"Guaranteed Income Supplement (GIS) Status Amongst the Retired Population: An Analysis of the Incidence"

Ross Finnie
School of International and Public Affairs
University of Ottawa

rfinnie@uottawa.ca

David Gray
Department of economics
University of Ottawa

dmgray@uottawa.ca

Yan Zhang
Statistics Canada

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1. Introduction

> Retirement Lost – Canada's aging work force hasn't saved enough to retire. Pension benefits are being slashed, employees are working longer, and the elderly are selling their homes and going back to work: Is this what your retirement will look like?

Such was the headline of the Globe and Mail on 17 October 2009. The income security of retired Canadians is a major challenge for Canadian public policy. This stems from a number of factors which are enumerated in Abbott *et al.*, 2008. The last 20 years have witnessed a decline in the incidence of workplace pensions in the private sector and a dramatic shift in the structuring of private-sector pensions away from defined-benefit plans and towards defined-contribution plans. Many long-run employees covered by workplace pensions in the private sector have been forced to accept major reductions in benefits due to under-funding of their plans. Life expectancies of both men and women continue to rise, so that pensions and savings need to last longer. As of 2008, the network of retirement income programs will face a 'tidal wave' of oncoming retirements to the tune of eight million baby boomers leaving the labour force over the next fifteen years. All of these factors can be expected to place financial pressure on retirement incomes.

Governmental income support programs are a critical component in seniors' retirement incomes. Until recently, the three elements of Canada's public pension schemes, namely the Canada/Quebec Pension Plan (CQPP), the Old Age Security (OAS), the OAS Allowance (also known as 'the spousal allowance' paid to the partner of the GIS recipient), and the Guaranteed Income Supplement (GIS) regimes have succeeded in

boosting seniors' incomes, and particularly in drastically reducing the poverty rate among retired Canadians over the post-war period. The entire framework of private combined with public savings and benefit provisions "appears to be doing relatively well in ensuring basic standards of well-being among seniors who had a substantial attachment to the labour force, at least for individuals near the median (of family income)" (La Rochelle-Cote *et al.*, 2008, p. 73).[1]

This literature has employed a number of outcome variables and indicators in order to analyze income security and living standards of this group, such as the replacement ratio afforded by retirement benefits and indicators of low-income status. In is paper we focus instead on the income support program that is specifically targeted at low-income seniors: the GIS regime. Whereas the CPP regime is a pay-as-you-go system that bases benefits in large part on prior contributions, and the OAS benefit takes the form of a quasi-universal demogrant, the GIS is the only means-tested source of income support for seniors. It is thus a quintessential 'safety net' type provision.[2]

We investigate the following questions. What percentage of the retired population receives GIS in any given year? Do dependency rates rise with age? Have take-up rates changed over time? What are the demographic and regional characteristics associated with higher or lower take-up rates? How is the receipt of GIS related to incomes and savings behaviour during the pre-retirement stage of the life cycle? In so doing, we paint an empirical portrait of GIS dependence over the last three decades.

[1] More specifically, according to their estimates, the overall income replacement rates (relative to peak-year, pre-retirement earnings) is 100 % for low-income individuals, close to 80 % for middle-income recipients, and about 70 % for high-income workers. An earlier reference is Myles (2000).

[2] GIS was addressed in the Federal government's 2011 budget. With the objective of alleviating financial hardship for those 680,000 (approximately) seniors who rely exclusively on the OAS and the GIS regimes, the Harper government allocated an estimated additional $ 300 million per year (relative to a base of approximately $ 7 billion) to the GIS regime by raising benefit levels by $ 600 annually to singles and by $ 840 annually to couples.

Our empirical analysis consists of a model of the incidence of GIS receipt among the age-eligible workers aged 65 and above. It is based on the Longitudinal Administrative Data (LAD) file from 1982-2008, which permits us to follow individuals over a lengthy time period. This work is in the spirit of the poverty/low-income literature that is developed in regards to the working-age population, but has been applied less frequently to the retired population.[3] We first provide a purely descriptive portrait of GIS incidence across all cohorts and examine rates by age and a number of other demographic and regional attributes. We then estimate multi-variate regression models in order to separate the influences of these same variables. This analysis reveals some striking empirical patterns and helps us to see that the run-up in the influence of age is due to a large extent to changes in the composition of the population by gender and marital status. We then augment the regression models by including the labour market histories of retirees (in the form of proxies for permanent income and savings activity) during the peak-income years of their working lives. This is interesting in helping us understand those relationships, but could be useful for predicting future GIS dependency rates of those who have not yet reached retirement.

2. Literature Review

The major public policy issues facing Canada's retirement system are discussed in Abbott *et al.* (2008). The most pertinent one for the purposes of this study is the adequacy of the old-age benefits in maintaining living standards in terms of security and stability. Veall (2008) measures and analyzes the degree of inequality of the distribution

[3] One such paper is Finnie and Irvine (2008), which consists of an analysis of social assistance take-up rates.

of income among seniors, and determines that it has risen over the past 25 years. Some of the policy debate and suggestions for reform have been centered on the labour market incentives for the public pension schemes of CPP, OAS, and the GIS. (Baker *et al.* 2003, Milligan 2005, Milligan and Schirle 2008, HRSDC Round Table 2008). One of their conclusions is that the GIS program may have the unintended consequence of inducing low-income seniors to retire too early.

Our focus for this paper is on income security issues, and is in part a function of longevity. Halliwell (2008) demonstrates the trend towards increasing life expectancy at age 65 in support of the obvious ramification that 'pensions must last longer, especially when combined with earlier retirement'. From the perspective of the retiree, this problem presents itself in the case of defined-contribution pension plans, but not in the case of either public pension plans or defined benefit plans. From the perspective of the government, our findings do have important repercussions for the long-term financial viability of the GIS and the OAS regimes.

There are a few studies that have focused narrowly on the workings of the GIS regime. Luong (2009) and Poon (2005) examine application and take-up among the population of the elderly who meet the eligibility criteria. Surprisingly, a minority of them (estimated at over 10 % in 2006) do not apply for the benefit. Poon (2005) also compares the financial profiles of senior GIS families to senior non-GIS families.

Our paper is in the spirit of Uppal *et al.* (2009), whose title is 'pathways into the GIS'. Using the same data set that we exploit, namely the LAD file (through the year 2006), they conduct an empirical analysis of the incidence of GIS receipt and its determinants. More specifically, their outcome variable is the event of a subject

receiving full or partial GIS benefits for three consecutive years for a sample restricted to those aged 66 to 68 years.[4] Their primary explanatory variables are indicators for the subjects' prior income levels (including labour market income, non-labour market income, and other family income), indicators for major *changes* in prior income levels, and proxies for the degree of stability of labour market income. They determine that the probability of receiving GIS benefits was strongly correlated with prior income levels, but that low earnings observed at that stage of the life-cycle "do not presage an immutable path into later GIS receipt." (p. 13) This is because for workers there exists a fair degree of income immobility between the late 40s and the mid 60s stages of the age-earnings profile. Negative labour market and health shocks occurring between those two stages significantly increased the probability of becoming a GIS recipient, as did the occurrence of a spell on social assistance. Participation in employer pension plans and RRSPs had the opposite impact. All of the effects that they discern were stronger at the lower end of the income distribution.

The role of prior income levels is quite germane to policy questions. The GIS program is designed especially for workers who received low earnings during much of their working lives, based on the fact that they lacked the financial capacity to save and plan for retirement. Middle and upper-income workers should be able and willing to save in order to provide themselves with at least a modest private pension to supplement the CPP and the OAS benefits. A key question for policy evaluation is the extent to which that latter group *does* rely subsequently on GIS benefits. If a worker who was not in a low-income state for much of his/her working life receives GIS benefits, it could be due to two sets of factors. First, certain workers fail to save adequately for retirement, which

[4] Partial GIS benefits implies that part of the initial amount to which the recipient is entitled is clawed back.

in turn could be caused by myopia, a low degree of financial literacy, a high discount rate for future income, a flawed investment strategy, or moral hazard behavior whereby workers under-save in anticipation of receiving GIS benefits. Second, they might have suffered negative shocks to their earnings and/or wealth over the late stages of their working lives, such as disability, loss of a spouse, undue expenses incurred by family responsibilities, or persistent bad luck with their financial investments.

Our study extends the work of Uppal *et al.* (2009) along a number of dimensions. First, it is based on more recent data. Second, we include a wider range of explanatory variables, some of which measure contemporaneous attributes. Third, we employ a much more precise measure for the outcome of GIS receipt. Uppal *et al.* (2009) note "…some individuals will have income near the boundaries of GIS eligibility and cycle in and out of receipt regularly, while others may drop into or out of receipt because of one-time factors such as RRSP withdrawals or investment gains" (p. 11). They deliberately abstract from such variability by restricting their sample and modeling only the incidence of the event described above.[5] By contrast, we include all observations (at an annual frequency) of GIS receipt into our analysis of incidence, and follow some individuals well into their 80s. This provides us with up to 25 observations for some individuals.

It is instructive to describe briefly the rules and the provisions for the GIS benefit, which is sometimes coupled with the OAS spousal allowance benefit (Spa). This summary is borrowed partially from Milligan and Schirle (2008). The benefit is paid to eligible residents of Canada aged 65 years or older. The recipient must qualify for OAS benefits but receive little in the way of other income. They must re-apply annually for

[5] Another reason for which the authors make this sampling restriction is that (as mentioned above) a non-trivial number of eligible recipients do not apply for benefits, which will cause lags in receipt (in those instances in which they eventually do apply).

the GIS benefit by filing an income statement or an income tax return; this requirement permits us to observe the payment. Like the CPP and the OAS benefits, it is indexed to consumer price inflation, but unlike those benefits, it is not taxable. As of 2009, the maximum monthly GIS benefit was $ 652 for a single individual and $ 431 for each spouse or partner of a couple. In the latter case, each partner declares his/her allocation separately on his/her tax return. If the beneficiary is married or living in a common-law relationship, the combined income of both partners must be declared and is taken into account, and the benefit amount depends on the pensioner's marital status. There are two basic components. The first applies to a) single pensioners, including widowed, divorced, or separated persons and to b) married pensioners whose partners do not receive either the basic OAS pension or the OAS spousal allowance (to be described below). The second component applies to couples where both spouses are OAS pensioners. In the latter case, both spouses/partners receive a benefit, but the per-person rate is lower than in the former case.

Given its means-tested nature, the GIS payments are subjected to very high clawback rates. For each marginal dollar of income earned from any source, the GIS benefit is reduced by $ 0.50 for the singles benefit and by $ 0.25 for each partner of the married benefit. In 2007 the break-even annual income level at which the entire GIS benefit is clawed back is $ 15,240 for a single and $ 36,528 for a couple.

As our analysis is restricted to those retirees aged 65 and over, we do not sample anyone who receives the spousal allowance, and thus we do not discuss the somewhat complicated regulations regarding the spousal allowance.

3. Data

Our data set is the Longitudinal Administrative Database (LAD), which is based on T1 tax data with an annual frequency. It has the advantage of having very large sample sizes, as it consists of a 20 % sample of the underlying population of tax-filing Canadians. It contains detailed information on the levels of income as well as a breakdown of the sources of income. Its longitudinal nature allows us to track individuals for long periods of time.

The record which we employ is a flag for receipt of GIS benefits. It is reported at individual level and is labeled "Net Federal Supplements – GIS or spouse's allowance". If the individual is turning 65, the amount reported could be either the spousal allowance, GIS, or a combination of both (spousal allowance received for the period before his/her 65 birthday, and GIS received after it).[6] Given that we are dealing with a discrete choice of whether or not the individual received GIS benefits, such a distinction is not required for our analysis. If the individual is 66 or older, the amount reported is unambiguously GIS.

Before 1992, this information was reported as part of overall non-taxable income as opposed to being reported separately, and thus it was not available in LAD. Moreover, the LAD file during this period was not representative of all of the relatively low-income, senior individuals because they had little incentive to file a tax return; before 1992 they are under-represented in the LAD file. Since 1992, however, not only is GIS information reported on a separate line on the tax return, but also the LAD file should consist of a

[6] One particular case is of an individual who is turning 65, has a spouse or partner between 60 and 65 years of age, and is receiving the spousal allowance before his/her birthday in that year. In cases for which there is no partner between 60 and 65 years of age, this individual must be a GIS recipient for the entire reference year.

representative sample of adult Canadians due to the fact that starting from 1992, it was required that these 'net federal supplements' be reported and included in total income as defined by the Canada Revenue Agency (CRA). That information is then used to calculate the appropriate rebate for the value added taxes (GST/HST). Since that point in time, almost all low-income individuals who received federal supplements had an incentive to file a tax return in order to benefit from the GST/HST rebate. For these reasons, our sampling years (for when subjects turn 65 years of age) commence in 1992. We can, however, make use of *pre*-retirement labour market histories of subjects as of 1982 and include information derived from them as explanatory variables.

Eligibility for the GIS benefit is determined in the middle of the current calendar year based on the level of income that was declared in the previous calendar year. Benefits are then paid at that rate from July 1 of the current year until June 30 of the following year, at which time eligibility is re-evaluated (based on the income that was declared during the previous calendar year, the last half of which overlaps with the first 6 months of payment of the GIS benefit.) Due to the particularities of the eligibility conditions and to lags in processing payments, it is possible for a 65-year old worker to be eligible for the GIS benefit (and receive it) without that benefit being reported on his/her tax return for that calendar year. In this case, the benefit would not be reported for that year in the LAD file, and that worker-year observation would be mis-classified (as non-receipt). Most but not all cases, however, should be correctly reported for the reference year during which the individual turns 66 years old. Nonetheless, for rather intricate reporting reasons, it is only when the individual turns 67 years old can one be certain that all cases of actual GIS receipt are accurately reported. We include all

individuals who are 65 years or older in our estimating sample, but we take account of their precise age in order to capture the effects tied to these reporting issues.

We make no attempt in our analysis to account for the labour force status of the subjects for two reasons. First, as Halliwell (2008) points out, the event of formal retirement from the labour force does not have a precise definition, and it is not straightforward to pinpoint the exact timing. Second, we view it as a secondary issue that is not central to our primary focus on living standards. We are interested in those who meet the age eligibility criteria for GIS receipt. Any such individual who is not retired from the labour force will not qualify for that benefit, and is not targetted by the program.

4. Empirical Approach For Modeling Incidence

We conduct multi-variate analyses of the *incidence* of GIS receipt in any year during which the subject was 65 years of age or older, and hence eligible according to the age criterion. The dependent variable is dichotomous and captures the event of receipt of GIS benefits during the reference year. The technique is somewhat similar to that employed by Uppal *et al.* (2009). While our equations share some of the same covariates, there are some significant differences between their specification and the one that we estimate.[7]

4.1 Demographic, Regional, Age-Specific, and Cohort-Specific Effects

The first set of regression equations is based on a very broad sample comprised of 27 cohorts and over 11 million observations. The cohorts, running from 1982 to 2008,

[7] One source of difference is that those authors include indicators for an individual's income that pertain to periods of the life cycle right up to the age of retirement.

are defined by the calendar year during which the individual turns 65 years of age. This is a much broader sample than the one that we employ for the regression analysis in the next section because these equations involve no lagged regressors and use no longitudinal information, allowing us to include earlier cohorts. The structure of these cohorts is presented in appendix table 1.

The model selection is based on a progressive augmentation of regressors to a trunk equation. First we estimate a very simple equation that includes only a set of indicators for the age effects. The point estimates generate the raw, univariate means for the proportion of all eligible individuals of that age who receive the GIS benefits. This empirical pattern serves as the benchmark case for the age profile. We then investigate the robustness of these estimates to the inclusion of successive sets of added explanatory variables. The second specification adds a set of indicators to capture cohort-specific effects. These will reflect unobservable attributes that are specific to that cohort, as well as potentially the labour market conditions that prevailed when the members were 65 years old. They might also potentially reflect policy changes, such as one that applied directly to the GIS regime in 2002 that involved the outreach program (treated in Poon (2005) and Luong (2009)). This consisted of a joint initiative between Human Resources and Skills Development Canada (HRSDC), Service Canada, and the Canada Revenue Agency designed to better inform potential beneficiaries of their entitlements and to facilitate their applications for GIS benefits – a sort of awareness campaign targeting low-income retirees. In 2003 HRSDC streamlined the application process. In order to strengthen the incentive for recipients to work part-time, in 2008 the implicit tax rate applied to labour market earnings was cut considerably; the threshold of earnings that can

be reached before the GIS benefit is clawed back (the 'allowable earnings' threshold) was raised. This change occurred too late in order for us to discern its effect based on our sample.

In the third and fourth specifications, we add regressors to account for the effects of gender and marital status. The attribute of having a partner proves to have a strongly *negative* impact on the likelihood of receiving GIS benefits, and the estimates for age effects diminish greatly once we account for that factor. In the fifth specification we include a set of indicators for the current province of residence (including a category for non-residents) and for the area size of residence in order to investigate the urban versus rural split. There is also a regressor corresponding to language (specifically minority language status). For the final specification, immigrant status, including indicators for years since immigration, is included.[8]

The parametric form of our incidence model is the linear probability model, which is selected for its ease of interpretation, but the logit specification is also estimated for the sake of robustness. Estimated standard errors are adjusted to account for clustering with respect to the individual.

4.2 Permanent Income, Work Interruption, and Saving Effects

The second set of equations model the incidence of GIS benefits as a function of selected contemporaneous attributes as well as pre-retirement variables that are generated by exploiting the longitudinal dimension of the data set, most notably a proxy for permanent income received during the working life. This step requires us to drop the 15

[8] According to program regulations, any recipient must have been in residence of Canada for 10 years in order to qualify for GIS.

earlier cohorts and restrict our analysis to a sample of subjects who became eligible for GIS benefits between 1997 and 2008. The oldest individuals in our sample reached the age of 65 years in 1997. For this cohort we consider income-related data going back to 1982, when he/she was approximately 50 years old. This restricted sample has 12 cohorts of individuals; the structure is displayed in Text table 1.

Text Table 1

Year in which subject turned 65	Year in which subject turned 50
1997	1982
1998	1983
1999	1984
2000	1985
2001	1986
2002	1987
2003	1988
2004	1989
2005	1990
2006	1991
2007	1992
2008	1993

In regards to the income variables, it is not appropriate to include variables such as retirement income drawn from other sources, as one would only be capturing mechanical effects. We seek to assess the impact of longer-term life-cycle factors. First and foremost, there is the subject's permanent income when he/she was active. There are a number of other attributes of the individual that are pertinent yet mostly unobservable, such as the propensity to save, the subjective rate of time preference (i.e. discount rate for future income), tastes toward risk, innate ability, the level of financial literacy, and whether he/she was affected by myopia when planning (or not) for retirement. The key explanatory variable of permanent income during the person's working life, which means essentially the maximum point (or near the peak) of the worker's age-earnings profile

that expressly does not account for transitory deviations that can occur from year to year. It is a notional variable that can only be estimated. We are interested in indicators for it as well as other related pre-determined variables.

While proxies for the permanent income variable are pre-determined with respect to post-retirement income levels, they can still be correlated with contemporaneous income variables. Low-income status *ex post* is caused in large part by low-income status *ex ante*, and this is driven in part by relatively time-invariant, unobservable factors. The exogenous variables that we do include, such as coverage by a private pension plan, coverage by an individual retirement fund, holding a unionized job, and self-employment status, are likely to be somewhat endogenous. One might argue, however, that evidence of preparation for retirement in the form of registered retirement savings plans (RRSP) and/or employer-sponsored Registered Retirement Plans (RRP) contributions, while being functions of income, should also exhibit some independent variation. While the indicators that we employ for income over prior phases of the life-cycle are pre-determined, they might not be totally exogenous variables, which can be expected to impart biases for the estimation of certain parameters. Nonetheless, from a public policy perspective, our estimates could still be quite informative. The magnitude of the statistical relationships might be useful for forecasting purposes and for reforming Canada's retirement income apparatus.

Our procedure for calculating the subject's permanent income (and other variables drawn from that prior stage of the life cycle) consists of the following steps. Luong and Hébert (2009) determine that earnings typically peak over the age-earnings profile when the worker is in their late 40s and early 50s. We thus adopt a measure based on earnings

that are observed during that age range. More precisely we calculate the permanent income as the simple average of actual income received over the window during which the subject was 50-52 years old in order to smooth out some of the transitory fluctuations in actual income that do not reflect permanent income.[9] This window places some distance in time from the outcomes that we model, which should strengthen the degree of exogeneity of our indicator for permanent income in light of the econometric challenge noted above. The proxy involves values of actual income lagged 15 years from the point in time at which the subject reached 65 years of age; the lags are longer for any of the observations at older ages.[10]

The explanatory variables are divided into three major groups, the first of which is the age and the cohort-year effects that are mentioned in the previous section. For this set of specifications, we also include a full set of interaction variables consisting of age crossed with cohort in order to more fully control for those influences.[11] The second group includes the demographic and geographic indicators that are mentioned above. The final group of regressors pertains to income and wealth effects that are tied to events occurring at earlier stages of the retiree's life-cycle: specifically the window between the ages of 50 and 52 years. These indicators are designed to supplement the variable of

[9] The precise record that we draw from the LAD is called 'market income', which consists of total income excluding government transfer payments. Here is a list of the sources: earnings from T4 slips, other employment income, self-employment income (net), limited partnership income, Indian exempt employment income, interest and investment income, rental income (net), dividends, alimony or support income, other income, and retirement income (which should involve very few subjects).

[10] This proxy is similar to the one utilized by Uppal *et al.* (2009) In their estimating equation, they include as regressors the average *level* of employment income between ages 45-49, the *change* in average level of employment income between the ages 45-49 and 50-54, the *change* in average level of employment income between the ages 50-54 and 55-59, and the *change* in average level of employment income between the ages 55-59 and 60-64. Because a simple linear combination of these values is equivalent to the average level of income between the ages of 60-64, the equation as specified will capture a mechanical effect to some extent.

[11] In the prior set of regressions, we are interested in the cohort effects per se, and specifying each of them with 25 age-specific interactions generates too much empirical detail that complicates any interpretation.

permanent income described above. There is a flag for the existence of self-employment income in an effort to capture an effect specific to self-employed workers. This indicator assumes a value of unity if the worker is observed to have received over $ 1,000 gross of expenses (in real terms with base year 2008) during the same window. While this is a very low threshold, we seek to mark those whose involvement was anything more than trivial.

There is an indicator for contributions to an RRSP. It assumes a value of unity if the individual contributed to an RRSP during any year over this window. Since 1986 there is a record for coverage in an RRP. This indicator can be included for the eight cohorts between the years 2001 and 2008. If the subject received EI for any year over the entire window, the indicator for EI status assumes a value of unity.[12] The impact of union membership during this window is captured by a binary regressor. Due to reporting inconsistencies over time (particularly before 1992), we elected not to include an indicator for having received social assistance or workers' compensation benefits between the ages of 50 and 52 years.

5. Empirical Results

5.1 Descriptive Statistics: Age and Cohort Patterns

Before discussing the regression results, we present a selection of descriptive statistics. For each cohort we calculate the proportion that receives GIS benefits in each

[12] The LAD file does not allow us to distinguish between regular EI benefits and special EI benefits, such as sickness and maternity/paternity/parental benefits. Nonetheless, given the age restrictions of 50-52 years old, there should not be many cases of the latter.

calendar year.[13] One would expect for the incidence for the ages of 65 as well as 66 years to be slightly under-estimated due to the reporting lags that were mentioned above. One would expect for the proportion to increase monotonically as the cohort ages from 65 to 66 to 67 years of age, in large part due to the reporting lags. Once any cohort reaches the age of 67 years, however, any rise (fall) in the statistic should be attributed to a positive (negative) net inflow of beneficiaries.

The first statistic that we display is the average incidence rate observed for 67-year olds by calendar year across all cohorts. Figure 1 displays these values as a function of chronological time between 1992 and 2007. The earliest cohort that we can include turned 65 in 1990 and 67 in 1992; before then we lack accurate information on their receipt of GIS. One might expect to discern at least some counter-cyclical pattern. In years of strong economic performance, 67-year-old workers have some employment opportunities (likely part-time), and income received from capital might rise as well, both of which would lower the incidence of GIS benefits. There appears to be a downward trend between the maximum value of 34 % observed in 1992 and the minimum value of 30.5 % observed in 2006, but the time pattern is at all not monotonic. The incidence rate spiked in 1996, dipped somewhat until 1998, turned up until 2000, and exhibited a gentle, steady decline until 2006. The incidence rate rose during the two-year period before (but not after) the implementation of the outreach initiative that was launched in 2002.

Figure 2 displays the average values of GIS receipt as a function of the age of the subject. For each cohort starting with the 1986 cohort, the proportion of members receiving GIS at each age (up to age 81 years) relative to the number of tax-filers is

[13] For instance, by construction the 1999 cohort turned 65 in 1999, 66 in 2000, 67 in 2001,…..,74 in 2008. We calculate a proportion for each of these 10 cells.

calculated. Given each age value, these proportions are averaged across all cohorts between the 1986 and the 2007 groups. Note that since these figures are based on averages pooled over 23 cohorts, any apparent trend or pattern in incidence rates could be attributed partly to compositional effects if the cohorts have different inherent trends as their respective members age. Note further that each cohort is observed over a different interval.[14] The averages for the various ages across cohorts are calculated from different counts. Earlier cohorts are not represented in calculations for younger ages (i.e. mid 60s), and later cohorts are not represented in calculations for older ages (i.e. late 70s).

The trend is increasing monotonically over the entire range of ages. The incidence rate is estimated to be 31.2 % among 65 year olds, increasing to 32.3 % at age 66 and to 32.6 % at age 67. It rises steeply once individuals reach their mid 70s, reaching a value of 42.3 % when they reach their early 80s. Abstracting from compositional effects, the figures contained in this graph suggest that it is a somewhat common phenomenon for individuals who entered their mid-60s without receiving GIS to collect benefits by the time that they each their early 70s.

In order to remove the compositional effects from these incidence rates, we also track a selection of cohorts individually, namely those turning 65 years of age in 1983, 1986, 1989, 1992, 1995, 1998, 2001, and 2004. The age-incidence profiles for all eight cohorts are plotted in Figure 3. Each curve shows the pattern for the incidence rate as the cohort in question ages. If the line for a cohort tends to lie above (below) that of another, the former (latter) tends to exhibit a higher incidence rate for a given age. The slopes of

[14] The earliest cohort turns 65 in 1986, but we do not include a value in the calculation until they reach 71 years of age in 1992, because that is the first year in which we observe a reliable value for GIS receipt. The latest cohort turns 65 in 2007. The latest value that we observe for them is in 2008 when they turn 66.

the lines indicate the extent to which incidence rises with age. The 1983 cohort stands out as exhibiting relatively high rates, but we only observe this group at older ages of 75 to 81 years. The remaining cohorts appear to have somewhat similar structures (both with respect to placement and gradient) over their overlapping ranges. The primary finding revealed by these curves indicates the existence of an incidence rate that increases somewhat monotonically with age. A primary objective of the multi-variate analysis is to determine the extent to which those apparent age effects are reflecting the impact of other confounding variables such as marital status.

The descriptive statistics for all of the variables employed in the regression analysis are listed in appendix tables. They are derived from the narrower sample that is used for the component of the regression analysis comprised of the twelve cohorts running from 1997 to 2008. Appendix Table 2 lists the incidence rates cross-tabulated by the various regressors. For the entire sample the rate is 31 %, which serves as the point of comparison for the cross-tabulated proportions. It ranges from 24.7 % for females with partners to 47.7 % for single females. By province the range spans 23.7 % in Ontario to 59.6 % in Newfoundland. The value for non-immigrants, which also includes immigrants who arrived more than 15 years prior to the reference year, is 30.9 % for non-immigrants, while it is more than double (71.4 %) for immigrants who arrived 11-15 years before that point. The role of population density in the subject's area of residence appears to be important. The incidence rate is 27.7 % for those in regions with more than 500,000 people, but 43.6 % in regions with fewer than 1,000 inhabitants. The empirical pattern by prior income bracket is as expected, ranging from 2.6 % for the best-off category to 70 % for those with 0 or negative income.

The descriptive statistics for the regressors are presented in appendix table 3. For the time-invariant variables that are measured during the window when the workers were between 50-52 years old, there are 930,520 subjects. For the other regressors, there are multiple observations per subject for just under 3 million observations. The values shown correspond to the sample shares (summing to 100 %) corresponding to each category. In regards to marital status, 9.3 % of the sample is composed of single males, 41.7 % of males with spouses, 18.6 % of single females, and 30.4 % of females with spouses. 96 % of the observations are for individuals situated in provinces where their tongue is the majority language. Almost the entire sample (99.5 %) is composed of non-immigrants by our definition.[15] The share of cases for which the individual resides in a region with fewer (more) than 30,000 inhabitants is 31.2 % (68.9 %); 43.5 % of the observations correspond to those residing in regions with more than 500,000 people. The average income level is calculated as a weighted average of the categories by taking the mid-point of each band; this amounts to approximately $ 40,000. 17.2 % of the subjects were self-employed when they were at the prime of their career, 29.2 % of them received EI, and 62.1 % were not in a union over this period. During this window of observation, 46.4 % contributed to an RRSP, while 33.4 % contributed to an RPP.

5.2 Regression Analysis Using All Cohorts: Focus on Demographic Characteristics

[15] The very low share of immigrants results from our definition of this variable. We classify any immigrant who arrived more than 15 years before the reference year as a non-immigrant. Only those subjects for whom we observe income when they are 50-52 years of age are included in this sample. This implies that they have been in Canada for at least 15 years when they are first eligible to receive GIS, so almost all of them are by then non-immigrants. The few cases that are classified as immigrant are those who had a visa when they were working, but became landed immigrants later on. For immigrants, this regressor is time varying. Those who arrived between 0 and 5 years prior to that point in time are classified as such, but they are eventually re-classified into the 5-10 years prior and the 10-15 years prior groups.

Table 1 contains the regression results obtained from the broad estimating sample containing 27 cohorts and over 11 million observations. All of the regressors are binary, and thus the constant term has a clear interpretation as a comparative baseline. The first column lists the estimates for the trunk specification that includes only the age dummies. The omitted age is 65, while the oldest age is 90 years. This empirical age profile is remarkable in terms of its pure monotonicity as well as its gradient; the average values run from 0.316 for 65-year olds to 0.567 (0.316 + 0.251) for 90 year-olds. Subjects who are 66 and 67 years old have only slightly higher incidence rates (0.007 and 0.011 on the scale from 0 to 1.0) than their 65-year-old counterparts. While all of these estimated coefficients are statistically significant, the corrected coefficient of determination for this bare-bones specification is only 0.008.

The estimates listed in column 2 of Table 1 correspond to the specification for which the cohort-specific indicators are included to the trunk specification. The omitted year is 2001. This set of point estimates are either small in magnitude or estimated imprecisely after the cohorts of 1985 and before the cohorts from 2004 through 2008, which exhibit negative values. The high values for the 2007 and 2008 cohorts are probably anomalies because they include only relatively young individuals who have not been eligible for very long, and the reporting lags mentioned above are probably at work. It appears as though the incidence rates for 2004 through 2006 cohorts are slightly lower, ceteris paribus, which might reflect the effect of the very low unemployment rates that prevailed over that period. The flipside of that finding is the strong positive and significant estimates for cohorts from 1982 through 1984, during which the labour market was weak. The estimated magnitude of the age effects does diminish considerably,

suggesting that the raw age effects are confounded partially with compositional effects associated with the cohort structure. Nonetheless, the sharply increasing, monotonic age pattern remains.

In the third column of Table 1, the only added regressor is the gender dummy, which enters as an intercept shifter. All other factors held constant, the incidence rate for women is 8.1 percentage points higher.

We include in specifications 4-6 a set of categorical variables for marital status and gender groups. These categories are single females, males with spouses, females with spouses, and single males (the omitted category). The value of the constant is 0.417, which corresponds to the case of a single 65-year old man who belongs to the 2001 cohort. His single female counterpart has an estimated incidence rate of approximately 0.507 (0.417 + 0.09). His married male counterpart, however, has an estimated incidence rate of approximately 0.276 (0.417 – 0.141). The (strongly negative) marriage effect for women is about the same in magnitude. For both genders there is a tremendous decline in the incidence rate associated with the presence of a spouse. The corrected coefficient of determination for this specification is 0.052 (compared to 0.016 in the preceding specification in column 3), and therefore this set of regressors contributes explanatory power. Furthermore, the estimated magnitudes of the age effects list in the preceding specification are reduced by more than half, and they are low until individuals reach their early 70s in age. The evolution of the magnitudes of the estimates for the age effects are plotted in Figure 4, which summarizes this empirical pattern of the importance of the spousal/partner effect.

The specifications listed in columns 5 and 6 of Table 1 consist of the trunk model augmented with regional and immigration variables. The immigrant status categories are native Canadians and long-time immigrants (omitted), those who immigrated i) 0-5 years ago, ii) 6-10 years ago, and iii) 11-15 years ago. There are binary indicators for 11 provinces and territories, with Ontario serving as the base category. We retain in our sample those who do not report a province of residence, and flag them with an indicator for non-residence in Canada. In regards to the official languages, the categories are those who speak French outside of Quebec, English in Quebec, and the majority language (omitted). The indicators for the area size of residence are the following: greater than 500,000 (omitted), ii) 100,000-500,000, iii) 30,000-100,000, iv) 15,000-30,000, v) 1,000-15,000, vi) below 1,000.

The estimated coefficients for the gender and marital status effects are totally robust to the inclusion of the cohort variables and to the set of interactions. The same applies to the results for the age indicators and the cohort indicators. The value of the constant (in column 6) is approximately 0.29, which corresponds to the case of a single 65-year old man belonging to the 2001 cohort who is a native Canadian residing in Ontario in the largest category of area size of residence and is a member of the dominant language group. The inclusion of this group of regressors more than doubles the value of R-bar squared from 0.05 to 0.107.

The impact of immigration status is remarkable (column 6). Compared to the baseline case, an immigrant who arrived 11 to 15 years ago has a value of 0.814 (0.287 + 0.527). An interpretation for this very high incidence rate is that many of these individuals arrived in Canada at fairly late stages in their life cycle (perhaps as sponsored

immigrants), and were unable to establish careers with pensions. The incidence rates for those with lower values of years since immigration are lower than the baseline value, which is likely a reflection of the eligibility rules (tied to residency) for GIS receipt. Nonetheless, all other factors held constant, the incidence rate for immigrants is much higher than is the case for native Canadians.

The influence of the province of residence is also quite noticeable. Ontario has the lowest incidence rate among all provinces and territories. All of the estimates are positive and significant, implying that Ontario has the lowest incidence rate in Canada. The point estimate for Newfoundland is 0.611 (0.293 + 0.318), while the corresponding value for Quebec is 0.491 (0.293 + 0.198). Even in the case of Alberta, which by most measures has been a wealthy province, the incidence ate is 5.2 percentage points higher than the Ontario baseline. The effects associated with the area size of residence are not surprising. Compared to the baseline of cities with more than 500,000 residents, the incidence rate in the most rural areas is 16 to 17 percentage points higher. The impact of residing is small cities and towns is positive, but of lower magnitude. The regional patterns of GIS receipt are quite sharp.

The estimated effects of the indicators for minority language status are also strong. Compared to case of those residing in provinces where their language predominates, the incidence rate for Quebec Anglophones is about 12 percentage points lower, while the rate for francophones in the rest of Canada is about 14 percentage points higher.

After the inclusion of all of these sets of regressors into the augmented equation (column 6 of Table 1), the age pattern is still strictly increasing, but the magnitude of the

effects remain small until individuals age into their mid 70s. The range of these estimates corresponding to ages 65 years up to age 90 years diminishes 25 percentage points when no other regressors are included to 9.2 percentage points.

5.3 Regression Analysis Using Later Cohorts: Focus on Income and Saving in the Pre-Retirement Years

The results for the specifications that include the variables related to permanent income are presented in Table 2 This estimating sample contains only 12 cohorts running from 1997 until 2008. All of the exogenous variables are categorical. The categories for the (annual) permanent income variable are as follows: 0-10k, 10-20k, 20-30 k, 30-40 k (omitted), 40-50 k, 50-60 k, 70-80k, 80-90-k, 90-100k, 100-150k, and 150k +). The flags for labour market activity over the window during which the individual was 50-52 years old are i) self-employment status, ii) EI receipt, iii) holding a unionized job, iv) making RRSP contributions, and v) making registered retirement plan contributions. The first column corresponds to the specification in which age-specific effects are included. The second column corresponds to the specification in which age-specific effects plus the cohort-specific effects are included. The third column corresponds to the specification in which all of the interacted effects are included as well. For expositional simplicity, none of those estimated coefficients are listed in Table 2. This same progression is adopted for columns four through six. These specifications are identical to those whose results are presented in columns one through three, except that they include an indicator for having contributed to an RSP plan. In order to include that measure, we

are forced to further restrict the sample to the 2001-2008 cohorts, and the sample size falls from almost 3,000,000 to approximately 1,500,000 observations.

Compared to the results contained in Table 1, which exclude the income-related variables and are based on a much larger sample that includes 15 earlier cohorts, the negative effect of married females is stronger (base category is single males), but the negative effect of married males is weaker. Net of the permanent income effects, single women are now *less* likely than their male counterparts to receive GIS benefits, but this effect is not large in magnitude. Even after controlling for life-time income, both men and women with partners are less likely to receive GIS benefits. When the income-related variables are excluded, the estimated (negative) magnitude is about the same relative to single males; there is no gender gap. When we control for permanent income, the gap between them widens to 21 percentage points (negative 0.252 minus negative 0.04). The partnered women are much less likely to receive GIS benefits compared to partnered men.

The estimated effects for immigrants are not nearly as sharp when including permanent income. The estimate for the most recently arrived immigrants is insignificantly different from zero. This empirical pattern suggests that the much higher incidence rate that is discerned among immigrants (relative to natives) is attributable primarily (but not exclusively) to their lower permanent incomes. A similar empirical pattern is obtained for the provincial effects, which diminish in magnitude when this final set of regressors is included. Nonetheless, the pattern across provinces remains robust even after controlling for these income-related factors, with Newfoundland having by far the highest value and Ontario the lowest. Compared to the findings that appear in Table

1, the area size of residence effects diminish in magnitude by a factor approximately one-half. Similarly, the estimates for the linguistic variables are not quantitatively robust to the inclusion of the set of income-related variables; the magnitude drops considerably.

The estimated coefficients of all of the indicators for permanent income are statistically significant. This group of regressors has strong explanatory power, as the value of R-bar squared increases from approximately 0.09 to 0.26. The estimates for the income brackets display a strictly monotonic but non-linear pattern, ranging from plus 37.5 percentage points for those with no income to minus 26.8 percentage points for those with more than $ 150,000 in income (relative to the base category of 30-40 k). The estimated coefficient for the self-employment flag is minus 6.5 percentage points, indicating that even after controlling for the level of permanent income, the event of being self-employed militates toward a lower incidence of GIS due to certain unobservable attributes. Those individuals who received EI benefits during the period when they were 50-52 years old are 5.6 percentage points more likely to receive GIS benefits, ceteris paribus. By contrast, previously unionized workers are 4.8 percentage points less likely. This effect is likely tied to coverage by a private pension plan because it diminishes in magnitude once we include the indicator of having contributed to an RRP scheme.

The estimates for the existence of private pension schemes are strongly negative in sign, as expected. Workers having contributed to these plans are much less likely to receive GIS benefits. All other factors held constant, those who contributed to RRSPs, which are strictly individualized accounts, have an incidence rate that is 8.2 percentage points lower. The estimates for the RRP flag appear in the penultimate row of columns

four through six. The incidence rate for receipt of GIS benefits is 8.5 percentage points lower. Note that the estimated magnitude for the coefficients of RRSP coverage is only slightly lower when RSP coverage is included in the regression, suggesting that these two variables are not highly correlated, and that there is not a lot of overlap between the participants of those two types of pension programs.

6. Conclusion

This paper consists of a statistical and econometric analysis of the incidence rate for receiving GIS benefits among age-eligible Canadians, which is based on administrative data drawn from tax returns. This program is a critical component of Canada's social safety net, as approximately one-third of Canada's senior citizens benefit from this purely means tested program.

The raw estimates for the incidence rate range from 30.5 % in 2006 to 34 % in 1992. It did not rise after the GIS program outreach initiative was launched in 2002. All other factors held constant, there appears to be a slight dip in the incidence rate for the 2004 through 2007 entry cohorts (i.e. at the point in time when they gain eligibility), which coincided with a very healthy labour market characterized by the lowest unemployment rates in a generation. Women are estimated to exhibit an incidence rate that is 8 percentage points higher in the specifications which exclude the permanent income variables. The bi-variate age profile rises monotonically from 31.2 % at age 65 to 32.6 % at age 67, and it tends to rise rapidly after age 70, and exceeding 40 % after individuals reach their late 70s. This very remarkable rising age profile does diminish in magnitude when year-specific cohort effects are included. After controlling for the effect

of marital status, only 20-30 % of the raw magnitude of the age effect remains for individuals aged between 68 and 80 years of age, and approximately 30-40 % of the original magnitude remains among those aged 80-90 years. The sharply increasing age profile that we discern reflects in large part the impact of individuals not having a partner.

With or without the inclusion of control variables, the effect of having a partner is highly negative for both genders; members of couples have lower incidence rates. This result is consistent with a central theme of the poverty literature, namely that in financial terms, being single is a disadvantage. The incidence rates for immigrants who have resided in Canada for a period of between 11 and 15 years are much higher than is the case for native Canadians, although some of that estimate is driven by different values of our proxies for permanent income.

In regards to the regional factors, Ontario has the lowest incidence rate, while Newfoundland's is twice as high as that of any other province. Rural areas and areas with relatively low population densities have higher rates than urban areas.

The estimates for our proxy variable of permanent income are as expected: a strongly negative, non-linear, monotonic relationship. This finding indicates that the program is reasonably well-targetted at those who had relatively low permanent incomes when they were in their prime earning years. Those who were previously self-employed are less likely to benefit even after controlling for the effect of permanent income. A similar finding was discerned for unionized workers, which is partially attributed to the effect of pensions. As expected, those individuals who contributed to RRSP and/or RRP are less likely to receive GIS benefits. Including the effects of the variables related to permanent income, the gender-related results are over-turned. Single women are slightly

less likely than single men to receive GIS benefits, but women with partners are much *less* likely than their male counterparts to receive them.

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