SOCIAL SECURITY AND RETIREMENT IN CANADA

Jonathan Gruber

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ABSTRACT

Government transfers to older persons in Canada are one of the largest and fastest growing components of the government budget. I provide an overview of the interaction between these transfer programs and retirement behavior. I begin by documenting historical trends in labor force participation and program receipt, and contemporaneous patterns of work and income receipt for the current cohort of older persons. I then present an overview of the structure of this system of Canadian transfer programs. Finally, I present results of a simulation model which measures the implicit tax/subsidy rate on work after age 55 through this system. I find that, for married male workers, there are modest taxes on work through age 64, that rise to fairly high levels thereafter. But these taxes are substantially lower for single workers, since they do not have wives eligible for means-tested transfers, and for workers with substantial other sources of income, since the family is not at all eligible for means-tested transfers.

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Government transfers to older persons in Canada are one of the largest and fastest growing components of the government budget. Total expenditures on the four primary transfer programs for older Canadians amounted to $41 billion in 1995, which was 23% of the federal budget and 5.3% of GNP in that year. In 1970, total expenditures were only $2 billion, amounting to just 14% of the federal budget and 2.3% of GNP. Moreover, without changes to the system, rapid growth appears likely for the near future. The ratio of persons 65 and over to persons 20-64 is projected to grow from its current level of 19% to over 40% by the year 2075. As a result, the payroll tax necessary to finance the major social insurance program for older persons, the Canada/Quebec Pension plan, is projected to grow from it's current level of 5.6% of wages to over 14% by the year 2075 (Office of the Superintendant of Financial Institutions Canada, 1993). Similar cost increases are in store for the other three major transfer programs to older Canadians, which are financed from general revenues: the Old Age Security demogrant, and the means tested Guaranteed Income Supplement and Spousal Allowance programs.

As a result of this growing fiscal imbalance, Canada may be required to consider a number of reforms to its Social Security system over the coming years. But for understanding the implications of any potential reforms, it is critical to understand how this complicated web of programs affects the retirement decisions of older Canadians. Public income support is the dominant feature of the opportunity set facing households over age 65 in Canada. For the median household where the head is over age 65, these Social Security programs represents 61% of total family income; for 23% of such households, they provide more than 90% of family income.[1] As a result, it seems likely that the structure of the Social Security program has important effects on the life-cycle savings and labor supply

[1]Authors' tabulations of the 1992 Survey of Consumer Finances.

decision-making of households, and in particular on their retirement decisions. But there has been little empirical analysis of either the retirement incentives under the Canadian system, or the effects of those incentives on behavior.

The purpose of this paper is to provide an overview of the interaction between SS and the labor force behavior of older persons in the Canada. I do so in four steps. First, in Part I, I document the pertinent facts about the labor market behavior of older persons in Canada, both today and over time. Then, in Part II, I describe the structure of the system of income support programs for older persons in Canada, summarizing the relevant institutional details for thinking about retirement behavior. Finally, in Part III, I present the results of a simulation model designed to document the retirement incentives inherent in these programs for current cohorts of retirees. Part IV concludes by considering the implications of my findings.

Part I: The Labor Market Behavior of Older Persons in Canada

As in most industrialized nations, the second half of the 20th century in Canada has been marked by a declining attachment to the labor force of older persons. In 1960, 87% of men aged 55-64 and 30% of men age 65 and above were participating in the labor force; by 1993, these ratios had fallen to 61% and 10%, respectively. One possible explanation for this shift is the increasing generosity of the income support programs for older Canadians. But before addressing the effects of these programs, it is useful to provide some more background on the labor market behavior of older men and women.

The historical and contemporaneous facts presented in this section are drawn from a number of different data sources. These are summarized in Appendix I. In that appendix, we also provide a brief overview of the databases that are used by researchers in the Canada to study retirement behavior.

Historical Trends

Figures 1 and 2 graph the labor force participation rates of men and women in different age groups since 1960. We focus on three age groups: 45-54; 55-64; and 65 plus. For men, there is a decline in the labor force participation of all of these groups. The decline for the youngest group is slight, while the decline for the other groups is much more precipitous. The percentage decline is most dramatic for those age 65 and over, who by the end of the sample period were very rarely participating in the labor force.

For women, the pattern is quite different: any trend towards earlier retirement is dominated by increased labor force participation. For the two younger groups, participation is rising; for the oldest group, it declines slightly.

One first pass approach to considering whether SS is associated with these labor force trends is to examine related trends in SS generosity. We do so in two ways. First, in Figure 3, we show the share of the population over age 55 receiving various sources of retirement income. We consider four types of income: OAS; GIS or SPA; CPP/QPP retirement benefits; and CPP/QPP disability benefits. We do not have data on age-specific receipt rates before 1981, so we simply normalize total receipt by the age 55 and over population. This is not a problem for all of the retirement programs, which are restricted to those age 60 and above; this will slightly overstate the size of the disability program, since some recipients are under age 55.

There has been a steady growth in receipt of OAS income and disability benefits. There has been a much more rapid growth in receipt of CPP/QPP retirement benefits, rising from zero to roughly one-half of the over 55 population by 1993. Perhaps due to the growth in this income source, there was little growth in GIS/SPA benefits after 1975, and even a decline after 1985.

Figures 4 and 5 explore this time series in more detail, focusing on the period after 1980 for

which I have data on receipt rates by age and sex for the CPP only. Each figure has four lines, representing: OAS receipt; GIS/SPA receipt; CPP retirement receipt; and receipt of any of these benefits, including CPP disability. These figures parallel Figure 3: slightly rising OAS receipt (more so for women than for men), more rapidly rising CPP retirement receipt, and a somewhat offsetting decline in GIS/SPA receipt. Of particular interest in these graphs is the jump in CPP retirement receipt in 1987; as discussed below, in this year, early eligibility at age 60 was made available. Overall, there is a steady rise in receipt of income from these programs, with a jump in 1987.

Second, in Figure 6a and 6b, we show the change in generosity of benefits payments over time. We show the replacement rate through all of these four income support programs from 1960 to 1991 for low earnings, medium earnings, and high earnings workers. These replacement rates are computed according to the algorithm described in the simulation section below, for a 65 year old man in 1995 with a 62 year old wife.[2] A key consideration in computing replacement rates is the level of other income (ie. asset income) available to potential retirees, since the GIS and SPA programs are means tested. As a result, we consider two cases: a couple with no asset income (Figure 6a); and a couple with $4818 in other income (in $1990), which is the median level of non-government income available in 1990 for families where the head is over age 65 (Figure 6b).

Replacement rates grow substantially over time. In all cases, they start at zero until 1965, since OAS benefits were restricted to those age 70 and over until that year. Then, in 1966, CPP/QPP benefits were introduced; as described below, this program was phased in over a ten year period; in 1967 the GIS program was introduced as well. As a result of these two features, the replacement rate grew steadily until 1975, reaching roughly 35% in that year for the median earner. In 1975, the SPA

[2]We use the earnings from the median, 10th, and 90th percentiles of the earnings distribution of the 1930 cohort that is used in our simulation model.

program was introduced, leading to a discrete jump in replacement rates due to the fact that the couple in our example has an eligible wife. Replacement rates then declined somewhat over time, as the growth rate in earnings exceeded inflation by a substantial amount in the mid-1980s.[3] The replacement rates for the 10th and 90th percentiles follow a similar pattern to the median case, although more pronounced for the 10th percentile; in the late 1970s, replacement rates exceeded one for this sample.

In Figure 6b, we consider the effect of introducing asset income. This substantially lowers replacement rates, by reducing the benefits received through the means tested GIS and SPA programs. But the time series pattern is similar to that in Figure 6A.

These time series patterns yield a mixed picture of the influence of SS. Clearly, there is a strong correlation between the size of the program and the labor force participation rate of older men. But the decline in participation of older men has continued unabated in the 1980s and 1990s, even as program generosity has declined.

Labor Market Behavior in 1993

For a more detailed understanding of the time pattern of labor force participation in recent times, we turn to the April 1992 and 1993 Survey of Consumer Finances. The SCF is a large nationally representative survey which asks individuals about their labor force attachment at both the point of the survey and the previous year, as well as about income in the previous year. We pool two years of the SCF for added precision in our estimates of labor force participation by age.

The age pattern of non-participation for men and women is depicted in Figure 7. At age 45, the participation of men is significantly higher, although almost 80% of 45 year old women are

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[3]Moreover, the earnings of our sample family head is tied to the earnings base for CPP taxation, which grew especially fast in the mid-1980s.

working. There is then a gradual parallel decline for men and women until age 55, at which the pace steepens; this is particularly true for men, so that the participation gap closes substantially by age 65. By age 70, participation has dropped quite low, with fewer than 10% of men or women participating in the labor force.

Figure 8 considers in more detail the allocation of time among men as they age, by dividing activities at each age into employment, unemployment, disability, and retirement. There is a steady decline in employment of men. Most of this decline is reflected in an increase in retirement, and in an increase in disability after age 55; unemployment rates are fairly constant until age 60. After age 60, employment falls more rapidly, and unemployment falls as well; disability begins to fall after age 65. These declines are reflected in rapid increases in retirement. This same exercise is repeated for women in Figure 9. The patterns are similar, with the exception that a much larger share of women are not pursuing any of these activities (they are out of the labor force for other reasons).

Income Sources of Older Persons

Figures 10 and 11 examine the incidence of public and private retirement income for older persons. Figure 11 graphs two series for men only: the rate of Social Security recipiency; the rate of recipiency of OAS, CPP/QPP, and GIS/SPA; and the rate of recipiency of other public assistance through the unemployment insurance and social assistance (means-tested welfare) programs. This figure highlights the fact that even before retirement, a large share of men are receiving public assistance. As a result, the dramatic increase in retirement income receipt after age 60 is to some extent offsetting other government transfer payments. By age 65, there is no receipt of other transfers, and all men are receiving some form of retirement income.

Figure 11 displays the percent of men and women at each age who are receiving private

pension income. This grows fairly rapidly from age 55 on, particularly for men, so that by age 67 more than one-half of the male population is receiving pension income. Pension receipt for women at older ages is only about two-thirds as common. At the same time, however, many women will be benefitting from these income streams through their husband's pension.

Finally, Figure 12 shows the distribution of income sources for couples, arrayed by the age of the head of the family.[4] We consider the distribution of income across four sources: earnings, capital income, private pensions, and public sector income (predominantly retirement income for older couples, as shown in Figure 10). Earnings is the dominant source of family income until age 55, at which point the earnings share begins to decline rapidly; even from age 45-55, however, public assistance plays a non-trivial role (mirroring the results in Figure 10). The decline in earnings after age 55 is compensated for by increases in each of the other elements, most importantly public income. By age 70, public assistance income accounts for over 70% of family income.

Part II: Key Features of the Income Security System

The Old Age Security System

The oldest component of the income security system for older Canadians is the Old Age Security System (OAS), which was put into place in 1952, replacing a provincially run means-tested benefits system that had existed since 1927. This program is available to anyone age 65 year or over who meets certain residence requirements.[5] The program originally provided benefits to those age 70

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[4]This differs somewhat from previous figures, where the unit of observation is the older person; we do this since these income concepts are best measured at the family level.

[5]Individuals must have been a Canadian citizen or legal resident of Canada at some point before application, and have resided in Canada for at least 10 years (if currently in Canada) or 20 years (if currently outside of Canada).

or over, and the age of eligibility was dropped to 65 in 1965.

The OAS pension itself is a uniform demogrant which was equal to $387.74 (19% of median monthly earnings of 20-64 year old males in Canada) in 1995. Individuals who do not meet residence requirements are entitled to a partial OAS benefit. OAS benefits have been indexed to the Consumer Price Index since 1972. OAS benefits are fully taxable by both federal and provincial income taxes. In addition, there is a clawback of OAS benefits from very high income individuals: in 1993, the OAS for a single individual was reduced by 15 cents per dollar of net income exceeding $53,215. OAS benefits are financed from general taxation revenues.

The Canada/Quebec Pension Plan

The largest component of the income security system is the Canada Pension Plan (CPP) and Quebec Pension Plan (QPP). These programs began on January 1, 1966, and are administered separately by Quebec and the rest of Canada.

The plan is financed by a payroll tax of 2.7% each on both employers and employees. This payroll tax is levied up to the Year's Maximum Pensionable Earnings (YMPE), $34,900 in 1995 (or 145% of median annual earnings). The YMPE is indexed to the growth in average wages in Canada. In addition, earnings up to the Year's Basic Exemption (YBE) is exempted from the computation; this is defined as 10% of the YMPE.

Eligibility for this plan is conditioned on contributions for at least one calendar year during the contributory period, which is the period from attainment of age 18, or January 1, 1966 if later. Benefits are then computed in several steps. First, the number of months used to compute the retirement pension is computed by subtracting from the number of months in the contributory period

months (a) receiving a disability pension, (b) spent rearing small children,[6] (c) between age 65 and the commencement of the pension, and (d) 15% of the remaining months. The last three of these conditions is subject to the provision that it not reduce the contributory period below 120 months minus months of disability pension receipt. In addition, excess earnings in one month above 1/12 of the YMPE may be applied to months in the same year where earnings are below 1/12 of the YMPE.

Second, the remaining months of earnings history are converted to current dollars, using as a deflator the ratio of the YMPE in each year to the average of the YMPE over the three years prior to (and including) the year of pension receipt. Finally, the benefit is computed as 25% of the average of this real earnings history. This 25% ratio has been in place since 1976; from 1967-1976, the program was phased in, with the share of average earnings paid out in benefits rising from 2.5% in 1967 to 25% in 1976. In addition, before the YMPE reached the average industrial wage in 1986, it was rising more rapidly than average wages (12.5 percent per year).

Until 1984 for the QPP and 1987 for the CPP, benefits could not be claimed before the 65th birthday, and there was no actuarial adjustment for delayed claiming. Beginning at these times, individuals were allowed to claim benefits as early as age 60, with an actuarial reduction of 0.5% for each month of early claiming (before age 65), and an actuarial increase of 0.5% for each month of delayed claiming (after age 65).

Until 1975, receipt of benefits under the CPP and QPP were conditioned on low earnings levels, with earnings above these ceilings taxed away at high rates. In 1975, these earnings tests were eliminated. With the introduction of early retirement in 1984 and 1987, however, an earnings test was reintroduced: workers can only claim early benefits if their annual earnings do not exceed the

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[6]This is defined as months where there was a child less than 7 years of age and the worker had annual earnings of at least one-twelfth of the YBE. This provision was introduced in 1983.

maximum retirement pension payable at age 65 for the year in which the pension is claimed ($713.19, or 36% of median monthly earnings, in 1995). This earnings test is only applied at the point of application, however; after that point, there is no additional check on the individual's earnings.[7] Moreover, the earnings test does not apply anymore once the individual reaches age 65.

CPP/QPP benefits are independent across spouses, and are a function of that spouse's earnings history only.[8] But there is an interdependence through survivor benefits (as well as the interdependences through the means tested programs described below). Spouses are eligible for survivor pensions if the deceased contributor made contributions for at least 10 years or one-third of the number of years in the contributory period, and if the spouse is over age 35 or has dependent children. For spouses under age 65, the survivor pension is a combination of a flat rate portion plus 37.5% the earnings-related pension of the deceased spouse. For spouses age 65 and above, the survivor's pension is equal to 60% of the earnings-related pension. The pension used to calculate the survivor's benefit is not subject to actuarial adjustment. If the surviving spouse is receiving their own earnings-related pension, then the combination of the two pensions cannot exceed the maximum retirement pension available in the year that the later of these two pensions commences. Children of deceased contributors are also entitled to a survivor's benefit if under 18 or a full time student between 18 and 25; this benefit is a flat amount. There is also a lump sum death benefit, which is generally equal to one-half of the annual CPP/QPP pension amount.

Benefits are legislated to increase with the consumer price index (since 1973), average over the

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[7]Although any earnings after initial receipt of a CPP/QPP pension is not included in the subsequent average earnings used to compute future benefits.

[8]Couples do have the option of sharing their benefits for income tax purposes, since taxation is at the individual level.

12 month period ending with October of the preceding year. Benefits are fully taxable by the federal and provincial income taxes.

The Guaranteed Income Supplement and Spouses Allowance

The Guaranteed Income Supplement (GIS) is a means-tested supplement available to recipients of OAS which was introduced in 1967. Individuals must re-apply for the GIS each year, and the means-test for eligibility (and benefit) levels is repeated. The income level for means-testing is defined in the same way as for income tax purposes, with the important exclusion of OAS pension income. Unlike the OAS or CPP/QPP, GIS benefits are based on family income levels

There are separate single and married guarantee levels, for the GIS; in 1995, these were $460.79 for singles and $300.14 (each person) monthly for marrieds (23% and 15% of median monthly income, respectively. Benefits are then taxed away as income rises at a rate of 50%, although a couple with one member over age 65 and one under age 60 is taxed at only 25% with an initial amount of income exempted.

The Spouses Allowance (SPA), which was introduced in 1975, is a means-tested monthly benefit available to 60-64 year old spouses of OAS recipients and to 60-64 year old widows/widowers. For the spouse of an OAS recipient, the benefit is equal to the OAS benefit plus GIS at the married rage; the OAS portion is then taxed at 75% as income rises until it is reduced to zero, and then the combined GIS benefits are taxed at 50%. For a widowed spouse, the benefit is equal to the OAS plus GIS at the widowed rate, and is taxed equivalently. Both the GIS and SPA guarantees are also indexed to inflation, and neither source of income is taxable by either the federal or provincial tax systems.

Hazard Rates

One natural question is whether the labor force behavior of older Canadians lines up with the incentives inherent in the systems described above. I explore this in Figures 13 and 14, which show hazard rates out of the labor force for men and women, respectively. This is measured as the increase in the rate of labor force leaving from the previous age, relative to the stock of workers participating at the previous age.

For men, there is clear evidence of a dramatic increase in labor force leaving at age 65, which is the age of normal retirement for CPP/QPP and of entitlement to OAS benefits. Fully 40% of the men who remain in the labor force at age 65 leave during that year. There is also evidence of a response to the CPP/QPP early retirement age of 60, but it is not particularly strong relative to the hazards in surrounding years. This is consistent with the notion that the response to early retirement entitlements emerges only slowly, as documented by Burtless and Moffitt (1984) for the U.S. For women, the pattern is similar: a pronounced spike at age 65, with some evidence of a response around age 60 but nothing particularly pronounced.

Other Public Programs

In addition to the federal retirement programs, there are a variety of provincial programs that provide supplements to low income retirees. For example, a program in Ontario provides $80/month to Ontario residents who are recipients of the GIS; but these funds are taxed back at 50% as other (non-OAS or GIS) income rises.

A final program that is important for considering retirement incentives is the Disability Insurance (DI) program that is operated through the CPP/QPP. This program provides benefits to those workers unable to work due to disability. The basic benefits structure consists of two portions: a flat-rate portion, which is a lump sum paid to all disabled workers; and an earnings-related portion,

which is 75% of the applicable CPP/QPP retirement pension, calculated with the contributory period ending at the date of disability. This program is fairly stringently screened, and fewer than 5% of older Canadian men are on DI. Nevertheless, recent research shows that the benefit structure of this program has important effects on labor supply (Gruber, 1996).

Private Pension Coverage

Another important feature of the retirement landscape is private pensions. Defined benefit pension plans share many of the same incentive features as public insurance plans. In fact, many Canadian workers are covered by occupational pensions, or RRPs. In 1992, 47.5% of paid workers were covered by occupational pensions, with coverage being slightly higher for males than for females. 90% of plan members were in defined benefit plans, although the share in defined contribution plans has been growing recently. Defined contribution plans may also affect retirement through income effects, but there should not be tax/subsidy effects on the work decision since the payout is not dependent on work patterns.

The Retirement Effects of Income Support Programs in Canada

While there is a large U.S. literature on Social Security and retirement (see Diamond and Gruber (1997) for a review), there is much less work in the Canadian context. Recently, Baker and Benjamin (1996) have explored the effects of the introduction of the early retirement option under the QPP in 1984 and the CPP in 1987. They found that there was little effect of this policy change on the labor force behavior of 60-64 year olds in the short run. But there is some suggestion of a longer run response, as a "spike" in labor force leaving has emerged at age 60 in recent years (as shown in Figure 13 above). Baker and Benjamin (1997) explore another important policy change, the removal of

earnings tests under the CPP and QPP in the 1970s. They find that the removal of earnings testing was associated with a significant shift from part time to full time work among older workers.

Part III: Retirement Incentives

Simulation Modelling

In this section, I use a model of benefits determination under these four programs to assess the incentives of SS on retirement through accrual rate effects. Given the similarities of the CPP and QPP programs, the incentives are calculated for the representative CPP worker. This program embeds the benefits computation and clawback structure of these four programs to compute benefits for a worker, given his age, spouse's age, earnings history, and date of retirement. I use the base case assumptions of the CPP for wage and price growth, as well as assumptions on the growth of the program contribution rate, to model incentives. The program computes benefits for the worker and survivor and death benefits for the case where the worker has died.

The next step in the simulation is to take these monthly benefit entitlements and compute an expected net present discounted value of Social Security Wealth (SSW); this includes the future entitlements from all four programs. This requires projecting benefits out until workers reach age 100, and then taking a weighted sum which discounts future benefits by both the individual discount rate, and the prospects that the worker will live to a given future age. The methodology for doing so is described in Diamond and Gruber (1996). For the worker himself, this is fairly straightforward; it is simply a sum of future benefits, discounted backwards by time preference rates and mortality rates. For survivor benefits, it is more complicated, since I must account for the joint likelihood of survival of the worker and the dependent. In our base case, I use a real discount rate of 3%, although we will vary this below. To adjust for mortality prospects, I use the sex/age specific U.S. life tables from

Statistics Canada (1990). Finally, to compute net SSW, I subtract out the CPP payroll tax payments that the individual would make during any continued work. I add both the employee and employer shares of the payroll tax, under the assumption that the employer share if fully borne by the worker in the form of lower wages. All figures are discounted back to age 55 by both time preference rates and mortality risk.

For the output of the simulations, I calculate three different concepts. The first is the net of tax replacement rate, the rate at which SS replaces the (after-tax) earnings of the worker should he continue working in that year. It is important to do this calculation on an after-tax basis, to account for the facts that (a) OAS, GIS, and SPA benefits are not taxable, and (b) even for taxable CPP benefits, the individual may be in a lower tax bracket when retired. I do modelling the average tax rate faced by earners of different earnings level in each year, and assuming that the tax system stays constant into the future (with the same rate structure and indexed tax brackets).

The second concept is the accrual rate, the percentage change in SSW from the previous year.

Finally, I compute a tax/subsidy rate, which is the absolute change in SSW over the potential earnings from working that next year. This represents the implicit tax on, or subsidy to continued work, in terms of the net change in SSW that is implied by that additional year of work. The numerator of this tax/subsidy rate is the opposite of the change in SSW from working the additional year. The denominator is the potential earnings over that additional year. Thus, if this figure is positive, it implies that the SS system causes a disincentive to additional work through foregone SSW. This is the relevant concept for the worker who is trading off leisure (on SS) against continued work.

Note that in computing these concepts I use the unconditional mortality risk beyond age 55; that is, there is some probability that the worker may be dead at each year after his 55th birthday. An alternative approach would be to use conditional life tables at each year, so that for the worker

considering retiring on his 63rd birthday we discount the future by the age 63-conditional life table. The correct approach here depends on the perspective from this which computation is taken. Our approach is appropriate if the computation is taken from the perspective of the forward looking 54 year old, who is considering the retirement incentives at all future ages. The alternative would be appropriate for year-by-year decision-making on retirement. Since I discount all of our dollar figures back to age 55 by both time preference and mortality risk, both concepts yield the same tax/subsidy effects (since both numerator and denominator are deflated); however, they will yield somewhat different values of SSW and therefore different accrual rates.

To produce the base case numbers, I use a typical individual who was born in January, 1930, and thus turned 65 in January, 1995. In theory, to calculate benefits for a worker I would need his entire earnings history since 1966. In practice, we use a "synthetic" earnings history which uses the median earnings of a cohort through time. As a first step in creating this synthetic earnings history, I have computed information on the median earnings by calendar year and age cohort from the 1973-1993 Survey of Consumer Finance (SCF data).[9] More specifically, I take the median earnings for a 62 year old in 1992, for a 61 year old in 1991, and so on back through the survey years. To backcast from 1973 to 1966, before cross-sectional survey data is available, I first estimate cross-sectional age-earnings profiles in the 1973 survey. I then apply these estimates to "un-age" the workers in the 1975 survey back to 1966, and deflate these pre-1975 profiles by average wage growth by region, using data from Gruber and Hanratty (1995). To project earnings beyond 1992, I use the growth in the YMPE (actual to 1995, projected thereafter).

In pursuing this calculation, I found a relatively steep decline in median earnings after about

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[9]These data are collected annually at the individual level from 1981 onwards. Before then, they were collected biannually at the family level; I use the information for male heads of household.

age 50, which presumably reflects the fact that more and more of the earning population is working only part-time. However, the synthetic individual is considering the decision to work full-time for an additional year, so this skews the true nature of the underlying earnings history. As a result, I use this synthetic earnings profile through age 50, and then assume that earnings stay constant in real terms from age 51 onwards.

For the purposes of the simulations below, I assume that workers claim SS benefits at the point of their retirement, or when they become eligible if they retire before the point of eligibility. I assume initially that the worker's wife is exactly three years younger than he. I also assume that she has never worked. Finally, a critical parameter is the level of outside (ie. asset) income available to the worker, since the GIS and SPA benefits are means tested. Following the computation of replacement rates above, I consider two cases: zero outside income and outside income of $4818.

Base Case Results

Table 1 shows the base case results, with zero asset income. Each row represents the age of the worker in the last year that they work; that is, the first row represents the effect of working during the 54th year and retiring on the 55th birthday (January 1, 1985). The first column shows the net replacement rate. This concept is not defined until the worker can actually claim benefits, which occurs if his last year of work is at age 59 so that he retires at 60.

At that first point of possible claiming, the replacement rate is roughly 18%. The replacement rate then rises slowly to age 65, as workers increase their SS benefits by delaying claiming. At age 65, there is a large discrete jump, as the OAS benefit begins, and then a continued slow rise from actuarial adjustment. Then, at age 68, there is another discrete jump from the wife's OAS benefit, and a continued rise from actuarial adjustment. Thus, for the worker who works through his 69th year and

collects on his 70th birthday, SS replaces roughly all of his after-tax earnings.

The next three columns show the evolution of SSW over time. For understanding these results, it is useful to recap the five mechanisms through which additional work affects the computation of SSW:

1) The worker must pay SS taxes on his earnings, lowering net SSW

2) The additional year of earnings is used in the recomputation of SS benefits, replacing a previous low (or zero) earnings year (besides the 15% of lowest months that have already been excluded). Additional work raises net SSW through this channel. But this is only true if these additional years of earnings are above the YMPE, and some earlier years of earnings were below. For our median worker, in fact, all years of earnings are above the YMPE.

3) The additional year of work, for work at ages 62 and beyond, implies a delay in claiming. This raises future benefits through the actuarial adjustment, but it implies fewer years over which benefits can be claimed. As a result, there is an ambiguous effect on net SSW.

4) The additional year of work will lower GIS and SPA benefits through means-testing, both of the income from work and of the higher CPP benefit which results from additional work.

5) For each year into the future we consider, there is some chance that the worker will die, lowering his net SSW.

Thus, it is unclear ex ante whether the SS system will tax or subsidize additional work in any given case.

As Table 1 shows, a worker who retires on his 55th birthday has accumulated $148,138 in SSW. There is then a small increase in SSW for work during the 55th year. This is because the worker still has not completed his earnings history, so that additional years of work therefore replace a zero in the benefits computation. Similarly, the system is neural with respect to work during the 56th year, since there is roughly (in our example) six months of work in that year required to fully complete the earnings history. After this point, additional earnings do not affect the average earnings, as noted above, since earnings in every year is above the YMPE. From age 57 onwards, therefore, the SSW uniformly declines, so that the system is placing a net tax on work. As a result, the accrual rate is

negative in all years except the first.

The final column shows the tax/subsidy rate. There is a slight subsidy to work of 4.2% in the 55th year, as noted above, and then taxes on work thereafter. This tax is lower than the payroll tax which finances the CPP through age 60, since earnings below the YBE and earnings above the YMPE are exempted from tax. But there is no other form of tax/benefit linkage in this range, since there is no benefit recomputation for additional work for a worker whose earnings each year were above the YMPE.

Beginning in the 60th year, tax rates on continued work rise more rapidly. There is actually an increase in the underlying value of the man's CPP wealth over the range of work in the 60th through 63rd year. But this is overshadowed by the scheduled rise in the CPP tax rate, and the reduction in GIS/SPA benefits.

Beginning with work during the 64th year, the tax rates rise substantially, as the (constant) actuarial adjustment becomes insufficient to compensate for delayed claiming of benefits.[10] In addition, beginning in the 65th year, there is a much larger tax rate through the GIS/SPA program. This is due to the fact that the GIS benefit kicks in once the worker is aged 65 and is receiving the OAS. The tax rate then declines again beginning with work during the 67th year. This is because the wife is turning 65, so that she is moving out of the range of eligibility for the (means-tested) SPA benefit. As a result, there is less of a disincentive for earnings for the husband.

Table 2 presents analogous results for the case with outside income. In this case, the pattern

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[10]The relatively large jump at age 64 is due to the particulars of this example. There is a much larger rise in the CPI from 1992 (when the worker is age 62) to 1993 (age 63) than from 1993 to 1994 (age 64). As a result, the increase in benefits is unusually large from age 62 to 63, and unusually small from 63 to 64. Thus, there is little change in the tax rate on continued work from age 62 to 63, and a large change from 63 to 64; in other years, the change from 62 to 64 would be spread across both years.

of tax rates is quite similar through age 60. From age 60 onwards, however, the tax rates on continued work are somewhat lower, with tax rates peaking at 32% (instead of the 41% tax rate with zero asset income). This pattern is a simple reflection of the implicit tax on work put in place by the GIS and SPA programs. With more outside income, these programs are irrelevant. As a result, raising CPP benefits through working to an older age is relatively more attractive, since doing so does not reduce the means-tested entitlement. Thus, the net effect of the Canadian retirement income system on work incentives is fairly sensitive to whether or not the family is in the range where means-tested benefits are relevant.

Other Cases

Table 3 explores these same results for a single worker, for the case with outside income. Until age 60, the pattern of incentives for the single worker is very similar to that of the married worker. From age 60 onwards, however, the tax rates are dramatically lower for the single worker than for the married worker base case. This reflects the fact that there is no implicit taxation through the SPA program in this case, since there is no spouse who can benefit from that program. That is, these findings illustrate that the CPP system itself is very close to actuarially fair after the age of early eligibility, but that the large tax rates that we saw earlier arose from the means-tested transfers that were in place through the SPA system. If there is no outside income for this single worker, however, there are non-trivial taxes after age 60 (on the order of 8%), reflecting the clawback of GIS benefits.

For retirement from age 65 onwards, however, there is once again a substantial tax for the single worker, due to unfair actuarial adjustment of the CPP benefit. These taxes rise steadily with age, as the actuarial adjustment becomes increasingly unfair. At the oldest ages in our computations,

the results are once again similar for marrieds and singles, as wives have moved out of the range of SPA eligibility.

One particularly interesting dimension of heterogeneity is the lifetime earnings of workers. Tables 4 and 5 contrast the cases of a worker whose earnings are at the 10th percentile of the earnings distribution with one whose earnings are at the 90th percentile. In doing this calculation, we assume that the age-earnings profiles of both workers are the same; we simply shift the intercept at age 50 for these profiles. For the 10th percentile worker, we assume no outside income; for the 90th percentile case, we assume the median outside income.

Before age 60, these cases yield fairly similar results. One interesting finding is that the tax rates on both high and low earners are lower than those on the base case worker. This is because more of the earnings of the high earner is above the YMPE and therefore exempt from taxation; similarly, more of the earnings of the low earner is below the YBE and also exempt from taxation. But these differences are fairly slight.

But from age 60 onwards a striking difference emerges. For the low income worker, this system is very generous, replacing 28% of his income if he retires after his 59th year, 122% of his income if he retires after his 64th year, and 186% of his income if he retires after his 69th year. At the same time, the tax rates in place are very large; they reach a peak of *over 70%* for retirement on the 70th birthday. Thus, the worker with low lifetime earnings and no outside income faces a large disincentive in considering further work after age 60, and particularly from age 65 onwards.

For workers with higher lifetime earnings, the replacement rates through the system are much lower, as are the implicit tax rates. Even at their peak, the tax rates on continued work are below 20%. These patterns are compared in Figure 15, which illustrates these differences: similar tax rates until age 60, with a growing divergence thereafter.

Finally, Table 6 considers a different permutation to the earnings history: assuming that the worker was unemployed for four years, so that he has an incomplete earnings history (for the case with outside income). This offers an incentive for the worker to retire later, since additional years of work replace zeros in the computation of CPP benefits. This is illustrated by the sizeable subsidy to work through age 59; this subsidy arises due to the replacement of zero values in the earnings history. From age 60 to 62, there is a tax rate on continued work, but it is smaller than in the base case. Then, from age 63 onwards, the tax rate is the same as in the base case, as the earnings history has been completed.

Part V: Conclusions

The system of retirement income provision in Canada is a critically important feature of the opportunity set of older workers who are considering retirement. This set of four programs provides a large source of income support for retired workers, but it also potentially taxes continued work among those who wish to work beyond the age of early retirement eligibility. I have documented that there is clearly an important effect of these programs on the timing of retirement. Future work on retirement in Canada could usefully explore the effect of program generosity on retirement behavior. In particular, it is important to assess the role that these (often quite large) implicit taxes play in determining retirement decisions, both on average, and across groups of workers that face very different incentives, for example high vs. low earners.

Appendix I: Data Sources

Historical Data:

1) Labor Force Participation data are from Statistics Canada's CANSIM CD-Rom, as well as data provided directly by StatCan.

2) Population data are from:

a) Economic Council of Canada (1976). People and Jobs: A Study of the Canadian Labor Market. Ottawa: Information Canada.

b) Denton, Frank D. and Slyvia Ostry. Historical Estimates of the Canadian Labour Fource. Ottawa: Dominion Bureau of Statistics, 1967.

c) Historical Labor Force Statistics. Ottawa: Statistics Canada, 1995.

3) Data on program receipt are from:

Human Resources Development Canada (1996). Statistics Related to Income Security Programs. Ottawa: HDRC.

Contemporaneous Data

All contemporaneous figures tabulated by Author from April SCF data for 1992 and 1993

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Baker, Michael and Dwayne Benjamin (1996). "Early Retirement Provisions and the Labour Force Behaviour of Older Men: Evidence from Canada". Mimeo, University of Toronto.

Baker, Michael and Dwayne Benjamin (1997). "How do Retirement Tests Affect the Labor Supply of Older Men?". Mimeo, University of Toronto.

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Table 1: Base Case Incentive Calculations, No Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	148138	0	0	0
55	--	149053	916	0.0062	-0.0415
56	--	148944	-109	-0.0007	0.0051
57	--	148188	-756	-0.0051	0.0355
58	--	147437	-751	-0.0051	0.0365
59	0.1760	146685	-753	-0.0051	0.0380
60	**0.1964**	**145232**	**-1453**	**-0.0099**	**0.0771**
61	0.2116	143667	-1565	-0.0108	0.0848
62	0.2520	142162	-1505	-0.0105	0.0848
63	0.2806	140528	-1634	-0.0115	0.0962
64	0.6037	137502	-3025	-0.0215	0.1859
65	0.6124	131793	-5709	-0.0415	0.3672
66	0.6212	125678	-6115	-0.0464	0.4128
67	0.9285	120112	-5565	-0.0443	0.3955
68	0.9545	115755	-4357	-0.0363	0.3269
69	0.9838	111473	-4282	-0.0370	0.3403

Table 2: Base Case Incentive Calculations, Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	124391	0	0	0
55	--	125406	1015	0.0082	-0.0488
56	--	125336	-70	-0.0006	0.0034
57	--	124580	-756	-0.0060	0.0374
58	--	123829	-751	-0.0060	0.0383
59	0.1817	123076	-753	-0.0061	0.0397
60	**0.2017**	**121938**	**-1138**	**-0.0092**	**0.0629**
61	0.2165	120759	-1179	-0.0097	0.0662
62	0.2449	119668	-1091	-0.0090	0.0636
63	0.2695	118501	-1167	-0.0097	0.0709
64	0.5078	115824	-2677	-0.0226	0.1694
65	0.5182	111513	-4311	-0.0372	0.2849
66	0.5268	106841	-4672	-0.0419	0.3234
67	0.8496	103284	-3557	-0.0333	0.2587
68	0.8805	100629	-2654	-0.0257	0.2034
69	0.9142	97805	-2824	-0.0281	0.2287

Table 3: Single Worker, Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	68957	0	0	0
55	--	69648	691	0.0100	-0.0352
56	--	69456	-192	-0.0028	0.0100
57	--	68700	-756	-0.0109	0.0390
58	--	67949	-751	-0.0109	0.0397
59	0.1551	67196	-753	-0.0111	0.0409
60	**0.1705**	**66469**	**-727**	**-0.0108**	**0.0413**
61	0.1826	66427	-42	-0.0006	0.0024
62	0.2002	66622	195	0.0029	-0.0116
63	0.2211	66884	262	0.0039	-0.0162
64	0.3616	65278	-1606	-0.0240	0.1036
65	0.3752	63202	-2076	-0.0318	0.1396
66	0.3884	60804	-2398	-0.0379	0.1686
67	0.4032	58435	-2369	-0.0390	0.1748
68	0.4175	55777	-2658	-0.0455	0.2062
69	0.4320	52951	-2826	-0.0507	0.2315

Table 4: 10th Percentile Earner, No Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	140871	0	0	0
55	--	141388	517	0.0037	-0.0474
56	--	141377	-12	-0.0001	0.0011
57	--	141042	-335	-0.0024	0.0322
58	--	140696	-346	-0.0025	0.0348
59	0.2810	140344	-352	-0.0025	0.0369
60	**0.3141**	**139124**	**-1220**	**-0.0087**	**0.1362**
61	0.3373	137743	-1381	-0.0099	0.1580
62	0.4143	136422	-1321	-0.0096	0.1584
63	0.4608	135014	-1408	-0.0103	0.1771
64	1.2210	132699	-2315	-0.0171	0.3057
65	1.2427	128110	-4589	-0.0346	0.6377
66	1.2650	123311	-4799	-0.0375	0.7035
67	1.7663	118940	-4370	-0.0354	0.6776
68	1.8110	115124	-3816	-0.0321	0.6276
69	1.8596	111432	-3692	-0.0321	0.6548

Table 5: 90th Percentile Earner, Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	124391	0	0	0
55	--	125406	1015	0.0082	-0.0318
56	--	125336	-70	-0.0006	0.0022
57	--	124580	-756	-0.0060	0.0239
58	--	123829	-751	-0.0060	0.0243
59	0.1146	123076	-753	-0.0061	0.0250
60	**0.1264**	**121938**	**-1138**	**-0.0092**	**0.0394**
61	0.1355	120759	-1179	-0.0097	0.0414
62	0.1529	119668	-1091	-0.0090	0.0397
63	0.1679	118501	-1167	-0.0097	0.0441
64	0.3152	115824	-2677	-0.0226	0.1050
65	0.3207	111513	-4311	-0.0372	0.1761
66	0.3251	106841	-4672	-0.0419	0.1993
67	0.5228	103284	-3557	-0.0333	0.1591
68	0.5404	100629	-2654	-0.0257	0.1247
69	0.5594	97805	-2824	-0.0281	0.1398

Table 6: Incomplete Earnings History, Outside Income

Last Year of Work	Replace-ment Rate	SSW	Accrual	Accrual Rate	Tax/ Subsidy
54	--	117249	0	0	0
55	--	118264	1015	0.0087	-0.0488
56	--	119252	988	0.0084	-0.0487
57	--	120247	995	0.0083	-0.0492
58	--	121237	990	0.0082	-0.0505
59	0.1783	122213	977	0.0081	-0.0515
60	**0.1995**	**121293**	**-920**	**-0.0075**	**0.0508**
61	0.2155	120387	-906	-0.0075	0.0509
62	0.2450	119462	-925	-0.0077	0.0539
63	0.2696	118295	-1167	-0.0098	0.0709
64	0.5085	115617	-2678	-0.0226	0.1695
65	0.5186	111257	-4361	-0.0377	0.2882
66	0.5275	106582	-4675	-0.0420	0.3236
67	0.8497	102978	-3604	-0.0338	0.2621
68	0.8807	100323	-2654	-0.0258	0.2034
69	0.9143	97499	-2824	-0.0281	0.2287

ERRATUM

Working Paper #6308

Enclosed are Figures 1-15 from Working Paper #6308, "Social Security and Retirement in Canada," by Jonathan Gruber, which were mistakenly omitted from the original paper. Please insert these pages in your copy.

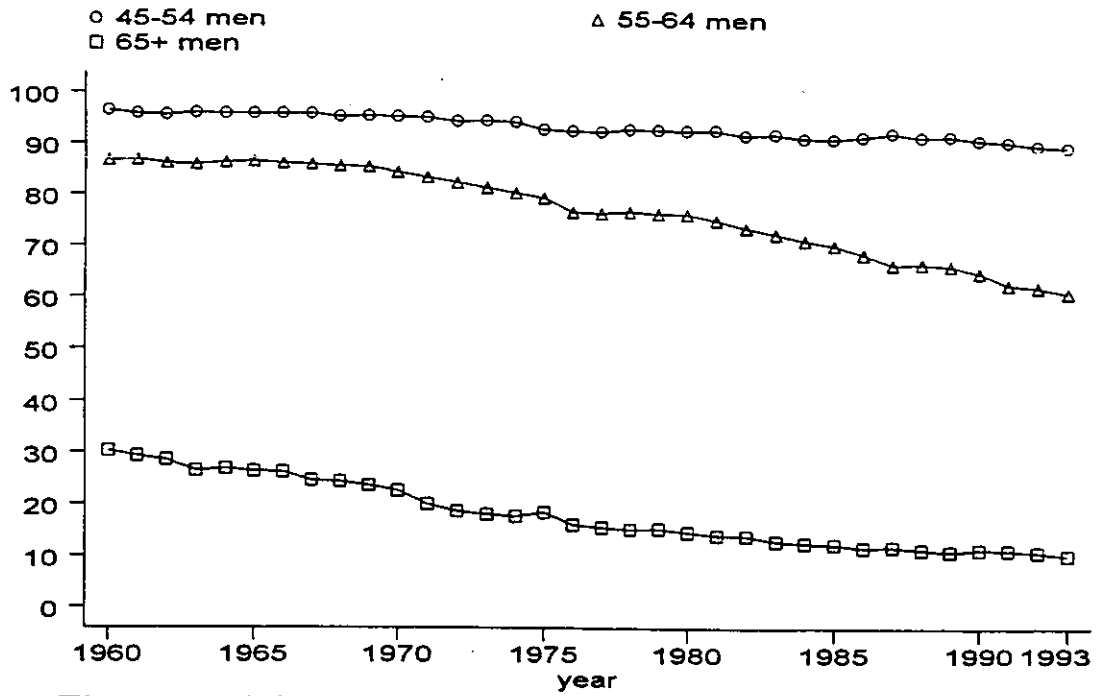


Figure 1: Historical Trends in LFP of Older Men

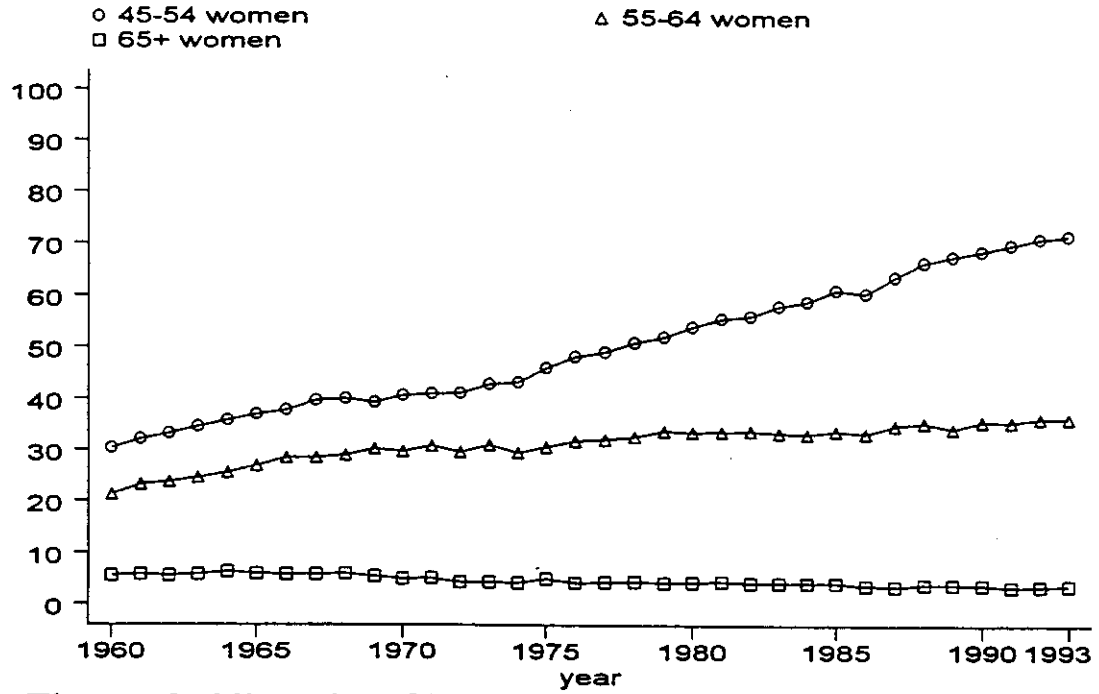


Figure 2: Historical Trends in LFP of Older Women

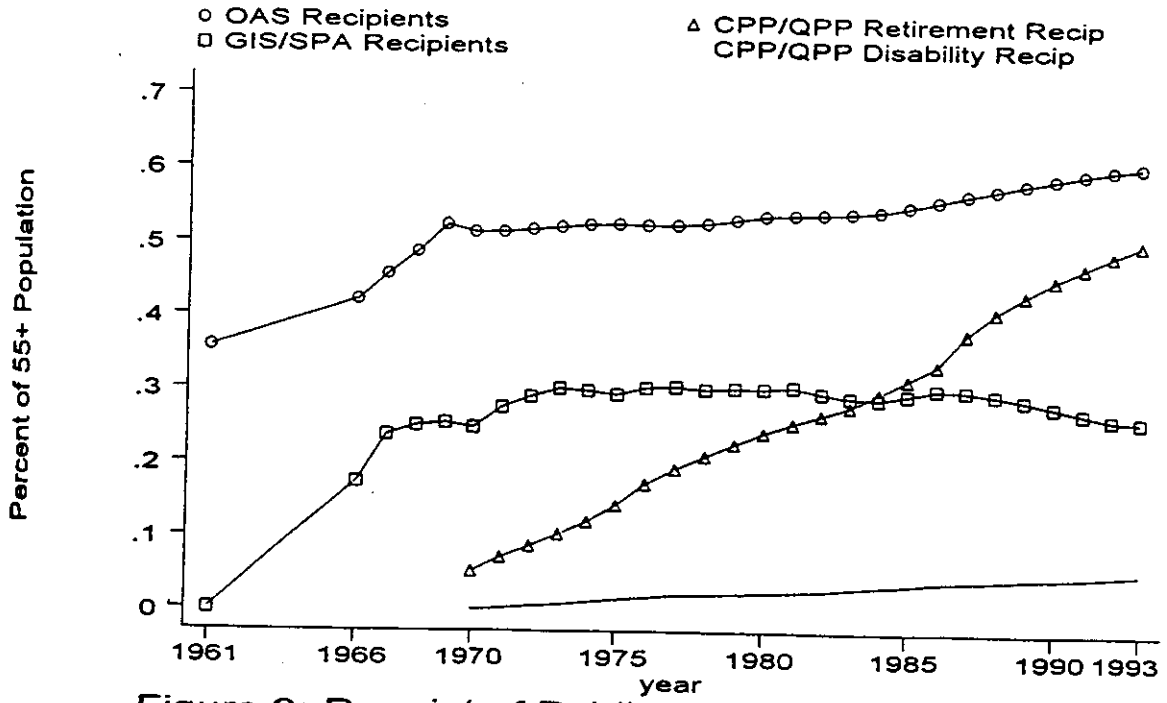


Figure 3: Receipt of Public Retirement Income

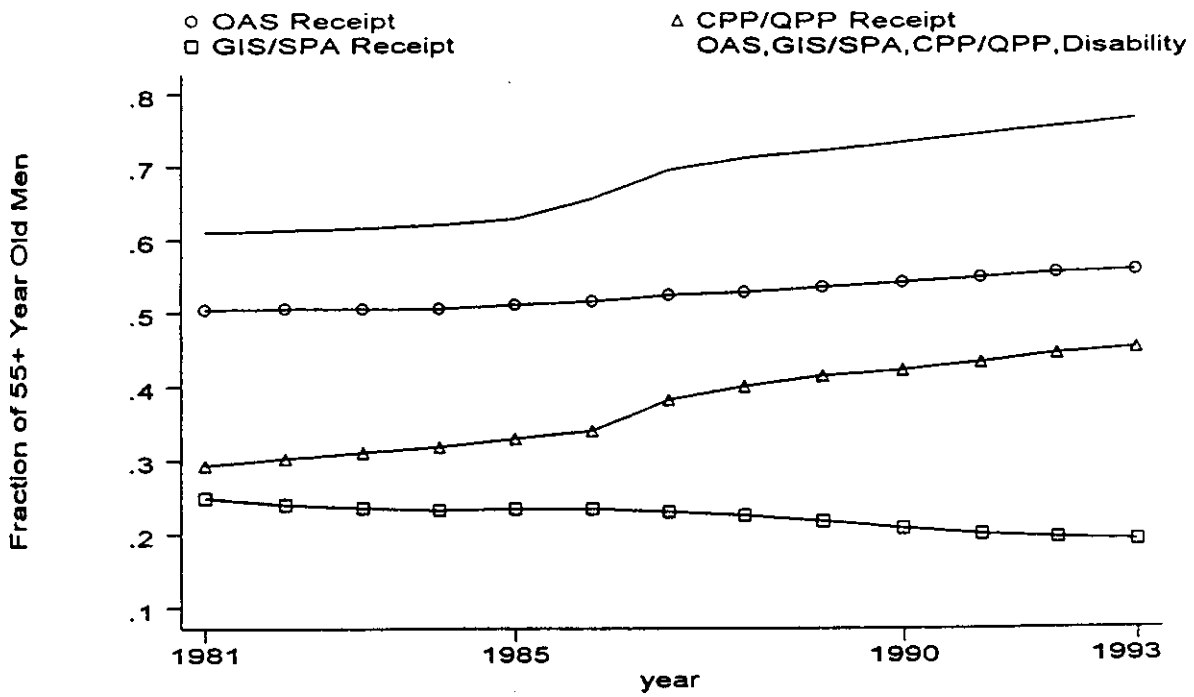


Figure 4: Program Receipt for Men

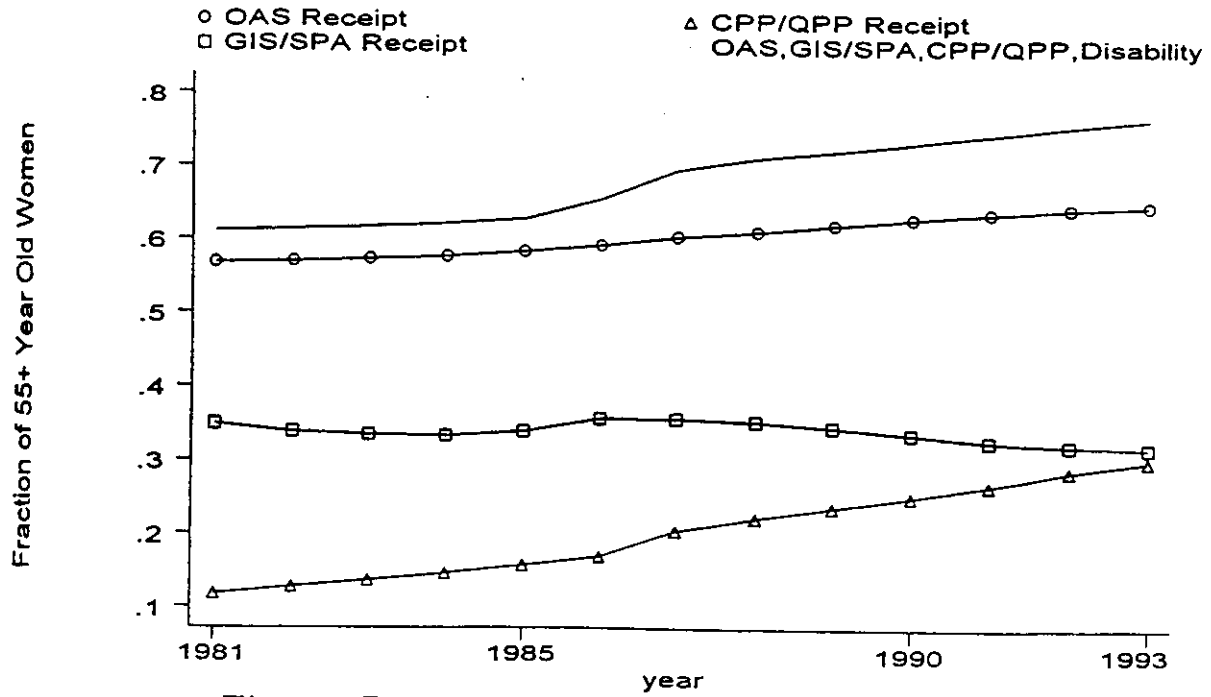


Figure 5: Program Receipt for Women

Figure 6a: Replacement Rates with No Asset Income

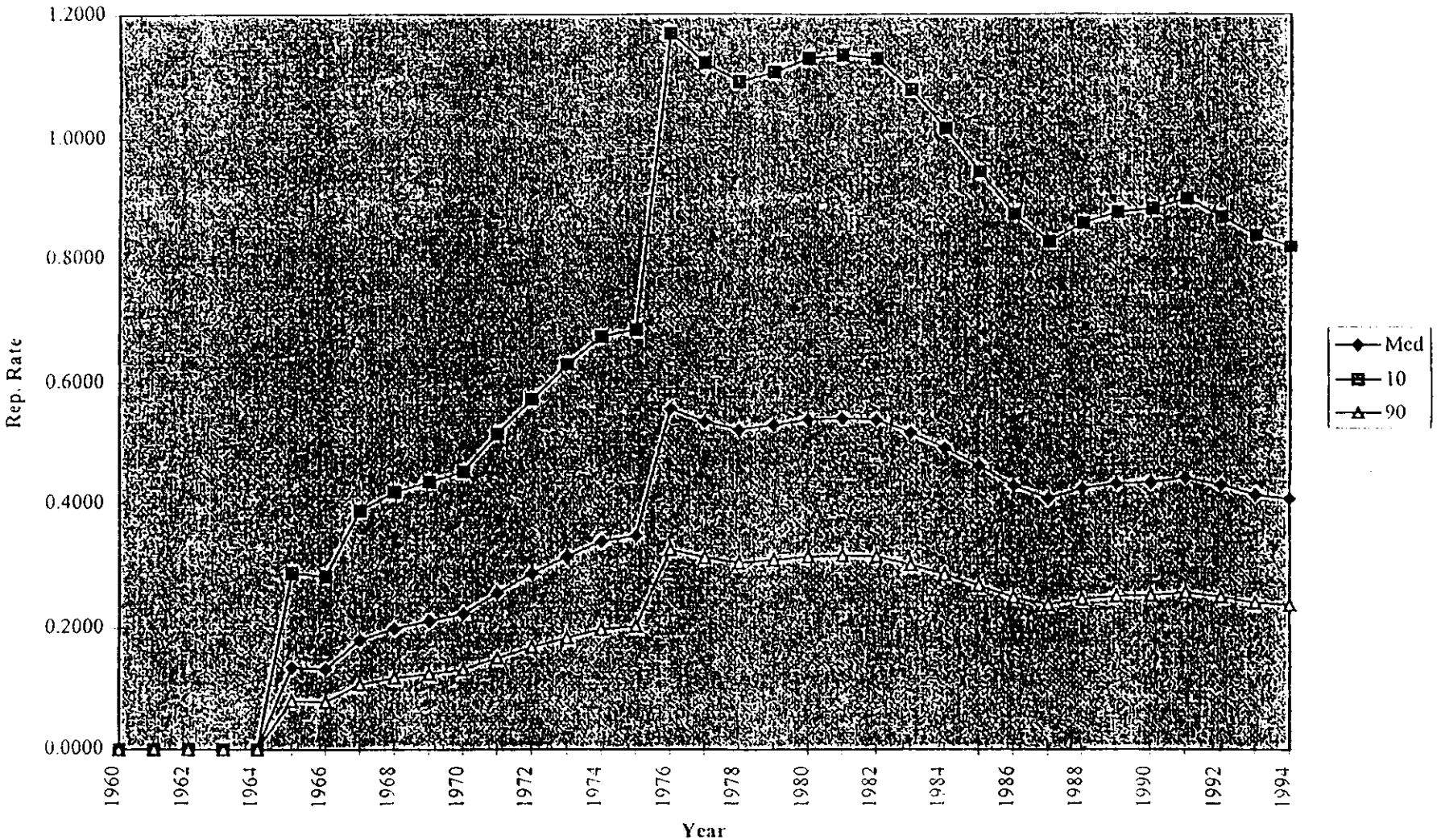
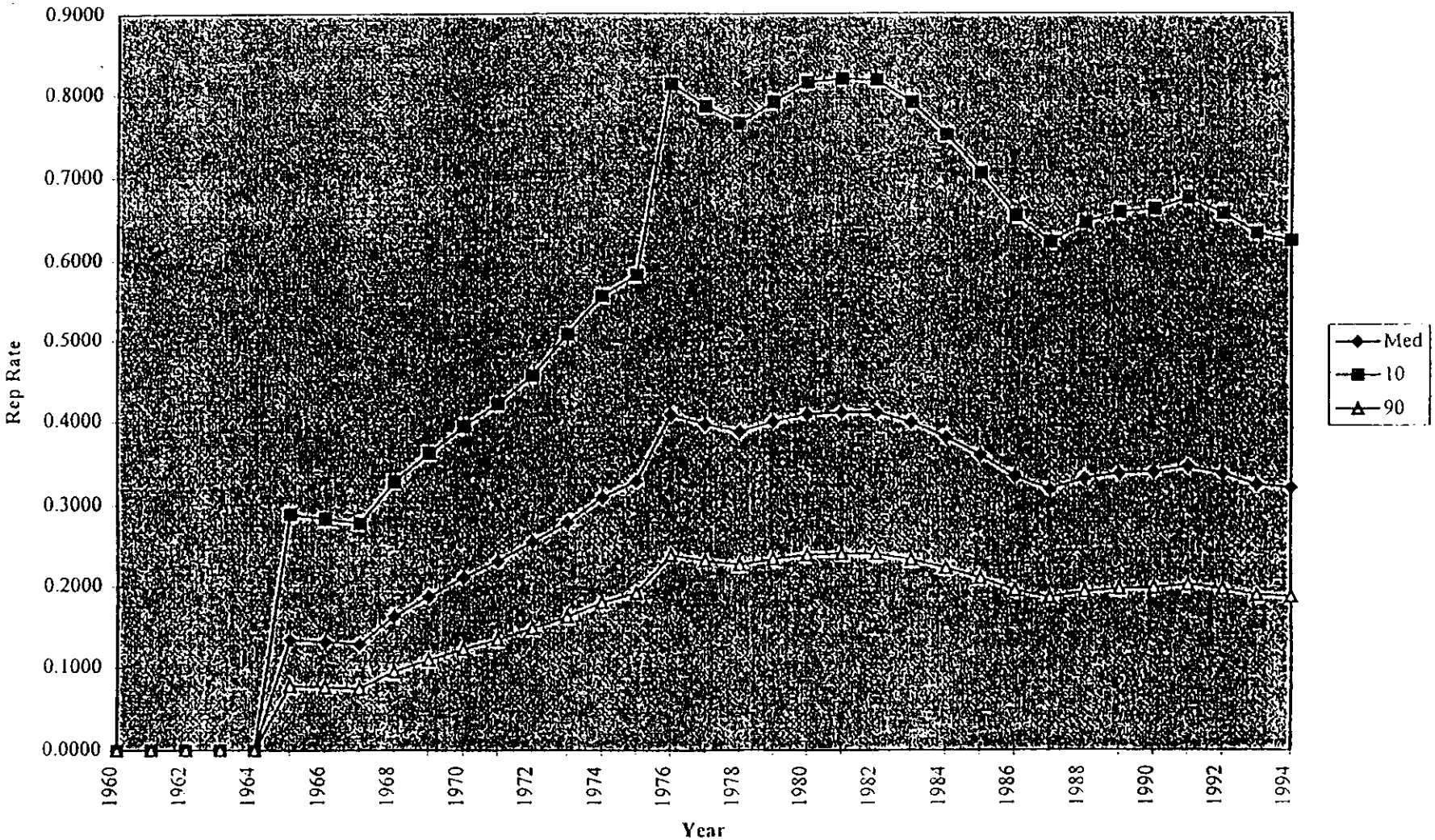


Figure 6b: Replacement Rates with Asset Income



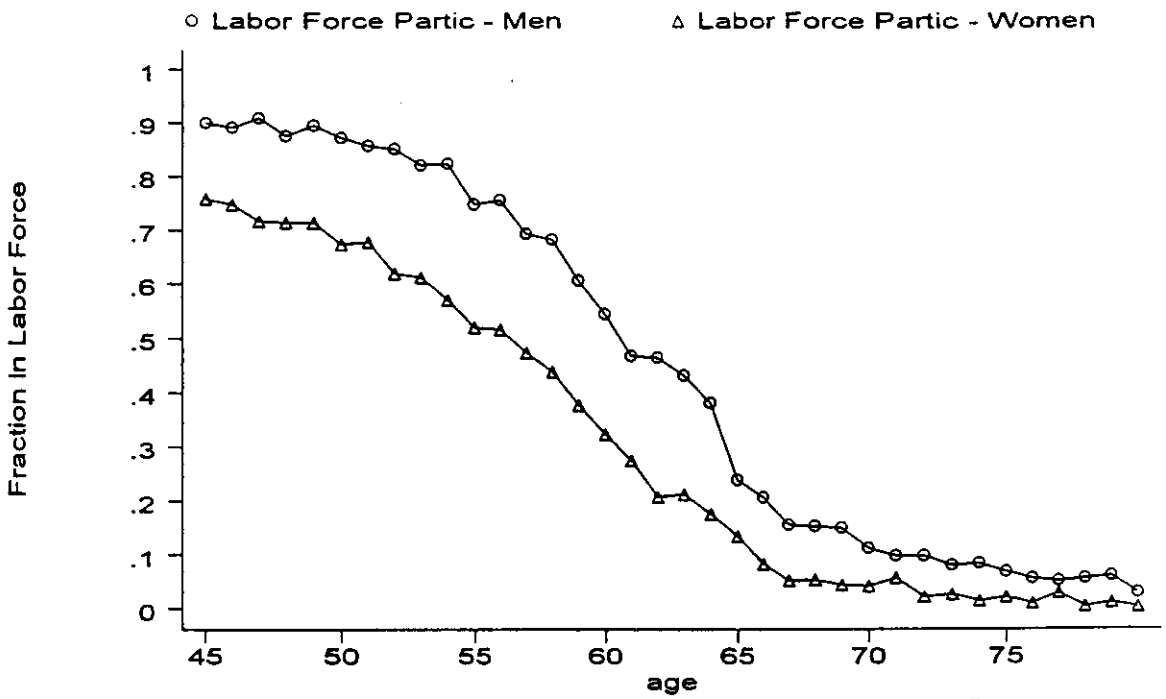


Figure 7: Participation Rates by Age and Sex

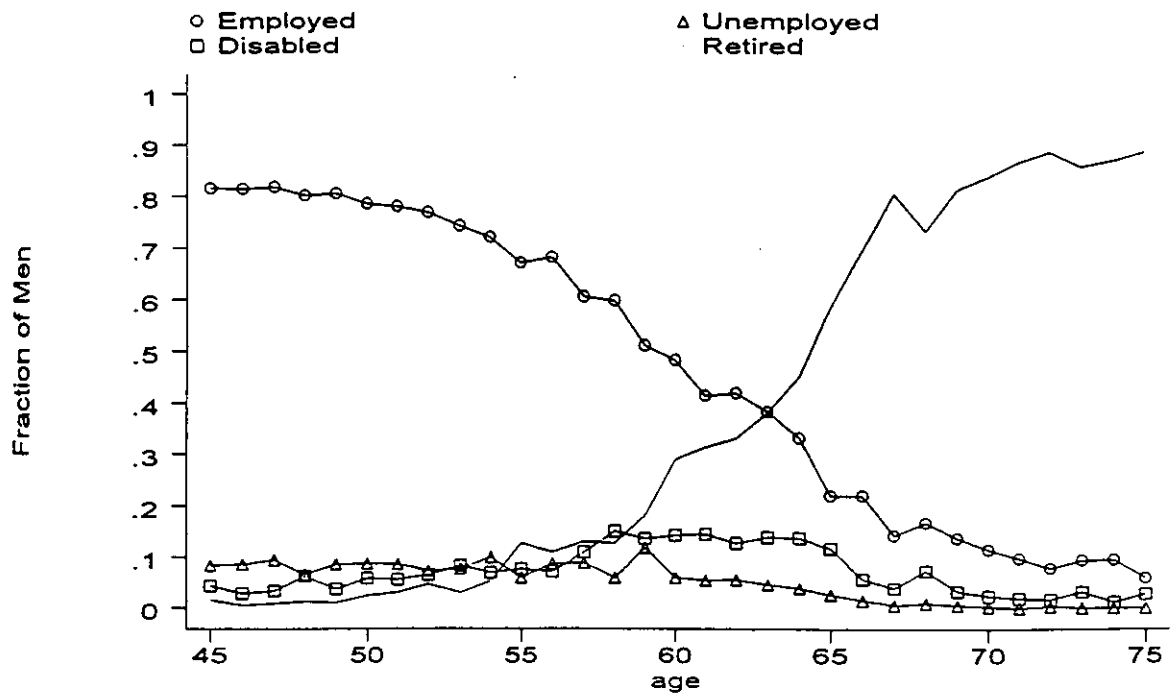


Figure 8: Distribution of Activities of Men by Age

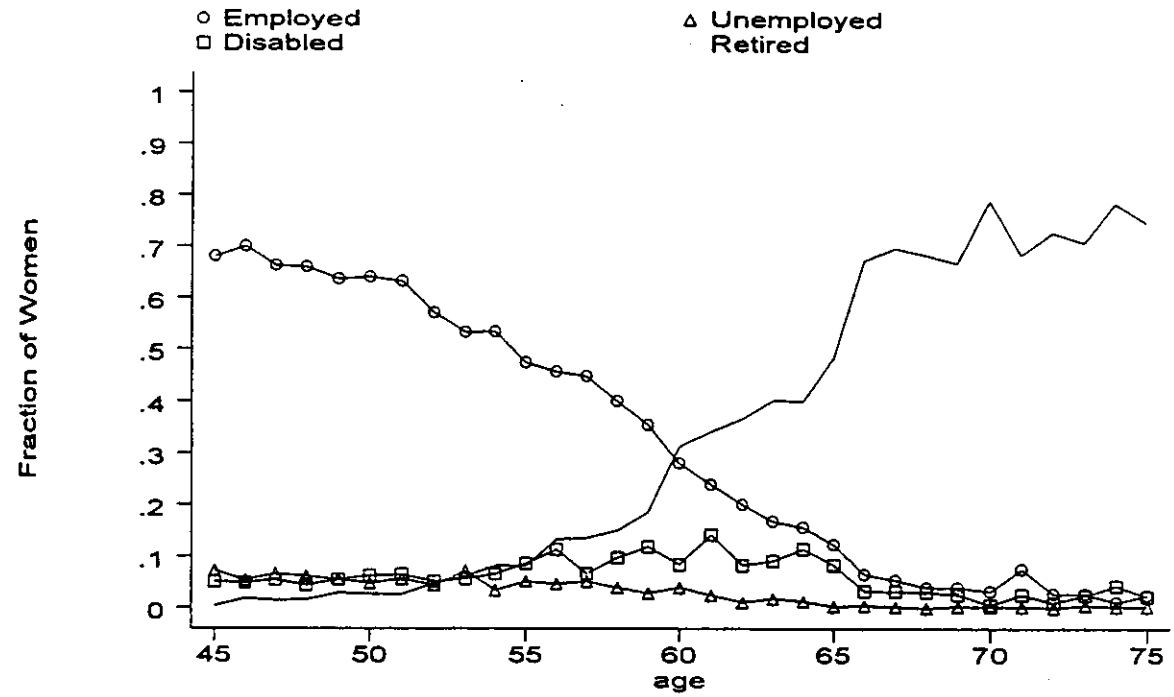


Figure 9: Distribution of Activities of Women by Age

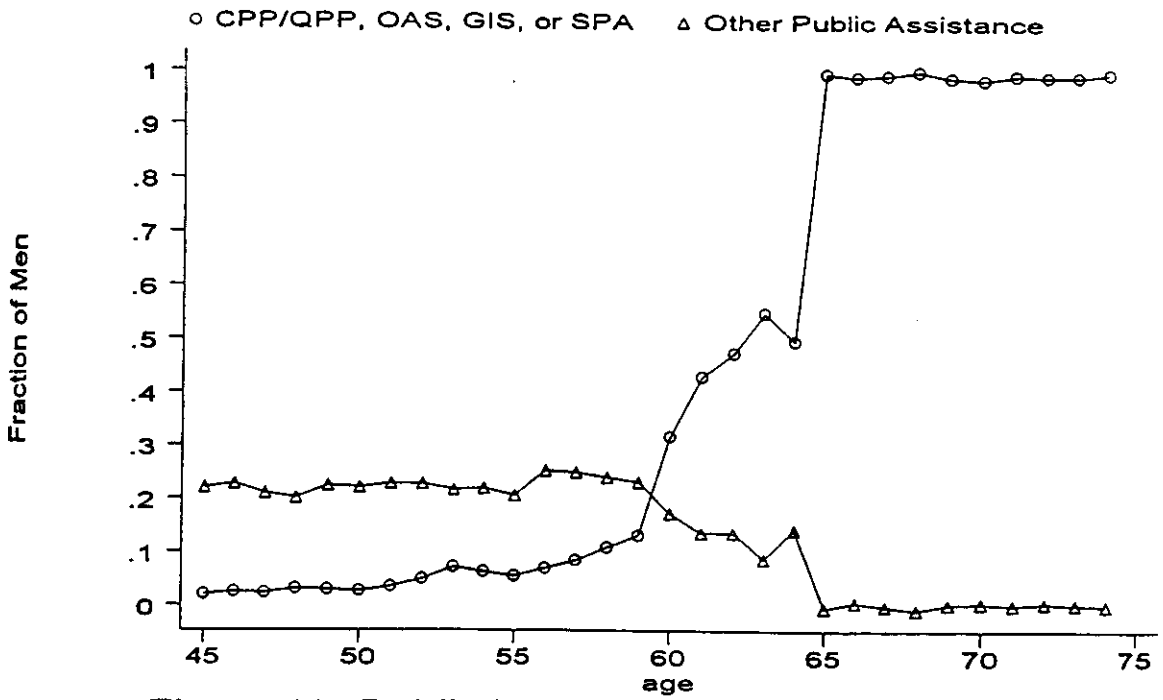


Figure 10: Public Income Recipiency for Men

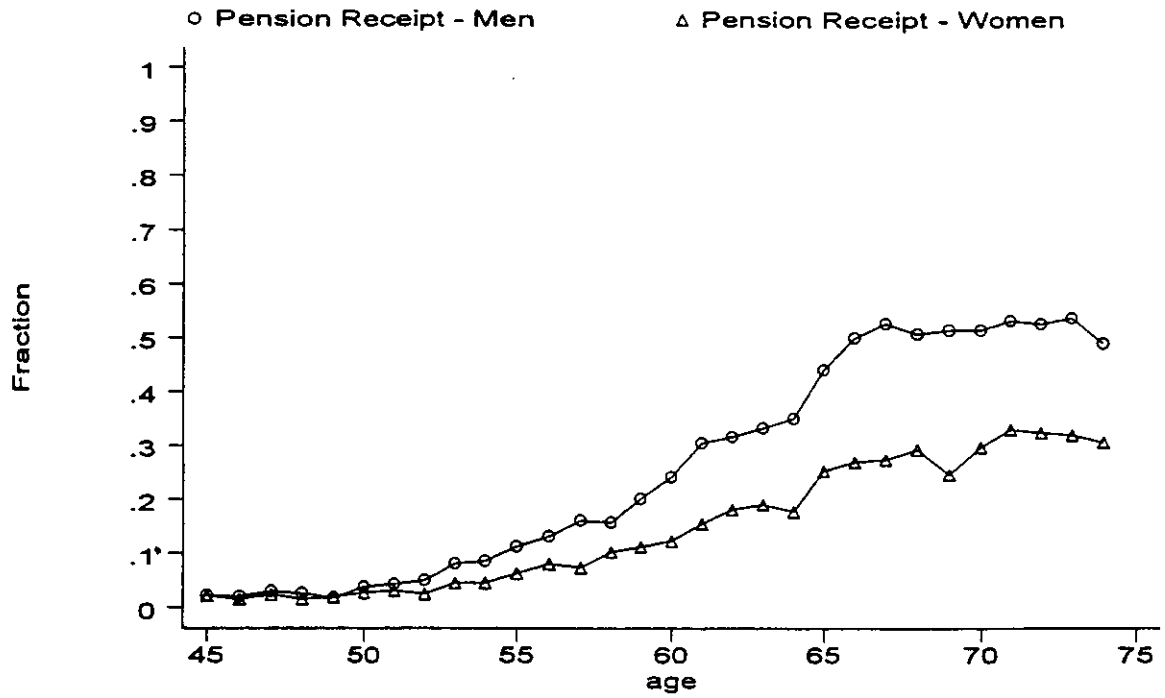


Figure 11: Private Pension Receipt by Sex

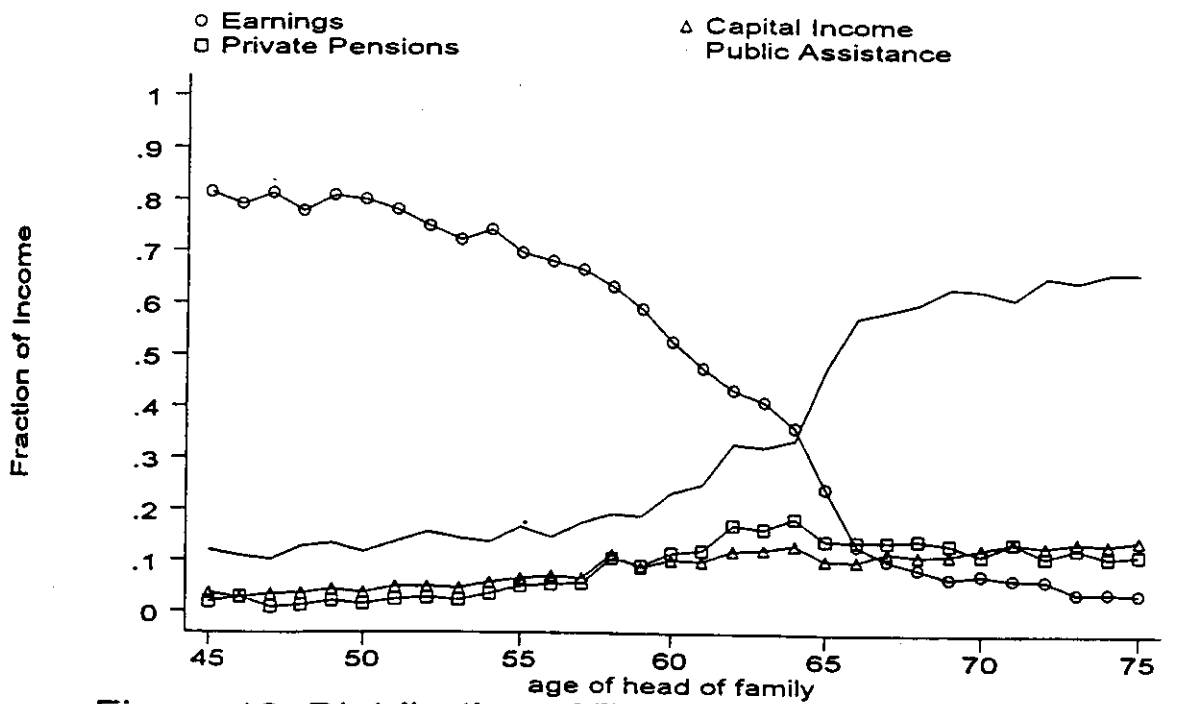


Figure 12: Distribution of Family Income by Source

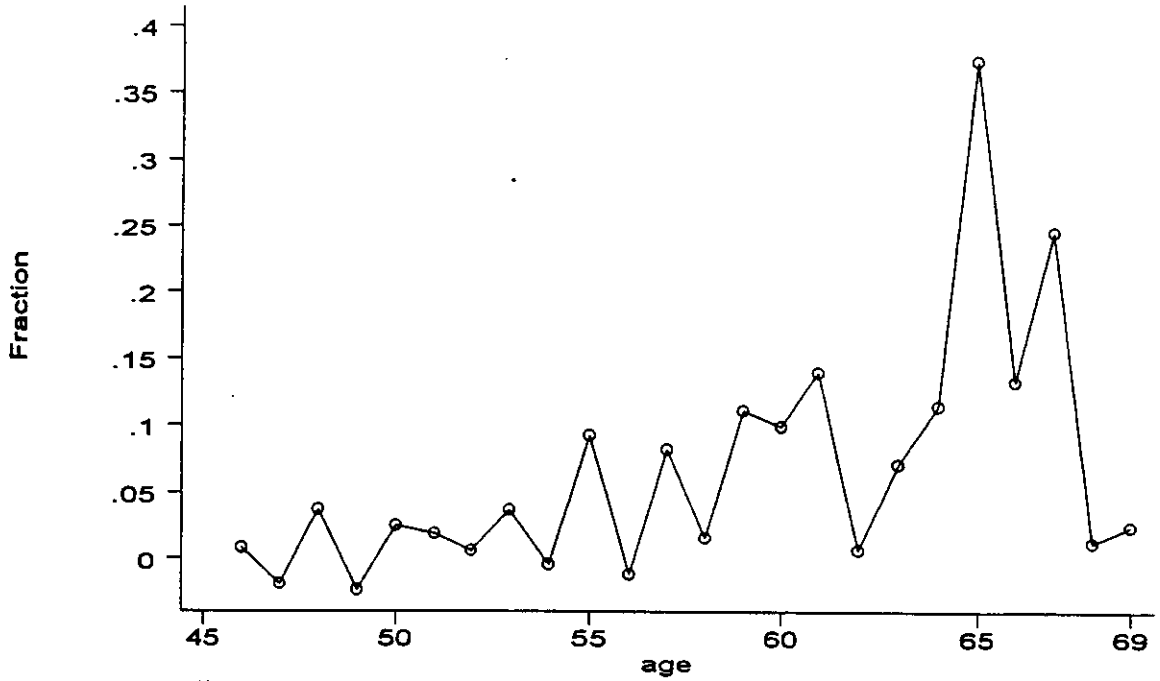


Figure 13: Hazard Rate Out of LF for Men

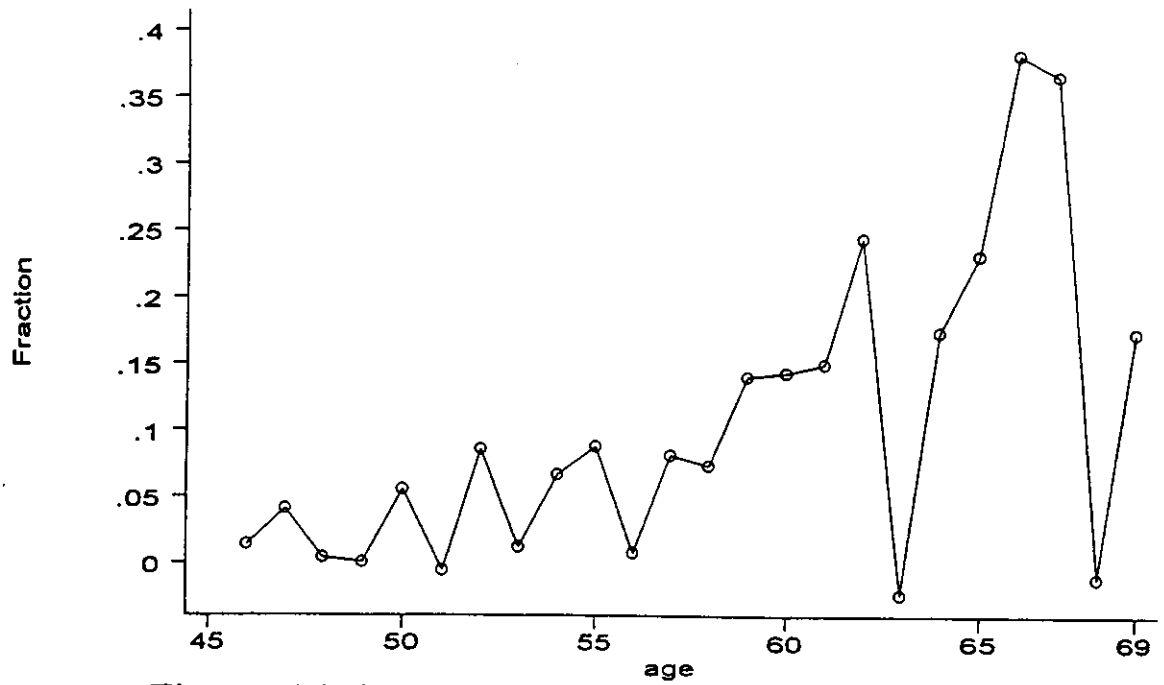


Figure 14: Hazard Rate Out of LF for Women

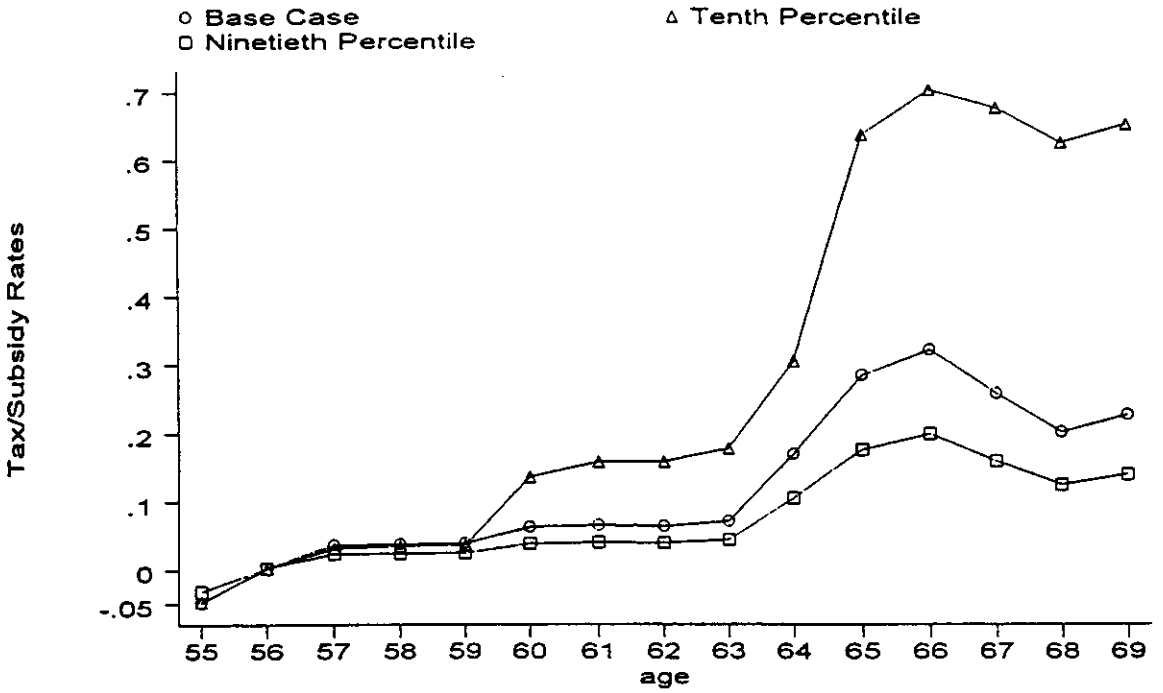


Figure 15: Tax/Subsidy Rates by Earnings Level

Stata