Determinants of Retirement:
Does Money Really Matter?

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Department of Finance Working Paper
2001-02

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* The author would like to thank Timothy Sargent and Jeremy Rudin for many helpful conversations, David Green, Peter Hicks and participants in the ESPAD and structural section workshops for their insightful comments. I would also like to thank Phil Giles and Daniel Dekoker at Statistics Canada for their help in accessing the internal files of SLID. The views expressed in this paper are my own and should not be attributed to the Department of Finance.

ABSTRACT

The worker to non-worker ratio in Canada is forecasted to fall dramatically over the next few decades due both to demographic pressures and the recent decline in the average age of retirement. If governments desire to reverse these trends, it is necessary to determine whether altering Canada's retirement income programs may impact retirement decisions. This analysis focuses on the CPP/QPP program using the internal longitudinal files of the Survey of Labour and Income Dynamics (SLID) and concludes that limited changes to CPP/QPP benefit levels will not have a large impact on the labour force behaviour of older workers. CPP/QPP benefits can affect retirement through two channels – by altering the relative benefits of work (the substitution effect) and by changing the net present value of lifetime wealth (the wealth effect). We first demonstrate that retirement and CPP/QPP benefit take-up are not temporally connected for most Canadians. This means that the substitution effect is unlikely to have an important impact on retirement decisions. We then use hazard regressions and ordered probit analyses to determine which factors influence retirement behaviour. We find no evidence that expected CPP/QPP benefits or current wage levels influence the retirement decision. This result provides further evidence that CPP/QPP benefits are not having a large impact on retirement through the substitution effect. We also find no evidence that wealth affects the retirement decision. Instead, demographic factors such as disability status, labour force status of spouse and class of worker dominate the regressions. This does not necessarily mean that the CPP/QPP program does not influence retirement, only that its influence is likely to be embedded in the structure of the program and the existence of borrowing constraints rather than through the benefit levels. However, the results also indicate that structural changes may not be required in order to raise the retirement age. Variables that do have a strong effect on retirement behaviour are moving in directions that may result in a reversal of the early retirement trend.

1. INTRODUCTION

Over the past number of years there has been increasing interest in retirement from the workforce. This interest is not surprising given current demographic forecasts. In 1997 the proportion of non-working to working-age Canadians stood at 18 per cent and is expected to rise to over 40 per cent by 2050. (PRI, February 1999) While the non-workers include individuals at both ends of the life cycle, the forecasted increase is entirely due to a rise in the number of non-working seniors.

For a number of reasons, governments may want to see this trend reversed. A dramatic increase in the proportion of non-working Canadians may strain government finances. A relatively small group of taxpayers would shoulder the tax burden for a large group of benefit recipients, and a reduction in the labour force may reduce the economy's ability to grow. Assuming that a reversal of the trend towards early retirement is desirable, are there potential policy levers that might raise the age of retirement?

There are a number of public retirement programs in Canada that may affect the retirement decision. The Old Age Security Program (OAS) is an age-based transfer that provides income to all seniors 65 years and older who meet minimum residency requirements. The Guaranteed Income Supplement (GIS) is an age-based and means-based transfer that supplements the OAS for low-income seniors. The Spouse's Allowance (SPA) provides income for seniors aged 60-64 who are married to pensioners. These programs may create retirement incentives for individuals over the age of 65 and for married individuals whose spouse is a pensioner. Note that none of these programs requires withdrawal from the labour force in order to receive benefits, although they do have tax-back provisions that reduce the returns to work after age 65.

The CPP/QPP is a public, pay-as-you-go pension plan. Benefit entitlements depend on the number of contributory years in the program and the level of contributions. Prior to 1987, benefits could be received no earlier than an individual's 65th birthday. Since then, individuals can choose to begin receiving benefits as early as age 60 or as late as age 70, subject to actuarial adjustments. An individual must retire from employment in order to claim CPP/QPP benefits, but may then re-enter the workforce without penalty. (For a complete description of Canada's retirement income system see Baker et al, 2000).

The main focus of this paper is the CPP/QPP program and its possible impacts on retirement behaviour. Currently, the average retirement age in Canada is approximately 62 years for men, slightly lower for women. Besides the spousal benefits, which are

available only to a select group of individuals, the CPP/QPP benefit is the only publicly provided benefit available at the current average retirement age.

The paper proceeds in the following manner. In the next section we provide a conceptual overview of the paper. Section three provides a brief discussion of past studies that link retirement behaviour and government pensions. Following a description of the data in section four, in section five we examine the timing of retirement and take-up of CPP/QPP benefits to determine how closely the two are related. Section six provides an overview of retirement in Canada using survival analysis. Here we outline how major demographic variables – sex, education, immigration status and earnings group – effect the probability of remaining in the workforce. Section seven presents ordered probit analyses that allow for a wider selection of covariates than are available in the duration analysis. We conclude with a summary and policy implications.

2. CONCEPTUAL OVERVIEW

There are a number of possible adjustments to the CPP/QPP program that may affect the decision to retire. These include reducing the early retirement benefits to make early retirement less attractive; raising the minimum age of benefit receipt to 62 years with full benefits available at 67; eliminating the early retirement provisions altogether; eliminating the work stoppage requirement; and increasing the number of drop-out years to ensure that individuals aren't penalized for part-time work at the end of their career. Program changes may influence the age of retirement both directly by altering the monetary benefits of retiring, and indirectly by influencing the social norm idea of a 'retirement age'. The second effect is more qualitative in nature, and thus very difficult to measure.

In terms of the monetary effect, program adjustments affect the retirement decision through two channels – by altering the lifetime wealth of an individual and by changing the relative costs of labour and leisure. For example, consider an adjustment to the early retirement benefit formula that would reduce the amount of benefits available at age 60. An individual retiring at age sixty would experience a reduction in lifetime wealth, since the present value of his CPP/QPP retirement benefits would be less than it was prior to the program change. In addition, if individuals were required to completely retire from the labour force upon receiving benefits, the reward to working past the age of 60 would increase. This is because the relative cost of leisure is equivalent to the wage earned

minus the pension benefits available. A reduction in available benefits increases the cost of leisure, thus raising the relative rewards of work. Both the wealth effect and the substitution effect work in the same direction. If the retirement decision is influenced by these changes in wealth and the rewards to working, the individual would delay retirement.

A. Substitution Effect

What would we expect to see in the data if the substitution effect were important? Much depends on whether benefit take-up requires a cessation of work. If not, then there is no substitution effect, because individuals do not need to substitute from work to leisure to receive benefits. When there is a work stoppage requirement we would expect to see the following:

i. A strong link between the timing of retirement from the workforce and eligibility for benefits. In particular, we would expect to see a large increase in retirement around the age of entitlement to the benefit. This is because up to the age when one can receive retirement benefits, the price of leisure is equal to the wage earned (w). Once the age of eligibility for benefits is reached, the price of leisure falls by the amount of the benefit (b) to be equal to the difference between the wage and the benefit.

ii. A positive correlation between the amount of benefits someone is entitled to, and the probability of them being retired. The price of leisure is lower for individuals with higher benefit entitlements, holding wage constant. This effect should be observed on and after the age of eligibility for benefits.

iii. A negative correlation between the wage and retirement. Higher wages raise the price of leisure both before and after the age of eligibility for benefits.

Of course, to observe these correlations in the data we would also have to control for wealth and other factors that influence retirement.

B. Wealth Effect

What would we expect to see if the wealth effect were important? Normally we would expect that individuals with more assets would retire earlier. Because leisure is a normal good, individuals with higher wealth would want to 'purchase' more leisure by retiring at an earlier age. However, there are a number of issues to consider which complicate the empirical identification of the wealth effect.

Identifying the wealth effect of CPP/QPP benefits is harder than identifying the substitution effect because, at least in a simple life cycle model, there is no necessary *temporal* link between being eligible for benefits and the retirement date. Changes in benefits that affect lifetime wealth will change the timing of retirement even if the receipt of those benefits takes place several years before or after retirement: what matters for the retirement decision is the net present value of all future benefits whenever they are collected. Note though, this conclusion would be modified if there are borrowing constraints. In this case, individuals cannot easily shift future income into the present, and those individuals without significant savings may be forced to tie their retirement date much more closely to the receipt of benefits.

The influence of other types of wealth on the retirement decision should be similar to the wealth effect of CPP/QPP benefits. Because we are unable to calculate the net present value of CPP/QPP benefits with the data available, we instead consider the effect of other wealth variables. However, this causes a further complication. Compared to CPP/QPP benefits, wealth that is accumulated voluntarily by the individual is more likely to be endogenous to the retirement decision, because the level of wealth is chosen by individuals to realise their retirement plans. Thus, someone who expects to live longer may save more, accumulate more wealth and retire later than someone with a shorter life expectancy. We would then observe people with more wealth retiring later, but this would not be because having more wealth *per se* makes you want to retire later.

To some extent we can control for these effects using covariates and by using longitudinal data. However, what we really need for proper identification is variation in wealth (through bequests for example) that is not endogenous to the retirement decision. Unfortunately, it is impossible to know the extent to which this is the case in our data.

3. CURRENT RESEARCH

The importance of ageing in many industrialized countries is apparent in the increasing number of studies on social security and labour force participation. The studies generally agree that age, poor health, having a non-working spouse, and poor labour market conditions are important determinants of retirement. Evidence on possible effects of pensions is mixed across and often within countries. A few interesting examples are noted below.

The United States

There is some evidence that Social Security in the U.S. has a disincentive effect on labour supply. The retirement hazard in the United States shows pronounced spikes at ages 62, and 65. These spikes are most often attributed to the early and normal retirement ages for Social Security. (Coile and Gruber, 2000)

Blau (1998) presents some evidence to suggest that social security benefits have a positive and statistically significant effect on the joint retirement decisions of married couples during the 1970s. However, the results suggest that social security creates disincentives to work after age 65 but increases labour supply at younger ages. His results cannot therefore help to explain the early retirement trend. Honig (1998) suggests that among women, expected social security benefits have a negative effect on the expected probability of working past the age of 62. However, the coefficient is not statistically significant.

Britain

Blundell and Johnson (1988) and Meghir and Whitehouse (1997) tackle the disincentive effects of social security and occupational pension schemes in Britain. The first paper uses a simulation technique to highlight the disincentives in the state system. The authors note that easy access to disability benefits creates considerable incentives for older low-to middle income earners without private pensions to leave the labour market. They do comment, however, that there has also been a fall in demand for lower-skilled workers over the past number of years. The fall in the retirement age may be a demand-side effect.

The second paper examines parametric hazard functions from work and from non-work to estimate the determinants of early retirement of British men. They find that individuals who are retired and are receiving benefits are less likely to return back to work than are those not receiving retirement benefits. Their results do not suggest that social security benefits influence the transition out of work but note that earnings have a negative effect on retirement. They also note that occupational pension plans play a major role in determining the age of retirement.

Germany

There have been a number of studies on the German system and its disincentive effects. Borsch-Supan (1992), Sikandar Siddiqui (1995) and Börsch-Supan and Schmidt (1996) Blau and Riphahn (1999) all conclude that the German social-security system strongly affects retirement behaviour[1]. The effect is large. The lack of actuarial fairness in the early retirement provisions is estimated to have a two-year effect on the retirement age.

The results in Germany, Britain and the U.S. suggest that the effect of government transfers may depend on the magnitude of the transfer. The results from the U.K. are often driven by the very generous disability benefits available. In Germany, where the disincentive effect is found to be large, the public system replaces 70 per cent of pre-retirement net earnings.

Canadian Studies

Michael Baker and Dwayne Benjamin (1999a, 1999b) of the University of Toronto have done a number of studies on retirement incentives using Canadian data. The authors exploit the timing of policy changes in the QPP and the CPP to determine whether alterations to the plans can account for behavioural changes. The first paper examines the behavioural response of men in the affected age groups to the removal of the earnings test in the 1970s [2]. Their results indicate that men delayed retirement past the age of 65 once their CPP pensions were not subject to an earnings test.

The second study focuses on the labour market adjustments to the inclusion of early retirement provisions into the CPP/QPP[3]. Although the workforce to population ratio decreases throughout the 1980s, they find no indication that the rate of decline is affected by the implementation of the early retirement provisions. While they do find a significant increase in the take-up of public pensions among the 60-64 year age group,

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[1] The effects are not statistically significant, however, in Blau and Riphahn (1999)

[2] When the plans began operations in 1966 any labour market earnings exceeding the monthly exempt earnings (1.5 per cent of the YMPE) was clawed back at a rate of 50 cents for each additional dollar earned. The pension was reduced by a further 50 cents for monthly earnings above 2.5 per cent of the YMPE. Therefore, after fairly low thresholds, all pension benefits were clawed back. These earnings tests were removed in stages during the 1970s. Since the earnings test was removed from the CPP and the QPP during different years, the authors can compare pre- and post- removal in the ROC and in Quebec with the benefit of a control group (the population in the alternate jurisdiction) facing common secular trends.

[3] Beginning in 1984 in Quebec and in 1987 in the rest of Canada, individuals were eligible to receive their pension benefits as early as age sixty, subject to actuarial adjustment and a retirement test.

there is a lack of any strong labour supply effect. They conclude that new pension beneficiaries were not men induced to retire early but rather men who would not have been employed anyway.

In a similar manner, Baker (1998) examines the effect of the introduction of the spouse's allowance on the joint retirement behaviour of married couples in the 1970s[4]. The introduction of the allowance provides an unambiguous incentive for eligible couples to withdraw from the labour force. Reduced employment rates and increased NLF rates among eligible males and females suggest that there was a definite labour response to these incentives.

Emile Tompa of McMaster University has undertaken research that looks at the retirement/pension issue in a different way. His study (1999) focuses on the age at which individuals take up CPP/QPP benefits, using linked tax files from Statistics Canada. His descriptive results confirm the Baker/Benjamin study on the effects of the 1987 amendments to the CPP, indicating that many who take up early CPP benefits were not induced to stop working, rather they were not likely to have been working with or without the availability of the benefits.

The principal findings of Tompa's regression analysis include a constant baseline probability of CPP take-up from age 60-64 for both men and women, a secular trend toward early receipt of benefits, evidence of joint take-up decisions and a higher probability of early take up among those who are out of the labour force or receiving UI benefits. Other labour market indicators – provincial unemployment rate, size of area of residence and urban/rural indicators – also effect the probability of early CPP take up. Higher permanent income and pension income increases the probability of early take up, while increased current income reduces the probability of early take up.

A recent study by Baker, Gruber and Milligan (2000) calculate detailed work disincentives of Canada's retirement income programs. The authors find that not only are there significant disincentives to work after age 60 but that the Canadian income security system is an important determinant of retirement.

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[4] In the 1970s, the two age related benefits of the Canadian income security system (the OAS and GIS) were available at age sixty-five, as was the CPP/QPP. Because females tend to marry older males and due to the prevalence of joint retirement, many couples would retire when the husband turned sixty-five with only his retirement pensions to rely upon. With the Spouse's Allowance, individuals could receive the age related social security benefits at age 60 if they were married to a pensioner. Since the policy affects only those with a spouse of certain age, the empirical strategy makes use of the age of the spouse to distinguish between individuals affected by the policy and those who fell outside its grasp.

To summarize, it is likely that the means tested age-based programs in Canada may create disincentives to work after the age of 65, especially those eligible for GIS benefits. The extension of certain benefits to younger spouses showed a marked decline in participation among affected groups. Eliminating these benefits or raising the eligibility age for OAS/GIS benefits past the age of 65 may increase the labour force participation of individuals who rely on these benefits for a large proportion of their retirement income.

However, evidence of the effects of Canada's income security program on early retirement is mixed. Prior changes that have been made to the CPP/QPP program do not seem to have produced changes in labour supply behaviour. This does not imply that future changes to the CPP/QPP program will not affect the labour supply of older workers. It is possible that prior changes to the CPP/QPP program may not have altered expected income or earnings enough to induce behaviour effect. It is also possible that previous changes to the CPP/QPP program affect behaviour in the long term. This was alluded to in the Baker and Benjamin (1998) and Tompa (1999) studies on the effect of the early retirement provisions. While both papers find no effect of the program changes on retirement patterns directly following their introduction, they note that such changes are more likely to have an affect on future birth cohorts, once the provisions are internalized.

4. THE DATA

The data employed in the following analyses are the internal files of the Survey of Labour and Income Dynamics (SLID) covering 1993-1996. SLID is a longitudinal data set providing information on a sample which is weighted to be representative of the Canadian population. There are many advantages to using this data set when studying labour market transitions, advantages that have not been available in Canada previously. Data is collected for each member of a household and it is possible to link household and family members. Income information is most often obtained directly from tax files, ensuring that the information is complete and accurate. Finally, labour market information is available on a weekly, monthly and annual basis, allowing us to follow individuals in great detail for the full four years.

5. RETIREMENT AND THE TAKE-UP OF CPP/QPP BENEFITS

This section considers the temporal link between retirement from the workforce and the take-up of CPP/QPP benefits. The timing of these two processes indicates the importance of the substitution effect of benefits on the retirement decision. If an individual retires prior to being eligible for benefits or if she decides to delay take-up of benefits then the substitution effect of CPP/QPP benefits has not influenced her retirement decision. Also, if an individual does not stop work when receiving benefits, the timing of his eventual retirement will be influenced only by the wealth effect of the CPP/QPP. Regulations of the CPP/QPP system do require a work stoppage in order to begin receiving benefits, but returning to work is not prohibited. If individuals return to work after receiving benefits, the substitution effect may still enter the retirement decision, but its effect is weakened by the ability of the individual to return to employment that provides comparable compensation as the pre-retirement position.

Table 1 shows the CPP/QPP and labour force status combinations observed in the SLID data. The sample includes all individuals over the age of 60 who are neither disabled nor widowed.[5] It is apparent from the chart that CPP receipt is correlated with labour force status. The majority of those fully employed do not receive CPP/QPP, the majority of those out of the workforce do. However, there are a number of individuals receiving CPP who work full-time, full year (28.7 per cent of fully-employed males, 20.6 per cent of fully-employed female) and a number of non-employed who do not receive CPP benefits (12.7 per cent of non-employed men, 41.8 per cent of non-employed women).

[5] The CPP/QPP information in the SLID does not allow a breakdown by type of benefits received. To focus on retirement benefits only, we exclude widows and the disabled from the analysis.

Table 1 – CPP Receipt by Work Force Status.

Annual LF Status	Row %	MEN (60+)		WOMEN (60+)	
	Column %	No CPP	CPP	No CPP	CPP
Fully Employed		71.3	28.7	79.4	20.6
		54.9	10.3	16.0	3.6
Partially Employed		28.6	71.4	46.5	53.5
		19.6	22.7	19.1	19.0
Out of the Workforce		12.7	87.3	41.8	58.2
		20.4	65.3	63.6	76.4

To provide a more precise indication of how closely the onset of retirement and the take-up of benefits are related, we examine at the labour force attachments of new recipients - individuals who did not receive CPP/QPP in year one, but received benefits in year two (Figure 1). While the joint retirement/CPP take-up is the most common situation for the male sample, with at least 40 per cent of new recipients being new retirees[6], this close link is not universal. Close to 17 per cent of men have no discernible break in their employment when they take up benefits. Over 23 per cent of men have been retired for over a year before they begin to receive benefits[7].

The link for women is considerably weaker. Most women are out of the workforce for at least twelve months before they receive CPP benefits. This is likely a result of the earlier retirement of women relative to their spouse. It may not be necessary or worthwhile to take-up CPP payments while their spouse is still employed.

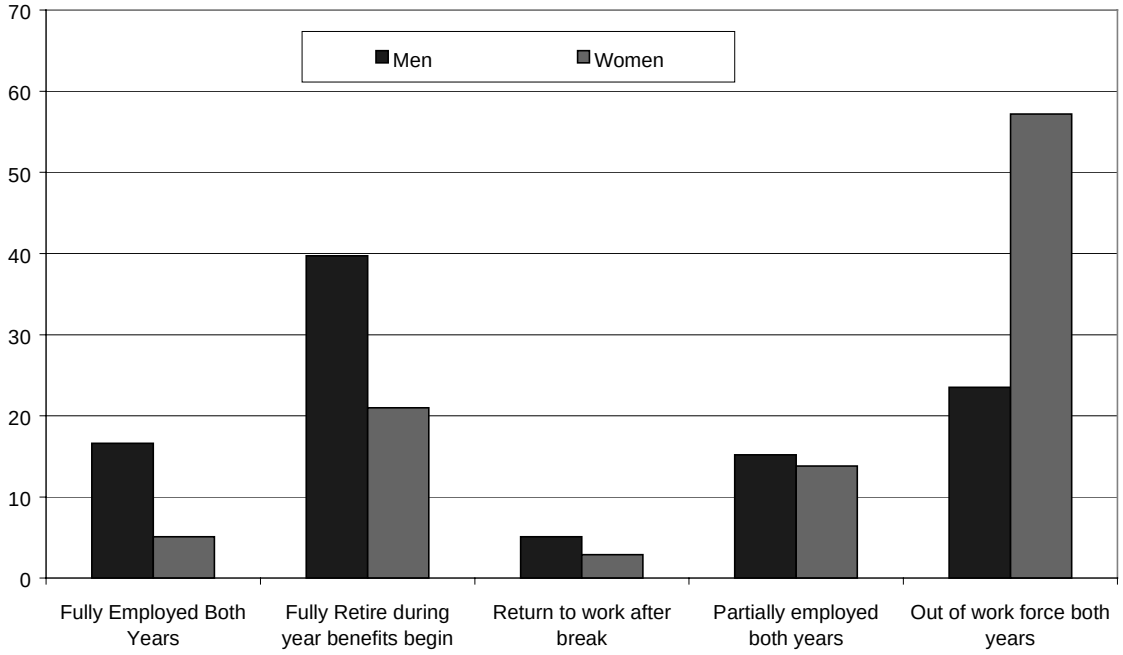
In summary, we note that for the majority of Canadians, the timing of retirement and the take-up of CPP/QPP benefits are only loosely connected. Although for some Canadians these two processes occur jointly, for many others there is a long span of time between retirement and the collection of benefits. This group includes individuals who retire

6 This percentage could be as high as 55 per cent - the category 'Partially employed in both years' includes individuals who fully retired in year two following a partial year of employment in year one as well as those individuals who work part-time through both years.

7 The breakdown was also calculated for immigrant and non-immigrant populations, with similar results.

several years prior to receiving benefits, individuals who collect benefits without a discernible break in employment (often the self-employed) and individuals who return to work following the take-up of CPP/QPP benefits. The more disconnected retirement from the labour force and take-up of benefits, the lower the impact of the substitution effect of CPP/QPP benefits. Although work disincentives exist and may affect the behaviour of certain individuals, we argue that for most Canadians work disincentives do not seem to be having an important impact. Further, with increasing flexibility in the labour market and the strong upsurge in self-employment during the 1990s it is possible that the timing of retirement and benefit receipt will become even less connected.

Figure 1 - Labour Force Attachment of New CPP/QPP Recipients



6. SURVIVAL AND HAZARD ESTIMATIONS OF RETIREMENT FROM THE WORKFORCE

To examine the factors affecting retirement from the workforce, we employ two techniques – hazard rate analyses and ordered probit analyses. Hazard rate analyses allow us to determine the probability of exiting the workforce at each age, and permits the calculation of the average retirement age. However, due to the structure of the data, we can only use a small number of covariates in this analysis. Hazard analyses calculate the conditional probability of retiring for each period in which the person is at risk of retiring – in our case, for each month after fifty years of age. Covariates included in

survival analyses must be either time invariant (constant over each year), or, if time specific, we must have information for each period. The data provides only four years of information. Many characteristics that may affect the retirement hazard (i.e. employment status of spouse, occupation, disability status) are not likely to be constant after the age of fifty but unfortunately retrospective information on these variables is not available in the data.

The ordered probit models outlined in section 7 allow for a wider variety of covariates. These models are concerned with only the current labour force status of the individual and thus require only the current covariates. Although these models do not allow for the calculation of hazard rates, they provide further information on which factors may affect an individuals decision to retire.

6.1 Age Pattern of Retirement in Canada

The average retirement age is calculated using survival analyses. The sample of interest are individuals who have worked in the paid labour market after the age of fifty[8], including both retirees (non-censored observations) and non-retirees (censored observations). To be defined as retired we require that individuals be out of the work force for all of 1996 (the last year of data available when the analysis began). Individuals who are observed in the workforce at some point during 1996 are considered to be non-retirees. We consider this group censored as at December 1995.[9]

We determine each individual's age at the time of retirement, or at the point of censoring, and calculate the number of years past the age of 50 each person survived in the workforce. It should be noted that the results presented use a definition of retirement that requires only that a person be out of the workforce for the years observed. This may include both time spent unemployed and time out of the labour force, however we consider this to be a reasonable definition of retirement. The distinction between months spent in unemployment or outside the labour force may be blurred, especially for older

[8] Excluded are individuals who leave the paid labour market at an early age, for example to care for children or parents. Including these individuals would reduce the average age of retirement.

[9] The censoring date is set at December 1995 since we have placed a restriction that individuals be out of the work force for an entire year in order to be labelled 'retired'. We may observe individuals exiting the workforce in 1996, however we do not have information to know if these exits are long-term. To avoid including as retired those in seasonal work, or those who are temporarily out of the workforce we consider individuals working in 1996 to be right-censored as of their age in December 1995.

persons. Individuals who lose their job may decide to retire, but find it more lucrative to remain officially in the labour force and collect their entitled EI benefits prior to officially dropping out of the labour force and receiving CPP benefits[10]. Further, individuals who are out of the workforce for a long period, whether in unemployment or outside the labour force have a low probability of re-entering the workforce. For these reasons we consider all long-term withdrawals from the workforce to be synonymous with retirement[11].

We estimate non-parametric conditional hazard rates into retirement and survival rates in employment using Kaplan-Meier estimation techniques, correcting for right-censored observations. The conditional hazard rates measure the probability that an individual will retire in year t, conditional on working in year t-1. We repeat this exercise to calculate the average length of survival in full-time work only. Put together, these two estimates provide an indication of the time spent in partial retirement.[12] Kaplan-Meier estimates of the survival in employment are shown in figure 2. The estimates suggest a smooth pattern of survival rates as age increases. There is a noticeable drop in survival estimates at age 64 for both sexes, and another drop for women at ages 58 and 59. This is confirmed with the hazard function plot in figure 3. For men, the increase in hazard rates is quite smooth with a slight increase in the slope after the age of 60, with a possible spike at age 62. For women, there appears to be a hump at ages 58-59 and then a large increase at 65.

[10] The definition of unemployment in the SLID follows the official definition in the Labour Force Survey. The unemployment definition does not depend on EI receipt but rather, it is determined by whether or not the out of work individual is searching for work.

[11] All analyses were also performed using a definition of retirement that required an individual to be entirely separated from the labour force for at least a year, and similar results were obtained.

[12] SLID provides calculations of the number of years with full-time and part-time employment following one's first full-time job. We have assumed that all time spent in part-time employment is experienced at the end of one's career. This assumption may be more reasonable for men than for women who may more frequently have bouts of part-time employment throughout their career. Unfortunately the data are not precise on past employment history and such assumptions are required.

FIGURE 2 - Survival Rates
Percentage of those in the workforce at age 50 who remain non-retired in subsequent years

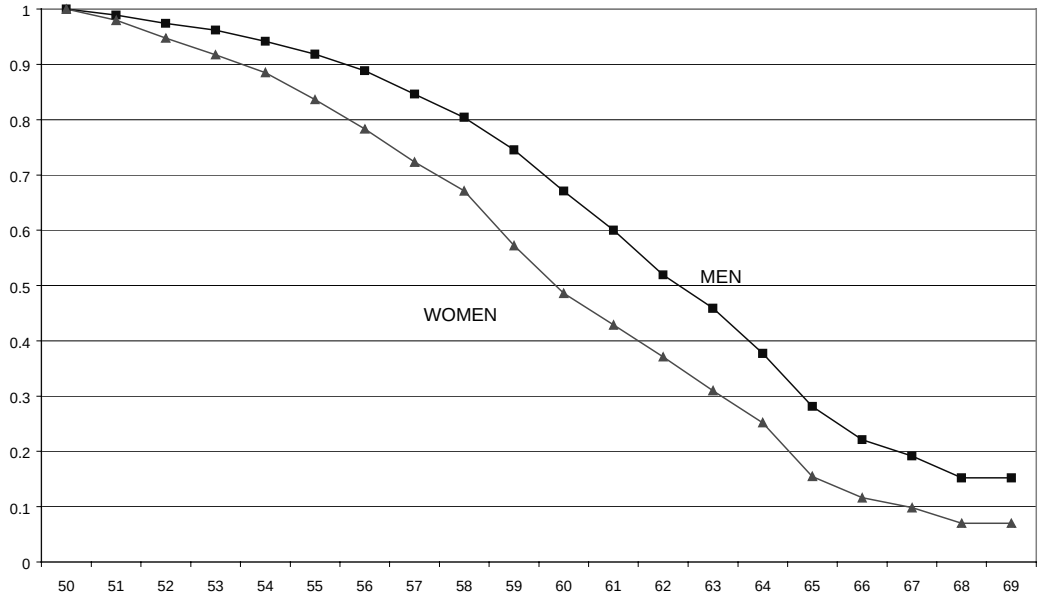
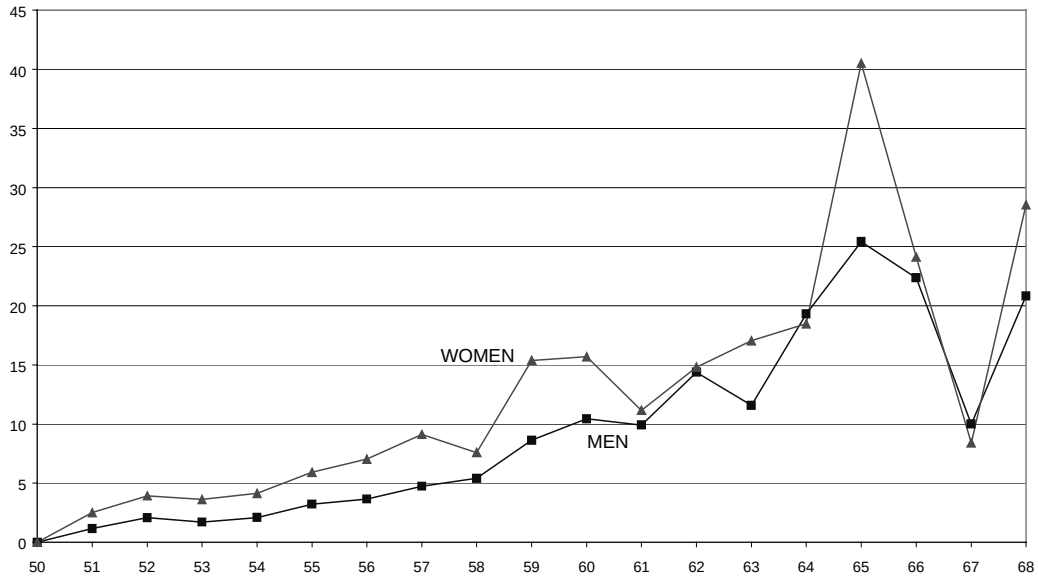


FIGURE 3 - Hazard Rates
The probability of retiring at each age, conditional upon surviving in the workforce up to the previous year



6.2 Effects of Demographic and Income variables on the Retirement Age

Kaplan-Meier estimates are also produced for different segments of the population grouped by education levels and earnings quartiles[13]. The shapes of the hazard functions for separate demographic sections of the population do not alter greatly from the shape of the overall hazard function. The differences occur in the levels. The average retirement age for each group is shown in figures 4 and 5. The estimated average age of retirement is 62.5 years for men, 60.3 years for women. Individuals in the higher earning quartiles have higher average retirement ages, as do those with higher levels of education. The difference between full-time retirement and part-time retirement is greater for women in all groups due to a higher propensity of women to work part-time.

Kaplan-Meier estimates do not control for correlation across characteristics. To do so, we employ a Cox proportional hazard model. The hazard in the Cox proportional hazards model is assumed to be

$$h(t) = h_0(t) \cdot e^{(\beta_1^T X_1 + ... + \beta_k^T X_k)}$$

where $h_0(t)$ is the baseline hazard, an individual specific constant that is equivalent to the Kaplan-Meier product-limit estimate. The effects of the characteristics are to change the units of measurement on the time axis. They do not have any effect on the degree of duration dependence.

To estimate the effect of CPP/QPP benefits we include as a time variant regressor the expected CPP/QPP benefit level. The expected benefit is calculated using Heckman's two-step procedure to correct for sample selection arising from the fact that we do not observe benefits for those still at work. Details of this regression are included in Appendix 1. Since we observe some individuals with both work and CPP/QPP variables

[13] Covariates included in survival analyses must be either time invariant, or, if time specific, the data must be available for each period in which the person is at risk of exiting – in our case, for each year after 50 years of age. By disaggregating by education and earnings quartile, we are implicitly assuming that education and income quartiles remain constant after the age of 50. One can easily argue that this is an acceptable assumption for education levels. Stability of income quartiles requires a bit more convincing, but this paper does not attempt to confirm this assumption. Earnings quartiles are defined for four-year age categories and for the working population and non-working population separately. Since we do not have information on earnings for individuals already retired, the pension income of these individuals is assumed to be correlated to earnings, and is used as a proxy. If a pensioner is in the top quartile compared with other pensioners, it is assumed that this individual would have been in the top earnings quartile when he/she was working.

we are able to regress the CPP/QPP benefit level (adjusted to reflect the level available at age 60) on individual and work related variables. After correcting for sample selectivity we use this regression to estimate the expected CPP/QPP benefit levels for each individual in the sample. Using the current actuarial formula, we then adjust the estimated benefit level for each age between 60-69.

Immigrant status, education and earnings group are assumed to be time invariant regressors. Marital status and expected CPP benefits are time variant. The regressions also include a birth year variable to capture cohort effects. This continuous variable is equal to zero for the oldest group of individuals, those who turn sixty in 1986, and increases by one for each successive birth year cohort.

The results, presented in table 2, indicate that the expected CPP benefit level does not impact retirement behaviour for either men or women. Moreover the results on the other monetary variable – earnings quartile – suggest that once we control for other factors, individuals have similar retirement patterns across the earnings distribution. Only those in the lowest quartile exhibit a different hazard rate. This result is stronger for women than for men. Men who earn income in the lowest quartile are 41 per cent more likely to retire at each age than are men with earnings in the highest quartile. In comparison,

FIGURE 4
Average Work Survival - Men

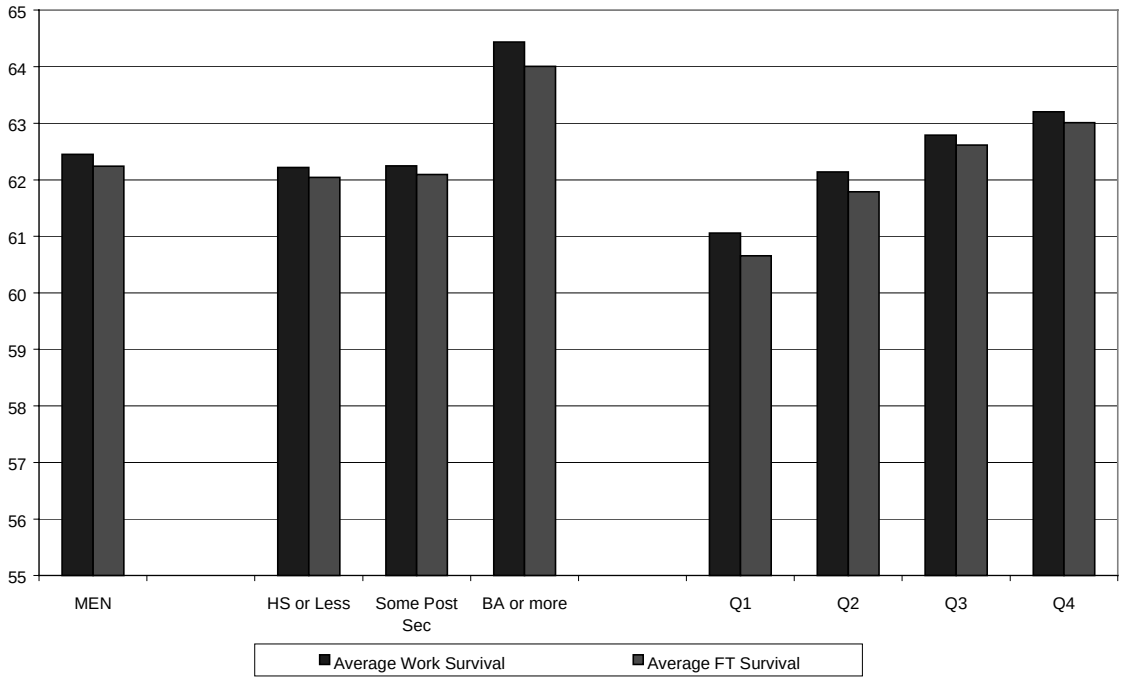
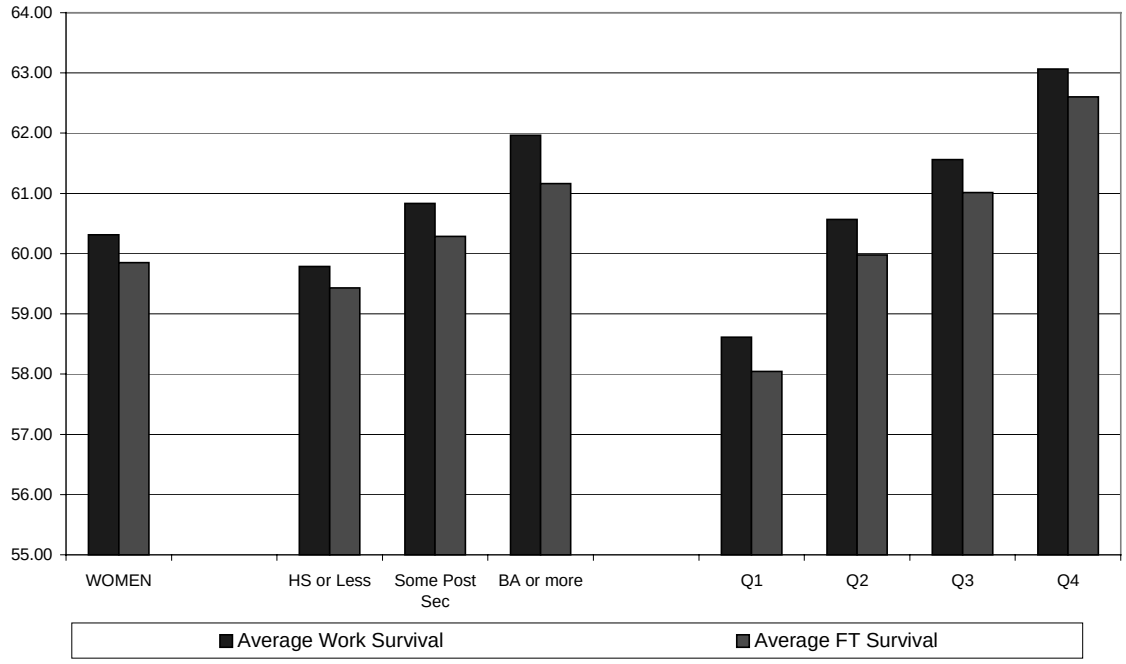


FIGURE 5
Average Work Survival - Women



women with earnings in the lowest quartile are 70 per cent more likely to retire than their counterparts with earnings in the highest quartile.

The results do confirm the Kaplan Meier results that higher education reduces the retirement hazard for men. Compared to those with some post-secondary education, men with higher education are 59 per cent less likely to retire, resulting in a much higher average retirement age for the highly educated. Individuals with higher levels of education may have begun full-time work at a later age and thus would be required to work to a later age in order to be eligible for certain public and private retirement benefits. Also, individuals with higher education levels may have greater job flexibility and job satisfaction that may induce them to work longer. The coefficients on education in the women's sample show a similar pattern, although they are not well defined.

A priori, one may suppose that immigrants, like who spent a long time in school, would be more likely to work to a later age in order to increase years of service and/or contributions to retirement plans. As well, the OAS/GIS programs contain residency requirements that would reduce the incentive to retire for recent immigrants. The results indicate that these aspects may affect the retirement behaviour of immigrant men, but not

immigrant women. Women immigrants have a lower average retirement age than do women who were born in Canada, although the results are not statistically significant.

The positive coefficient on the age trend variable indicates that each annual cohort is more likely to retire at every age category than the cohort if follows. The coefficient is similar for both men and women suggesting a similar trend towards early retirement for both men and women.

The results of this section highlight the diversity of retirement behaviour across different segments of the population. An analysis of retirement behaviour that focuses on the average behaviour of the population will miss a great deal of information. The hazard function out of employment is fairly smooth up to the age of sixty-five, with a hump at ages 58-59 observed in the women's sample. Further, there are distinguishable differences in the retirement behaviour of men and women, as well as within gender differences by education and immigrant groups. Expected CPP/QPP retirement benefits are not found to influence retirement behaviour, and only those in the lowest earnings quartile exhibit hazards that are distinguishable from the other earnings groups.

TABLE 2 - Cox Proportional Hazard Regressions

Cox-Proportional Hazard Regressions

MEN	**COEFFICIENTS**	**HAZARD RATIO***
High School or Less	0.052	1.053
	(0.092)	*(0.097)*
Bachelors Degree	**-0.537***	**0.585***
	(0.178)	*(0.104)*
Earnings Quartile1	**0.343***	**1.410***
	(0.117)	*(0.165)*
Earnings Quartile2	-0.051	0.950
	(0.119)	*(0.113)*
Earnings Quartile3	-0.003	0.997
	(0.113)	*(0.112)*
Immigrant	**-0.338***	**0.713***
	(0.122)	*(0.087)*
Age Trend	**0.032***	**1.032***
	(0.012)	*(0.013)*
Married	-0.261	0.771
	(0.115)	*(0.088)*
Expected CPP Benefits	-0.015	0.985
	(0.042)	*(0.042)*
WOMEN	**COEFFICIENTS**	**HAZARD RATIO***
High School or Less	0.098	1.103
	(0.091)	*(0.100)*
Bachelors Degree	-0.109	0.897
	(0.188)	*(0.168)*
Earnings Quartile1	**0.531***	**1.700***
	(0.169)	*(0.287)*
Earnings Quartile2	0.142	1.153
	(0.176)	*(0.203)*
Earnings Quartile3	-0.084	0.919
	(0.186)	*(0.171)*
Immigrant	0.012	1.012
	(0.114)	*(0.116)*
Age Trend	**0.031***	**1.031***
	(0.011)	*(0.012)*
Married	0.000	1.000
	(0.096)	*(0.096)*
Expected CPP Benefits	-0.048	0.953
	0.223)	*(0.213)*

Variables in bold type are significant at the 95 per cent confidence interval.

*The Hazard Ratio is the ratio of the resulting hazard rate when the variable is equal to one to the hazard rate that results when the variable is equal to zero.

7. DETERMINANTS OF THE TRANSITION INTO RETIREMENT

The broad demographic variables included in the prior analysis are only a few of the important determinants of retirement. Unfortunately, the data used in these analyses does not allow us to include many time-invariant variables in the hazard analyses because we do not have retrospective data. To allow for a wider variety of covariates, we turn to ordered probit analyses to model the determinants of the decision to retire. This type of analysis focuses on current behaviour, allowing us to exploit the wide range of current information available in the SLID data.

7.1 The Transition into Retirement – The Model

To analyse the current transitions into retirement, we seek to answer the following question. Given that a person is employed full-time in year one, what is the probability that he will fully retire, partially retire, or remain in full-time employment in year two?

The inclusion of transitions into partial retirement is an important aspect of this model. We want to stress the distinction between full-time and part-time work for this age group. Part-time employment is becoming an increasingly important precursor to full retirement in Canada and the United States. Transitions to retirement in Canada originate in part-time employment in 15 per cent of the male sample and in 40 per cent of the female sample.

The four-year longitudinal data set is reorganized to give two, three-year samples (93-94-95, 94-95-96). Individual characteristics, X_i, are associated with year one. Only the dependent variable is taken from the second year, the transition to part or full retirement. The third year information is maintained to ensure that the transitions are permanent.[14] We use the monthly labour force status of the individual to trace their transitions from full-time employment. An individual is selected into the sample if he or she ended the first year as a full-time worker.

We assume the individual has an underlying preference for leisure that is approximated by the following latent equation

14 In order to ensure that we are not classifying short-term unemployment or out of the labour force spells as retirement we stipulate that if a transition occurs into non-work, the non-work state must continue for the twelve months following the initial transition to be considered a transition into retirement. Similarly, a transition to part-time is noted only if the part-time state lasts six months.

$$y^* = \beta'X + \varepsilon.$$

The underlying preference for leisure time desired, y^*, is unobserved. Only the consequence of this preference is observed. We assume that individuals with higher levels of leisure preference will fully retire, those with lower preference levels will switch to part-time employment while those with even less desire for leisure will remain fully employed[15]. The dependent variable – the transition to partial or full retirement – is ordered because its discrete outcomes reflect the underlying variable y* which, as a continuous single variable is inherently ordered[16].

We have defined y=0 as remaining in full-time work; y=1 as making a transition to part-time employment; and y=2 as fully retiring. The choice the individual makes concerning his/her labour market attachment is assumed to follow his/her leisure preference in the following way:

$$\begin{aligned} y = 0 \quad & \text{if } y^* \le \mu_1, \\ = 1 \quad & \text{if } \mu_1 < y^* \le \mu_2 \\ = 2 \quad & \text{if } \mu_2 < y^* \end{aligned}$$

The parameters μ_1 and μ_2 are unknown and are estimated with β. We assume that ε is normally distributed across observations.

The transition patterns by age are shown in figures 6 and 7. The male transition pattern show a fairly constant rate of exits out of the workforce or into part-time employment until the age of sixty-one. There is a large increase at sixty-one and again at age sixty-four - a high proportion of full-time employees change labour force states during the year in which they turn sixty-two or sixty-five. The same spikes were noted in Tompa (1999). The female transition pattern also shows a fairly constant rate of exit to the age of sixty-three followed by a drastic increase.

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[15] Note that the time dimension is omitted from the interpretation. We assume that when the individual retires during the year is institutionally determined, and irrelevant to their underlying preferences.

[16] An unordered multinomial probit regression was also estimated. The results are consistent with the ordered probit model presented here.

FIGURE 6
Men - Annual Transitions from Full Time Employment

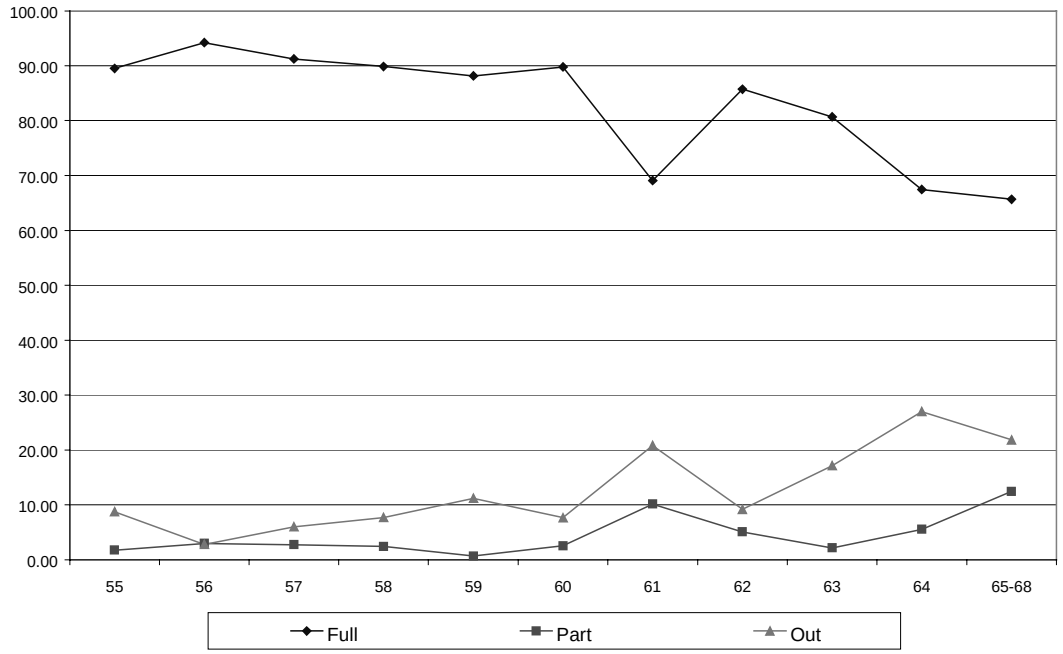
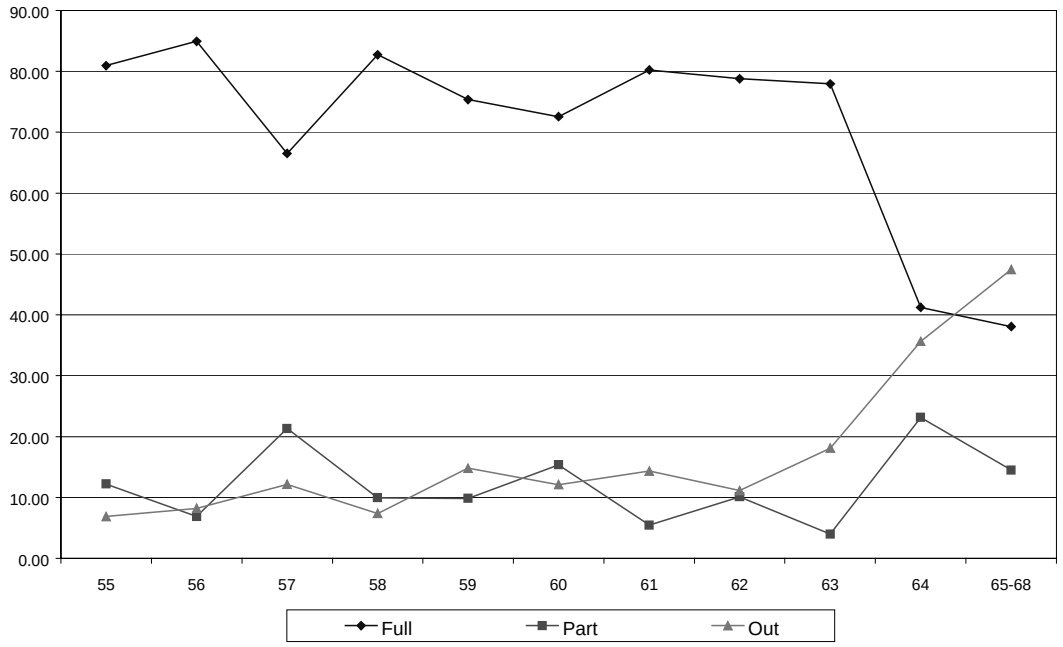


FIGURE 7
Women - Transitions from Full-time Employment



7.2 Description of the Variables

In addition to the demographic and personal characteristics common in retirement models, the richness of the SLID data allows us to expand the list of variables to include disability status, spouse's labour force transitions and the individual's full-time equivalent work experience.

By ensuring that all dependent variables occur prior to the transition we avoid the endogeneity of retirement and variables such as current income, province of residence, etc[17]. However, there may be a long time lapse between variables defined for year one and a transition that may occur in the last months of year two. Events such as the death of a spouse, becoming disabled or children leaving home may have an immediate effect on the decision to retire. Because of the time lapse, we may miss these immediate causes of retirement.

Spousal labour force variables are structured to capture the effect of joint retirement by determining the probability of retiring given the transition behaviour of the spouse. Since we are concerned only with those currently employed, we can include information on class of worker, industry, union status and presence of an occupational pension plan[18].

To capture the substitution effect of CPP/QPP benefits on the decision to retire we include current reported wages and calculate an expected CPP/QPP benefit level using information on years of full-time equivalent work experience and current annual earnings level. This measure can be considered as an upper bound on the benefit level expected, since current earnings levels are most likely among the highest of their career.

Although we do not have enough information to calculate the net present value of CPP/QPP benefits to determine the wealth effect, we pursue a second line of investigation. If other wealth variables affect the decision to retire, it would be reasonable to expect that changes to the net present value of CPP/QPP benefits would affect labour force behaviour in a similar manner.

Since SLID does not provide complete wealth information, we use three proxy variables. A dummy variable that indicates whether or not an individual owns his home is included

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[17] Note, however, that the possibility of endogeneity of the wealth variables is not corrected by this structure.

[18] Industry variables and union status are not included in all regressions as they are found to be consistently insignificant.

as well as the amount of investment income earned by the household. Also, the current income of other family members is included as a regressor. Definitions and means of the variables are presented in Appendix 2.

7.3 Transitions to Retirement – Regression Results

The sample includes all fully employed individuals aged 55 and over. We have run the regressions separately for men and women, and for married individuals only. There are 1909 observations in the full sample and 1493 observations in the married sample. Overall, the fit of the models is quite good, with average estimated probabilities falling close to the actual probabilities. The only odd result is the high estimated probability of married women transiting into partial employment. This is likely a result of the low sample size for this regression.

TABLE 3 - Actual and Estimated Transition Probabilities
Ordered Probit Regression - Probability of Moving to Partial or Full Retirement

	All		**Men**		**Women**	
	To PT	**To Retire**	**To PT**	**To Retire**	**To PT**	**To Retire**
MARRIED SAMPLE						
Sample Size	1493		1161		412	
Actual Probabilities	6.07	11.00	3.65	10.95	3.65	10.95
Estimated Average Probabilities	5.80	13.06	3.53	13.14	12.70	13.67
Estimated Probs of Average Person	5.31	8.91	3.12	8.48	3.12	8.48
FULL SAMPLE						
Sample Size	1909		1303		606	
Actual Probabilities	6.38	12.12	3.68	10.54	12.15	15.51
Estimated Average Probabilities	6.08	13.19	3.67	12.93	11.32	14.95
Estimated Probs of Average Person	5.90	10.02	3.21	8.27	12.00	12.44

The coefficients provide information on what may and may not be affecting the retirement decision. Similar to the results in the previous section, we find little evidence that monetary variables are an important indicator or the retirement decision. Coefficients are presented in appendix 3. The variable coefficients of an ordered probit model do not provide any direct information as to how the variables affect the probabilities. The marginal effects of the regressors in ordered probability models are quite involved, and are difficult to interpret. Instead, we calculate the change in the estimated probabilities that arise from altering each variable separately. The probabilities

for an ordered probit model are calculated as follows:

$$\text{Prob}(y = 0) = \Phi(\mu_1 - \beta'\text{X})$$
$$\text{Prob}(y = 1) = \Phi(\mu_2 - \beta'\text{X}) - \Phi(\mu_1 - \beta'\text{X})$$
$$\text{Prob}(y = 2) = 1 - \Phi(\mu_2 - \beta'\text{X})$$

The effects of changes in continuous variables are presented in two forms. We present the percentage point change in the estimated probabilities for both a one percent increase at the mean of the continuous variable and for a specific dollar amount increase, holding all other variables constant at their means. We present the results of dummy variables as the percentage change in the probabilities that result when the dummy variable takes the value one as compared to zero, again holding the other variables at the sample means. The results, shown in tables 4 and 5 indicate that the effects of the monetary variables are both statistically insignificant and empirically small[19]. The variables that strongly influence the probabilities include age, education, immigration status, self-employment status and spouse's labour force attachment.

The age effect on labour force status is straightforward. We expect that older individuals have a lower probability of being fully employed than younger individuals, a pattern that holds in the regressions, although the pattern is not linear. Compared to individuals aged 55-58 in the first year, the probability of retiring increases by over 30 percentage points for individuals aged 64 and 65.

There is a jump in the percentage point change at age 64, as observed in the transition patterns in figures 6 and 7 as well as in the hazard rates presented earlier. It is likely that the structures of both the Canadian income retirement system and private pension plans strongly contribute to the increased probability of retiring in the year an individual turns 65. Note also that there is a stronger effect for men aged 61 than for individuals aged 59, 60 or 62. This result reflects the jump in male retirement transitions at age 62 that was observed in figure 6.

The effect of a spouse's labour force status on that of a married individual has been well documented. Leisure time is more valued if it can be shared with one's spouse. The evidence of joint retirement is not strong in these regressions. Individuals whose spouse

[19] Appendix 4 presents variations on the main regression. The results are similar to those presented in the main body of the text.

retires in year two are more likely to retire than individuals whose spouse is out of the

Table 4 - Percentage Point Change in Probabilities
Transition from Full-Time Employment - Married Sample

	All		Men		Women	
	To PT	To Retire	To PT	To Retire	To PT	To Retire
AGE (Age 55-58 base)						
Age 59	**2.88**	**6.87**	**1.75**	**6.13**	**7.00**	**6.59**
Age 60	1.95	4.31	**1.57**	**5.38**	6.95	6.54
Age 61	**5.32**	**16.02**	**4.49**	**23.47**	5.44	4.75
Age 62	**2.57**	**5.96**	**2.51**	**9.60**	5.37	4.68
Age 63	**6.20**	**21.01**	**4.23**	**20.97**	**13.90**	**20.65**
Age 64	**7.24**	**30.53**	**5.11**	**32.10**	**14.14**	**49.29**
Age 65	**6.81**	**25.69**	**4.75**	**26.46**	**15.65**	**33.55**
SPOUSE (non-working spouse base)						
Spouse Working both years	-0.08	-0.21	-0.27	-1.04	3.08	2.86
Spouse retires in second year	0.42	1.10	0.09	0.35	0.15	0.12
EDUCATION (Some Post-secondary base)						
High School or Less	**-1.67**	**-4.30**	-0.87	-3.47	**-5.87**	**-5.44**
Bachelors or More	0.23	0.69	-0.53	-2.18	**8.72**	**20.22**
OTHER DUMMY VARIABLES (Opposite base)						
Married						
Immigrant	**-1.68**	**-4.03**	**-1.47**	**-5.42**	0.95	0.92
Disabled	**5.08**	**20.18**	**3.18**	**17.89**	**13.07**	**31.23**
Spouse Disabled	-0.67	-1.64	-0.55	-2.04	3.25	3.41
Female	**2.04**	**5.65**				
Self-Employed	**-2.25**	**-5.28**	**-1.29**	**-4.75**	-5.25	-4.30
Occupational Pension Plan	0.65	1.67	0.81	3.29	-2.16	-1.97
Own Home	-0.13	-0.32	-0.91	-3.85	5.96	4.62
CONTINUOUS VARIABLES (Effect of a one per cent increase at the mean)						
Household Investment Income	0.001	0.003	0.001	0.004	0.002	0.002
Other Household Income	-0.007	-0.018	-0.004	-0.017	-0.006	-0.005
Employment Rate	0.034	0.087	-0.008	-0.030	0.286	0.272
FT Equivalent Years of Experience	-0.006	-0.015	-0.007	-0.026	-0.004	-0.003
Hourly Wage Earned - Year 1	-0.010	-0.024	-0.003	-0.010	**-0.110**	**-0.103**
Expected CPP	-0.004	-0.011	-0.003	-0.013	-0.006	-0.005
CONTINUOUS VARIABLES (Increased by $ amount at the mean)						
Household Investment Income (+$1,000)	0.043	0.110	0.033	0.130	0.060	0.056
Other Household Income (+$1,000)	-0.030	-0.076	-0.021	-0.081	-0.019	-0.018
Employment Rate (+1)	0.041	0.105	-0.009	-0.036	0.341	0.326
FT Equivalent Years of Experience (+1)	-0.018	-0.046	-0.020	-0.079	-0.013	-0.013
Hourly Wage Earned - Year 1 (+$1)	-0.067	-0.169	-0.017	-0.067	**-0.847**	**-0.769**
Expected CPP (+1,000)	-0.209	-0.520	-0.142	-0.544	-0.346	-0.321
SAMPLE SIZE	1493		1161		412	

Controls for year, province and industry were included in the regression.
Results in bold type are significant at the 95% confidence interval.

Table 5 - Percentage Point Change in Probabilities
Transition from Full-Time Employment - ALL

	ALL		Men		Women	
	To PT	TO Retire	To PT	TO Retire	To PT	TO Retire
AGE (Age 55-58 base)						
Age59	**2.58**	**6.02**	**1.55**	**5.12**	**7.11**	**11.13**
Age 60	**1.86**	**4.09**	0.93	2.90	**9.63**	**18.55**
Age 61	**5.32**	**16.06**	**4.50**	**22.42**	**7.44**	**11.94**
Age 62	2.25	5.12	**1.94**	**6.72**	**6.72**	**10.25**
Age 63	**4.23**	**11.40**	**3.63**	**15.58**	**7.24**	**11.44**
Age 64	**7.34**	**32.99**	**4.96**	**27.65**	**11.26**	**45.55**
Age 65	**7.40**	**34.36**	**4.92**	**27.00**	**9.44**	**56.94**
EDUCATION (Some Post-secondary base)						
High School or Less	**-1.45**	**-3.94**	-0.75	-2.86	**-2.99**	**-5.69**
Bachelors or More	-0.90	-2.56	-0.98	-3.64	0.72	1.75
OTHER DUMMY VARIABLES (Opposite base)						
Married	1.04	2.61	1.24	4.15	-0.73	-1.38
Immigrant	-1.19	-3.02	**-1.54**	**-5.34**	0.41	0.78
Disabled	**3.87**	**13.92**	**2.97**	**15.00**	**4.89**	**12.98**
Spouse Disabled						
Female	**2.11**	**5.96**				
Self-Employed	**-2.54**	**-6.11**	**-1.40**	**-4.89**	-2.45	-4.17
Occupational Pension Plan	0.31	0.81	0.75	2.87	-2.30	-4.15
Own Home	-0.01	-0.02	-0.08	-0.29	0.34	0.63
CONTINUOUS VARIABLES (Effect of a one per cent increase at the mean)						
Household Investment Income	0.000	0.001	0.001	0.004	-0.001	-0.002
Other Household Income	-0.003	-0.007	-0.003	-0.011	0.009	0.018
Employment Rate	0.063	0.168	0.008	0.031	0.441	0.855
FT Equivalent Years of Experience	-0.011	-0.030	-0.005	-0.019	-0.002	-0.004
Hourly Wage Earned - Year 1	-0.007	-0.018	-0.002	-0.006	-0.023	-0.044
Expected CPP	-0.005	-0.014	-0.002	-0.009	**-0.029**	**-0.055**
CONTINUOUS VARIABLES (Increased by $ amount at the mean)						
Household Investment Income (+$1,000)	0.018	0.047	0.038	0.141	-0.048	-0.090
Other Household Income (+$1,000)	-0.013	-0.034	-0.016	-0.060	0.045	0.086
Employment Rate (+1)	0.076	0.202	0.010	0.038	0.525	1.023
FT Equivalent Years of Experience (+1)	-0.036	-0.095	-0.016	-0.057	-0.008	-0.016
Hourly Wage Earned - Year 1 (+$1)	-0.047	-0.124	-0.010	-0.038	-0.176	-0.328
Expected CPP (+1,000)	-0.231	-0.598	-0.101	-0.369	**-1.303**	**-2.278**
SAMPLE SIZE	1909		1303		606	

Controls for year, province and industry were included in the regression.
Results in bold type are significant at the 95% confidence interval.

work force in both years, while an individual whose spouse is working both years is less likely to retire. However the effect is small and not well defined.

It has been shown that poor health is one of the major reasons given for early retirement in Canada[20] (Policy Research Secretariat, 1999). Since general health status of an individual is not available on early years of SLID data, we include a variable that indicates whether or not the individual suffered from any long-term physical condition, mental condition or health problem. Disability status greatly increases the probability of retiring in all samples. Having a spouse who is unable to work reduces the probability of retiring from the workforce for men and increases the probability of retirement for women. It is likely that the importance of earned income and workplace health insurance becomes more important when a female spouse is suffering from a disability. Male spouses suffering from a disability are more likely to have their own disability coverage and thus the necessity of their spouse working is likely diminished.

Self-employed individuals are less likely to retire, likely due to both the attractive flexibility of self-employment for older workers, the lack of institutional retirement rules for the self-employed and the difficulty in enforcing the CPP/QPP retirement rules for this class of worker. Male immigrants are less likely to retire, which, as mentioned previously, is possibly linked to the residency requirements for Canada's retirement income system. The results of the education variable are opposite to what was found in the survival regressions. Here we find that individuals with less education are less likely to retire than are those with some post-secondary education.

As in the survival regression, little is explained by the monetary variables. In almost all cases, the coefficients are neither economically important nor statistically different from zero. There is very little indication that higher CPP/QPP benefits raise the probability of retiring. In the model presented, the variable is statistically significant only in the female sample and the sign of the coefficient is opposite to expected. In an alternative version of the presented regression, we replaced the estimated CPP/QPP benefits with the ratio between estimated CPP/QPP benefits and current earnings. The results indicate that the higher this ratio, the higher the probability of retiring. However, the variable is not statistically significant and the effect is empirically small. To raise the retirement probability by three percentage points would require raising the average ratio from 0.14 to 0.24, reflecting a substantial increase in CPP/QPP benefits.

Current hourly wage earned is not a statistically significant determinant of retirement in any specification. Nor are any of the wealth variables. The empirically small relationship between monetary variables and retirement suggests that once a certain age is reached (and taking into account one's disability status, education level, spouse's characteristics and class of worker), the value of leisure time increases dramatically. As a result, small changes in earned and non-earned income have little effect on behaviour.

A few caveats to these results should be noted. First, the results are based upon variations across individuals, not on observed behaviour of the same individual as characteristics change. For example, we are assuming that an individual whose wage increases will behave in the same manner as an otherwise identical individual with a higher starting wage. Secondly, the data used for this analysis covers a relatively short time span (1993-1996). The behaviour patterns of individuals in this age cohort for this time period may not necessarily be consistent with the behaviour of other cohorts during other years.

8. CONCLUSIONS

This analysis is concerned with the potential for CPP/QPP program changes to influence retirement behaviour. We provide evidence to suggest that limited adjustments to the benefit levels of the CPP/QPP program are unlikely to have a large effect on retirement behaviour.

In a recent paper, Baker et al (2000) indicate that there are substantial work disincentives embedded in the structure of Canadian retirement income programs. The degree to which these work disincentives affect the behaviour of older workers rests on two points – the level of knowledge that Canadians have about the income retirement programs, and the degree to which receiving benefits is linked to work stoppage. Investigating the first point is beyond the scope of this paper.

To address the second point, we demonstrated that for the majority of Canadians, there is no close temporal link between retirement and the take-up of benefit. The results indicate that many individuals retire well before taking up CPP/QPP benefits, while many others continue to work after receiving benefits. We conclude therefore that for these individuals, the substitution effects of changes in CPP/QPP benefits on the decision to retire appear to be largely absent. To the extent that individuals may return to

[20] The extent to which disability status might be endogenous with retirement is beyond the scope of this paper.

employment that provides the same compensation post-retirement, the substitution effect will be diluted. It appears, therefore, that the impact of disincentives to work that are a feature of the Canadian retirement income system are likely to be quite muted.

Next, in analysing the determinants of retirement we find little evidence that CPP/QPP benefits have either a substitution effect or a wealth effect on the decision to retire. Since no changes were made to the CPP/QPP programs during the survey years, it is not possible to use natural experiments to examine the wealth and substitution effects that a change in regulations may have on retirement behaviour. Instead, we use cross-section variation to identify the effects of the variables. To determine the substitution effect of CPP/QPP benefits on retirement, we include estimated CPP/QPP benefit variables and current earnings variables in both the survival and the ordered probit regressions. The only indication of a substitution effect is the observation that individuals in the lowest earnings quartiles retire earlier than those in higher quartiles. However, once we control for work experience, education, labour force status of spouse and disability status there is little discernible adjustment in labour market behaviour across wage or CPP/QPP benefit levels.

Because we can not determine the net present value of CPP/QPP benefits with the data available, we include other wealth variables such as home ownership, investment income and other household income in the ordered probit regressions. If individuals adjust their labour market behaviour due to differences in these wealth variables, it is reasonable to assume that they would also adjust their behaviour with changes in CPP/QPP wealth. However, the wealth variables are statistically insignificant and economically unimportant in all specifications of the model. This implies that individuals do not adjust their labour force participation decisions to variations in wealth. To the extent that the wealth variables chosen may be partially endogenous to the retirement decision, this finding would be tempered. The degree to which these wealth variables are endogenous to the retirement decision is unknown.

The results do not necessarily imply that CPP/QPP benefits do not effect the participation decision at all. Since we are controlling for age in the regressions, the differences in expected CPP/QPP benefits do not capture differences in program eligibility. Instead, effects of program structure may be included in the coefficients on the age variables. Although there is no spike in the retirement hazard rate at the age of eligibility (curiously, the spike occurs at age 62) we note that individuals over 60 years of age do have a higher probability of retiring than younger individuals. Similarly, it is evident that individuals

reaching the age of 65 are also more likely to retire than younger ages. These results correspond to the availability of CPP/QPP benefits (age 60) and the availability of OAS/GIS benefits (age 65). These increases can be explained by the existence of borrowing constraints. Although individuals may wish to retire before the age of 60 (or before 65) based on their net present value of wealth, if they cannot shift future income to the present they might be forced to continue working until they are eligible for benefits.

In short, we show substantial evidence that CPP/QPP benefits do not affect retirement through the substitution effect. While there may be work disincentives embodied in the structure of the CPP/QPP program, it does not appear that these are influencing the retirement decisions of most Canadians. There is also no indication of a wealth effect of retirement, although this finding is tempered by possible endogeneity between the wealth variables and retirement. It is likely that the structure of the CPP/QPP program may influence the decision to retire due to borrowing constraints, as suggested by the of increases in the retirement hazards at ages 60 and 65. The program structure may also affect social norms of behaviour concerning retirement, however this influence is difficult to measure empirically.

The general conclusions in this paper are confirmed in a companion paper[21] that uses simulation analyses to directly model the effect of adjustments to CPP/QPP regulations on labour force participation. The model indicates that small changes to the monetary provisions to the CPP/QPP program - i.e. altering the level of retirement benefits – has little effect on participation. Adjusting the structure of the program has some effect on the retirement age, but the change in labour force participation is small and limited to certain income groups. In part these results stem from the fact that for most people CPP/QPP benefits are only part, and not even the most important part, of their retirement wealth.

The wide variations in retirement behaviour suggest that any alterations to the structure of retirement income programs may have widely different effects across demographic groups. However, our results suggest that although governments may wish to raise the average retirement age, such program changes may not be necessary. The factors that are found to have a large influence on retirement behaviour appear to be moving in a direction that would reverse the declining retirement age.

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[21] Sargent, Timothy and Janice Compton. "Retirement Behaviour and the CPP: A Simulation Analysis." Forthcoming.

- The women in this sample, those aged 55 and over in 1993, still have low participation rates compared to cohorts that follow. As female cohorts with high participation levels approach retirement, the flexibility of retirement plans that allow for spouses of different ages to retire together will be an important facet of the programs. Since males with working spouses are less likely to retire than those whose spouse is not working, the increasing labour force participation of women may act to increase the retirement age of both sexes.
- Disability status has a strong effect on retirement. Individuals suffering from any long-term physical condition, mental condition or health problem are more likely to exit the workforce than those without a disability. Between 1989-1994, approximately 17 per cent of retirees listed health as a reason for retirement, down slightly from the 1983-1988 period. Statistics Canada recently reported that individuals aged 45 to 64 in 1999 are generally in better health than those in the same age group two decades prior (Statistics Canada, 2000). If this trend continues, it is possible that retirement for health reasons will continue to decline and the average age of retirement should rise.
- Our results suggest that self-employed individuals tend to work longer than do paid employees. Similarly, immigrant males tend to retire at later ages than do Canadian born. During the 1990s, self-employment was responsible for almost all job growth (Lin, Compton and Picot, 2000). If these trends continue, the increasing proportion of the self-employed in the Canadian labour force and the increasing proportion of immigrants will raise the age of retirement.

Raising the average age of retirement may be a desirable goal for governments. However, our analysis suggests that small changes in programs like the CPP/QPP will not have a discernible impact on the labour force participation of older workers in the short term. Large structural changes may have the desired impact but might be unnecessary, since other external factors appear to be moving in a direction that may result in a rising average age of retirement.

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Appendix 1 - Heckman Estimation of CPP Benefits

We estimate the benefits at age 60. We adjust the years experience variable for individuals who are observed to receive benefits to reflect their years of experience at age 60. Benefits were age adjusted, according to the age of retirement. For example, if an individual retired at age 62 and we observe his CPP benefits, we assume his benefits started at age 62, and calculate the be that he would have been eligible for at age 60. If an individual retired prior to age 60, we conside current benefits as the benefits available at age 60.

A. Probability of Receiving CPP Benefits

Variable Name	**Coefficient**	**SE**
Female	**-0.205**	*0.091*
Education - HS or Les	0.174	*0.096*
Education - University	**-0.305**	*0.152*
Self-Employed	-5.925	*9314.2*
Immigrant	0.142	*0.121*
Atlantic	0.067	*0.143*
Quebec	0.067	*0.137*
Prairie	0.071	*0.155*
Alberta/BC	-0.082	*0.141*
Constant	**-1.314**	*0.119*

B. Estimation of Benefits, Controlling for Receipt of Benefits

Variable Name	**Coefficient**	**SE**
Female	-0.233	*0.131*
Education - HS or Les	-0.137	*0.114*
Education - University	-0.175	*0.198*
Earnings	**2.530E-06**	*1.490E-06*
Weeks Employed	0.002	*0.003*
Years Experience	**0.013**	*0.005*
Immigrant	-0.192	*0.124*
Private Pension Plan	0.134	*0.106*
Constant	**7.522**	*0.555*

Although the regressions show few statistically significant variables , we are more concerned with the overall fit, which is acceptable.

	Mean	SD
Actual CPP	3749.921	*2159.01*
Estimated CPP	3040.776	*862.6405*

Appendix 2 - Definitions of Regressors

Dummy=1 if Female	
age59	
age60	
age61	
age62	
age63	
age64	
age65	
Wage - year 1	Hourly wage reported for the main job held in year 1
Household Investment Income	Total household income from investments
Dummy=1 if own home	=1 if the principal residence of the individual was owned by a family member
Other Household Income	Total income of all household members, excluding investment income and income of the individual
Dummy=1 if spouse retires	**=1 if we observe the spouse retiring in year 2**
Dummy=1 if spouse works	**=1 if the spouse works in both years one and two**
Dummy=1 if Married	
Dummy=1 if Disabled	
Dummy=1 if Spouse Disabled	
Dummy=1 if Atlantic	includes Newfoundland, Nova Scotia, PEI and New Brunswick
Dummy=1 if Quebec	
Dummy=1 if West	Includes Manitoba, Saskatchewan, Alberta and BC
Dummy=1 if Immigrant	
Dummy=1 if High School or less	
Dummy=1 if Bachelor or higher	
Dummy=1 if Self-Employed	
Dummy=1 if Pension plan	=1 if the main job held in year one was covered by a private pension plan
Provincial Employment Rate	Employment rate of men aged 25-54
Years of FTE work experience	Full-time equivalent years of work experience after the individual's first full-time job held
CPP Benefit Calculation	CPP= Earn1 * Age Adjustment * 0.25 * (Years of FTE Work Experience/35) *Earn1= max (earnings in year 1, adjusted to represent full year earnings if the individual worked less than 53 weeks, and the YMPE) *Years FTE work experience capped at 35 * Age adjustment if individual is less than 65, the amount is adjusted by the current actuarial formula (6% per year reduction)
Dummy=1 if Resource/Manufacturing	
Dummy=1 if Trade/Transportation	
Year = 1994	

Appendix 2 - Means of Regressors

	Full Sample			Married Sample		
	All	**Men**	**Women**	**All**	**Men**	**Women**
Dummy=1 if Female	0.319			0.246		
age59	0.093	0.096	0.086	0.093	0.098	0.078
age60	0.085	0.097	0.060	0.077	0.084	0.056
age61	0.062	0.062	0.062	0.059	0.060	0.057
age62	0.051	0.051	0.051	0.059	0.053	0.077
age63	0.067	0.061	0.081	0.058	0.058	0.057
age64	0.061	0.046	0.094	0.039	0.041	0.035
age65	0.064	0.066	0.062	0.058	0.069	0.026
Wage - year 1	14.505	15.048	13.383	14.308	14.805	12.807
Household Investment Income	2,658	2,886	2,172	2,977	3,028	2,820
Dummy=1 if own home	0.872	0.898	0.818	0.924	0.929	0.911
Other Household Income	19,441	18,888	20,620	22,888	20,589	29,941
Dummy=1 if spouse retires				0.064	0.053	0.096
Dummy=1 if spouse works				0.433	0.388	0.569
Dummy=1 if Married	0.803	0.889	0.619			
Dummy=1 if Disabled	0.086	0.091	0.077	0.085	0.091	0.067
Dummy=1 if Spouse Disabled				0.110	0.102	0.134
Dummy=1 if Atlantic	0.066	0.072	0.053	0.069	0.071	0.063
Dummy=1 if Quebec	0.214	0.237	0.165	0.219	0.228	0.192
Dummy=1 if West	0.315	0.313	0.319	0.315	0.312	0.325
Dummy=1 if Immigrant	0.273	0.280	0.257	0.277	0.295	0.221
Dummy=1 if High School or less	0.536	0.541	0.526	0.551	0.548	0.560
Dummy=1 if Bachelor or higher	0.115	0.128	0.088	0.101	0.109	0.077
Dummy=1 if Self-Employed	0.231	0.282	0.122	0.256	0.287	0.161
Dummy=1 if Pension plan	0.302	0.292	0.324	0.300	0.295	0.315
Provincial Employment Rate	83.380	83.131	83.911	83.304	83.174	83.702
Years of FTE work experience	31.506	33.512	27.223	32.048	33.420	27.837
CPP Benefit Calculation	2,290.6	2,310.4	2,248.4	2,089.8	2,254.8	1,583.5
Dummy=1 if Resource/Manufacturing	0.288	0.343	0.173	0.323	0.363	0.200
Dummy=1 if Trade/Transportation	0.241	0.275	0.169	0.263	0.291	0.175
Year = 1994	0.521	0.520	0.521	0.522	0.522	0.521

Appendix 3
Coefficients - Ordered Probit Regressions

	Full Sample					
	All		Men		Women	
	Coeff	SE	Coeff	SE	Coeff	SE
Dummy=1 if Female	0.315	0.108				
age59	0.411	0.178	0.412	0.239	0.677	0.272
age60	0.303	0.180	0.263	0.238	0.949	0.311
age61	0.829	0.208	1.112	0.253	0.710	0.348
age62	0.363	0.226	0.503	0.275	0.640	0.369
age63	0.656	0.276	0.886	0.301	0.690	0.495
age64	1.326	0.262	1.265	0.277	1.686	0.422
age65	1.362	0.266	1.246	0.312	1.976	0.452
Wage - year 1	-0.007	0.006	-0.002	0.007	-0.016	0.014
Household Investment Income	0.003	0.005	0.009	0.006	-0.004	0.009
Dummy=1 if own home	-0.001	0.183	-0.019	0.227	0.031	0.247
Other Household Income	-0.002	0.003	-0.004	0.004	0.004	0.006
Dummy=1 if spouse retires						
Dummy=1 if spouse works						
Dummy=1 if Married	0.158	0.150	0.325	0.221	-0.067	0.262
Dummy=1 if Disabled	0.595	0.171	0.689	0.181	0.506	0.317
Dummy=1 if Spouse Disabled						
Dummy=1 if Atlantic	0.402	0.244	0.316	0.280	0.643	0.494
Dummy=1 if Quebec	0.081	0.183	0.023	0.207	0.095	0.356
Dummy=1 if West	0.058	0.121	0.076	0.144	-0.002	0.207
Dummy=1 if Immigrant	-0.181	0.124	-0.394	0.155	0.038	0.197
Dummy=1 if High School or less	-0.217	0.106	-0.178	0.127	-0.277	0.167
Dummy=1 if Bachelor or higher	-0.134	0.160	-0.235	0.227	0.071	0.260
Dummy=1 if Self-Employed	-0.399	0.141	-0.356	0.172	-0.224	0.253
Dummy=1 if Pension plan	0.046	0.113	0.179	0.134	-0.211	0.199
Provincial Employment Rate	0.011	0.020	0.002	0.021	0.049	0.049
Years of FTE work experience	-0.005	0.006	-0.004	0.011	-0.001	0.008
CPP Benefit Calculation	-0.035	0.025	-0.025	0.028	-0.119	0.054
Dummy=1 if Resource/Manufacturing	0.595	0.171	0.020	0.151	-0.315	0.224
Dummy=1 if Trade/Transportation	0.005	0.127	-0.019	0.151	0.041	0.193
Dummy=1 if year =1994	0.007	0.095	-0.190	0.113	0.355	0.158
K1	2.008	1.765	1.494	1.846	4.849	4.134
K2	2.291	1.765	1.680	1.846	5.310	4.132

Appendix 3, continued

Coefficients - Ordered Probit Regressions

	Married Sample					
	All		**Men**		**Women**	
	Coeff	**SE**	**Coeff**	**SE**	**Coeff**	**SE**
Dummy=1 if Female	0.315	0.118				
age59	0.475	0.196	0.486	0.250	0.530	0.334
age60	0.332	0.203	0.442	0.252	0.527	0.366
age61	0.854	0.228	1.166	0.273	0.419	0.478
age62	0.427	0.248	0.663	0.287	0.415	0.386
age63	1.018	0.289	1.089	0.322	1.103	0.548
age64	1.291	0.276	1.409	0.317	1.874	0.470
age65	1.157	0.288	1.254	0.325	1.474	0.516
Wage - year 1	-0.011	0.007	-0.004	0.007	-0.063	0.019
Household Investment Income	0.007	0.005	0.008	0.007	0.004	0.008
Dummy=1 if own home	-0.020	0.218	-0.219	0.258	0.492	0.340
Other Household Income	-0.005	0.004	-0.005	0.004	-0.001	0.007
Dummy=1 if spouse retires	0.065	0.203	0.021	0.262	0.011	0.335
Dummy=1 if spouse works	-0.013	0.113	-0.068	0.138	0.229	0.215
Dummy=1 if Married						
Dummy=1 if Disabled	0.835	0.179	0.780	0.193	1.256	0.377
Dummy=1 if Spouse Disabled	-0.108	0.150	-0.142	0.177	0.235	0.275
Dummy=1 if Atlantic	0.318	0.266	0.121	0.305	0.663	0.561
Dummy=1 if Quebec	0.041	0.188	-0.052	0.218	0.035	0.372
Dummy=1 if West	0.034	0.126	0.030	0.151	-0.246	0.237
Dummy=1 if Immigrant	-0.271	0.130	-0.388	0.161	0.070	0.229
Dummy=1 if High School or less	-0.263	0.111	-0.216	0.135	-0.444	0.184
Dummy=1 if Bachelor or higher	0.035	0.187	-0.128	0.242	0.784	0.334
Dummy=1 if Self-Employed	-0.369	0.152	-0.337	0.187	-0.417	0.262
Dummy=1 if Pension plan	0.101	0.122	0.200	0.143	-0.162	0.239
Provincial Employment Rate	0.006	0.021	-0.002	0.023	0.025	0.051
Years of FTE work experience	-0.003	0.007	-0.005	0.011	-0.001	0.009
CPP Benefit Calculation	-0.033	0.027	-0.036	0.030	-0.026	0.061
Dummy=1 if Resource/Manufactu	-0.034	0.135	-0.030	0.159	-0.678	0.261
Dummy=1 if Trade/Transportation	-0.001	0.129	-0.043	0.156	-0.090	0.226
Dummy=1 if year =1994	-0.003	0.007	-0.172	0.119	0.592	0.167
K1	1.409	1.836	0.438	2.010	2.926	4.288
K2	1.685	1.836	0.616	2.011	3.524	4.291

APPENDIX 4 - Alternative Regression Specifications
Ordered Probit Regression

	(1) - Full		(2) - CPP Ratio		(3)	
	PART	**OUT**	**PART**	**OUT**	**PART**	**OUT**
AGE (Age 55-58 base)						
Age 59	**2.58**	**6.02**	**1.23**	**2.96**	1.71	4.01
Age 60	1.86	4.09	0.62	1.43	0.89	1.96
Age 61	**5.32**	**16.06**	**3.64**	**10.83**	**4.41**	**13.10**
Age 62	2.25	5.12	0.55	1.25	1.16	2.61
Age 63	4.23	11.40	1.90	4.83	3.08	8.06
Age 64	**7.34**	**32.99**	**6.11**	**26.00**	**6.64**	**28.28**
Age 65	**7.40**	**34.36**	**6.59**	**34.03**	**6.78**	**30.40**
OTHER DUMMY VARIABLES (Opposite base)						
Female	**2.11**	**5.96**	**1.76**	**5.08**	**2.06**	**5.84**
Married	1.04	2.61	1.24	3.21	1.01	2.55
Disabled	**3.87**	**13.92**	**3.63**	**13.35**	**3.63**	**13.35**
Immigrant	-1.19	-3.02	-1.10	-2.89	-1.13	-2.89
Self-Employed	**-2.54**	**-6.11**	**-9.72**	**-16.87**	**-2.45**	**-5.93**
Occupational Pension Plan	0.31	0.81	0.38	1.05	0.25	0.65
Own Home	-0.01	-0.02	-0.10	-0.29	-0.04	-0.10
EDUCATION (Some Post-secondary base)						
High School or Less	**-1.45**	**-3.94**	**-1.49**	**-4.16**	**-1.38**	**-3.74**
Bachelors or More	-0.90	-2.56	-0.58	-1.74	-0.77	-2.19
CONTINUOUS VARIABLES (Effect of a one per cent increase at the mean)						
Household Investment Inco	0.00	0.00	0.00	0.00	0.00	0.00
Other Household Income	0.00	-0.01	0.00	0.00	0.00	-0.01
Employment Rate	0.06	0.17	0.09	0.26	0.07	0.19
FT Equivalent Years of Exp	-0.01	-0.03	-0.03	-0.09	-0.02	-0.04
Hourly Wage Earned - Yea	-0.01	-0.02	-0.01	-0.01	-0.01	-0.02
Expected CPP	-0.01	-0.01				
Expected CPP/Earnings			0.02	0.04		
CONTINUOUS VARIABLES (Increased by $ amount at the mean)						
Household Investment Inco	0.02	0.05	-0.01	-0.03	0.02	0.06
Other Household Income (+	-0.01	-0.03	0.00	-0.01	0.02	0.06
Employment Rate (+1)	0.08	0.20	0.11	0.31	0.08	0.23
FT Equivalent Years of Exp	-0.04	-0.09	-0.11	-0.30	-0.05	-0.14
Hourly Wage Earned - Yea	-0.05	-0.12	-0.04	-0.10	-0.06	-0.16
Expected CPP (+1,000)	-0.23	-0.60				
CPP Ratio (+0.10)			1.13	3.40		

**** Base case for qualitative variables are noted in categories (opposite for binomial variab**
**** Base case for quantitative variables are the population average.**

APPENDIX 4 Con't - Alternative Reg
Ordered Probit Regression

	(4)		(5)		(6)	
	PART	**OUT**		**OUT**	**PART**	**OUT**
AGE (Age 55-58 base)						
Age 59	**2.70**	**5.68**	1.54	3.25	1.24	1.84
Age 60	2.30	4.70	1.04	2.13	0.65	0.92
Age 61	**5.72**	**15.73**	**4.56**	**12.39**	**3.92**	**7.14**
Age 62	2.61	5.47	1.22	2.52	0.89	1.29
Age 63	**4.55**	**11.13**	3.10	7.38	2.53	4.14
Age 64	**7.90**	**31.84**	**6.93**	**26.47**	**7.17**	**17.31**
Age 65	**7.85**	**30.96**	**7.01**	**27.32**	**7.66**	**19.52**
OTHER DUMMY VARIABLES (Opposite base)						
Female	**2.82**	**7.36**	**2.82**	**7.46**	**2.01**	**3.51**
Married	-0.93	-2.08	0.82	1.92	0.60	0.97
Disabled	**4.12**	**13.40**	**4.18**	**13.91**	**3.93**	**8.29**
Immigrant	-0.72	-1.67	-0.66	-1.55	-0.84	-1.34
Self-Employed	**-2.47**	**-5.42**	**-2.17**	**-4.87**	**-1.94**	**-2.98**
Occupational Pension Plan	0.17	0.41	0.04	0.11	0.19	0.31
Own Home	0.17	0.41	-0.07	-0.17	0.04	0.06
EDUCATION (Some Post-secondary base)						
High School or Less	-1.36	-3.35	-1.18	-2.91	**-1.14**	**-1.91**
Bachelors or More	-1.01	-2.54	-0.98	-2.45	-0.66	-1.15
CONTINUOUS VARIABLES (Effect of a one per cent increase at the mean)						
Household Investment Income						
Other Household Income	0.00	-0.01				
Employment Rate	0.08	0.18	0.11	0.26	0.07	0.11
FT Equivalent Years of Experience						
Hourly Wage Earned - Year 1					-0.01	-0.01
Expected CPP	-0.01	-0.02				
Expected CPP/Earnings						
CONTINUOUS VARIABLES (Increased by $ amount at the mean)						
Household Investment Inco	0.01	0.03				
Other Household Income (+	-0.02	-0.05				
Employment Rate (+1)	0.09	0.22	0.13	0.31	0.08	0.14
FT Equivalent Years of Experience (+1)						
Hourly Wage Earned - Year 1 (+$1)					-0.05	-0.09
Expected CPP (+1,000)	**-0.31**	**-0.71**				
CPP Ratio (+0.10)						

**** Base case for qualitative variables are noted in categories (opposite for binomial variables)**
**** Base case for quantitative variables are the population average.**