummy variable indicating current receipt of UI is significant and negative as predicted--individuals out of work are more likely to exit. Some individuals may voluntarily cycle through the UI system before exiting.[19] In contrast, individuals receiving UI for a number of years have a lower probability of exit. These individuals are likely employed in seasonal work rather than displaced from a career job. The out-of-labour-force variables are also significant and display signs similar to the UI variables. The significance of the unemployment-rate variable in some specifications for men reinforces the notion of exit due to lack of job prospects. Additionally, individuals living in medium sized urban centres are less likely to exit than those living in larger urban centres. The small urban/rural variable is significant only in some specifications. These geographic variables may reflect differences in job prospects, though they may also reflect other characteristics that vary across area size of residence.

The markers of health status have mixed results. The dummy variable indicating a disability deduction for self is significant in all specifications for men. The variable for a current deduction is positive indicating an increased probability of exit. As with the disability model, the

[18] Additionally, permanent income for both self and spouse have high correlations with the wealth variable (>0.5). Thus, the variable could be a good marker of wealth holdings of various forms.

[19] Prior to 1991, individuals exiting at age 65 were entitled to receive three weeks of UI benefits before collecting CPP if they had never received UI during their career. The reasoning behind this entitlement was that one could not receive UI after age 65. This aspect of the UI programme was eliminated when UI rules were changed in 1991 to allow one to collect even after age 65. It is not this aspect of the UI programme that is driving the results of the model because all individuals in the sub-sample are under age 65 in 1991. Furthermore, even in the truncated model, in which exits at 65 are censored (Appendix XXI, Table 21.2), the UI variable is significant.

lagged variable is negative indicating a decreased probability of exit. A similar interpretation can be extended here—individuals may delay exit to maintain company medical benefits until a provincial drug plan takes effect at age 65. For women, only the lagged medical expenses variable is significant and negative, indicating a decreased probability of exit.[20] A negative coefficient for the lagged variable could indicate a recovery from illness, or that such expense encourages increased work effort in order to recoup financial losses. The spouse's disability deduction variables are significant only in the specification for men. Once again the current and lagged variable have opposite signs.[21] Overall, the markers of health status have mixed results--likely due to these variables being blunt measures of health status. Disability deductions indicate very serious health impairments. Only a small proportion of the sample has disability deductions. Medical expenses do not accurately reflect gradations in health status. Furthermore, some individuals are covered by medical insurance as part of an employment benefits package. For these individuals, medical expenses will not surface in personal income tax files.

Table 21.3 in Appendix XXI provides estimates of a linear model with and without unobserved heterogeneity. The significance of the two probabilities in the unobserved heterogeneity models suggests that there are two groups of individuals with differing probabilities of exit in each of these samples. The specifications with and without unobserved heterogeneity have similar results, though there are some differences. Most noteworthy are the spouse's permanent income and employment income variables. These variables are significant in the unobserved heterogeneity model but not in the standard linear model. Other changes include the years out of the labour force variable and the small urban/rural variable in the specifications for women, and for men, the time trend at age 62 and non-taxable income variables.

Appendix XXII provides predicted probabilities of unconditional survival and exit using the unobserved heterogeneity models and an individual with average income for the income variables as a base of comparison (see Appendix XXII, Table 22.1 for specifics of the characteristics employed for the base individual). Many of the variables discussed above have quite a dramatic impact on the probability of survival and exit. Particularly the income variables have large differences between very low and very high levels. Noteworthy is the fact that the measures of health status have a very small impact on the predicted probabilities.

## Discussion

What factors have a bearing on the retirement decision? In most cases, a complex combination of personal preferences, situation factors, and societal forces motivate a person to retire. Personal choice elements such as a preference for leisure, a spouse's decision to retire, or job dissatisfaction play a role. Several elements of an individual's personal situation may have a bearing, e.g. own or spouse's health, lack of job prospects, or the presence of dependants. Finally, institutional factors such as the availability of social security and private pensions, as

[20] Medical expenses claimed by an individual could have been incurred by any member of the family unit. For married individuals, this variable includes the expenses claimed by both the individual and her/his spouse.
[21] Spouses with a disability deduction are likely to be receiving CPP disability benefits, so these two variables are related.

well as societal attitudes toward retirement play an important role. Situational and societal factors can change unexpectedly through time. Thus individuals continually re-evaluate their retirement decision as these changes occur. A realistic model of retirement needs to take into account the multiple influences as well as the uncertainty aspect in the retirement decision. This paper has taken many of the above elements into consideration in modelling the transition from the labour force to age of CPP take up.

In this study, an overall trend of decreasing labour earnings is found to exist before and after the introduction of CPP early retirement benefits, though business cycle effects interrupt this trend for men. In fact, the pattern of decreasing labour-force participation has been present for many years. Unlike the U.S. programme that had begun in the 1960s, the introduction of early retirement provisions under the CPP programme occurred quite recently, making it an unlikely motivator of the trend. Furthermore, no noticeable drop in labour income just prior or subsequent to the amendments can be found in the cross sectional data. No definitive conclusions can be made, but it appears that there has not been an immediate impact on labour earnings as a result of the CPP amendments of 1987.

This paper focuses less on labour-force participation issues and more on the factors influencing the retirement decision. Of particular interest is the identification of the characteristics of individuals who exit to retired-worker benefits early in order to determine whether the provisions have benefited those who need them most, e.g. the less healthy, those with poor job prospects, or those with little savings. A central objective of this paper is to study the issue of retirement as it pertains to all individual for whom it is a salient life course decision. More specifically, the population of interest is comprised of all women and men, both single and married, who are eligible for CPP retirement benefits. This broad focus is one of the central features of this study.

The principal findings of this analysis are as follows:

- The baseline probability of exit to both retired-worker and disability benefits is constant from age 60 to age 64 for women and men. The hazard is similar for men and women who exit to retired-worker benefits, though it is higher for men who exit to disability benefits, indicating possibly poor health profiles of working older men or possibly a greater use of CPP disability benefits to smooth the transition to retirement.

- A secular trend toward early exit to retired-worker benefits is apparent through the time trend variables. Exit at age 60, 61 and 62 appears to be on the rise for men, whereas for women, 60, 61 and 63 appear to be significant ages. No time trend seems to exist for exit to disability benefits.

- Poor job prospects appear to be an important determinant of exit. Individuals receiving unemployment insurance or who are out of the labour force in the current year are more likely to exit. Some may voluntarily cycle through unemployment before exiting, or voluntarily exit the labour force before take up. Those with high incomes may choose to cycle through UI because it provides higher benefits than CPP. Other related indicators point in the

direction of involuntary job displacement, at least for some individuals. The provincial unemployment rate is a significant explanatory variable for men. The population in the area of residence has a bearing for both men and women. Individuals living in smaller urban centres are more likely to exit. Urban size could be an indicator of many characteristics, one possibility being that larger urban centres offer more job opportunities.

- Health status, though measured with blunt instruments, is significant for both retired-worker and disability exits. Disability deductions are a significant predictor of exit to retired-worker benefits for men and are a significant predictor of exit to disability benefits for both men and women. The disability deduction variable has the largest impact of all explanatory variables for the disability exit models. This is predictable, since these deductions are an indicator of serious health impairments. The unexpected negative sign of lagged disability deductions is more difficult to explain. It is possible that company health plans are an incentive to delay exit for some individuals. Medical expenses are significant in a few models—most notably those of women exiting to retired-worker benefits.

- Both women and men appear to make joint retirement decisions with their spouses. The larger the CPP or other pension income a spouse receives, the more likely an individual is to exit. Some of the labour market income sources reinforce this notion such as a spouse's employment and self-employment income. In contrast, women receiving CPP survivor benefits are less likely to exit. This may reflect fewer resources available for retirement or possibly a desire to maintain social contacts through work.

- Most indicators of savings and wealth had predicted signs. Higher permanent income and pension income increased the probability of exit to retired-worker benefits. In terms of current labour income, it appears that the substitution effect dominates. Higher current labour income reduces the probability of exit to retired-worker benefits for both men and women. Higher labour income also reduces the probability of exit to disability benefits, indicating that lower income earners may be in poorer health. This is consistent with the findings that a large socio-economic gradient in health and life expectancy exists even after individuals reach retirement age.

- Other demographic characteristics are important factors. Individuals with more dependants are less likely to retire. This is likely driven by increased financial responsibilities. In general, both unattached men and unattached women are less likely to exit.

In summary, it appears that the probability of exit to retired-worker benefits is increased if an individual's spouse is retired, job prospects are poor, and current labour income earnings are low. Individuals with higher permanent income and those receiving a private pension are also more likely to exit, suggesting that many who take up early are in higher income brackets and use the CPP as a top-off to their retirement income. Some have already exited the labour force, while others cycle through UI before making an exit. For those who are involuntarily displaced from a job, financial constraint may be the incentive to pick up early. For others, financial constraints and obligations may limit the ability of certain individuals to exit early, such as might be the case

for unattached individuals and individuals with several dependants. Overall, it appears that many who take up early are only loosely attached to the labour force.

Some individuals may actually receive a higher net-present value of benefits by picking up early, while others, particularly those with longer life expectancy may receive a lower net-present value of benefits. Nonetheless, the Le Chatalier principle suggests that more choice cannot be detrimental to utility. But is the introduction of flexibility actuarially neutral in terms of cost to the programme? An interesting question, and seed for future investigation.

# Appendix I

## Canadian Pension System

The Canadian Pension System is a complex bundle of federal, provincial and private programmes. The principal components consists of three tiers, namely 1) the Old Age Security (OAS) System which consist of Old Age Security (OAS) Pension, Guaranteed Income Supplement (GIS), and Spousal Allowance (SPA), 2) Canada and Quebec Pension Plans, and 3) Private Pensions which include Registered Pension Plans and Registered Retirement Savings Plans.

Old Age Security System

The OAS system, begun in 1952, is the oldest component of the federal public pension system. It is an unfunded plan paid for through general taxes. It was instituted as a replacement for a provincially-administered, means-tested pension system in existence from 1927. The OAS system has three components, OAS pension, Guaranteed Income Supplements (GIS), and Spouse's Allowance (SPA). OAS benefits are indexed to the Consumer Price Index (CPI), and were originally available at age 70 but are currently available at age 65 (with the exception of SPA, which is available at age 60). To qualify, one must reside in the country for 10 years prior to receipt, or a total of 40 years after age 18. A partial entitlement is also available to individuals who do not meet the residency requirements.

**OAS Pension**: The OAS pension is a flat-rate monthly benefit ($399.91 per month in December 1996) that is fully taxable. Previously available to all Canadians, the OAS pension is currently means-tested through a clawback and withholding system. The pension is clawed back at a rate of 15% per dollar for income over $53,215 (in 1996). Furthermore, payments are subject to withholding of potential clawbacks based on the prior year's clawback.

**GIS**: The GIS was introduced in 1967. It is a means-tested, non-taxable monthly benefit available to OAS pension recipients with low income. Benefits eligibility and amounts are based on total family income from the previous year. The maximum monthly amounts in 1995 were $460.79 for a single individual, and $300.14 each for married individuals. The combined GIS benefits are reduced at a rate of 50% of a couple's total income that is over and above the OAS pension, if both spouses receive an OAS pension (the rate is 25% for couples with one person over 65 and the other under 60, and only takes effect if the combined yearly income over and above the OAS pension, is more than 12 times the OAS pension). For single individuals the rate is 25% for income over and above the OAS pension. Recipients must reapply for benefits each year. Thus, the monthly benefit may change from one year to the next according to the recipient's reported income.

**SPA**: The SPA was introduced in 1975. It is a means-tested, non-taxable monthly benefit available to 60-64 year-old spouses of OAS pensioners and to 60-64 year-old widows and widowers. For a married individual, the maximum benefit is equivalent to the OAS benefit plus the GIS benefit at the married rate, and for widowed individuals it is equal to the OAS benefit plus the GIS at the single rate. The benefit is reduced at a rate of 75% for couples with income over and above the OAS pension, until the OAS portion of the SPA is reduced to zero. Thereafter, the combined GIS and spouse's equivalent portion is reduced at a rate of 50% for couples, and for widowed individuals at a rate of 25%. Recipients must reapply for these benefits each year.

## Appendix I (continued)

## Canadian Pension System

Canada and Quebec Pension Plan (CPP/QPP)

CPP and QPP are contributory, earnings-related social security programmes funded by employees and employers. They provide income security for contributors and their families in cases of income loss due to retirement, disability or death. The programme covers most of the paid labour force and benefits are fully portable. Originally, retired-worker benefits were available only starting at age 65, but are now available between the ages of 60 and 70. Benefits are fully indexed to the consumer price index and are based on the average industrial wage and the contributions made by the individual. For details of benefit calculation see Appendix III.

Private Pensions

**Registered Pension Plans**: The Registered Pension Plan (RPP) programmes are private pension plans offered by employers and are funded by employers and/or employees. In general, RPPs can be classified into one of two types-- defined benefit plans which provide retirement benefits based on a formula involving years of service and average or final earnings, and defined contribution plans which provide benefits based on the investment earnings over time of a set contribution. Approximately 50% of the paid labour force is covered by RPPs, and the majority of these plans are defined benefit plans.

**Registered Retirement Savings Plans**: The Registered Retirement Savings Plan (RRSP) programme began in 1957. It was initiated to encourage individuals to save for old age by offering tax shelter/ deferment of retirement savings. The programme was designed particularly for individuals without RPP coverage, though individuals with coverage can also contribute to the programme.

## Appendix II

## Objectives of the CPP

The objectives of the CPP were not stated in the Canada Pension Plan Act of 1965, nor were they presented during preliminary discussions before passage of the Act (Bill C-75 (July 1963): Act to establish the CPP). Objectives were first defined in a White Paper tabled by the Honourable Judy LaMarsh. A revised Bill (C-136), introduced in March 1964 along with a White Paper, noted some changes in these initial objectives, partly in reaction to Quebec's decision to establish its own plan. In total, nine objectives were listed (Review of the Objectives of the CPP, 1978, 1):

1. In conjunction with OAS and private pension plans to assure a fair and practical way for Canadians to retire in security and with dignity.

2. To provide a programme of coverage for Canadian income earners.

3, To make reasonable minimum levels of income available at retirement and at the same time to allow scope for the continuation and extension of private pension plans and personal savings over these minimum levels.

4. To provide such retirement income at normal retirement ages.

5. To achieve realistic minimum levels of pension income by relating benefits and contributions to earnings.

6. To be entirely self-financing.

7. Initially to provide a fund for use by the provinces.

8. To provide parallelism with the Quebec Pension Plan.

9. To provide survivor and disability benefits.

In 1976, ten years after the start of the programme, a sub-committee of the Canada Pension Plan Advisory Committee was formed to review the original objectives of the CPP to assess the extent to which they had been met. In 1978 they presented their report titled Review of Objectives of the CPP to the Minister of National Health and Welfare, the Honourable Monique Bégin, in which nine objectives of the plan were identified and evaluated.

## Appendix II (continued)

## Objectives of the CPP

The 1978 report described the CPP as part of a three-tiered retirement package. Tier one, the OAS programme, was meant to provide a guaranteed minimum income. Tier two, the CPP, was to provide a more reasonable level of income. Lastly, tier three, consisting of private pensions and personal savings, was open to individuals to provide beyond the minimum level.

It is difficult to assess what a reasonable minimum level of income security should be. The 1964 White Paper and the CPP Act of 1965 implicitly defined this minimum as 25% of average lifetime pensionable earnings. Only earnings above a minimum and below maximum are pensionable. The maximum, called the Year's Maximum Pensionable Earnings (YMPE), defines an earnings ceiling above which contributions are not deducted. The minimum identified a threshold level of earnings under which contributions to the plan are not made. Originally the YMPE was approximately equal to the average industrial wage ($5,000 in January 1, 1966). A reasonable minimum level of income security was thus implicitly assumed to be 25% of this average wage. In conjunction with the OAS pension ($900 in 1966) this amounted to approximately 43% of the YMPE before tax and 50% after tax.

## Appendix III

## Calculation of Yearly Canada Pension Plan Benefits

Basic calculation: [22] $\frac{\Sigma_i \text{ proportion of max in month}_i}{\Sigma_i \text{ contributory month}_i} \times (4 \text{ year YMPE average}) \times 25\%$

Proportion of maximum in contributory months: The numerator comprises the sum of the fraction of the monthly prorated YMPE (of the year in which the contribution was made) earned in each month in the denominator. For example, if an individual contributes 50% of the maximum contributions for 120 months, then the numerator would be 0.5x120.

Number of contributory months: The denominator is the sum of the number of contributory months which is based on the time frame of age 18 to 65 or from the start of the programme to age 65. The minimum number of contributory months is 120 and the maximum period is 564 ((65-18)x12).

Drop-out months and deductions: A drop-out provision in the calculation of the number of contributory months is allowed for 1) low earnings while rearing children under age 7, 2) low earning months after age 65, if claiming after age 65, and 3) 15% of the remaining contributory period when earnings were lowest.

YMPE: This is the yearly maximum pensionable earnings. At the time of application, benefits are based on a four-year average of the current YMPE and the YMPE for the previous three years.

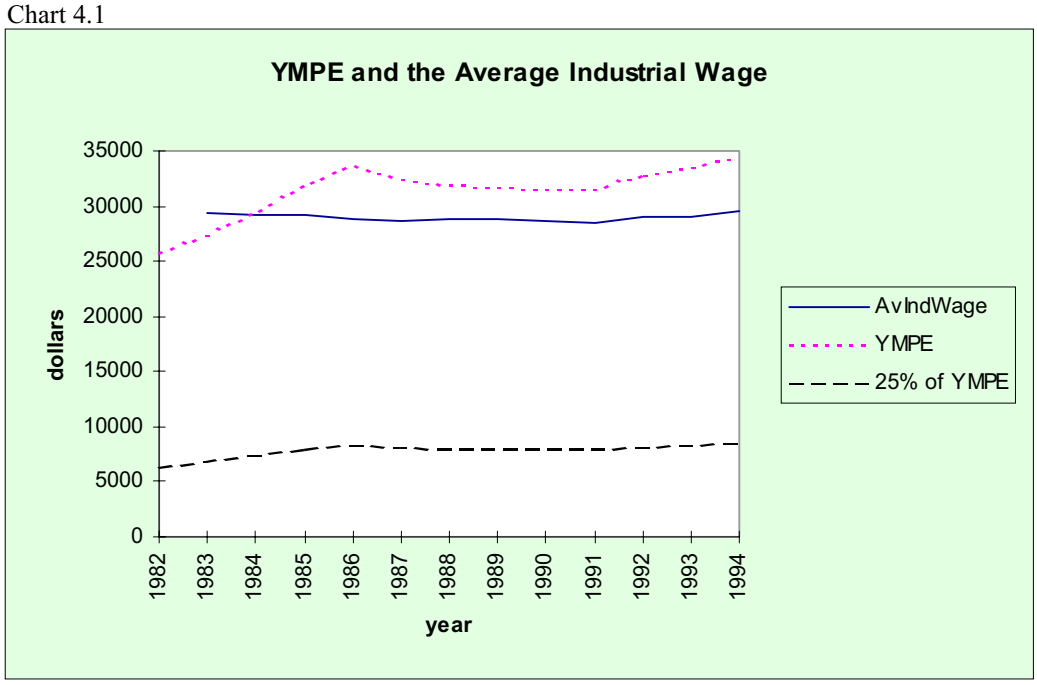
Actuarial adjustment for early and late retirement: Prior to 1987, retirement benefits under the CPP were payable only at age 65. Amendments to the CPP in 1987, and to the QPP in 1984, allowed benefits to be claimed at any time between the ages of 60 and 70, with actuarial adjustments for early or late take up. Early take up requires complete or substantial withdrawal from the labour force, though late take up at age 65 or over does not have such a requirement. For early claims the actuarial adjustment is 0.5% reduction for each month under that age of 65, and for late claims, the adjustment is 0.5% increase for each month over the age of 65. Thus, someone claiming at 60 would receive 1- 0.005x12x5=0.7 of the benefit s/he would have received if s/he were 65, and someone claiming at 70 would receive 1+0.005x12x5=1.30 of the amount s/he would receive at 65.

[22] Originally the YMPE average was taken over three years.

# Appendix IV

## YMPE[23] and Average Industrial Wage[24] (1994 $)[25]

Chart 4.1



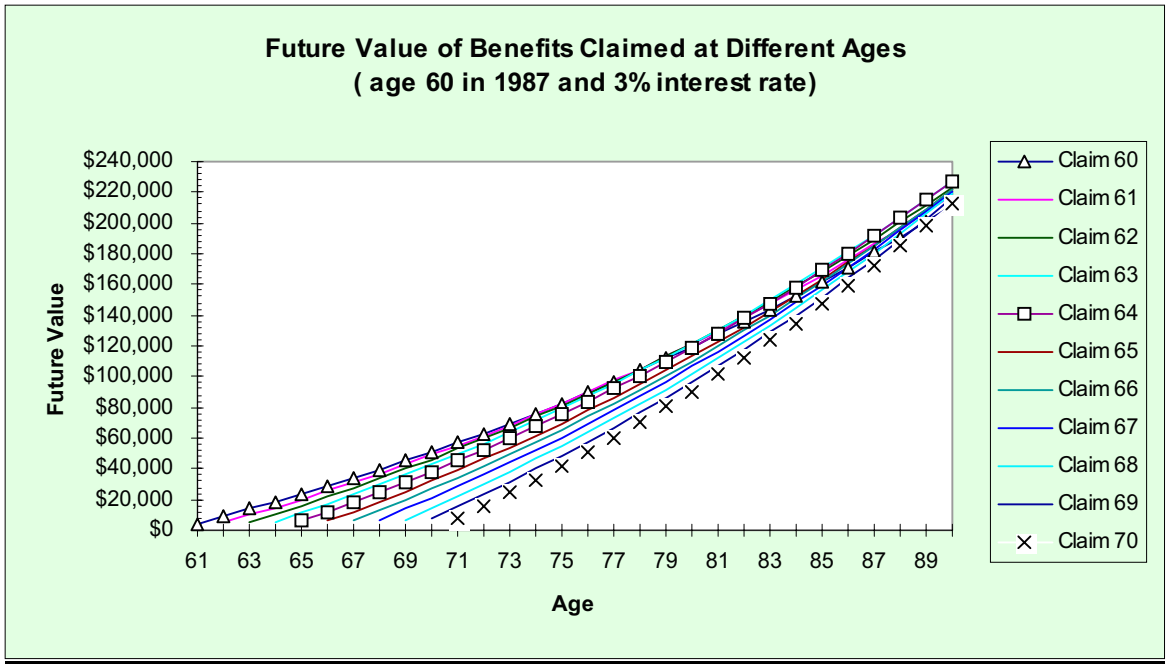

[23] CCH Canada Limited. Canadian. North York: CCH, 1995.
[24] Statistics Canada. Employment Earnings and Hours. Ottawa: Statistics Canada, 1996.
[25] A new series for the Canadian Industrial Aggregate Average Wages and Salaries started in 1987 and figures before 1987 were adjusted to be homogenous with the new series, thus the Industrial Aggregate appears to be less than the YMPE for the period 1984 to 1986, though it was not at the time.

# Appendix V

## Future Value of CPP Benefits Commencing At Different Ages

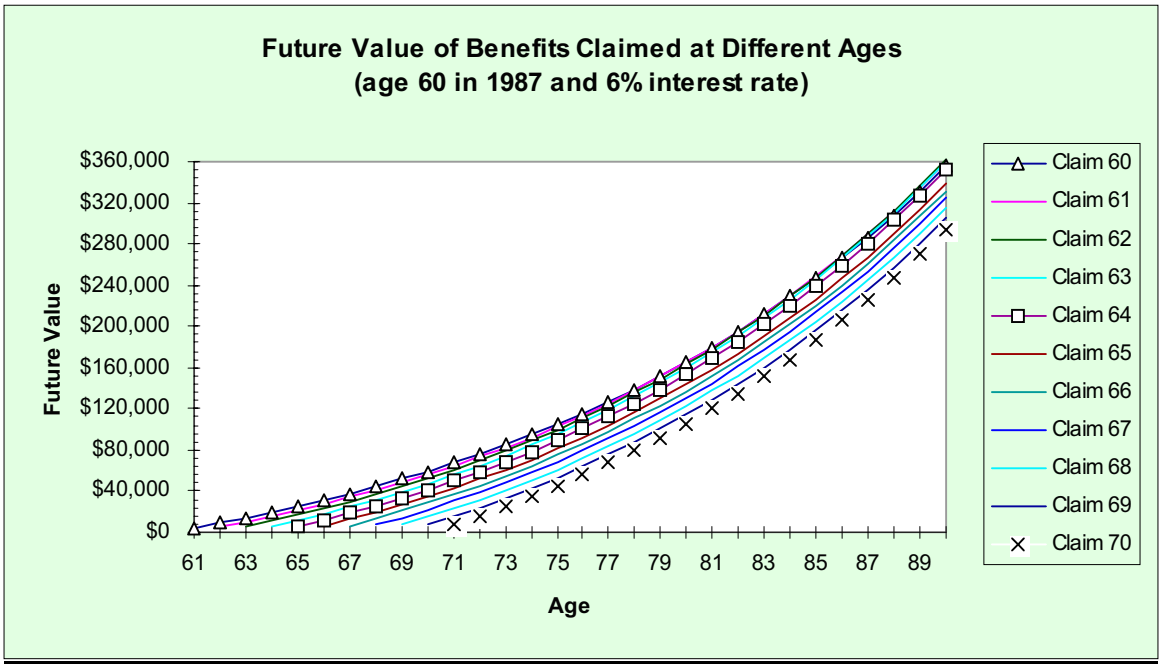
### Scenario 1

Chart 5.1a




### Scenario 2

Chart 5.1b



## Appendix V (continued)

## Calculation of Monthly Benefit[26] and Conditional Male and Female Life Expectancies[27]

Table 5.1

| Calculation of Monthly Benefit Amount for Scenarios 1 and 2 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Year | Age Rct | Cntrib Per | Mths Max | Base | Prop Max | Mthly Amt | Act Adj | Mthly Pymt |
| 1987 | 60 | 252 | 252 | 252 | 1.000 | $521.52 | 0.70 | $365.06 |
| 1988 | 61 | 264 | 252 | 252 | 1.000 | $521.52 | 0.76 | $396.36 |
| 1989 | 62 | 276 | 252 | 252 | 1.000 | $521.52 | 0.82 | $427.65 |
| 1990 | 63 | 288 | 252 | 252 | 1.000 | $521.52 | 0.88 | $458.94 |
| 1991 | 64 | 300 | 252 | 255 | 0.988 | $515.26 | 0.94 | $484.35 |
| 1992 | 65 | 312 | 252 | 263 | 0.958 | $499.62 | 1.00 | $499.62 |
| 1993 | 66 | 324 | 252 | 263 | 0.958 | $499.62 | 1.06 | $529.59 |
| 1994 | 67 | 336 | 252 | 263 | 0.958 | $499.62 | 1.12 | $559.57 |
| 1995 | 68 | 348 | 252 | 263 | 0.958 | $499.62 | 1.18 | $589.55 |
| 1996 | 69 | 360 | 252 | 263 | 0.958 | $499.62 | 1.24 | $619.52 |
| 1997 | 70 | 372 | 252 | 263 | 0.958 | $499.62 | 1.30 | $649.50 |

Table 5.2a

| Conditional Female Life Expectancy | | |
|---|---|---|
| Age | Remaining LE | Cond LE |
| 60 | 23.17 | 83 |
| 61 | 22.34 | 83 |
| 62 | 21.52 | 84 |
| 63 | 20.71 | 84 |
| 64 | 19.91 | 84 |
| 65 | 19.12 | 84 |
| 66 | 18.34 | 84 |
| 67 | 17.58 | 85 |
| 68 | 16.82 | 85 |
| 69 | 16.08 | 85 |
| 70 | 15.35 | 85 |

Table 5.2b

| Conditional Male Life Expectancy | | |
|---|---|---|
| Age | Remaining L E | Cond LE |
| 60 | 18.41 | 78 |
| 61 | 17.68 | 79 |
| 62 | 16.96 | 79 |
| 63 | 16.25 | 79 |
| 64 | 15.57 | 80 |
| 65 | 14.90 | 80 |
| 66 | 14.24 | 80 |
| 67 | 13.61 | 81 |
| 68 | 12.99 | 81 |
| 69 | 12.38 | 81 |
| 70 | 11.80 | 82 |

[26] In determining benefits eligibility it is assumed that the individual has contributed the maximum amount every month from the inception of the programme to age 60 in 1987. Thus years out of the labour force after age 60 and prior to take up are less than the 15% drop out provision unless take up is after age 63.

[27] Statistics Canada. Health Reports. Ottawa: Statistics Canada, 1991.

# Appendix VI[28]

Chart 6.1

Diagram 1: Below Average Life Expectancy

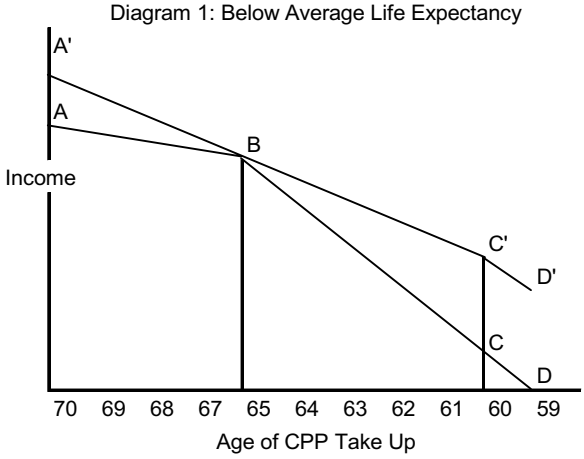



Diagram 2: Average Life Expectancy

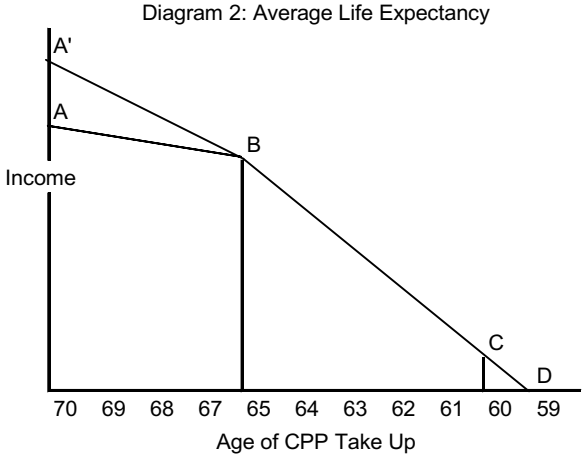
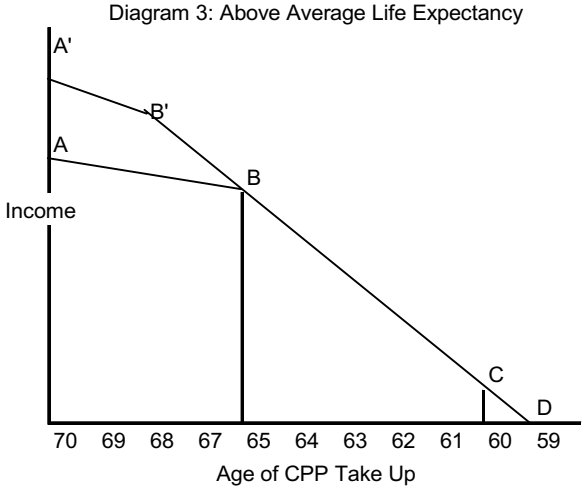



Diagram 3: Above Average Life Expectancy




[28] Diagram 1 is reproduced from Baker and Benjamin (1997). Diagrams 2 and 3 are variations of the concept.

# Appendix VII

## Details of the LAD[29] and T1FF[30]

Table 7.1a

| LAD Variables (Partial List) | |
|---|---|
| *Individual Demographics*<br>- age<br>- sex<br>- marital status | *Family Demographics*<br>- type of family (husband-wife, lone parent, non-family person)<br>- number and ages of children |
| *Geography*<br>- province or territory, city, town<br>- postal: forward sortation area<br>- census: census metropolitan area, census division | *Individual and Family Income Deductions*<br>- CPP/QPP contributions<br>- RRSP contributions<br>- alimony paid<br>- full-time education deductions |
| *Individual and Family Income*<br>- total income<br>- wages/salaries/commissions<br>- self-employment<br>- transfer payments<br>- UI, OAS, CPP/QPP, social assistance<br>- investment income<br>- rental, alimony, RRSP, limited partnership<br>- market income<br>- after-tax income<br>- labour market income<br>- low-income status (LIM-based) | *Individual and Family Refundable Tax Credits*<br>- provincial refundable tax credits<br>- GST/FST tax credits<br>- child tax credits |

Table 7.1b

| Summary of Comparisons Between T1FF (T1 Family File) and Official Population Estimates | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| T1FF | 1982 | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
| 1. Number of Taxfilers (000) | 15,161 | 15,224 | 15,462 | 15,522 | 16,441 | 16,684 | 17,251 | 17,947 | 18,450 | 18,786 | 19,267 | 19,882 |
| 2. Changes in # of Taxfilers (000) | | 63 | 238 | 60 | 919 | 243 | 567 | 696 | 503 | 336 | 481 | 615 |
| 3. Percentage changes | | 0.4 | 1.6 | 0.4 | 5.9 | 1.5 | 3.4 | 4.0 | 2.8 | 1.8 | 2.6 | 3.2 |
| 4. Coverage (1)/(20) | 59.6 | 59.6 | 59.6 | 59.2 | 61.9 | 62.0 | 63.0 | 64.6 | 65.6 | 65.8 | 66.6 | 68.0 |
| 5. Total T1FF Pop. (000) | 23,619 | 23,472 | 23,728 | 23,833 | 24,517 | 24,833 | 25,155 | 25,909 | 26,577 | 27,007 | 27,534 | 28,129 |
| 6. Percentage change | | -0.6 | 1.1 | 0.4 | 2.9 | 1.3 | 1.3 | 3.0 | 2.6 | 1.6 | 2.0 | 2.2 |
| 7. Coverage (5)/(20) | 92.8 | 91.3 | 91.5 | 91.0 | 92.3 | 92.3 | 91.9 | 93.2 | 94.5 | 94.1 | 95.1 | 96.2 |
| POPULATION ESTIMATES | 1983 | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 20. Official Pop. Est. (000) | 25,456 | 25,702 | 25,942 | 26,204 | 26,550 | 26,895 | 27,379 | 27,791 | 28,120 | 28,542 | 28,941 | 29,248 |
| 21. Percentage change | | 1.0 | 0.9 | 1.0 | 1.3 | 1.3 | 1.8 | 1.5 | 1.2 | 1.5 | 1.4 | 1.1 |

[29] Clark. Introduction. Ottawa: Statistics Canada, 1997.
[30] Harris, and Lucaciu. Overview. Ottawa: Statistics Canada, 1995.

# Appendix VIII

## LAD Database Coverage[31] [32]

Chart 8.1a

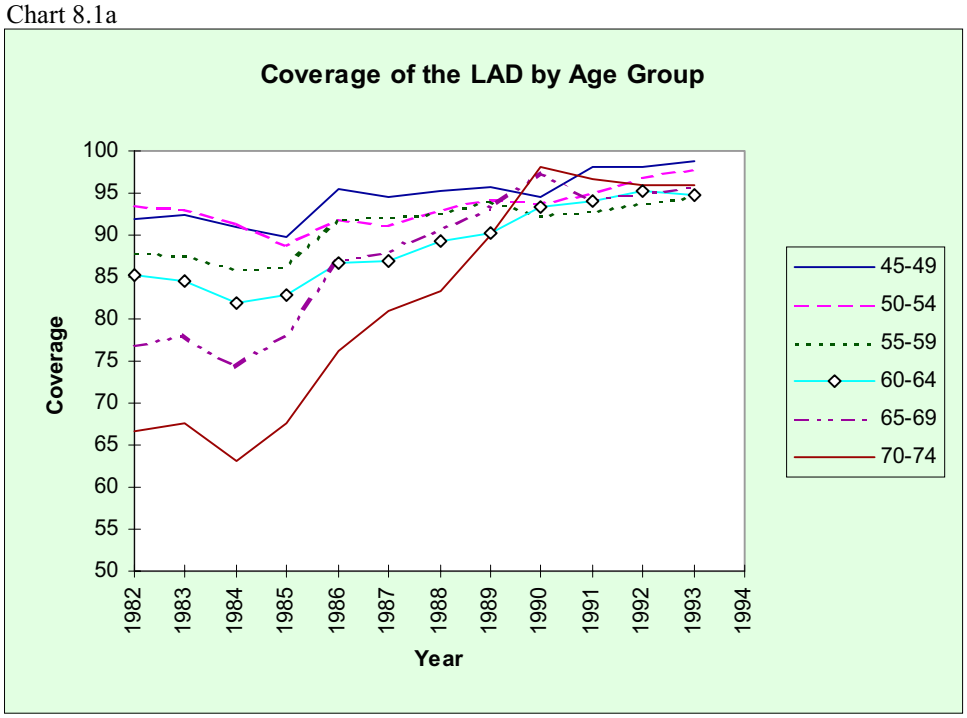
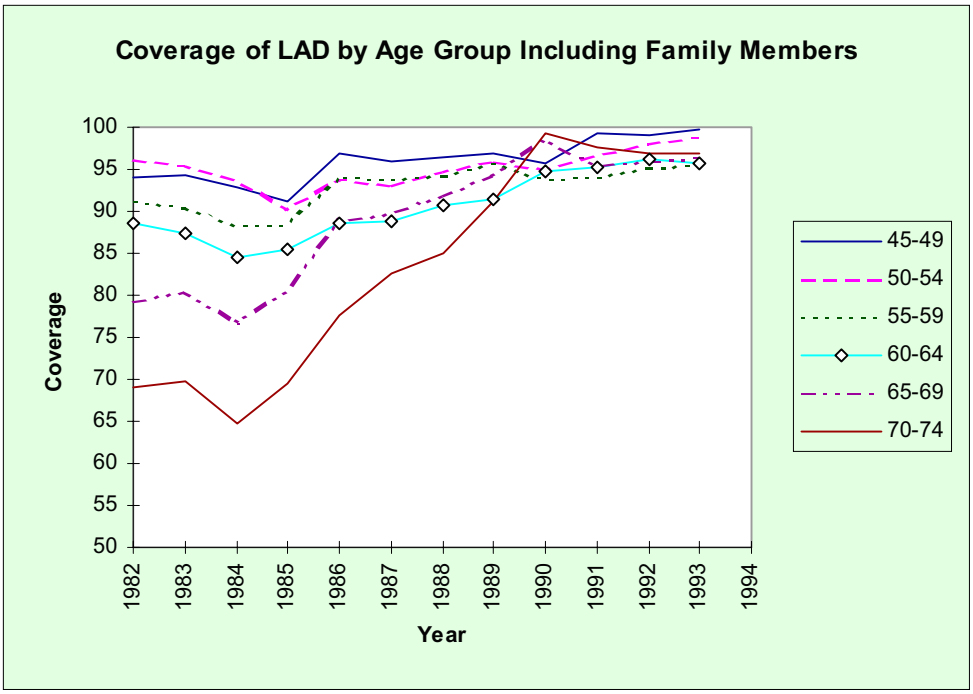



Chart 8.1b




[31] Statistics Canada. Unpublished. Ottawa: Statistics Canada, 1997.
[32] Compared to Official Population Estimates based on yearly updates of the Census.

# Appendix IX

## Sub-Sample Details[33]

Table 9.1a

| Number of People Turning 60 Each Year in Sample | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| Females | 440 | 430 | 470 | 500 | 510 | 460 | 470 | 480 |
| Males | 650 | 690 | 640 | 740 | 690 | 660 | 680 | 650 |

Chart 9.1

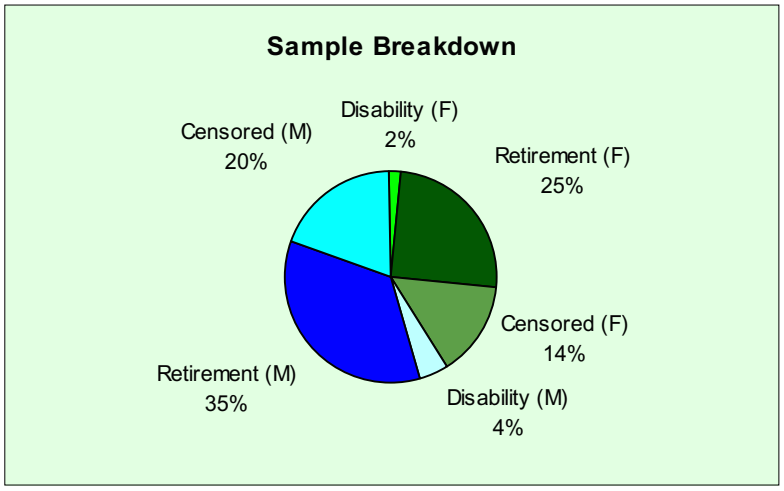



Table 9.1b

| Age and Year of Retired-Worker Benefit Take Up for Women (1987-94) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 60 | 70 | 90 | 100 | 120 | 120 | 130 | 120 | 150 |
| 61 | 80 | 60 | 40 | 50 | 50 | 60 | 50 | 70 |
| 62 | 80 | 30 | 50 | 30 | 40 | 40 | 50 | 50 |
| 63 | 80 | 40 | 30 | 20 | 20 | 30 | 30 | 40 |
| 64 | | 40 | 40 | 20 | 40 | 40 | 40 | 30 |
| 65 | | | 160 | 140 | 130 | 130 | 130 | 130 |
| 66-69 | | | | --- | --- | --- | --- | --- |
| TTL | 320 | 250 | 410 | 410 | 410 | 460 | 460 | 500 |

Table 9.1c

| Age and Year of Retired-Worker Benefit Take Up for Men (1987-94) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 60 | 100 | 150 | 120 | 140 | 160 | 160 | 180 | 180 |
| 61 | 120 | 60 | 70 | 70 | 70 | 80 | 80 | 100 |
| 62 | 140 | 60 | 60 | 40 | 60 | 60 | 70 | 70 |
| 63 | 180 | 60 | 40 | 50 | 50 | 30 | 60 | 60 |
| 64 | | 90 | 60 | 50 | 50 | 50 | 40 | 50 |
| 65 | | | 240 | 260 | 230 | 220 | 210 | 200 |
| 66-69 | | | | --- | --- | --- | --- | --- |
| TTL | 540 | 410 | 590 | 620 | 670 | 640 | 660 | 670 |

[33] In the LAD files, the age of an individual is as of December 31 of the calendar year, thus age at take up will be inflated by one year for individuals who take up prior to their birthday.

# Appendix IX (continued)

## Canada Pension Plan New Beneficiaries[34]

Table 9.2a

| Canada Pension Plan: New Retirement Pensions Paid to Women by Age and Calendar Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 60 | 23,948 | 20,677 | 21,139 | 22,739 | 23,631 | 25,837 | 27,314 | 30,024 |
| 61 | 16,370 | 6,511 | 5,204 | 4,836 | 5,234 | 5,615 | 6,223 | 6,274 |
| 62 | 17,293 | 6,601 | 4,691 | 4,358 | 4,233 | 4,833 | 5,281 | 5,285 |
| 63 | 16,920 | 6,568 | 4,739 | 3,812 | 3,858 | 4,159 | 4,497 | 4,675 |
| 64 | 21,018 | 13,196 | 9,978 | 8,192 | 7,127 | 7,163 | 6,901 | 7,174 |
| 65 | 39,575 | 28,039 | 24,387 | 23,281 | 22,226 | 22,210 | 22,391 | 22,298 |
| 66 | 902 | 1,159 | 912 | 783 | 916 | 1,251 | 1,035 | 926 |
| 67 | 708 | 778 | 617 | 503 | 564 | 703 | 565 | 531 |

Table 9.2b

| Canada Pension Plan: New Retirement Pensions Paid to Men by Age and Calendar Year | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 |
| 60 | 23,309 | 20,420 | 20,569 | 22,504 | 25,116 | 27,418 | 28,696 | 33,075 |
| 61 | 17,271 | 7,627 | 6,149 | 5,987 | 6,888 | 7,357 | 7,333 | 7,411 |
| 62 | 18,992 | 8,405 | 6,149 | 5,838 | 6,476 | 6,866 | 6,975 | 6,795 |
| 63 | 19,534 | 7,872 | 5,910 | 5,477 | 5,824 | 5,899 | 6,094 | 5,875 |
| 64 | 22,109 | 33,165 | 9,015 | 8,553 | 7,916 | 7,942 | 7,577 | 7,791 |
| 65 | 59,759 | 45,913 | 41,117 | 39,956 | 38,284 | 37,344 | 37,029 | 35,600 |
| 66 | 693 | 798 | 818 | 786 | 828 | 978 | 1,021 | 1,055 |
| 67 | 480 | 471 | 425 | 409 | 412 | 498 | 521 | 549 |

Table 9.2c

| CPP New Disability Pensions Paid to Men | |
|---|---|
| 1987 | 8,735 |
| 1988 | 8,595 |
| 1989 | 8,366 |
| 1990 | 7,156 |
| 1991 | 7,828 |
| 1992 | 7,544 |
| 1993 | 8,385 |
| 1994 | 7,921 |

Table 9.2d

| CPP New Disability Pensions Paid to Women | |
|---|---|
| 1987 | 3,757 |
| 1988 | 3,557 |
| 1989 | 3,529 |
| 1990 | 3,025 |
| 1991 | 3,403 |
| 1992 | 3,496 |
| 1993 | 4,322 |
| 1994 | 4,324 |

[34] Human Resources and Development Canada. Unpublished. Ottawa: HRDC, 1997.

# Appendix X

## Sub-Sample Details

Table 10.1a

| Presence Patterns in LAD 1% | | | | | | |
|---|---|---|---|---|---|---|
| | women | | men | | total | |
| only at 60 | 330 | 4.7% | 160 | 1.8% | 500 | 3.1% |
| 60 & (58 or 59) | 390 | 5.6% | 340 | 3.8% | 730 | 4.6% |
| 60 & 58 & 59 | 6280 | 89.6% | 8430 | 94.4% | 14710 | 92.3% |
| total | 7010 | 100.0% | 8930 | 100.0% | 15940 | 100.0% |

Table 10.1b

| Censoring Patterns in Sub-sample | | | | | | |
|---|---|---|---|---|---|---|
| | women | | men | | total | |
| cnsrd in 1994 | 1170 | 90.7% | 1640 | 90.6% | 2810 | 90.6% |
| before 1994 | 120 | 9.3% | 170 | 9.4% | 290 | 9.4% |
| total cnsrd | 1290 | 100.0% | 1810 | 100.0% | 3100 | 100.0% |

Table 10.1c

| Censoring Patterns in Sub-sample | | | | | | |
|---|---|---|---|---|---|---|
| | women | | men | | total | |
| total cnsrd | 1290 | 34.4% | 1810 | 33.4% | 3100 | 33.8% |
| sample size | 3750 | 100.0% | 5420 | 100.0% | 9170 | 100.0% |

# Appendix XI

## Description of Variables

### DEPENDENT VARIABLE

DURATION: The variable DURATION is the dependent variable and is defined as the number of years from one's 59th birthday after which one begins to receive retired-worker or disability social security benefits. Because the exact date of an individual's birthday is not know (i.e. only the person's age as of December 31st is available in the LAD files), it is assumed that birthdays are at the beginning of the year as are exits, receipts, and censoring. Thus, for example, if someone turned 60 in 1987, information on current variables such as employment income for their first year of the duration (the year [59-60) or the 59th year) is their employment income from January to December of 1986. Duration is calculated as age at CPP take up less age 59. For example, someone who begins receiving at age 63 has a duration of 4 years (59-60, 60-61, 61-62, 62-63) and is assumed to have exited at the beginning of the 63rd year (i.e. the exit year is the year prior to the actual year of receipt). If an individual dies before receipt, the last full year observed is the year before s/he died. For example, someone who dies at age 63 is considered censored after age 62, and is observed for only 3 full years (59-60, 60-61, 61-62). The last year does not count because it is incomplete, that is, the person might have claimed in that year if s/he had not died, and therefore the 62nd year (or the year [62-63)) cannot be identified (it could or could not have been an exit). If an observation is censored, censoring occurs in the last year the individual is observed. For example, someone who is observed up to, but not including age 63 is observed for 3 years (59-60, 60-61, 61-62). Once again the 62nd year cannot be identified as exit or not exit. Similarly, for the competing risks model, individuals exiting to the alternative state are censored in the year prior to exit, since, if the individual had not exited to the alternative state, they may or may not have exited to the state of interest in that year. For example, someone exiting to disability benefits at age 63 would be censored at age 62 for the retired-worker benefits model. Thus, individuals exiting to the competing risk at age 60 are censored at age 59 and have a duration of zero. These individuals are not included in the estimates for the exit of interest. Therefore, sample size varies for each competing risk model.

### EXPLANATORY VARIABLES

#### Baseline Hazard

STEP60-STEP66: These variables represent the integrated baseline hazard for each period of the discrete time model. The hazard is assumed to be constant in each period.

#### General and Demographic

TIME60-TIME63: These variables measure early exit time trends (1986=1, 1987=2, ... 1993=8) for exits at age 60 through to 63 (STEP60-STEP63). A STEP64 was not included because exits could only occur at age 64 from 1991-1994—too few years for a time trend variable to have enough variability.

NTMRDI: This dummy variable identifies whether an individual is attached or unattached. It is 1 for single parents and non-family people, and 0 for married or common law.

## Appendix XI (continued)

## Description of Variables

FMSZ_I, FMSZ_IN: Family size includes self, spouse and children 25 years or younger living in the household. Family size of single parents includes self and children living in the household

UNIONI: This is a dummy variable indicating payment of union or professional dues.

UNEMPI: This is a time varying continuous variable containing data on the unemployment rate for the 55+ age group in the province of residence of the individual[35].

C3MAD, C5MAD: These dummy variables identify the size of urban area that the individual lives in. C3MAD represents an urban area with a population of 15,000-99,999 and C5MAD represents small urban and rural areas of 14,999 or less. The base of comparison is an urban area with a population of 100,000+.

### Income and Wealth

PERMI, PERMS: These variables are permanent income for self and spouse, defined as average income from all sources. The average is taken over all pre-CPP take up years in which the individual is present in the LAD.

### Current Income Sources

EMPLI, EMPLS: These variables are wage income for self and spouse, respectively. Employment income is defined as T4 employment earnings and other employment income.

SEMPI, SEMPS: These variables are net self-employment income from all sources for self and spouse. Self-employment income can be from one or more of farming, fishing, professional, commission, and business sources.

PENSI, PENSS: These variables are pension income from Registered Pension Plans and Registered Retirement Savings Plans for self and spouse.

CPP__I, CPP__S: These variables are CPP benefits income. For the individual, this income can only be from the survivors benefits programme since individuals in the sample have not yet exited to retired-worker or disability benefits. For a spouse, these benefits can be survivor (from a previous marriage), retired-worker or disability benefits.

WLTHI: This variable is income from wealth, defined as interest, dividend and rental income. Both own and spouse's income from these sources have been combined because this income may not be directly attributable to the individual since spouses may split wealth income to minimize tax incidence.

[35] Statistics Canada. CANSIM -- various series. Ottawa: Statistics Canada.

## Appendix XI (continued)

## Description of Variables

NTXI, NTXS: These variables are non-taxable income for self and spouse. Non-taxable income includes Workers' Compensation payments, Social Assistance income, Guaranteed Income Supplements and Spouse's Allowance.

### Health Markers

MEDTT, MEDTTB: These variables identify total medical expenses claimed by self and spouse in the current and previous year. Medical expenses can be for self, spouse and/or dependents and can be shared between self and spouse in order to minimize tax incidence.

DISADI, DISADB, DISADS, DISASB: These are dummy variables indicating a disability deduction in the current and previous year for self and spouse respectively.

### Labour Market Attachment

UIDUM, UICNT: UIDUM is a dummy variable indicating receipt of UI in the current year. UICNT counts the number of years an individual has received UI benefits from age 58 to the year prior to the current.

OTLFDUM, OTLFCNT: OTLFDUM is a dummy variable indicating an individual being out of the labour force in the current year, defined as not having employment, self-employment or UI benefits income. OTLFCNT counts the number of years an individual is out of the labour force from age 58 to the year prior to the current.

# Appendix XII

## Mean Total and Labour Income by Sex (1994 dollars)

Chart 12.1a

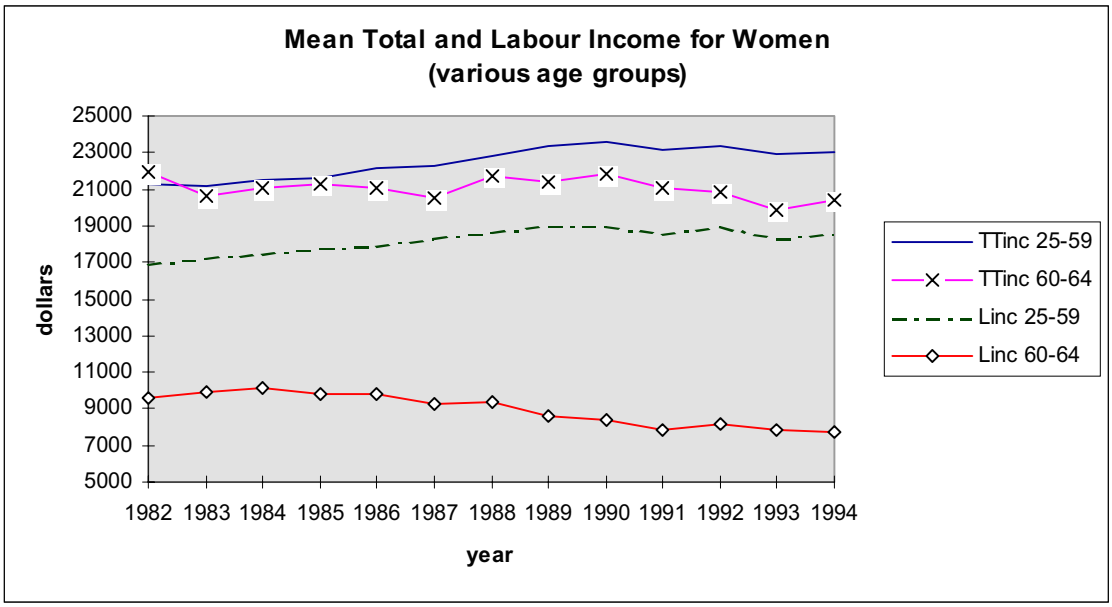
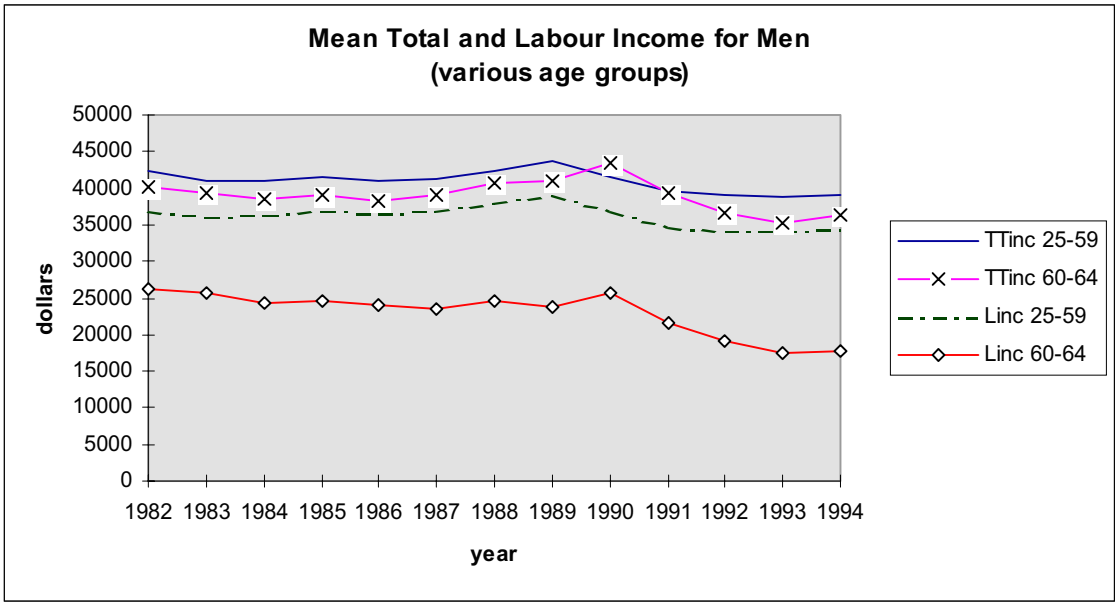



Chart 12.1b



## Appendix XII (continued)

## Mean Income by Source by Sex (1994 dollars)

Chart 12.1c

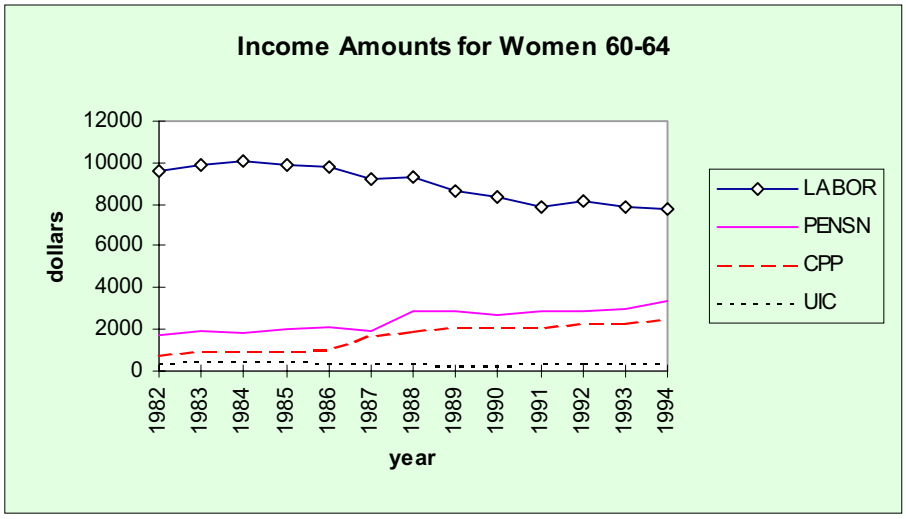
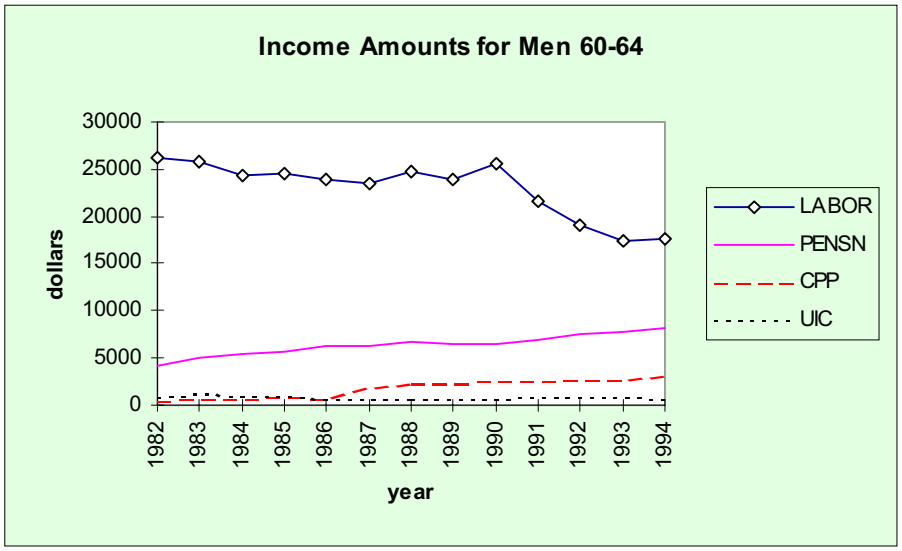



Chart 12.1d



# Appendix XIII

## Proportion of Income from Different Sources by Sex

Chart 13.1a

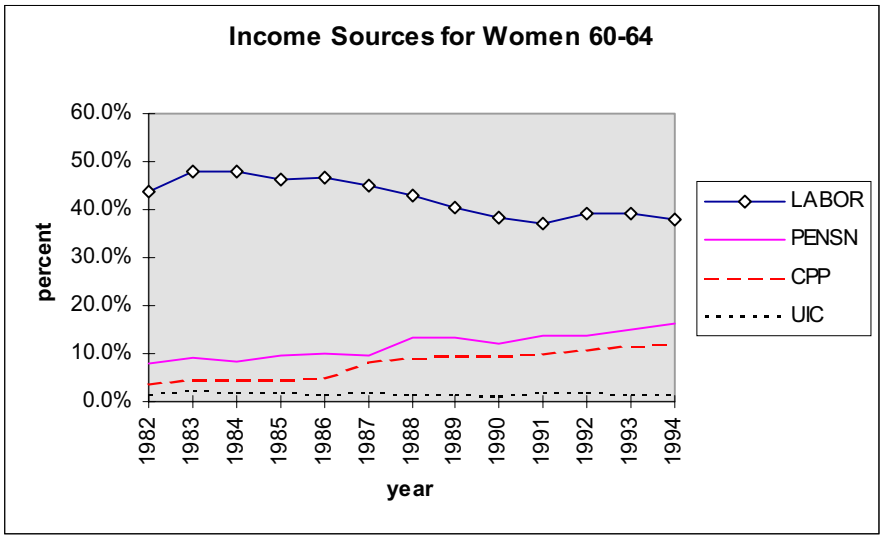
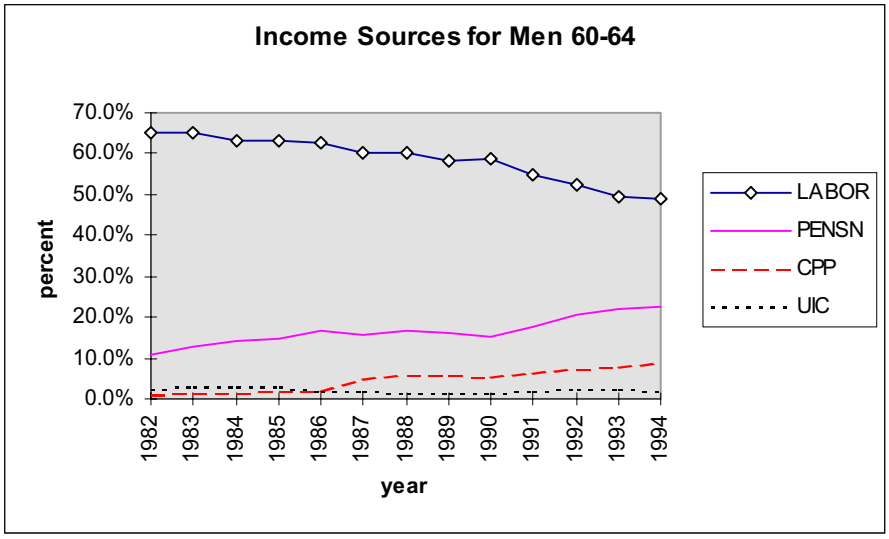



Chart 13.1b



# Appendix XIV

## Mean Income and Income Sources for the 2nd and 4th Quintiles (1994 dollars)

Chart 14.1a

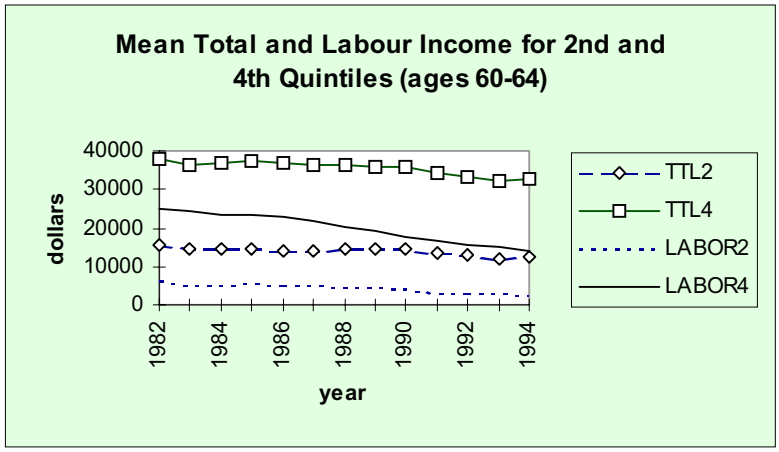



Chart 14.1b

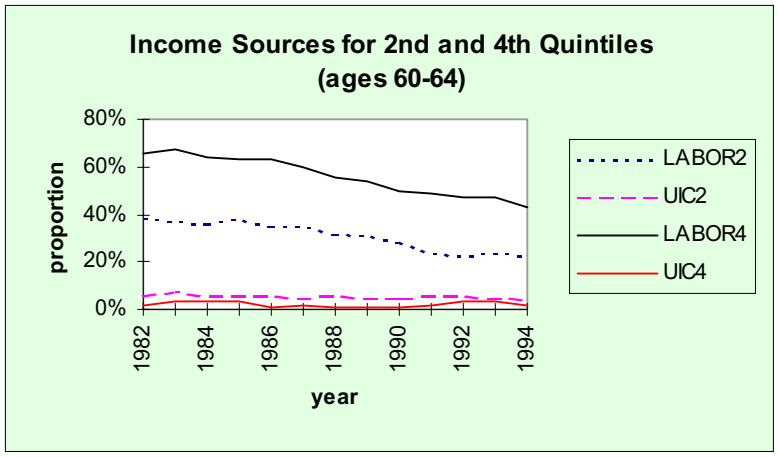
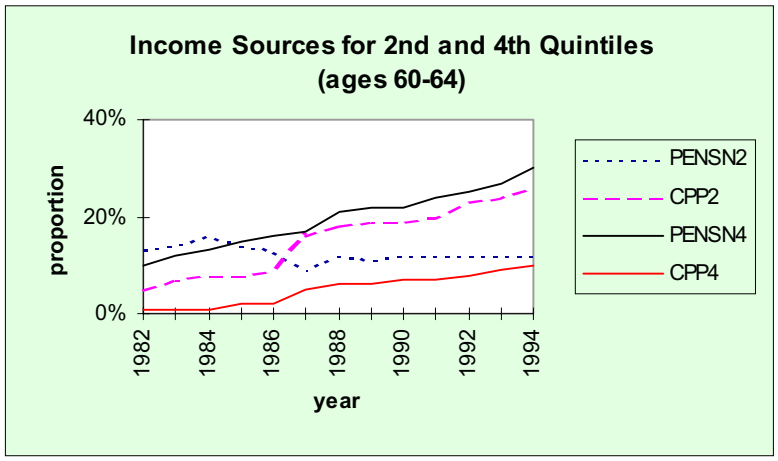



Chart 14.1c



# Appendix XV

## Proportion with Labour Income of Different Amounts by Sex

Chart 15.1a

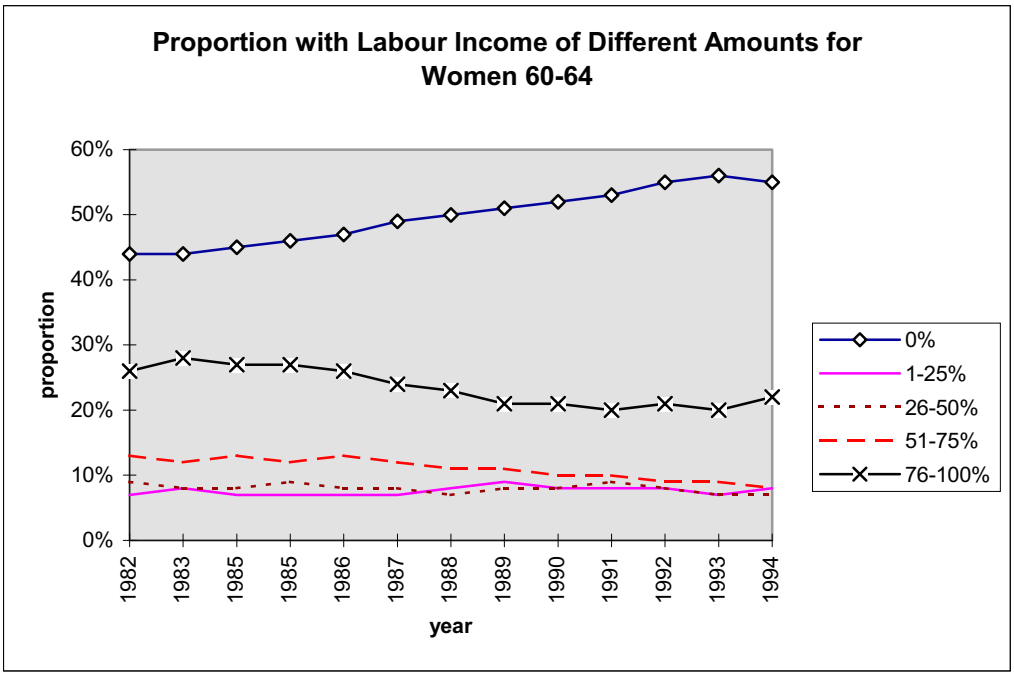
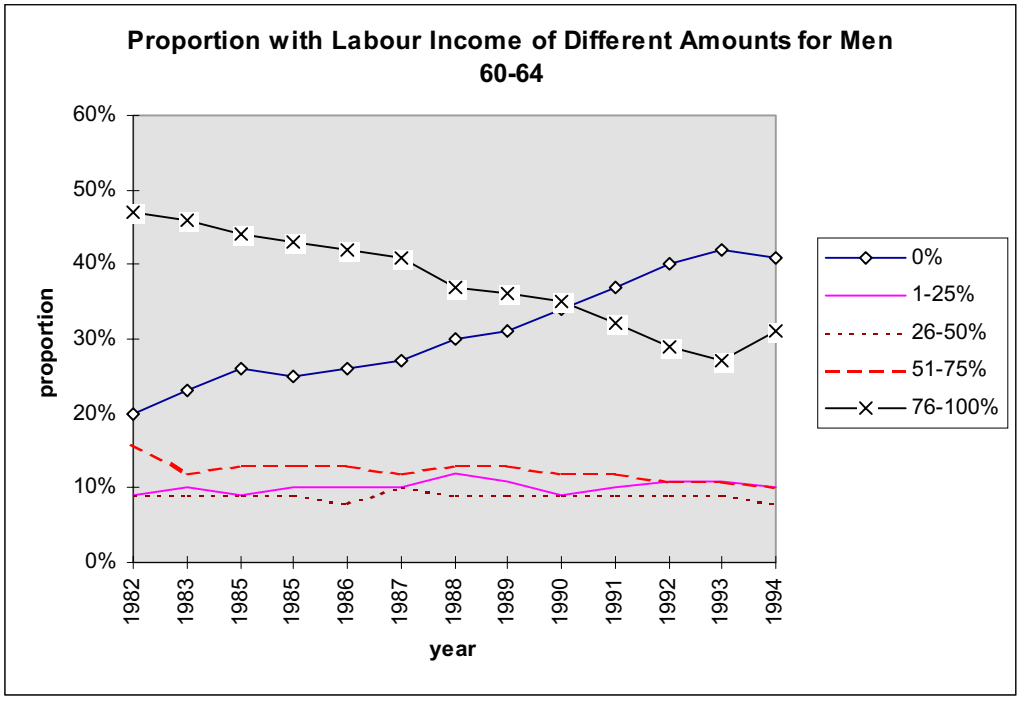



Chart 15.1b



# Appendix XVI

## Kaplan Meier Hazard

Table 16.1a

| KM Hazard for Retired-Worker Benefits (Women) | | | | |
|---|---|---|---|---|
| Age | Failures | Candidates | Hazard | Survivor |
| 60 | 910 | 3660 | 0.248 | 0.752 |
| 61 | 380 | 2350 | 0.161 | 0.839 |
| 62 | 250 | 1660 | 0.151 | 0.849 |
| 63 | 140 | 1150 | 0.125 | 0.875 |
| 64 | 150 | 790 | 0.184 | 0.816 |
| 65 | 400 | 480 | 0.827 | 0.173 |

Table 16.1b

| KM Hazard for Retired-Worker Benefits (Men) | | | | |
|---|---|---|---|---|
| Age | Failures | Candidates | Hazard | Survivor |
| 60 | 1200 | 5250 | 0.228 | 0.772 |
| 61 | 530 | 3430 | 0.155 | 0.845 |
| 62 | 350 | 2420 | 0.144 | 0.856 |
| 63 | 250 | 1710 | 0.146 | 0.854 |
| 64 | 190 | 1160 | 0.159 | 0.841 |
| 65 | 630 | 720 | 0.875 | 0.125 |

Table 16.1c

| KM Hazard for Disability Benefits (Women) | | | | |
|---|---|---|---|---|
| Age | Failures | Candidates | Hazard | Survivor |
| 60 | 80 | 2840 | 0.029 | 0.971 |
| 61 | 50 | 2020 | 0.025 | 0.947 |
| 62 | 20 | 1430 | 0.017 | 0.932 |
| 63 | 20 | 1030 | 0.022 | 0.911 |
| 64 | 20 | 660 | 0.023 | 0.890 |

Table 16.1d

| KM Hazard for Disability Benefits (Men) | | | | |
|---|---|---|---|---|
| Age | Failures | Candidates | Hazard | Survivor |
| 60 | 150 | 4210 | 0.035 | 0.965 |
| 61 | 100 | 3000 | 0.033 | 0.932 |
| 62 | 80 | 2150 | 0.035 | 0.899 |
| 63 | 50 | 1510 | 0.034 | 0.869 |
| 64 | 30 | 1010 | 0.031 | 0.842 |

# Appendix XVII

## Mean Income Statistics (1994 dollars)

Table 17.1

| Mean Income and Expenses from Different Sources for Select Variables | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | emp | s-emp | wealth | pension | cpp | med exp |
| age 59 | men | not exiting | 41826 | 4212 | 4569 | 2447 | 29 | 48 |
| | | exiting | 15524 | 912 | 4247 | 11750 | 53 | 83 |
| | women | not exiting | 17079 | 723 | 5072 | 1219 | 448 | 74 |
| | | exiting | 8375 | 166 | 4723 | 3916 | 342 | 73 |
| age 60 | men | not exiting | 38930 | 4644 | 4689 | 2498 | 31 | 58 |
| | | exiting | 26668 | 1751 | 4204 | 6691 | 43 | 23 |
| | women | not exiting | 17512 | 828 | 5471 | 1131 | 475 | 88 |
| | | exiting | 11584 | 363 | 4568 | 2216 | 532 | 71 |
| age 61 | men | not exiting | 34846 | 4687 | 6129 | 2831 | 53 | 66 |
| | | exiting | 26714 | 1797 | 3829 | 4700 | 34 | 31 |
| | women | not exiting | 16957 | 795 | 6310 | 1228 | 567 | 182 |
| | | exiting | 13572 | 492 | 4964 | 2048 | 356 | 80 |
| age 62 | men | not exiting | 36087 | 5489 | 6075 | 3003 | 54 | 81 |
| | | exiting | 26796 | 1048 | 10612 | 3700 | 72 | 16 |
| | women | not exiting | 16210 | 786 | 7635 | 1429 | 593 | 136 |
| | | exiting | 15286 | 86 | 4479 | 1636 | 457 | 136 |
| age 63 | men | not exiting | 34407 | 5796 | 7009 | 3868 | 60 | 79 |
| | | exiting | 24026 | 1916 | 3789 | 3295 | 47 | 158 |
| | women | not exiting | 15920 | 703 | 9614 | 1556 | 680 | 177 |
| | | exiting | 12971 | 607 | 5221 | 2086 | 414 | 157 |
| age 64 | men | not exiting | 28856 | 6144 | 4578 | 2878 | 56 | 333 |
| | | exiting | 31013 | 4737 | 5089 | 3867 | 59 | 90 |
| | women | not exiting | 14638 | 263 | 7013 | 3000 | 1300 | 88 |
| | | exiting | 14648 | 848 | 6163 | 1315 | 650 | 138 |

# Appendix XVIII

## Labour-Force Participation Prior to and After CPP Take Up

Table 18.1a

| Women—consecutive years out of labour force, from 58, prior to exit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6-8 | total |
| count | 2810 | 190 | 370 | 120 | 60 | 40 | 80 | 3660 |
| percent | 76.8% | 5.2% | 10.1% | 3.3% | 1.6% | 1.1% | 2.2% | 100% |

Table 18.1b

| Women—years out of labour force, from 58, prior to exit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6-8 | total |
| count | 2690 | 270 | 390 | 120 | 70 | 40 | 80 | 3660 |
| percent | 73.5% | 7.4% | 10.7% | 3.3% | 1.9% | 1.1% | 2.2% | 100% |

Table 18.1c

| Men—consecutive years out of labour force, from 58, prior to exit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6-8 | total |
| count | 4590 | 240 | 270 | 60 | 40 | 20 | 40 | 5250 |
| percent | 87.4% | 4.6% | 5.1% | 1.1% | 0.8% | 0.4% | 0.8% | 100% |

Table 18.1d

| Men-- years out of labour force, from 58, prior to exit | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 0 | 1 | 2 | 3 | 4 | 5 | 6-8 | total |
| count | 4470 | 320 | 290 | 80 | 40 | 20 | 40 | 5250 |
| percent | 85.1% | 6.1% | 5.5% | 1.5% | 0.8% | 0.4% | 0.8% | 100% |

Table 18.1e

| Employment Inc After Exit | | | | |
|---|---|---|---|---|
| | age | overall average | non-zero average | percent of present |
| F | 61 | 1382 | 6306 | 22% |
| F | 62 | 1660 | 7033 | 24% |
| F | 63 | 1416 | 7494 | 19% |
| F | 64 | 1101 | 6608 | 17% |
| F | 65 | 977 | 5773 | 17% |
| F | 66 | 2325 | 11293 | 21% |
| F | 67 | 2127 | 13117 | 16% |
| M | 61 | 1940 | 7185 | 27% |
| M | 62 | 2095 | 8053 | 26% |
| M | 63 | 2024 | 8500 | 24% |
| M | 64 | 1712 | 7740 | 22% |
| M | 65 | 1762 | 9535 | 18% |
| M | 66 | 5186 | 22471 | 23% |
| M | 67 | 3708 | 23638 | 16% |

Table 18.1f

| Self-employment Inc After Exit | | | | |
|---|---|---|---|---|
| | age | overall average | non-zero average | percent of present |
| F | 61 | 160 | 1950 | 6% |
| F | 62 | 89 | 1580 | 6% |
| F | 63 | 137 | 2460 | 6% |
| F | 64 | 122 | 2375 | 5% |
| F | 65 | 186 | 3025 | 6% |
| F | 66 | 406 | 5520 | 7% |
| F | 67 | 416 | 7700 | 5% |
| M | 61 | 305 | 1906 | 16% |
| M | 62 | 568 | 3177 | 18% |
| M | 63 | 490 | 3247 | 15% |
| M | 64 | 443 | 3340 | 13% |
| M | 65 | 270 | 2255 | 12% |
| M | 66 | 1439 | 8806 | 16% |
| M | 67 | 1194 | 7613 | 16% |

# Appendix XIX

## Model Estimates

Table 19.1

| Standard Model: Exit to Disability Benefits | | | | | | |
|---|---|---|---|---|---|---|
| | | | **Women** | **Women** | **Men** | **Men** |
| | | | **linear** | **lg-linear** | **linear** | **lg-linear** |
| | | s-size | 2840 | 2840 | 4210 | 4210 |
| N.B. values less than 1 set to zero | | -2LL | 15750 | 15750 | 23300 | 23300 |
| for log-linear model | | -2LL model | 1600 | 1620 | 3120 | 3120 |
| **Description** | | **Variable** | **Coeff** | **Coeff** | **Coeff** | **Coeff** |
| BASELINE 60 | | STEP60 | -2.648 ** | -3.347 ** | -2.696 ** | -3.148 ** |
| BASELINE 61 | | STEP61 | -2.625 ** | -3.341 ** | -2.765 ** | -3.171 ** |
| BASELINE 62 | | STEP62 | -3.011 ** | -3.699 ** | -2.645 ** | -3.086 ** |
| BASELINE 63 | | STEP63 | -2.680 ** | -3.344 ** | -2.643 ** | -3.052 ** |
| BASELINE 64 | | STEP64 | -2.619 ** | -3.279 ** | -2.674 ** | -3.104 ** |
| UNATTACHED | | NTMRDI | -0.511 ^ | -0.834 * | -0.272 | -0.352 |
| FAMILY SIZE | (log) | FMSZ_I | -0.329 ^ | -1.329 | -0.179 * | -1.002 * |
| UNION/PROF MEMBERSHIP | | UNIONI | 0.730 ** | 0.601 ** | 0.604 ** | 0.605 ** |
| PERMANENT INCOME | (log) | PERMI | 0.012 * | 1.544 ** | 0.006 ** | 0.921 ** |
| EMPLOYMENT INCOME | (log) | EMPLI | -0.052 ** | -1.593 ** | -0.024 ** | -1.112 ** |
| SELF-EMPLOYMENT INCOME | (log) | SEMPI | -0.043 * | -1.715 ** | -0.025 ** | -1.366 ** |
| RETURNS ON WEALTH | (log) | WLTHI | -0.011 ** | -0.883 ** | -0.013 ** | -0.253 * |
| PENSION INCOME | (log) | PENSI | -0.032 | -0.674 * | -0.028 ** | -0.469 ** |
| CPP INCOME | (log) | CPP__I | -0.015 | 0.081 | 0.062 | 0.562 |
| NON-TAXABLE INCOME | (log) | NTXI | 0.108 ** | 0.764 * | 0.070 ** | 0.969 ** |
| UI INCOME DUMMY | | UIDUM | 1.042 ** | 0.885 ** | 1.066 ** | 1.051 ** |
| YEARS RECEIVING UI | | UICNT | -0.138 | -0.120 | -0.057 | -0.055 |
| OUT OF LABOUR-FORCE DUMMY | | OTLFDUM | 0.085 | -0.486 | 0.871 ** | 0.170 |
| YEARS OUT OF LABOUR FORCE | | OTLFCNT | -0.606 ** | -0.536 ** | -0.710 ** | -0.725 ** |
| CURRENT DISABILITY DED | | DISADI | 2.849 ** | 2.571 ** | 3.544 ** | 3.509 ** |
| DISABILITY DED IN LAST YEAR | | DISADB | -0.871 | -0.748 | -2.070 ** | -1.977 ** |
| CURRENT MEDICAL EXP | (log) | MEDTT | 0.036 | 0.901 | 0.119 * | 0.862 |
| MEDICAL EXP LAST YEAR | (log) | MEDTTB | -0.045 | -1.096 | -0.103 | -0.618 |
| PROV UNEMP RATE 55+ | | UNEMPI | -0.017 | -0.022 | -0.038 | -0.047 * |
| URBAN POP 15,000-99,999 | | C3MAD | 0.319 | 0.422 * | 0.185 | 0.282 ^ |
| SMALL URBAN AND RURAL | | C5MAD | 0.066 | 0.138 | -0.072 | 0.034 |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XIX (continued)

## Model Estimates

Table 19.2

| Standard Model: Exit to Disability Benefits | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Women lg-linear | | Women positive | Men lg-linear | | Men positive | |
| | s-size | | 2840 | | 2480 | 4210 | | 3590 | |
| N.B. values less than 1 set to zero | -2LL | | 15750 | | 13580 | 23300 | | 19250 | |
| for log-linear model | -2LL model | | 1620 | | 1420 | 3120 | | 2760 | |
| **Description** | | **Variable** | **Coeff** | | **Coeff** | **Coeff** | | **Coeff** | |
| BASELINE 60 | | STEP60 | -3.347 | ** | -3.017 | ** | -3.148 | ** | -2.983 | ** |
| BASELINE 61 | | STEP61 | -3.341 | ** | -2.973 | ** | -3.171 | ** | -3.033 | ** |
| BASELINE 62 | | STEP62 | -3.699 | ** | -3.400 | ** | -3.086 | ** | -2.907 | ** |
| BASELINE 63 | | STEP63 | -3.344 | ** | -3.002 | ** | -3.052 | ** | -2.778 | ** |
| BASELINE 64 | | STEP64 | -3.279 | ** | -2.778 | ** | -3.104 | ** | -2.916 | ** |
| UNATTACHED | | NTMRDI | -0.834 | * | -0.966 | ** | -0.352 | | -0.309 | |
| FAMILY SIZE | (log) | FMSZ_I | -1.329 | | -1.795 | ^ | -1.002 | * | -0.857 | ^ |
| UNION/PROF MEMBERSHIP | | UNIONI | 0.601 | ** | 0.561 | ** | 0.605 | ** | 0.622 | ** |
| PERMANENT INCOME | (log) | PERMI | 1.544 | ** | 1.405 | ** | 0.921 | ** | 1.115 | ** |
| EMPLOYMENT INCOME | (log) | EMPLI | -1.593 | ** | -1.594 | ** | -1.112 | ** | -1.315 | ** |
| SELF-EMPLOYMENT INCOME | (log) | SEMPI | -1.715 | ** | -1.949 | ** | -1.366 | ** | -1.553 | ** |
| RETURNS ON WEALTH | (log) | WLTHI | -0.883 | ** | -0.756 | ** | -0.253 | * | -0.260 | * |
| PENSION INCOME | (log) | PENSI | -0.674 | * | -0.731 | * | -0.469 | ** | -0.566 | ** |
| CPP INCOME | (log) | CPP__I | 0.081 | | 0.186 | | 0.562 | | 0.714 | |
| NON-TAXABLE INCOME | (log) | NTXI | 0.764 | * | 1.057 | ** | 0.969 | ** | 0.864 | ** |
| UI INCOME DUMMY | | UIDUM | 0.885 | ** | 0.779 | ** | 1.051 | ** | 1.044 | ** |
| YEARS RECEIVING UI | | UICNT | -0.120 | | -0.132 | | -0.055 | | -0.146 | * |
| OUT OF LABOUR-FORCE DUMMY | | OTLFDUM | -0.486 | | -0.732 | * | 0.170 | | 0.097 | |
| YEARS OUT OF LABOUR FORCE | | OTLFCNT | -0.536 | ** | -0.538 | ** | -0.725 | ** | -0.903 | ** |
| CURRENT DISABILITY DED | | DISADI | 2.571 | ** | 2.727 | ** | 3.509 | ** | 3.551 | ** |
| DISABILITY DED IN LAST YEAR | | DISADB | -0.748 | | -0.863 | | -1.977 | ** | -1.903 | ** |
| CURRENT MEDICAL EXP | (log) | MEDTT | 0.901 | | 0.949 | | 0.862 | | 0.878 | |
| MEDICAL EXP LAST YEAR | (log) | MEDTTB | -1.096 | | -0.863 | | -0.618 | | -0.306 | |
| PROV UNEMP RATE 55+ | | UNEMPI | -0.022 | | -0.013 | | -0.047 | * | -0.066 | ** |
| URBAN POP 15,000-99,999 | | C3MAD | 0.422 | * | 0.443 | * | 0.282 | ^ | 0.326 | * |
| SMALL URBAN AND RURAL | | C5MAD | 0.138 | | 0.053 | | 0.034 | | 0.104 | |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XIX (continued)

## Model Estimates

Table 19.3

| Unobserved Heterogeneity Model: Exit to Disability Benefits | | | | | |
|---|---|---|---|---|---|
| | | **Women** | **Women** | **Men** | **Men** |
| | | **2 types** | **1 type** | **2 types** | **1 type** |
| | s-size | 2840 | 2840 | 4210 | 4210 |
| N.B. Linear model is being used | -2LL | 15750 | 15750 | 23300 | 23300 |
| | -2LL model | | 1600 | | 3120 |
| **Description** | **Variable** | **Coeff** | **Coeff** | **Coeff** | **Coeff** |
| PROBABILITY OF BEING TYPE 1 | PROB1 | 0.400 ** | | 0.224 | |
| PROBABILITY OF BEING TYPE 2 | PROB2 | 0.600 ** | | 0.776 | |
| TYPE 1 INTERCEPT | INT1 | -42.337 | | -3.823 | |
| TYPE 2 INTERCEPT | INT2 | -2.046 ** | -2.648 ** | -2.506 * | -2.696 ** |
| BASELINE 61 | STEP61 | 0.010 | 0.022 | -0.046 | -0.068 |
| BASELINE 62 | STEP62 | -0.303 | -0.363 | 0.088 | 0.051 |
| BASELINE 63 | STEP63 | 0.062 | -0.032 | 0.091 | 0.053 |
| BASELINE 64 | STEP64 | 0.192 | 0.029 | 0.067 | 0.022 |
| UNATTACHED | NTMRDI | -0.770 ** | -0.511 ^ | -0.279 | -0.272 |
| FAMILY SIZE | FMSZ_I | -0.304 | -0.329 ^ | -0.175 * | -0.179 * |
| UNION/PROF MEMBERSHIP | UNIONI | 0.718 ** | 0.730 ** | 0.618 ** | 0.604 ** |
| PERMANENT INCOME | PERMI | 0.043 ** | 0.012 * | 0.006 ** | 0.006 ** |
| EMPLOYMENT INCOME | EMPLI | -0.081 ** | -0.052 ** | -0.024 ** | -0.024 ** |
| SELF-EMPLOYMENT INCOME | SEMPI | -0.087 ^ | -0.043 * | -0.025 ** | -0.025 ** |
| RETURNS ON WEALTH | WLTHI | -0.063 ** | -0.011 ** | -0.013 * | -0.013 ** |
| PENSION INCOME | PENSI | -0.072 * | -0.032 | -0.029 ** | -0.028 ** |
| CPP INCOME | CPP__I | 0.026 | -0.015 | 0.063 | 0.062 |
| NON-TAXABLE INCOME | NTXI | 0.107 ** | 0.108 ** | 0.078 ** | 0.070 ** |
| UI INCOME DUMMY | UIDUM | 0.922 ** | 1.042 ** | 1.072 ** | 1.066 ** |
| YEARS RECEIVING UI | UICNT | -0.175 | -0.138 | -0.059 | -0.057 |
| OUT OF LABOUR-FORCE DUMMY | OTLFDUM | -0.141 | 0.085 | 0.908 ** | 0.871 ** |
| YEARS OUT OF LABOUR FORCE | OTLFCNT | -0.564 ** | -0.606 ** | -0.743 ** | -0.710 ** |
| CURRENT DISABILITY DED | DISADI | 3.011 ** | 2.849 ** | 3.737 ** | 3.544 ** |
| DISABILITY DED IN LAST YEAR | DISADB | -0.570 | -0.871 | -2.015 ** | -2.070 ** |
| CURRENT MEDICAL EXP | MEDTT | 0.036 | 0.036 | 0.116 | 0.119 * |
| MEDICAL EXP LAST YEAR | MEDTTB | -0.030 | -0.045 | -0.112 | -0.103 |
| PROV UNEMP RATE 55+ | UNEMPI | -0.013 | -0.017 | -0.043 ^ | -0.038 |
| URBAN POP 15,000-99,999 | C3MAD | 0.325 | 0.319 | 0.192 | 0.185 |
| SMALL URBAN AND RURAL | C5MAD | 0.106 | 0.066 | -0.070 | -0.072 |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XX

## Predicted Probabilities from Disability Model

Table 20.1

| Base Characteristics for Exit to Disability Benefits | | |
|---|---|---|
| | women | men |
| initial age | 60 | 60 |
| initial year | 1987 | 1987 |
| NTMRDI | 0 | 0 |
| FMSZ_I | 2 | 2 |
| UNIONI | 0 | 0 |
| PERMI | 25,716 | 51,004 |
| EMPLI | 16,863 | 37,902 |
| SEMPI | 751 | 4,593 |
| WLTHI | 11,398 | 8,210 |
| PENSI | 1,282 | 2,693 |
| CPP__I | 515 | 40 |
| NTXI | 291 | 289 |
| UIDUM | 0 | 0 |
| UICNT | 0 | 0 |
| OTLFDUM | 0 | 0 |
| OTLFCNT | 0 | 0 |
| DISADI | 0 | 0 |
| DISADB | 0 | 0 |
| MEDTT | 167 | 120 |
| MEDTTB | 167 | 120 |
| UNEMPI | 6.52% | 6.49% |
| C3MAD | 0 | 0 |
| C5MAD | 0 | 0 |

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.2

**Predicted Probability of Survival and Exit to Disability Benefits for Women in Different Years**

| coeff | | unattached/attached (marital status) | | | | |
|---|---|---|---|---|---|---|
| -0.770 ** | | age | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 |
| attached | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| unattached | survival | 99.2% | 99.1% | 99.1% | 99.1% | 99.1% |
| attached | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| unattached | exit | 0.8% | 0.1% | 0.0% | 0.0% | 0.0% |

| coeff | | family size | | | | |
|---|---|---|---|---|---|---|
| -0.304 | | 60 | 61 | 62 | 63 | 64 |
| no children | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| two children | survival | 99.3% | 99.2% | 99.2% | 99.2% | 99.2% |
| four children | survival | 99.6% | 99.6% | 99.6% | 99.6% | 99.6% |
| no children | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| two children | exit | 0.7% | 0.1% | 0.0% | 0.0% | 0.0% |
| four children | exit | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% |

| coeff | | union/professional membership | | | | |
|---|---|---|---|---|---|---|
| 0.718 ** | | 60 | 61 | 62 | 63 | 64 |
| not payer | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| payer | survival | 97.4% | 96.5% | 96.3% | 96.2% | 96.2% |
| not a payer | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| payer | exit | 2.6% | 0.9% | 0.2% | 0.0% | 0.0% |

| coeff | mean value | | permanent income | | | | |
|---|---|---|---|---|---|---|---|
| 0.043 ** | $2,5716 | | 60 | 61 | 62 | 63 | 64 |
| $10,000 in perm. income | | survival | 99.3% | 99.3% | 99.3% | 99.3% | 99.3% |
| ave. perm. income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $50,000 in perm. income | | survival | 96.5% | 94.9% | 94.3% | 94.1% | 93.9% |
| $100,000 in perm. income | | survival | 76.2% | 36.8% | 14.8% | 5.9% | 2.4% |
| $10,000 in perm. income | | exit | 0.7% | 0.1% | 0.0% | 0.0% | 0.0% |
| ave. perm. income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $50,000 in perm. income | | exit | 3.5% | 1.6% | 0.6% | 0.3% | 0.2% |
| $100,000 in perm. income | | exit | 23.8% | 39.5% | 22.0% | 8.9% | 3.5% |

| coeff | mean value | | employment income | | | | |
|---|---|---|---|---|---|---|---|
| -0.081 ** | $16,863 | | 60 | 61 | 62 | 63 | 64 |
| no emp. income | | survival | 95.2% | 92.1% | 90.6% | 89.6% | 88.9% |
| ave. emp. income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $50,000 in emp. income | | survival | 99.9% | 99.9% | 99.9% | 99.9% | 99.9% |
| $100,000 in emp. income | | survival | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| no emp. income | | exit | 4.8% | 3.1% | 1.5% | 1.0% | 0.8% |
| ave. emp. income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $50,000 in emp. income | | exit | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |
| $100,000 in emp. income | | exit | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.3

**Predicted Probability of Survival and Exit to Disability Benefits for Women in Different Years**

| coeff | mean value | | self-employment income | | | | |
|---|---|---|---|---|---|---|---|
| -0.087 ^ | $751 | | age | | | | |
| characteristic | | prob type | 60 | 61 | 62 | 63 | 64 |
| no self-emp. income | | survival | 98.6% | 98.4% | 98.4% | 98.4% | 98.4% |
| ave. self-emp. income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $25,000 in self-emp. income | | survival | 99.8% | 99.8% | 99.8% | 99.8% | 99.8% |
| $50,000 in self-emp. income | | survival | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| no self-emp. income | | exit | 1.4% | 0.2% | 0.0% | 0.0% | 0.0% |
| ave. self-emp. income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $25,000 in self-emp. income | | exit | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| $50,000 in self-emp. income | | exit | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

| coeff | mean value | | returns on wealth | | | | |
|---|---|---|---|---|---|---|---|
| -0.063 ** | $11,398 | | 60 | 61 | 62 | 63 | 64 |
| no wealth income | | survival | 97.4% | 96.5% | 96.3% | 96.2% | 96.2% |
| ave. wealth income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $25,000 in returns on wealth | | survival | 99.5% | 99.4% | 99.4% | 99.4% | 99.4% |
| $50,000 in returns on wealth | | survival | 99.9% | 99.9% | 99.9% | 99.9% | 99.9% |
| no wealth income | | exit | 2.6% | 0.9% | 0.2% | 0.1% | 0.0% |
| ave. wealth income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $25,000 in returns on wealth | | exit | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% |
| $50,000 in returns on wealth | | exit | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% |

| coeff | mean value | | pension income | | | | |
|---|---|---|---|---|---|---|---|
| -0.072 * | $1,282 | | 60 | 61 | 62 | 63 | 64 |
| no pension income | | survival | 98.6% | 98.4% | 98.3% | 98.3% | 98.3% |
| ave. pension income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $25,000 in pension income | | survival | 99.8% | 99.8% | 99.8% | 99.8% | 99.8% |
| $50,000 in pension income | | survival | 100.0% | 100.0% | 100.0% | 100.0% | 100.0% |
| no pension income | | exit | 1.4% | 0.3% | 0.0% | 0.0% | 0.0% |
| ave. pension income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $25,000 in pension income | | exit | 0.2% | 0.0% | 0.0% | 0.0% | 0.0% |
| $50,000 in pension income | | exit | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |

| coeff | mean value | | CPP income | | | | |
|---|---|---|---|---|---|---|---|
| 0.026 | $515 | | 60 | 61 | 62 | 63 | 64 |
| no cpp income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| ave. cpp income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $5,000 in CPP income | | survival | 98.6% | 98.3% | 98.3% | 98.3% | 98.3% |
| no cpp income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| ave. cpp income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $5,000 in CPP income | | exit | 1.4% | 0.3% | 0.0% | 0.0% | 0.0% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.4

**Predicted Probability of Survival and Exit to Disability Benefits for Women in Different Years**

| coeff | | UI income dummy | | | | |
|---|---|---|---|---|---|---|
| 0.922 ** | | age | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 |
| no ui income | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| ui income every year | survival | 97.3% | 96.6% | 96.4% | 96.4% | 96.4% |
| no ui income | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| ui income every year | exit | 2.7% | 0.8% | 0.1% | 0.0% | 0.0% |

| coeff | | out of labour-force dummy | | | | |
|---|---|---|---|---|---|---|
| -0.141 | | 60 | 61 | 62 | 63 | 64 |
| not out of labour force | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| out of labour force every year | survival | 99.4% | 99.3% | 99.3% | 99.3% | 99.3% |
| not out of labour force | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| out of labour force every year | exit | 0.6% | 0.0% | 0.0% | 0.0% | 0.0% |

| coeff | last year | | current/last year's disability dummy | | | | |
|---|---|---|---|---|---|---|---|
| 3.011 ** | -0.570 | | 60 | 61 | 62 | 63 | 64 |
| no disability deductions | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| disability ded both years | | survival | 86.9% | 67.2% | 47.6% | 26.4% | 11.3% |
| no disability deductions | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| disability ded both years | | exit | 13.1% | 19.7% | 19.6% | 21.2% | 15.2% |

| coeff | last year | mean value | current/last year's medical expenses | | | | |
|---|---|---|---|---|---|---|---|
| 0.036 | -0.030 | $167 | 60 | 61 | 62 | 63 | 64 |
| no medical exp both yrs | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| ave. medical exp both yrs | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $1,000 in medical exp both yrs | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| $2,000 in medical exp both yrs | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| no medical exp both yrs | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| ave. medical exp both yrs | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $1,000 in medical exp both yrs | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| $2,000 in medical exp both yrs | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |

** significant at 1% * significant at 5% ^ significant at 10%

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.5

| Predicted Probability of Survival and Exit to Disability Benefits for Men in Different Years | | | | | | |
|---|---|---|---|---|---|---|
| coeff | | unattached/attached (marital status) | | | | |
| -0.279 | | age | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 |
| attached | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| unattached | survival | 98.7% | 98.4% | 98.4% | 98.4% | 98.4% |
| attached | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| unattached | exit | 1.3% | 0.2% | 0.1% | 0.0% | 0.0% |

| coeff | | family size | | | | |
|---|---|---|---|---|---|---|
| -0.175 * | | 60 | 61 | 62 | 63 | 64 |
| no children | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| two children | survival | 99.0% | 98.8% | 98.8% | 98.8% | 98.8% |
| four children | survival | 99.3% | 99.2% | 99.2% | 99.2% | 99.2% |
| no children | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| two children | exit | 1.0% | 0.1% | 0.0% | 0.0% | 0.0% |
| four children | exit | 0.7% | 0.1% | 0.0% | 0.0% | 0.0% |

| Coeff | | union/professional membership | | | | |
|---|---|---|---|---|---|---|
| 0.618 ** | | 60 | 61 | 62 | 63 | 64 |
| not payer | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| Payer | survival | 97.3% | 96.3% | 95.8% | 95.7% | 95.6% |
| not a payer | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| Payer | exit | 2.7% | 1.0% | 0.4% | 0.2% | 0.1% |

| Coeff | mean value | | permanent income | | | | |
|---|---|---|---|---|---|---|---|
| 0.006 ** | $51,004 | | 60 | 61 | 62 | 63 | 64 |
| $10,000 in perm. income | | survival | 98.9% | 98.7% | 98.6% | 98.6% | 98.6% |
| $25,000 in perm. income | | survival | 98.7% | 98.5% | 98.5% | 98.5% | 98.5% |
| ave. perm. income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $100,000 in perm. income | | survival | 98.0% | 97.5% | 97.3% | 97.3% | 97.3% |
| $10,000 in perm. income | | exit | 1.2% | 0.2% | 0.0% | 0.0% | 0.0% |
| $25,000 in perm. income | | exit | 1.3% | 0.2% | 0.0% | 0.0% | 0.0% |
| ave. perm. income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $100,000 in perm. income | | exit | 2.0% | 0.5% | 0.2% | 0.1% | 0.0% |

| Coeff | mean value | | employment income | | | | |
|---|---|---|---|---|---|---|---|
| -0.024 ** | $37,902 | | 60 | 61 | 62 | 63 | 64 |
| no emp. Income | | survival | 96.3% | 94.5% | 93.4% | 92.8% | 92.4% |
| ave. emp. income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $50,000 in emp. income | | survival | 98.9% | 98.7% | 98.7% | 98.7% | 98.7% |
| $100,000 in emp. income | | survival | 99.7% | 99.7% | 99.7% | 99.7% | 99.7% |
| no emp. Income | | exit | 3.7% | 1.9% | 1.1% | 0.6% | 0.4% |
| ave. emp. income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $50,000 in emp. income | | exit | 1.1% | 0.2% | 0.0% | 0.0% | 0.0% |
| $100,000 in emp. income | | exit | 0.3% | 0.0% | 0.0% | 0.0% | 0.0% |

** significant at 1% * significant at 5% ^ significant at 10%

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.6

**Predicted Probability of Survival and Exit to Disability Benefits for Men in Different Years**

| Coeff | mean value | | self-employment income | | | | |
|---|---|---|---|---|---|---|---|
| -0.025 ** | $4,593 | | age | | | | |
| Characteristic | | prob type | 60 | 61 | 62 | 63 | 64 |
| no self-emp. income | | survival | 98.4% | 98.0% | 97.9% | 97.9% | 97.8% |
| ave. self-emp. income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $25,000 in self-emp. income | | survival | 99.1% | 99.0% | 99.0% | 99.0% | 99.0% |
| $50,000 in self-emp. income | | survival | 99.5% | 99.5% | 99.5% | 99.5% | 99.5% |
| no self-emp. income | | exit | 1.6% | 0.4% | 0.1% | 0.0% | 0.0% |
| ave. self-emp. income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $25,000 in self-emp. income | | exit | 0.9% | 0.1% | 0.0% | 0.0% | 0.0% |
| $50,000 in self-emp. income | | exit | 0.5% | 0.0% | 0.0% | 0.0% | 0.0% |

| Coeff | mean value | | returns on wealth | | | | |
|---|---|---|---|---|---|---|---|
| -0.013 * | $8,210 | | 60 | 61 | 62 | 63 | 64 |
| no wealth income | | survival | 98.4% | 98.0% | 97.9% | 97.9% | 97.9% |
| ave. wealth income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $25,000 in returns on wealth | | survival | 98.8% | 98.6% | 98.6% | 98.6% | 98.6% |
| $50,000 in returns on wealth | | survival | 99.2% | 99.1% | 99.0% | 99.0% | 99.0% |
| no wealth income | | exit | 1.6% | 0.4% | 0.1% | 0.0% | 0.0% |
| ave. wealth income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $25,000 in returns on wealth | | exit | 1.2% | 0.2% | 0.0% | 0.0% | 0.0% |
| $50,000 in returns on wealth | | exit | 0.8% | 0.1% | 0.0% | 0.0% | 0.0% |

| Coeff | mean value | | pension income | | | | |
|---|---|---|---|---|---|---|---|
| -0.029 ** | $2,693 | | 60 | 61 | 62 | 63 | 64 |
| no pension income | | survival | 98.4% | 98.1% | 98.0% | 98.0% | 98.0% |
| ave. pension income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $25,000 in pension income | | survival | 99.2% | 99.1% | 99.1% | 99.1% | 99.1% |
| $50,000 in pension income | | survival | 99.6% | 99.6% | 99.6% | 99.6% | 99.6% |
| no pension income | | exit | 1.6% | 0.4% | 0.1% | 0.0% | 0.0% |
| ave. pension income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $25,000 in pension income | | exit | 0.8% | 0.1% | 0.0% | 0.0% | 0.0% |
| $50,000 in pension income | | exit | 0.4% | 0.0% | 0.0% | 0.0% | 0.0% |

| Coeff | mean value | | CPP income | | | | |
|---|---|---|---|---|---|---|---|
| 0.063 | $40 | | 60 | 61 | 62 | 63 | 64 |
| no cpp income | | survival | 98.5% | 98.2% | 98.2% | 98.2% | 98.1% |
| ave. cpp income | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $5,000 in CPP income | | survival | 98.0% | 97.4% | 97.3% | 97.2% | 97.2% |
| no cpp income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| ave. cpp income | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $5,000 in CPP income | | exit | 2.0% | 0.6% | 0.2% | 0.1% | 0.0% |

** significant at 1% * significant at 5% ^ significant at 10%

# Appendix XX (continued)

## Predicted Probabilities from Disability Model

Table 20.7

**Predicted Probability of Survival and Exit to Disability Benefits for Men in Different Years**

| Coeff | | UI income dummy | | | | |
|---|---|---|---|---|---|---|
| 1.072 ** | | age | | | | |
| Characteristic | prob type | 60 | 61 | 62 | 63 | 64 |
| no ui income | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| ui income every year | survival | 96.0% | 94.0% | 92.8% | 92.1% | 91.8% |
| no ui income | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| ui income every year | exit | 4.0% | 2.1% | 1.2% | 0.6% | 0.3% |

| Coeff | | out of labour-force dummy | | | | |
|---|---|---|---|---|---|---|
| 0.908 ** | | 60 | 61 | 62 | 63 | 64 |
| not out of labour force | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| out of labour force every year | survival | 98.3% | 98.1% | 98.1% | 98.1% | 98.1% |
| not out of labour force | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| out of labour force every year | exit | 1.7% | 0.2% | 0.0% | 0.0% | 0.0% |

| Coeff | last year | | current/last year's disability dummy | | | | |
|---|---|---|---|---|---|---|---|
| 3.737 ** | -2.015 ** | | 60 | 61 | 62 | 63 | 64 |
| no disability deductions | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| disability ded both years | | survival | 92.1% | 83.8% | 73.9% | 62.6% | 50.5% |
| no disability deductions | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| disability ded both years | | exit | 7.9% | 8.3% | 9.9% | 11.3% | 12.1% |

| Coeff | last year | mean value | current/last year's medical expenses | | | | |
|---|---|---|---|---|---|---|---|
| 0.116 | -0.112 | $120 | 60 | 61 | 62 | 63 | 64 |
| no medical exp both yrs | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| ave. medical exp both yrs | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $1,000 in medical exp both yrs | | survival | 98.5% | 98.2% | 98.2% | 98.1% | 98.1% |
| $2,000 in medical exp both yrs | | survival | 98.5% | 98.2% | 98.1% | 98.1% | 98.1% |
| no medical exp both yrs | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| ave. medical exp both yrs | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $1,000 in medical exp both yrs | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |
| $2,000 in medical exp both yrs | | exit | 1.5% | 0.3% | 0.1% | 0.0% | 0.0% |

** significant at 1% * significant at 5% ^ significant at 10%

# Appendix XXI

## Model Estimates

Table 21.1

| Standard Model: Exit to Retired-Worker Benefits | | | | | | |
|---|---|---|---|---|---|---|
| | | | Women linear | Women lg-linear | Men linear | Men lg-linear |
| | | s-size | 3660 | 3660 | 5250 | 5250 |
| N.B. values less than 1 set to zero | | -2LL | 17840 | 17840 | 26050 | 26050 |
| for log-linear model | | -2LL model | 8950 | 8840 | 12610 | 12280 |
| **Description** | | **Variable** | **Coeff** | **Coeff** | **Coeff** | **Coeff** |
| BASELINE 60 | | STEP60 | -1.331 ** | -1.331 ** | -1.511 ** | -1.513 ** |
| BASELINE 61 | | STEP61 | -1.622 ** | -1.596 ** | -2.010 ** | -1.971 ** |
| BASELINE 62 | | STEP62 | -1.588 ** | -1.556 ** | -1.941 ** | -1.961 ** |
| BASELINE 63 | | STEP63 | -2.324 ** | -2.328 ** | -2.019 ** | -2.009 ** |
| BASELINE 64 | | STEP64 | -1.183 ** | -1.197 ** | -1.561 ** | -1.557 ** |
| BASELINE 65 | | STEP65 | 1.061 ** | 1.030 ** | 1.007 ** | 1.084 ** |
| BASELINE 66 | | STEP66 | 0.932 ** | 0.886 ** | 0.731 ** | 0.792 ** |
| TIME TREND X STEP60 | | TIME60 | 0.075 ** | 0.069 ** | 0.062 ** | 0.060 ** |
| TIME TREND X STEP61 | | TIME61 | 0.049 ^ | 0.042 | 0.085 ** | 0.082 ** |
| TIME TREND X STEP62 | | TIME62 | 0.037 | 0.030 | 0.053 | 0.062 ^ |
| TIME TREND X STEP63 | | TIME63 | 0.122 * | 0.120 ^ | 0.062 | 0.064 |
| UNATTACHED | | NTMRDI | -0.357 ** | -0.443 ** | -0.318 ** | -0.416 ** |
| FAMILY SIZE | (log) | FMSZ_I | -0.317 ** | -1.825 ** | -0.179 ** | -0.976 ** |
| PERMANENT INCOME | (log) | PERMI | 0.007 ** | 0.287 ** | 0.002 ** | 0.395 ** |
| EMPLOYMENT INCOME | (log) | EMPLI | -0.017 ** | -0.655 ** | -0.008 ** | -0.651 ** |
| SELF-EMPLOYMENT INCOME | (log) | SEMPI | -0.022 ** | -0.816 ** | -0.013 ** | -0.781 ** |
| RETURNS ON WEALTH | (log) | WLTHI | -0.006 ** | -0.109 * | -0.002 ^ | 0.034 |
| PENSION INCOME | (log) | PENSI | 0.008 * | 0.263 ** | 0.011 ** | 0.411 ** |
| CPP INCOME | (log) | CPP__I | -0.082 ** | -0.723 ** | -0.028 | 0.111 |
| NON-TAXABLE INCOME | (log) | NTXI | -0.038 * | -0.309 * | -0.021 * | -0.165 |
| UI INCOME DUMMY | | UIDUM | 0.715 ** | 0.577 ** | 0.518 ** | 0.465 ** |
| YEARS RECEIVING UI | | UICNT | -0.120 ** | -0.119 ** | -0.088 ** | -0.090 ** |
| OUT OF LABOUR-FORCE DUMMY | | OTLFDUM | 0.807 ** | 0.312 ** | 0.985 ** | 0.314 ** |
| YEARS OUT OF LABOUR FORCE | | OTLFCNT | -0.139 ** | -0.134 ** | -0.180 ** | -0.208 ** |
| CURRENT DISABILITY DED | | DISADI | -0.114 | -0.163 | 1.363 ** | 1.416 ** |
| DISABILITY DED IN LAST YEAR | | DISADB | 0.087 | 0.177 | -1.494 ** | -1.545 ** |
| CURRENT MEDICAL EXP | (log) | MEDTT | 0.016 | 0.066 | -0.008 | -0.215 |
| MEDICAL EXP LAST YEAR | (log) | MEDTTB | -0.155 ** | -1.316 ** | -0.003 | -0.285 |
| PERMANENT INCOME OF SPSE | (log) | PERMS | 0.001 | 0.185 ** | 0.001 | -0.133 * |
| SPSE'S EMPLOYMENT INCOME | (log) | EMPLS | 0.000 | -0.049 | -0.002 | 0.039 |
| SPSE'S S-EMPLOYMENT INCOME | (log) | SEMPS | -0.002 * | -0.351 ** | -0.016 * | -0.014 |
| SPOUSE'S PENSION INCOME | (log) | PENSS | 0.011 ** | 0.235 ** | 0.006 | 0.301 ** |
| SPOUSE'S CPP INCOME | (log) | CPP__S | 0.034 ** | 0.199 * | 0.037 ** | 0.347 ** |
| NON-TAXABLE INCOME OF SPSE | (log) | NTXS | 0.000 | -0.022 | 0.012 | 0.112 |
| CURRENT DISAB DED BY SPSE | | DISADS | -0.070 | -0.015 | -0.539 * | -0.437 |
| DISAB DED BY SPSE LAST YR | | DISASB | -0.018 | -0.041 | 0.561 * | 0.481 ^ |
| PROV UNEMP RATE 55+ | | UNEMPI | 0.016 | 0.018 | 0.027 ** | 0.025 * |
| URBAN POP 15,000-99,999 | | C3MAD | 0.210 ** | 0.205 ** | 0.175 ** | 0.177 ** |
| SMALL URBAN AND RURAL | | C5MAD | 0.090 | 0.096 ^ | 0.076 ^ | 0.088 ^ |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXI (continued)

## Model Estimates

Table 21.2

| Standard Model: Exit to Retired-Worker Benefits | | | | | | |
|---|---|---|---|---|---|---|
| | | | Women lg-linear | Women truncated | Men lg-linear | Men truncated |
| | | s-size | 3660 | 3660 | 5250 | 5250 |
| N.B. values less than 1 set to zero | | -2LL | 17840 | 17240 | 26050 | 25220 |
| for log-linear model | | -2LL model | 8840 | 8240 | 12280 | 11600 |
| **Description** | | **Variable** | **Coeff** | **Coeff** | **Coeff** | **Coeff** |
| BASELINE 60 | | STEP60 | -1.331 ** | -1.367 ** | -1.513 ** | -1.358 ** |
| BASELINE 61 | | STEP61 | -1.596 ** | -1.607 ** | -1.971 ** | -1.808 ** |
| BASELINE 62 | | STEP62 | -1.556 ** | -1.552 ** | -1.961 ** | -1.796 ** |
| BASELINE 63 | | STEP63 | -2.328 ** | -2.326 ** | -2.009 ** | -1.844 ** |
| BASELINE 64 | | STEP64 | -1.197 ** | -1.180 ** | -1.557 ** | -1.375 ** |
| BASELINE 65 | | STEP65 | 1.030 ** | | 1.084 ** | |
| BASELINE 66 | | STEP66 | 0.886 ** | | 0.792 ** | |
| TIME TREND X STEP60 | | TIME60 | 0.069 ** | 0.066 ** | 0.060 ** | 0.062 ** |
| TIME TREND X STEP61 | | TIME61 | 0.042 | 0.042 | 0.082 ** | 0.085 ** |
| TIME TREND X STEP62 | | TIME62 | 0.030 | 0.030 | 0.062 ^ | 0.065 ^ |
| TIME TREND X STEP63 | | TIME63 | 0.120 ^ | 0.122 * | 0.064 | 0.067 |
| UNATTACHED | | NTMRDI | -0.443 ** | -0.429 ** | -0.416 ** | -0.514 ** |
| FAMILY SIZE | (log) | FMSZ_I | -1.825 ** | -1.623 ** | -0.976 ** | -1.093 ** |
| PERMANENT INCOME | (log) | PERMI | 0.287 ** | 0.345 ** | 0.395 ** | 0.345 ** |
| EMPLOYMENT INCOME | (log) | EMPLI | -0.655 ** | -0.795 ** | -0.651 ** | -0.690 ** |
| SELF-EMPLOYMENT INCOME | (log) | SEMPI | -0.816 ** | -1.061 ** | -0.781 ** | -0.895 ** |
| RETURNS ON WEALTH | (log) | WLTHI | -0.109 * | -0.157 ** | 0.034 | 0.050 |
| PENSION INCOME | (log) | PENSI | 0.263 ** | 0.359 ** | 0.411 ** | 0.467 ** |
| CPP INCOME | (log) | CPP__I | -0.723 ** | -0.618 ** | 0.111 | 0.192 |
| NON-TAXABLE INCOME | (log) | NTXI | -0.309 * | -0.235 | -0.165 | -0.188 |
| UI INCOME DUMMY | | UIDUM | 0.577 ** | 0.627 ** | 0.465 ** | 0.496 ** |
| YEARS RECEIVING UI | | UICNT | -0.119 ** | -0.139 ** | -0.090 ** | -0.100 ** |
| OUT OF LABOUR-FORCE DUMMY | | OTLFDUM | 0.312 ** | 0.306 ** | 0.314 ** | 0.257 ** |
| YEARS OUT OF LABOUR FORCE | | OTLFCNT | -0.134 ** | -0.184 ** | -0.208 ** | -0.269 ** |
| CURRENT DISABILITY DED | | DISADI | -0.163 | -0.716 | 1.416 ** | 1.449 ** |
| DISABILITY DED IN LAST YEAR | | DISADB | 0.177 | 0.374 | -1.545 ** | -1.506 ** |
| CURRENT MEDICAL EXP | (log) | MEDTT | 0.066 | -0.120 | -0.215 | -0.123 |
| MEDICAL EXP LAST YEAR | (log) | MEDTTB | -1.316 ** | -0.943 * | -0.285 | -0.273 |
| PERMANENT INCOME OF SPSE | (log) | PERMS | 0.185 ** | 0.229 ** | -0.133 * | -0.113 ^ |
| SPSE'S EMPLOYMENT INCOME | (log) | EMPLS | -0.049 | -0.068 | 0.039 | 0.004 |
| SPSE'S S-EMPLOYMENT INCOME | (log) | SEMPS | -0.351 ** | -0.353 ** | -0.014 | -0.043 |
| SPOUSE'S PENSION INCOME | (log) | PENSS | 0.235 ** | 0.259 ** | 0.301 ** | 0.320 ** |
| SPOUSE'S CPP INCOME | (log) | CPP__S | 0.199 * | 0.122 | 0.347 ** | 0.357 ** |
| NON-TAXABLE INCOME OF SPSE | (log) | NTXS | -0.022 | 0.134 | 0.112 | 0.113 |
| CURRENT DISAB DED BY SPSE | | DISADS | -0.015 | -0.052 | -0.437 | -0.485 ^ |
| DISAB DED BY SPSE LAST YR | | DISASB | -0.041 | 0.003 | 0.481 ^ | 0.470 ^ |
| PROV UNEMP RATE 55+ | | UNEMPI | 0.018 | 0.014 | 0.025 * | 0.020 ^ |
| URBAN POP 15,000-99,999 | | C3MAD | 0.205 ** | 0.252 ** | 0.177 ** | 0.265 ** |
| SMALL URBAN AND RURAL | | C5MAD | 0.096 ^ | 0.132 * | 0.088 ^ | 0.118 * |

** significant at 1% * significant at 5 ^ significant at 10%

# Appendix XXI (continued)

## Model Estimates

Table 21.3

| Unobserved Heterogeneity Model: Exit to Retired-Worker Benefits | | | | | |
|---|---|---|---|---|---|
| | | Women | Women | Men | Men |
| | | 2 types | 1 type | 2 types | 1 type |
| | s-size | 3660 | 3660 | 5250 | 5250 |
| N.B. Linear model is being used | -2LL | 17840 | 17840 | 26050 | 26050 |
| | -2LL model | 8838 | 8950 | 12400 | 12610 |
| **Description** | **Variable** | **Coeff** | **Coeff** | **Coeff** | **Coeff** |
| PROBABILITY OF BEING TYPE 1 | PROB1 | 0.135 ** | | 0.141 ** | |
| PROBABILITY OF BEING TYPE 2 | PROB2 | 0.865 ** | | 0.859 ** | |
| TYPE 1 INTERCEPT | INT1 | -8.959 ** | | -15.902 ** | |
| TYPE 2 INTERCEPT | INT2 | -1.314 ** | -1.331 ** | -1.509 ** | -1.511 ** |
| BASELINE 61 | STEP61 | -0.233 | -0.291 ^ | -0.417 ** | -0.500 ** |
| BASELINE 62 | STEP62 | -0.191 | -0.257 | -0.357 ^ | -0.430 * |
| BASELINE 63 | STEP63 | -0.917 * | -0.993 * | -0.313 | -0.508 ^ |
| BASELINE 64 | STEP64 | 0.353 ** | 0.149 | 0.231 * | -0.050 |
| BASELINE 65 | STEP65 | 8.438 ** | 2.392 ** | 15.635 ** | 2.518 ** |
| BASELINE 66 | STEP66 | 9.559 ** | 2.263 ** | 16.381 ** | 2.242 ** |
| TIME TREND X STEP60 | TIME60 | 0.074 ** | 0.075 ** | 0.060 ** | 0.062 ** |
| TIME TREND X STEP61 | TIME61 | 0.052 ^ | 0.049 ^ | 0.086 ** | 0.085 ** |
| TIME TREND X STEP62 | TIME62 | 0.045 | 0.037 | 0.070 * | 0.053 |
| TIME TREND X STEP63 | TIME63 | 0.134 * | 0.122 * | 0.067 | 0.062 |
| UNATTACHED | NTMRDI | -0.424 ** | -0.357 ** | -0.303 ** | -0.318 ** |
| FAMILY SIZE | FMSZ_I | -0.294 ** | -0.317 ** | -0.193 ** | -0.179 ** |
| PERMANENT INCOME | PERMI | 0.019 ** | 0.007 ** | 0.005 ** | 0.002 ** |
| EMPLOYMENT INCOME | EMPLI | -0.028 ** | -0.017 ** | -0.012 ** | -0.008 ** |
| SELF-EMPLOYMENT INCOME | SEMPI | -0.036 ** | -0.022 ** | -0.020 ** | -0.013 ** |
| RETURNS ON WEALTH | WLTHI | -0.018 ** | -0.006 ** | -0.001 | -0.002 ^ |
| PENSION INCOME | PENSI | 0.008 ** | 0.008 * | 0.023 ** | 0.011 ** |
| CPP INCOME | CPP__I | -0.081 ** | -0.082 ** | 0.106 ^ | -0.028 |
| NON-TAXABLE INCOME | NTXI | -0.045 * | -0.038 * | -0.015 | -0.021 * |
| UI INCOME DUMMY | UIDUM | 0.746 ** | 0.715 ** | 0.543 ** | 0.518 ** |
| YEARS RECEIVING UI | UICNT | -0.069 ^ | -0.120 ** | -0.063 ^ | -0.088 ** |
| OUT OF LABOUR-FORCE DUMMY | OTLFDUM | 0.782 ** | 0.807 ** | 0.894 ** | 0.985 ** |
| YEARS OUT OF LABOUR FORCE | OTLFCNT | -0.029 | -0.139 ** | -0.151 ** | -0.180 ** |
| CURRENT DISABILITY DED | DISADI | -0.241 | -0.114 | 1.582 ** | 1.363 ** |
| DISABILITY DED IN LAST YEAR | DISADB | -0.058 | 0.087 | -1.493 ** | -1.494 ** |
| CURRENT MEDICAL EXP | MEDTT | 0.052 | 0.016 | 0.007 | -0.008 |
| MEDICAL EXP LAST YEAR | MEDTTB | -0.195 ** | -0.155 ** | -0.018 | -0.003 |
| PERMANENT INCOME OF SPSE | PERMS | 0.005 ** | 0.001 | 0.006 * | 0.001 |
| SPSE'S EMPLOYMENT INCOME | EMPLS | -0.003 * | 0.000 | -0.006 * | -0.002 |
| SPSE'S S-EMPLOYMENT INCOME | SEMPS | -0.005 ** | -0.002 * | -0.020 ** | -0.016 * |
| SPOUSE'S PENSION INCOME | PENSS | 0.013 ** | 0.011 ** | 0.004 | 0.006 |
| SPOUSE'S CPP INCOME | CPP__S | 0.027 ** | 0.034 ** | 0.044 ** | 0.037 ** |
| NON-TAXABLE INCOME OF SPSE | NTXS | 0.001 | 0.000 | 0.015 | 0.012 |
| CURRENT DISAB DED BY SPSE | DISADS | -0.155 | -0.070 | -0.542 * | -0.539 * |
| DISAB DED BY SPSE LAST YR | DISASB | 0.091 | -0.018 | 0.591 * | 0.561 * |
| PROV UNEMP RATE 55+ | UNEMPI | 0.010 | 0.016 | 0.031 ** | 0.027 ** |
| URBAN POP 15,000-99,999 | C3MAD | 0.316 ** | 0.210 ** | 0.225 ** | 0.175 ** |
| SMALL URBAN AND RURAL | C5MAD | 0.177 ** | 0.090 | 0.147 ** | 0.076 ^ |

# Appendix XXII

# Predicted Probabilities of Retirement Model

Table 22.1

| Base Characteristics for Exit to Retired-worker Benefits | | |
|---|---|---|
| | women | men |
| initial age | 60 | 60 |
| initial year | 1987 | 1987 |
| | | |
| NTMRDI | 0 | 0 |
| FMSZ_I | 2 | 2 |
| PERMI | 25,377 | 50,613 |
| EMPLI | 15,715 | 35,131 |
| SEMPI | 667 | 4,146 |
| WLTHI | 10,944 | 8,232 |
| PENSI | 1,632 | 3,721 |
| CPP__I | 512 | 43 |
| NTXI | 286 | 276 |
| UIDUM | 0 | 0 |
| UICNT | 0 | 0 |
| OTLFDUM | 0 | 0 |
| OTLFCNT | 0 | 0 |
| DISADI | 0 | 0 |
| DISADB | 0 | 0 |
| MEDTT | 168 | 123 |
| MEDTTB | 168 | 123 |
| PERMS | 30,467 | 13,662 |
| EMPLS | 12,632 | 8,769 |
| SEMPS | 2,896 | 507 |
| PENSS | 3,868 | 518 |
| CPP__S | 1,812 | 353 |
| NTXS | 122 | 83 |
| DISADS | 0 | 0 |
| UNEMPI | 6.61% | 6.64% |
| C3MAD | 0 | 0 |
| C5MAD | 0 | 0 |

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.2

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Women at Different Ages**

| coeff | | unattached/attached (marital status) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| -0.424 ** | | age | | | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| attached | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| unattached | survival | 90.3% | 87.1% | 85.9% | 85.5% | 85.3% | 12.0% | 0.0% |
| attached | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| unattached | exit | 9.7% | 3.3% | 1.2% | 0.3% | 0.2% | 73.4% | 12.0% |

| coeff | | family size | | | | | | |
|---|---|---|---|---|---|---|---|---|
| -0.294 ** | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no children | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| two children | survival | 92.6% | 90.7% | 90.1% | 90.0% | 90.0% | 42.4% | 0.8% |
| four children | survival | 95.8% | 95.2% | 95.1% | 95.1% | 95.1% | 92.8% | 12.2% |
| no children | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| two children | exit | 7.4% | 1.9% | 0.6% | 0.1% | 0.1% | 47.6% | 41.6% |
| four children | exit | 4.2% | 0.6% | 0.1% | 0.0% | 0.0% | 2.2% | 80.7% |

| coeff | mean value | | permanent income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.019 ** | $25,377 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| $10,000 in perm. income | | survival | 90.3% | 86.9% | 85.7% | 85.3% | 85.1% | 11.8% | 0.0% |
| ave. perm. income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $50,000 in perm. income | | survival | 80.2% | 67.3% | 58.0% | 52.9% | 47.0% | 4.8% | 0.0% |
| $100,000 in perm. income | | survival | 57.0% | 19.5% | 3.3% | 0.5% | 0.1% | 0.0% | 0.0% |
| $10,000 in perm. income | | exit | 9.7% | 3.3% | 1.3% | 0.4% | 0.2% | 73.3% | 11.8% |
| ave. perm. income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $50,000 in perm. income | | exit | 19.8% | 12.9% | 9.3% | 5.1% | 5.9% | 42.2% | 4.8% |
| $100,000 in perm. income | | exit | 43.0% | 37.5% | 16.2% | 2.8% | 0.4% | 0.1% | 0.0% |

| coeff | mean value | | employment income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.028 ** | $15,715 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no emp. income | | survival | 80.8% | 68.6% | 60.0% | 55.4% | 50.2% | 5.4% | 0.0% |
| ave. emp. income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $50,000 in emp. income | | survival | 94.9% | 93.9% | 93.7% | 93.7% | 93.7% | 86.1% | 10.1% |
| $100,000 in emp. income | | survival | 98.7% | 98.7% | 98.7% | 98.7% | 98.7% | 98.7% | 97.4% |
| no emp. income | | exit | 19.2% | 12.2% | 8.6% | 4.6% | 5.2% | 44.7% | 5.4% |
| ave. emp. income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $50,000 in emp. income | | exit | 5.1% | 0.9% | 0.2% | 0.0% | 0.0% | 7.6% | 76.0% |
| $100,000 in emp. income | | exit | 1.3% | 0.1% | 0.0% | 0.0% | 0.0% | 0.0% | 13.0% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.3

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Women at Different Ages**

| coeff | mean value | | self-employment income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.036 ** | $667 | | age | | | | | | |
| characteristic | | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no self-emp. income | | survival | 86.8% | 80.9% | 77.8% | 76.6% | 75.7% | 10.1% | 0.0% |
| ave. self-emp. income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $25,000 in self-emp. income | | survival | 94.4% | 93.3% | 93.0% | 93.0% | 80.7% | 8.4% | 5.6% |
| $50,000 in self-emp. income | | survival | 97.7% | 97.5% | 97.5% | 97.5% | 97.5% | 97.4% | 45.0% |
| no self-emp. income | | exit | 13.2% | 6.0% | 3.1% | 1.2% | 0.9% | 65.7% | 10.1% |
| ave. self-emp. income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $25,000 in self-emp. income | | exit | 5.6% | 1.1% | 2.4% | 0.0% | 0.0% | 12.3% | 72.3% |
| $50,000 in self-emp. income | | exit | 2.3% | 0.2% | 0.0% | 0.0% | 0.0% | 0.1% | 52.4% |

| coeff | mean value | | returns on wealth | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.018 ** | $10,944 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no wealth income | | survival | 84.5% | 76.4% | 71.5% | 69.3% | 67.3% | 8.6% | 0.0% |
| ave. wealth income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $25,000 in returns on wealth | | survival | 89.9% | 86.3% | 84.9% | 84.5% | 84.2% | 11.4% | 0.0% |
| $50,000 in returns on wealth | | survival | 93.5% | 92.0% | 91.6% | 91.5% | 91.5% | 64.0% | 3.9% |
| no wealth income | | exit | 15.5% | 8.1% | 4.9% | 2.2% | 2.0% | 58.7% | 8.6% |
| ave. wealth income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $25,000 in returns on wealth | | exit | 10.1% | 3.6% | 1.4% | 4.1% | 0.3% | 72.8% | 11.4% |
| $50,000 in returns on wealth | | exit | 6.5% | 1.5% | 0.4% | 0.1% | 0.0% | 27.5% | 60.0% |

| coeff | mean value | | pension income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.008 ** | $1,632 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no pension income | | survival | 87.3% | 81.7% | 78.9% | 77.9% | 77.1% | 10.3% | 0.0% |
| ave. pension income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $25,000 in pension income | | survival | 84.6% | 76.5% | 71.7% | 69.5% | 67.5% | 8.7% | 0.0% |
| $50,000 in pension income | | survival | 81.4% | 69.8% | 61.8% | 57.6% | 53.0% | 6.0% | 0.0% |
| no pension income | | exit | 12.7% | 5.6% | 2.8% | 1.0% | 0.8% | 66.9% | 10.3% |
| ave. pension income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $25,000 in pension income | | exit | 15.4% | 8.1% | 4.8% | 2.1% | 2.0% | 58.9% | 8.7% |
| $50,000 in pension income | | exit | 18.6% | 11.5% | 8.0% | 4.2% | 4.6% | 47.0% | 6.0% |

| coeff | mean value | | CPP income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.081 ** | $512 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no CPP income | | survival | 86.6% | 80.5% | 77.3% | 76.0% | 75.0% | 9.9% | 0.0% |
| ave. CPP income | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $5,000 in CPP income | | survival | 90.8% | 87.9% | 86.8% | 86.5% | 86.4% | 13.6% | 0.0% |
| no CPP income | | exit | 13.4% | 6.2% | 3.2% | 1.2% | 1.0% | 65.1% | 9.9% |
| ave. CPP income | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $5,000 in CPP income | | exit | 9.2% | 2.9% | 1.1% | 0.3% | 0.2% | 72.8% | 13.6% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.4

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Women at Different Ages**

| coeff | | UI income dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.746 ** | | age | | | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no ui income | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| ui income every year | survival | 76.5% | 60.1% | 48.3% | 42.2% | 36.0% | 3.5% | 0.0% |
| no ui income | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| ui income every year | exit | 23.5% | 16.4% | 11.8% | 6.1% | 6.2% | 32.4% | 3.5% |

| coeff | | out of labour-force dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.782 ** | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| not out of labour force | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| out of labour force every year | survival | 74.9% | 56.0% | 41.1% | 32.7% | 23.2% | 1.2% | 0.0% |
| not out of labour force | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| out of labour force every year | exit | 25.1% | 18.9% | 14.8% | 8.5% | 9.5% | 22.0% | 1.2% |

| curr coeff | last year | | current/last year's disability deduction dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.241 | -0.058 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no disability deductions | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| disability ded both years | | survival | 90.2% | 86.9% | 85.7% | 85.3% | 85.1% | 11.8% | 0.0% |
| no disability deductions | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| disability ded both years | | exit | 9.8% | 3.3% | 1.3% | 0.4% | 0.2% | 73.3% | 11.8% |

| curr coeff | last year | mean value | current/last year's medical expenses | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.052 | -0.195 ** | $168 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no medical exp both yrs | | survival | 86.8% | 80.9% | 77.8% | 76.6% | 75.7% | 10.1% | 0.0% |
| ave. medical exp both yrs | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| $1,000 in medical exp both yrs | | survival | 88.5% | 83.8% | 81.8% | 81.1% | 80.6% | 10.8% | 0.0% |
| $2,000 in medical exp both yrs | | survival | 89.9% | 86.3% | 84.9% | 84.5% | 84.3% | 11.4% | 0.0% |
| no medical exp both yrs | | exit | 13.2% | 6.0% | 3.1% | 1.2% | 0.9% | 65.7% | 10.1% |
| ave. medical exp both yrs | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| $1,000 in medical exp both yrs | | exit | 11.5% | 4.6% | 2.1% | 0.7% | 0.5% | 69.8% | 10.8% |
| $2,000 in medical exp both yrs | | exit | 10.1% | 3.6% | 1.4% | 0.4% | 0.2% | 72.8% | 11.4% |

| curr coeff | last year | | current/last year's disability deduction of spouse | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.155 | 0.091 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no spousal dis. deductions | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| spousal dis. ded both years | | survival | 87.1% | 81.4% | 78.5% | 77.5% | 76.6% | 10.2% | 0.0% |
| no spousal dis. deductions | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |
| spousal dis. ded both years | | exit | 12.9% | 5.7% | 2.9% | 1.1% | 0.8% | 66.4% | 10.2% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.5

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Men at Different Ages**

| coeff | | unattached/attached (marital status) | | | | | | |
|---|---|---|---|---|---|---|---|---|
| -0.303 ** | | age | | | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| attached | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| unattached | survival | 88.1% | 82.7% | 79.9% | 78.3% | 77.0% | 10.4% | 0.0% |
| attached | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| unattached | exit | 11.9% | 5.4% | 2.8% | 1.7% | 1.3% | 66.6% | 10.4% |

| coeff | | family size | | | | | | |
|---|---|---|---|---|---|---|---|---|
| -0.193 ** | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no children | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| two children | survival | 90.5% | 87.1% | 85.6% | 84.9% | 84.5% | 11.8% | 0.0% |
| four children | survival | 93.4% | 91.8% | 91.3% | 91.1% | 91.1% | 12.8% | 0.0% |
| no children | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| two children | exit | 9.5% | 3.5% | 1.4% | 0.7% | 0.4% | 72.7% | 11.8% |
| four children | exit | 6.6% | 1.7% | 0.5% | 0.2% | 0.1% | 78.3% | 12.8% |

| coeff | mean value | | permanent income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.005 ** | $50,613 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| $10,000 in perm. income | | survival | 88.9% | 84.2% | 81.9% | 80.6% | 79.7% | 10.9% | 0.0% |
| $25,000 in perm. income | | survival | 88.0% | 82.6% | 79.7% | 78.0% | 76.7% | 10.3% | 0.0% |
| ave. perm. income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $100,000 in perm. income | | survival | 82.7% | 71.7% | 63.8% | 57.2% | 50.3% | 4.3% | 0.0% |
| $10,000 in perm. income | | exit | 11.1% | 4.7% | 2.3% | 1.3% | 0.9% | 68.8% | 10.9% |
| $25,000 in perm. income | | exit | 12.0% | 5.4% | 2.9% | 1.7% | 1.3% | 66.4% | 10.3% |
| ave. perm. income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $100,000 in perm. income | | exit | 17.3% | 11.0% | 8.0% | 6.5% | 7.0% | 46.0% | 4.3% |

| coeff | mean value | | employment income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.012 ** | $35,131 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no emp. income | | survival | 80.0% | 65.7% | 54.2% | 44.0% | 32.9% | 1.2% | 0.0% |
| ave. emp. income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $50,000 in emp. income | | survival | 88.5% | 83.5% | 81.0% | 79.5% | 78.4% | 10.7% | 0.0% |
| $100,000 in emp. income | | survival | 93.6% | 82.0% | 91.6% | 91.4% | 91.4% | 12.8% | 0.0% |
| no emp. income | | exit | 20.0% | 14.3% | 11.5% | 10.1% | 11.2% | 31.7% | 1.2% |
| ave. emp. income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $50,000 in emp. income | | exit | 11.5% | 5.0% | 2.5% | 1.4% | 1.1% | 67.8% | 10.7% |
| $100,000 in emp. income | | exit | 6.4% | 1.6% | 4.5% | 1.4% | 0.1% | 78.5% | 12.8% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.6

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Men at Different Ages**

| coeff | mean value | | self-employment income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.020 ** | $4,146 | | age | | | | | | |
| characteristic | | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no self-emp. income | | survival | 85.4% | 77.3% | 72.2% | 68.6% | 65.1% | 7.7% | 0.0% |
| ave. self-emp. income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $25,000 in self-emp. income | | survival | 90.8% | 87.5% | 86.2% | 85.5% | 85.2% | 11.9% | 0.0% |
| $50,000 in self-emp. income | | survival | 94.3% | 93.0% | 92.7% | 92.6% | 92.5% | 13.0% | 0.0% |
| no self-emp. income | | exit | 14.6% | 8.0% | 5.1% | 3.7% | 3.5% | 57.3% | 7.7% |
| ave. self-emp. income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $25,000 in self-emp. income | | exit | 9.2% | 3.3% | 1.3% | 0.6% | 0.4% | 73.3% | 11.9% |
| $50,000 in self-emp. income | | exit | 5.7% | 1.3% | 0.3% | 0.1% | 0.0% | 79.5% | 13.0% |

| coeff | mean value | | returns on wealth | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.001 | $8,232 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no wealth income | | survival | 86.3% | 79.3% | 75.1% | 72.3% | 69.7% | 8.8% | 0.0% |
| ave. wealth income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $25,000 in returns on wealth | | survival | 86.6% | 79.8% | 75.8% | 73.2% | 70.8% | 9.1% | 0.0% |
| $50,000 in returns on wealth | | survival | 86.8% | 80.3% | 76.5% | 74.0% | 71.9% | 9.3% | 0.0% |
| no wealth income | | exit | 13.7% | 7.1% | 4.2% | 2.8% | 2.5% | 60.9% | 8.8% |
| ave. wealth income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $25,000 in returns on wealth | | exit | 13.4% | 6.8% | 4.0% | 2.6% | 2.3% | 61.8% | 9.1% |
| $50,000 in returns on wealth | | exit | 13.2% | 6.6% | 3.8% | 2.5% | 2.1% | 62.6% | 9.3% |

| coeff | mean value | | pension income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.023 ** | $3,721 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no pension income | | survival | 87.4% | 81.4% | 78.1% | 76.1% | 74.4% | 9.8% | 0.0% |
| ave. pension income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $25,000 in pension income | | survival | 79.1% | 63.5% | 50.7% | 39.3% | 26.9% | 0.6% | 0.0% |
| $50,000 in pension income | | survival | 66.5% | 34.7% | 11.7% | 2.2% | 0.3% | 0.0% | 0.0% |
| no pension income | | exit | 12.6% | 6.0% | 3.3% | 2.1% | 1.7% | 64.6% | 9.8% |
| ave. pension income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $25,000 in pension income | | exit | 20.9% | 15.6% | 12.8% | 11.4% | 12.4% | 26.4% | 0.6% |
| $50,000 in pension income | | exit | 33.5% | 31.8% | 23.0% | 9.5% | 1.9% | 0.3% | 0.0% |

| coeff | mean value | | CPP income | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.106 ^ | $43 | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no CPP income | | survival | 86.5% | 79.6% | 75.5% | 72.8% | 70.4% | 9.0% | 0.0% |
| ave. CPP income | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $5,000 in CPP income | | survival | 78.3% | 61.7% | 47.9% | 35.5% | 22.4% | 0.3% | 0.0% |
| no CPP income | | exit | 13.5% | 6.9% | 4.1% | 2.7% | 2.4% | 61.4% | 9.0% |
| ave. CPP income | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $5,000 in CPP income | | survival | 21.7% | 16.6% | 13.8% | 12.4% | 13.1% | 22.1% | 0.3% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXII (continued)

## Predicted Probabilities of Retirement Model

Table 22.7

**Predicted Probability of Survival and Exit to Retired-worker Benefits for Men at Different Ages**

| coeff | | UI income dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.543 ** | | age | | | | | | |
| characteristic | prob type | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no ui income | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| ui income every year | survival | 79.1% | 64.5% | 53.6% | 45.1% | 36.9% | 2.5% | 0.0% |
| no ui income | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| ui income every year | exit | 20.9% | 14.6% | 10.9% | 8.6% | 8.2% | 34.3% | 2.5% |

| coeff | | out of labour-force dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 0.894 ** | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| not out of labour force | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| out of labour force every year | survival | 73.9% | 54.1% | 39.8% | 29.8% | 22.0% | 1.2% | 0.0% |
| not out of labour force | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| out of labour force every year | exit | 26.1% | 19.8% | 14.3% | 10.0% | 7.8% | 20.8% | 1.2% |

| curr coeff | last year | | current/last year's disability deduction dummy | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1.582 ** | -1.493 ** | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no disability deductions | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| disability ded both years | | survival | 85.3% | 77.1% | 72.0% | 68.2% | 64.6% | 7.6% | 0.0% |
| no disability deductions | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| disability ded both years | | exit | 14.7% | 8.1% | 5.2% | 3.7% | 3.6% | 57.0% | 7.6% |

| curr coeff | last year | mean value | current/last year's medical expenses | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 0.007 | -0.018 | $123 | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no medical exp both yrs | | survival | 86.4% | 79.4% | 75.3% | 72.5% | 70.0% | 8.9% | 0.0% |
| ave. medical exp both yrs | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| $1,000 in medical exp both yrs | | survival | 86.5% | 79.7% | 75.7% | 73.0% | 70.6% | 9.0% | 0.0% |
| $2,000 in medical exp both yrs | | survival | 86.7% | 79.9% | 76.0% | 73.5% | 71.2% | 9.1% | 0.0% |
| no medical exp both yrs | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.1% | 8.9% |
| ave. medical exp both yrs | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| $1,000 in medical exp both yrs | | | 13.5% | 6.9% | 4.0% | 2.7% | 2.4% | 61.6% | 9.0% |
| $2,000 in medical exp both yrs | | | 13.3% | 6.7% | 3.9% | 2.6% | 2.3% | 62.1% | 9.1% |

| curr coeff | last year | | current/last year's disability deduction of spouse | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| -0.542 * | 0.591 * | | 60 | 61 | 62 | 63 | 64 | 65 | 66 |
| no spousal dis. deductions | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| spousal dis. ded both years | | survival | 86.4% | 79.5% | 75.3% | 72.6% | 70.1% | 8.9% | 0.0% |
| no spousal dis. deductions | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |
| spousal dis. ded both years | | exit | 13.6% | 7.0% | 4.1% | 2.8% | 2.5% | 61.2% | 8.9% |

** significant at 1%  * significant at 5%  ^ significant at 10%

# Appendix XXIII

## Graphs of Baseline Hazard

Chart 23.1a

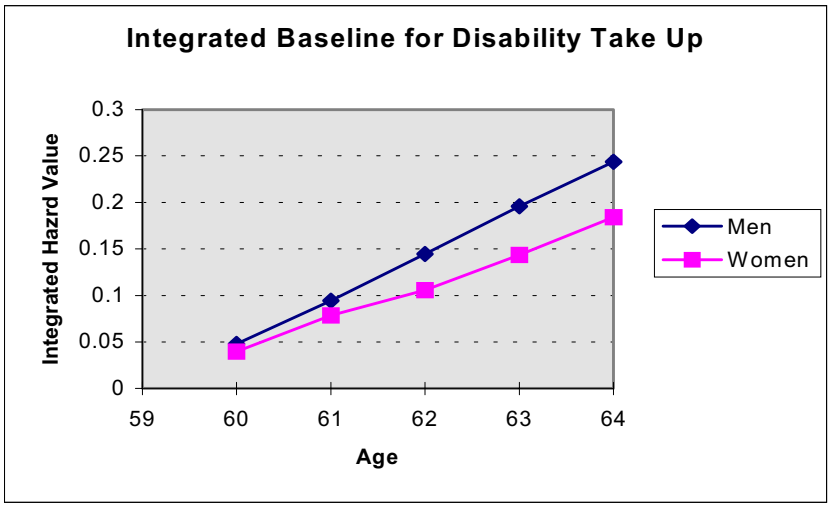
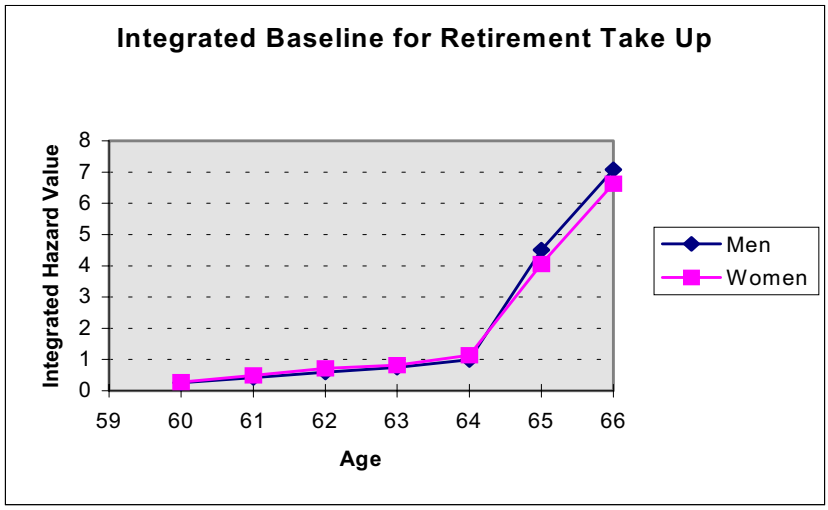



Chart 23.1b



## References

Allison, Paul D. Event History Analysis. Beverly Hills: Sage Publications, 1984.

Baker, Michael, and Dwayne Benjamin. "The Economics of Aging in Canada: A Survey of Some Issues and Preliminary Evidence." Paper presented at "Unemployment in the 1990s" Conference on July 17-21, 1995, Montreal.

Baker, Michael, and Dwayne Benjamin. "Early Retirement Provisions and the Labour Force Behaviour of Older Men: Evidence from Canada." Toronto: University of Toronto, March 1997. Unpublished manuscript.

Battle, Ken. "Pension Reform in Canada." Canadian Journal on Aging, 16.3 (Fall 1997): 519-552.

Berkovec, James, and Steven Stern. "Job Exit Behavior of Older Men." Econometrica, 59.1 (January 1991): 189-210.

Burbidge, John. Canadian Tax Paper No. 79: Social Security in Canada: An Economic Appraisal. Toronto: Canadian Tax Foundation, 1987.

Burbidge, John B., and A. Leslie Robb. "Pensions and Retirement Behaviour." Canadian Journal of Economics, 13.3 (August 1980): 421-437.

Campione, Wendy A. "The Married Woman's Retirement Decision: A Methodological Comparison." Journal of Gerontology, 42.4 (1987): 381-386.

"Canada Pension Plan Investment Board Act: Chapter 40." Canada Gazette III, 20.3 (February 2, 1998): 1-98.

CCH Canadian Limited. Canadian Employment Benefits and Pension Guide Reports V. 1. North York: CCH Canadian Limited, 1995.

Clark, Colleen. An Introduction to the Longitudinal Administrative DataBank (LAD). Ottawa: Statistics Canada, Small Area Administrative Data Division, 1997.

Clark, Robert L., Thomas Johnson, and Ann Archibald McDermed. "Allocation of Time and Resources by Married Couples Approaching Retirement." Social Security Bulletin, 43.4 (April 1980): 3-16.

CPP Advisory Committee. Review of the Objectives of the CPP. Ottawa: Health and Welfare Canada, 1978.

CPP Advisory Committee. Retirement Ages Ottawa: Health and Welfare Canada, 1980.

"Debates of the Senate." Official Report (Hansard), 1st S. 36th P. 137.34 (December 17, 1997): 838-869.

Diamond, Peter A., and Jerry A. Hausman. "The Retirement and Unemployment Behavior of Older Men." Retirement and Economic Behavior, Henry J. Aaron and Gary Burtless, eds. Washington: The Brookings Institute, 1984a. 97-134.

Diamond, Peter A., and Jerry A. Hausman. "Individual Retirement and Savings Behaviour." Journal of Public Economics, 23 (1984b): 81-114.

"Economy." Canadian Consumer, 6 (August 1981): 43.

Grad, Susan. "Income Changes at Retirement." Social Security Bulletin, 53.1 (January 1990): 2-10.

"Groping for Pension Reform." Perceptions, 6 (Spring/Summer 1993): 26-27.

Grossman, Michael. The Demand for Health: A Theoretical and Empirical Investigation. New York: National Bureau of Economic Research, 1972.

Gustman, Alan L., and Thomas L. Steinmeier. "A Structural Retirement Model." Econometrica, 54.3 (May 1986): 555-84.

Gustman, Alan L., and Thomas L. Steinmeier. "A Disaggregated, Structural Analysis of Retirement by Race, Difficulty of Work and Health." Review of Economics and Statistics, 68.3 (August 1986): 509-513.

Hamermesh, Daniel S. "Expectations, Life Expectancy, and Economic Behavior." Quarterly Journal of Economics, 10.2 (May 1985): 389-408.

Han, Aaron, and Jerry A. Hausman. "Flexible Parametric Estimation of Duration and Competing Risk Models." Journal of Applied Economics, 5 (1990): 1-28.

Hanoch, Giora, and Marjorie Honig. "Retirement, Wages, and Labor Supply of the Elderly." Journal of Labor Economics, 1.2 (1983): 131-151.

Harris, Shelly, and Daniella Lucaciu. An Overview of the T1FF Creation: LAD Reports Ref. #24-01E V1.3. Ottawa: Statistics Canada, Small Area Administrative Data Division, 1995.

Hausman, Jerry A., and David A. Wise. "Social Security, Health Status, and Retirement." Pension, Labor, and Individual Choice, David A. Wise, ed. Chicago: University of Chicago Press, 1985. 159-191.

Henretta, John C., and Angela M. O'Rand. "Labor-Force Participation of Older Married Women." Social Security Bulletin, 43.8 (August 1980): 10-16.

Heckman, J., and B. Singer. "A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data." Econometrica, 52.2 (March 1984): 271-320.

Honig, Marjorie, and Cordelia Reimers. "Retirement, Re-entry, and Part-time Work." Eastern Economic Journal, 13.4 (October-December 1987): 361-371.

Human Resources Development. Unpublished Data on Canada Pension Plan Data by Income Security Programs, Planning and Strategic Studies. Ottawa: Human Resources Development, 1997.

Hurd, Michael D. "Research in the Elderly: Economic Status, Retirement, and Consumption and Savings." Journal of Economic Literature, 28 (June 1990): 565-637.

Hurd, Michael D. "The Joint Retirement Decision of Husbands and Wives." Issues in the Economics of Aging, David A. Wise, ed. Chicago: University of Chicago Press, 1990. 231-258.

Iams, Howard M. "Employment of Retired-Worker Women." Social Security Bulletin, 49.3 March 1986): 5-13.

Kiefer, Nicholas M. "Economic Duration Data and Hazard Functions." Journal of Economic Literature, 26 (June 1988): 646-679.

Kiefer, Nicholas M. "Econometric Methods For Grouped Duration Data." Panel Data and Labour Market Studies, Hartog, J., G. Ridder and J Theeuwes, eds. Amsterdam: Elsevier Science Publishers B. V.(North-Holland), 1990: 97-117.

Lancaster, Tony. The Econometric Analysis of Transition Data. Cambridge: Cambridge University Press, 1990.

Lumsdaine, Robin L., and David A. Wise. "Aging and Labor Force Participation: A Review of Trends and Explanations." Aging in the United States and Japan: Economic Trends, Noguchi, Yukio, and David A. Wise, eds. Chicago: University of Chicago Press, 1994. 7-41.

McCarty, Therese A. "The Effect of Social Security on Married Women's Labor Force Participation." National Tax Journal, 43.1 (March 1990): 95-110.

McDonald, Lynn, Peter Donahue, and Brooke Moore. "Independence and Economic Security of the Older Population." IESOP Research Paper, 29 (April 1998): 1-51.

Muurinen, Jaana-Marja. "Demand for Health: A Generalised Grossman Model." Journal of Health Economics, 1 (1982): 5-28.

Meyer, Bruce D. " Unemployment Insurance and Unemployment Spells." Econometrica, 58.4 (July 1990): 757-82.

"Now You Can Retire at 60 or Defer Pension Past 65." Montreal Gazette, (January 9, 1984): A4.

"Pension Improvements Considered by Quebec." Globe and Mail, (May 12, 1982): B3.

Pozzebon, Silvana, and Olivia S. Mitchell. "Married Women's Retirement Behavior." Journal of Population Economics, 2 (1989): 39-53.

Poulin, Susan. "Dual-Pensioner Families." Perspectives on Labour and Income, (Autumn 1996): 24-29.

Prentice, R. L., and L. A. Gloeckler. "Regression Analysis of Grouped Survival Data with Application to Breast Cancer Data." Biometrics, 34 (March 1978): 57-67.

"QPP Overhaul-- or Just Premium Rise?" Globe and Mail, (May 31, 1982): R3.

"Quebec Pension Law Widens Gap Between Rich and Poor." Montreal Gazette, (June 18, 1983): B5.

Reimers, Cordelia, and Marjorie Honig. "Responses to Social Security by Men and Women." Journal of Human Resources, 21.2 (Spring 1996): 559-582.

"Report on Insurance and Pensions." Globe and Mail, (May 30, 1993): R1-R10.

Sickles, Robin C., and Paul Taubman. "An Analysis of the Health and Retirement Status of the Elderly." Econometrica, 54.6 (November 1986): 1339-56.

Statistics Canada. Health Reports: Life Tables, Canada and Provinces 1985-1997--Cat No. 82-003S. Supplement No. 13 Volume 2, Number 4 1990, Ottawa: Ministry of Supply and Services, 1991.

Statistics Canada. Unpublished Charts and Graphs by the Small Area and Administrative Data Division. Ottawa: Statistics Canada, 1997.

Statistics Canada. "Table 9: Historical Estimates of Average Weekly Earnings." Employment, Earnings and Hours -- Cat No. 72-002. Ottawa: Statistics Canada, 1996.

Statistics Canada. CANSIM -- various series. Ottawa: Statistics Canada.

Sweetman, Arthur. Three Essays on Firm-Worker Separations. Hamilton: Ph.D. thesis for McMaster University, 1996.

Vistnes, Jessica Primoff. "An Empirical Analysis of Married Women's Retirement Decisions." National Tax Journal, 47.1 (March 1994): 135-155.

Wilkins, Kathryn, and Evelyn Park. "Chronic Conditions, Physical Limitations and Dependency among Seniors Living in the Community." Health Reports, 8.3 (Winter 1996): 7-15.

Weaver, David A. "The Work and Retirement Decisions of Older Women: A Literature Review." Social Security Bulletin, 57.1 (Spring 1994): 3-24.

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