NBER WORKING PAPER SERIES

ACHING TO RETIRE?
THE RISE IN THE FULL RETIREMENT AGE AND ITS IMPACT ON THE DISABILITY ROLLS

Mark Duggan
Perry Singleton
Jae Song

Working Paper 11811
http://www.nber.org/papers/w11811

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
December 2005

The authors are grateful to David Autor, Ed DeMarco, Bill Evans, Jonah Gelbach, Judy Hellerstein, John Hennessy, Howard Iams, Erzo Luttmer, Joyce Manchester, L. Scott Muller, John Rust, Seth Sanders, Michael Wiseman, and seminar participants at the University of Maryland, the University of North Carolina at Chapel Hill, the Social Security Administration, and the NBER Summer Institute for helpful suggestions. Thanks also to the many employees of the Social Security Administration who assisted us with the data used in this paper. Duggan thanks the Alfred P. Sloan Foundation for support. The authors can be contacted at: 3105 Tydings Hall, College Park, MD 20742. The conclusions and opinions expressed in this paper are solely those of the authors and should not be construed as representing the opinions or policies of the Social Security Administration or any agency of the Federal Government. All errors are our own. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

Aching to Retire? The Rise in the Full Retirement Age and its Impact on the Disability Rolls
Mark Duggan, Perry Singleton, and Jae Song
NBER Working Paper No. 11811
December 2005
JEL No. H53, H55, J21, J26

ABSTRACT

In 1983 the federal government passed legislation that gradually increases the age at which individuals can receive full social security retirement benefits from 65 to 67 and reduces the generosity of benefits available at the early retirement age of 62. No corresponding changes were made to social security disability insurance (DI) benefits. This increase in the full retirement age will substantially increase individuals' financial incentives to apply for DI benefits. In this paper we use administrative data from the Social Security Administration to estimate the effect of this change on DI enrollment. Our findings indicate that the policy has contributed to the recent growth in the disability rolls with the effect concentrated among 63 and 64 year old men. When the policy is fully implemented, our estimates suggest that DI enrollment for this group of near elderly men will increase by 1.6 percentage points (13 percent). The overall effect would be modest, however, as it would account for just 1.3 percent of total DI enrollment and offset less than 4 percent of the estimated budgetary savings that will result from increasing the full retirement age.

Mark Duggan
University of Maryland
Department of Economics
3115C Tydings Hall
College Park, MD 20742
and NBER
duggan@econ.umd.edu

Perry Singleton
University of Maryland
singleto@econ.bsos.umd.edu

Jae Song
Social Security Administration
jae.song@ssa.gov

I. Introduction

In September of 2005, approximately 6.5 million non-elderly adults received disabled worker benefits from the Social Security Disability Insurance (DI) program. Twenty years ago just 2.3 percent of U.S. residents between the ages of 25 and 64 were receiving DI benefits but in 2005 the corresponding percentage is almost twice as high at 4.3 percent (Figure 1). If recent entry and exit rates persist in the years ahead then the steady-state share will increase to almost 7 percent. The results from recent research suggest that several factors have contributed to the growth in DI receipt, including less stringent medical eligibility criteria, the aging of the baby boom generation, an increase in female labor force participation, the recessions of 1991 and 2001, and an increase in replacement rates for low-skilled workers caused by the interaction of rising wage inequality and a progressive benefit formula.[1]

One factor that has not previously been considered when explaining the past and expected future growth in DI receipt is the reduction in the generosity of social security retirement benefits. As a result of legislation passed in 1983, the full retirement age (at which a person receives full benefits) is gradually increasing from 65 for those born in 1937 or earlier to 67 for those born in 1960 or later. Along with this, the percentage of full benefits that an individual can receive at the early entitlement age of 62 is declining from 80 to 70 percent. This latter change is important given that more than 56 percent of all individuals claim social security retirement benefits at 62. Because DI benefits were not affected by this legislation, the incentive to apply for this program will increase considerably once the changes are fully implemented.

In this paper we estimate the contribution of the declining relative generosity of social security retirement benefits to the growth in DI receipt. To do this we use individual-level

[1] See Autor and Duggan (2003), Black, Daniel, and Sanders (2002), Bound and Burkhauser (1999), Duggan and Imberman (2006), Gruber and Kubik (1997), Gruber (2000), Kreider (1999), and Rupp and Stapleton (1995) for an examination of the effect of one or more of these factors on DI applications or enrollment.

administrative data from the Social Security Administration for a random one-percent sample of all individuals ever issued a social security number. This restricted-use data has three important advantages for our purposes. First, it contains each individual's year of birth, which is the main source of variation that we exploit in our analysis as it determines the generosity of DI relative to early retirement benefits. Second, it gives us a large sample of individuals, which is important given that the increase in the full retirement age from 65 to 67 has not yet been fully implemented. Plausible effects would be difficult to detect in data sets such as the Current Population Survey or Health and Retirement Study that have much smaller sample sizes. And finally, it contains detailed information on earnings, the receipt of social security benefits, and mortality for the individuals in the sample from 1951 to 2003. This allows us to follow the same individual over time, to accurately capture differences in earnings histories, to determine whether an individual is insured for or has previously received DI benefits, and to determine whether a person dies and if so the month and year during which the death occurs.

In constructing our analysis sample, we focus primarily on individuals born between 1935 and 1945. We do this because the earlier cohorts[2] were not exposed to the policy change, and program participation for the more recent cohorts would be truncated to a significant extent. We consider only near-elderly individuals between the ages of 55 and 64 because we assume that the change in policy would have little impact on behavior for younger individuals. We further restrict attention to males because the steady increase in female labor force participation during our study period substantially changes the fraction (and thus perhaps the composition) of women who are insured for DI benefits.

The source of variation that we exploit is the individual's year of birth, which determines the fraction of full benefits that a person can receive at the early retirement age of 62. As shown

[2] Here and elsewhere in the paper the word cohort refers to a particular year of birth.

in Figure 2, people born between 1935 and 1937 were not affected by the legislative change and could therefore receive 80 percent of full benefits if they claimed benefits on their 62nd birthday. This ratio decreased by increments of 0.833 percentage points per year for the next six cohorts and was thus equal to 75 percent for those born in 1943. Individuals born in 1944 and 1945 also could receive 75 percent of full benefits at the age of 62.

Our baseline specification estimates the probability that an individual is enrolled in the program as a function of his ratio of early retirement to DI benefits at age 62. In trying to disentangle the effect of the policy change from other factors, we also control flexibly for each individual's age given that the probability of DI enrollment varies with age. Similarly we include a full set of calendar year effects given that DI enrollment is affected by economic conditions. We allow the effect of the policy change to vary by age given that the average costs of applying for the program and the probability of being awarded benefits will also vary by age. Specifically, it is more costly for the average 56-year old to apply for DI than it is for the average 62-year old because a person cannot be working and both employment rates and average earnings decline with age among the near elderly. Additionally, the probability that a potential applicant would be awarded benefits is likely to increase with age given that older individuals tend to be in worse health.

Consistent with these predictions, we estimate a statistically significant effect of the change in retirement benefits on DI enrollment, with this effect largest for individuals just past the early retirement age. The estimated effects are somewhat greater for individuals below the median AIME (average indexed monthly earnings), suggesting that low-skilled workers have been more affected by the change. We conduct a "placebo test" by estimating an analogous set of specifications for individuals born between 1927 and 1937. These cohorts were unaffected by

the policy change though we assign the ratios described above so that the 1935-37 cohorts are fully treated, the 1930-34 cohorts are partially treated, and the 1927-29 cohorts are not treated. Constructing the analysis sample in the same way and estimating an identical set of specifications, we find no similar effect. This suggests that our findings for the cohorts that were affected by the policy change are not simply driven by model misspecification.

Taken together, our estimates suggest that the reduction in the generosity of social security retirement benefits has increased DI enrollment among near elderly men. The magnitude of the estimated effect is actually quite small, with our estimates suggesting that an additional 42,000 men would receive DI benefits had the policy been fully implemented (i.e when the FRA reaches 67). This represents just 1.3 percent of current male DI recipients and thus the falling generosity of social security retirement benefits has not been a driving force behind the recent increase in DI enrollment. Additionally, while the induced increase in DI enrollment will to some extent offset the expected decline in social security expenditures resulting from the policy change, our findings suggest less than $.04 of offset for each expected dollar saved.

The outline of the paper is as follows. In section 2 we summarize the changes in social security benefits that are relevant for our study, the effects of these changes on individual incentives, the growth in the DI program, and the findings from related research studies. In section 3 we describe our SSA administrative data and the construction of our analysis sample. Section 4 outlines our identification strategy and section 5 summarizes our empirical results. In section 6 we discuss the implications of our results and outline important directions for future research.

II. Background and Previous Research

A. The Increasing Incentive to Apply for DI Benefits

To be entitled to social security disability insurance (DI) benefits, a person must (1) submit an application to a Social Security Administration (SSA) field office, (2) satisfy the medical and vocational criteria used to evaluate disability and (3) be DI insured. Thus, for an applicant to be awarded benefits, it must be established that the applicant exhibits an "inability to engage in any substantial gainful activity by reason of any medically determinable physical or mental impairment which can be expected to result in death or has lasted or can be expected to last for a continuous period of not less than 12 months" (SSA, 2004). Additionally, the person must have a sufficiently long and recent enough work history to be insured for DI benefits. Typically this means that the person must have worked for at least five of the ten years prior to submitting an application for DI benefits.[3]

Once an award has been made, the Social Security Administration determines a person's DI benefit by first calculating that person's average indexed monthly earnings (AIME). The SSA indexes earnings to the average wage in each year as specified in the following formula:

$$(1)\quad AIME = \left\{12 * \left[(T-1) - 21 - \min\left[5, \text{int}\left(\frac{(T-1)-21}{5}\right)\right]\right]\right\}^{-1} * \sum_{t=0}^{T-1} Max\left(1, \frac{\overline{w}_{T-2}}{\overline{w}_t}\right) * w_t * I_t$$

In this equation, T is equal to the age at which the person becomes disabled and w_t represents his/her earnings at age t. For individuals DI entitled on or after age 46, the five lowest years of indexed earnings are dropped from this calculation, so the sum of annual earnings is divided by

[3] The number of work credits that a person must have depends on his/her age. Anyone over the age of forty would need at least twenty quarters of coverage during the preceding ten years. A person who earned more than $3120 in the 2000 calendar year would receive exactly four quarters of coverage for that year with this dollar threshold adjusted for increases in average wage growth from one year to the next. For example, in 2003 a person would need to earn $3560 to get four quarters of coverage whereas a person in 1995 would need $2520. Thus a person who worked in at least five of the preceding ten years would typically be insured for DI benefits

(12 * ((T – 21)– 5)). The indicator I_t is equal to one if the person's indexed earnings in year t are included in the calculation. This calculation applies to persons less than age 63 when applying so that no more than 35 years of annual earnings are included in the calculation.[4]

Using this AIME, SSA then uses the progressive benefit formula shown in Figure 3 to calculate a person's primary insurance amount (PIA), which is equal to monthly DI benefits in the year that the person is first eligible for benefits. In 2003 the first $612 in AIME was replaced at a 90 percent rate, the next $3077 at a 32 percent rate, and the rest at 15 percent, with the "bend points" indexed to average wage growth in the economy.[5] Thus a low-income worker can replace a much larger fraction of his/her earnings with DI benefits than can a high-income worker. In each January, SSA uses the consumer price index (CPI) to adjust monthly benefits for all OASDI recipients to account for increases in the cost of living. In 2003 the average DI award was $936 per month, with 25 percent of awards below $625 per month and 25 percent above $1240 per month.

The same formula is used to calculate monthly benefits for individuals who claim retired worker benefits at the age of 62 or later. But in this case a person's monthly benefit amount also depends on his/her age when first claiming benefits, with lower benefits given to those who claim earlier. For an individual born in 1937 or earlier, the monthly benefit would be 80 percent of the PIA if benefits were claimed on his/her 62nd birthday, with this amount increasing by 5/9 of a percentage point per month until reaching 100 percent of the PIA at the full retirement age of 65.[6] In 1999 (when the 1937 cohort reached the age of 62) approximately 59 percent of

[4] The maximum number of years used is 35 and thus more than five years of earnings would be dropped for applicants who become disabled after age 62. Fewer than five years are excluded for awardees in their twenties, thirties, or early forties.

[5] This formula has been in effect since 1979, when the corresponding amounts of AIME replaced at 90 and 32 percent were 180 and 905, respectively.

[6] The actuarial adjustment past the full retirement age is gradually increasing from 3 percent per year (0.25 percent per month) for individuals born between 1916 and 1924 to 8 percent per year for those born in 1943 or later.

retired worker awards were made to individuals who were 62 years old. Thus most workers eligible for retirement benefits from social security took them when they were first available. These early claimers would have received monthly benefits that were 25 percent greater if instead they had been awarded DI benefits. Thus a person planning to claim retired worker benefits at the age of 62 or who has already claimed these benefits would have a financial incentive to apply for DI.[7] Consider a male who plans to claim retirement benefits on his 62nd birthday with an average PIA in 2003 of $1274, an annual mortality rate in each subsequent year that is 50 percent greater than the national average for men[8], and a real discount rate of three percent. For this person the expected present value difference between a DI award and claiming retirement benefits would be $36,793. To the extent that individuals are forward-looking this difference might influence their incentives to apply for DI in earlier years as well.

Because of federal legislation passed in 1983, the incentive to apply for DI for individuals born in 1938 or later is even greater. This added incentive is a result of the increase in the full retirement age and the corresponding reduction in the generosity of benefits at the early retirement age of 62. As shown in Figure 2, the percent of full benefits that an individual can receive declines by increments of 0.833 percentage points per year for cohorts born between 1937 and 1943 and between 1954 and 1960. Thus a person born in 1943 would receive just 75 percent of full benefits if they claimed on their 62nd birthday while their counterpart born in 1960 would receive just 70 percent. The present value difference in the example above would increase from $36,793 for a person born in 1937 to $45,991 and $55,190 for individuals born in 1943 and 1960, respectively. While the exact change in expected benefits would vary across individuals as

[7] See Benitez-Silva et al (1999), Gruber and Kubik (2005), and Hausman and Halpern (1986) for studies of the determinants of the DI application decision.

[8] This assumption is made to account for the fact that DI applicants are less healthy than the average individual insured by the program. Annual data by single year of age were obtained from the Social Security Administration website at http://www.ssa.gov/OACT/STATS/table4c6.html.

a function of the PIA, the probability of qualifying for benefits, the life expectancy, and the annual discount rate, it is clear that this legislation would increase the average incentive to apply for disability benefits.

Policymakers recognized that the projected budgetary savings from increasing the full retirement age might be offset to some extent by its effect on DI enrollment. For example, a 1998 report on social security reform by the U.S. General Accounting Office concluded by stating that "participation in disability insurance programs will likely increase . . . if retirement ages are raised. The magnitude of the increase will depend on the extent to which individuals react to the newly created incentives to apply to these programs" (GAO, 1998).

B. The Rise in the Disability Rolls

In September of 2005, approximately 6.47 million individuals received disabled worker benefits from the DI program. An additional 1.76 million people received DI benefits as children or spouses of disabled workers. Total DI expenditures were $78.2 billion in calendar year 2004, with average monthly payments to disabled workers and dependents equal to approximately $900 and $260, respectively. Virtually all disabled worker recipients of DI benefits receive health insurance from the federal Medicare program, with total expenditures from this program on behalf of DI recipients close to $45 billion in 2004.[9]

The rise in DI receipt during the past two decades has been substantial and has accelerated in the last several years. In 1985 just 2.3 percent of individuals between the ages of 25 and 64 were receiving DI benefits. By September of 2005, this fraction had almost doubled

[9] Approximately 20 percent of DI recipients are dually eligible for disability benefits from the Supplemental Security Income (SSI) program and thus also obtain health insurance from the Medicaid program. If one includes SSI and Medicaid expenditures for “dual eligibles”, total expenditures for DI recipients in the 2004 calendar year exceeded $160 billion.

to 4.3 percent. The annual percentage point increase was approximately twice as large from 2000 to 2005 as it was in the preceding five years. The application rate also increased during this period (by 75 percent from 1999 to 2004) after remaining roughly constant during the late 1990s. Given that the rate of entry to the program is currently much higher than the exit rate, it is clear that the program is far below its equilibrium size[10]. Assuming these rates are constant, one can approximate the equilibrium size by dividing the number of awards in a typical year by the exit rate from the program.[11] Using data for 2002 to 2004, the number of DI recipients would have to reach 10.1 million before the flow into and out of the program would be equal. This is 57 percent greater than the number of individuals currently on DI and suggests that the fraction of non-elderly adults between the ages of 25 and 64 enrolled in DI could eventually reach 7 percent from its current rate of just 4.3 percent.

A number of explanations have been proposed for the rise in DI receipt.[12] One obvious one is the aging of the baby boom population. The probability of DI receipt is a steadily increasing function of age. For example a 60-year old is three times more likely than a 45 year old and ten times more likely than a 30-year old to be enrolled in the program. As the baby boom population ages into their fifties and sixties, this would lead to a mechanical increase in the number of individuals enrolled in the program. Related to this is the increase in life expectancy. Because fewer individuals are now dying in their thirties, forties, and fifties, a larger fraction of individuals are living to the age at which DI receipt is most likely.

[10] The exit rate includes all DI termination paths: reaching the full retirement age, death, and no longer meeting the medical and vocational standards for disability.

[11] Here we are assuming that other factors influencing entry and exit rates to the program will remain constant over time. The main point is that current entry rates onto the DI rolls are considerably greater then exit rates and thus current enrollment greatly understates projected future enrollment.

[12] Most of the previous work on DI has considered the effect of the program on labor supply rather than the factors contributing to its increase. See for example Parsons (1980,1991) and Bound (1989, 1991). A related literature has considered the optimal level and screening stringency of DI benefits (Diamond, 1995; Bound et al, 2004). See Bound and Burkhauser (1999) for an excellent review of this literature.

A second factor that can help to explain the steady rise in DI receipt is the increase in female labor force participation. This has increased both the fraction of women who are independently insured for DI benefits and the potential benefits that insured women can receive. An examination of sex-specific rates of DI receipt suggests that this factor is important. In 1985 the ratio of male to female DI recipients was 2.05. Eighteen years later in 2003 that ratio had fallen to just 1.22.[13]

Changes in financial incentives have also influenced the rate of DI receipt. One change in policy that increased this incentive was the 1984 liberalization of the medical eligibility criteria used by SSA in making DI award decisions. This policy change made it significantly easier for individuals with certain conditions (e.g. mental disorders, arthritis, and back pain) to qualify for benefits. Given that there is a cost to applying for the program, the increase in the award probability has made it more financially attractive to apply for DI benefits.[14]

Another factor that increased individuals' incentives to apply for DI was the rise in income inequality (Autor and Duggan, 2003). Given the progressive benefit formula used by SSA and the fact that the "bend points" are indexed to average wage growth in the economy, low-skilled workers saw an increase in their potential replacement rate if they became eligible for DI. As other research has noted, the replacement rate exerts an important effect on the receipt of disability benefits (Gruber, 2000).

One final factor that has been the focus of much previous research on DI is the effect of economic conditions (Black, Daniel, and Sanders, 2002). The recessions of 1991 and 2001 substantially increased the number of people applying for and eventually enrolled in the program.

[13] This probably partially explains why DI receipt has grown much more rapidly than SSI receipt during the past decade. Women who in the past would have qualified for SSI now instead qualify for DI because they are more likely to have worked in the previous decade.

[14] See Gruber and Kubik (1997) and Hausman and Halpern (1986) for theoretical and empirical evidence regarding the effect of this probability on the incentive to apply for disability benefits.

The explanation typically given for this is that the weak job market reduces the costs of applying for disability benefits and thus more people apply as a result.

According to recent research, all of these factors have contributed to the growth in DI receipt (Duggan and Imberman, 2006). But virtually no empirically-oriented papers have considered the effect of the increase in the full retirement age described above on the rise in DI receipt.[15] One exception is a recent paper by Bound, Stinebrickner, and Waidman (2004), in which the authors use a structural model to simulate the effects of the increase in the full retirement age on individual behavior. In this paper, the authors use data from the HRS for a sample of 196 single men employed in 1991 (the first year of the survey) to estimate the model parameters. Using these estimates, their simulations suggest that the increase in the full retirement age has little effect on behavior before the age of 62 but increases work effort and leads to a slight increase in the propensity to apply for DI between the ages of 62 and 64.[16]

Even absent any change in individual behavior, the increase in the full retirement age will increase DI enrollment because DI recipients are considered OA recipients once they reach the full retirement age. Thus, when the full retirement age is 67, there will be individuals aged 65 and 66 on the DI rolls. We ignore this mechanical effect in our empirical analyses below when investigating whether the decline in the generosity of retired worker benefits has increased the rate of DI receipt among non-elderly adults.

[15] Previous work has investigated whether other transfer programs in the U.S. serve to some extent as substitutes. For example, Kubik (1999, 2003), Garret and Glied (2001), Schmidt and Sevak (2004), and Duggan and Kearney (2005) demonstrate that changes in the generosity of welfare benefits influence enrollment in the Supplemental Security Income program.

[16] In related work, Gustman and Steinmeier (2005) estimate a structural model that considers the effect of an increase in the early retirement age on behavior, including application for DI benefits.

III. Data and Construction of Analysis Sample

To estimate the effect of the declining generosity of social security retirement benefits on DI enrollment, we obtained individual-level data from the Social Security Administration. This data contains earnings histories and detailed information on the receipt of OASDI benefits for a one percent sample of individuals who have ever had a social security number. For each person, the data contains up to 53 years of annual earnings data for the period from 1951 to 2003. If a person had multiple employers during the year, then the earnings are aggregated. From 1951 to 1977 the data includes only those earnings that were subject to social security taxes, whereas the more recent earnings data include all W-2 earnings in each year.[17] The annual data on OASDI receipt allows us to determine if a person received retirement, survivors, disability, and/or dependent benefits in each year along with the amount of benefits. The data also includes each individual's gender, date of birth, and date of death.

We use a subset of the individuals in this one percent sample for the empirical analyses that follow. As described above, the 1983 legislation gradually reduced the generosity of retirement benefits, so that cohorts born in 1937 or earlier were unaffected whereas those born in 1960 or later were fully affected. The changes were phased in over two six-year intervals, from 1937 to 1943 and from 1954 to 1960. We focus on the first of these changes, given that individuals born in the 1950s and early 1960s would still be relatively young in 2003 (the most recent year for which we have data) and thus unlikely to be affected to a significant extent by the change in the generosity of retirement benefits. We further restrict attention to individuals born between 1935 and 1945, giving us three cohorts (1935 to 1937) that were unaffected by the

[17] Thus in the early years a large fraction of the observations are truncated. For example in 1965 more than half of all men with non-zero earnings were at the cap. Of this group, approximately 10 percent were above the cap, presumably because they worked for multiple employers during the year and combined earnings exceeded the cap.

change in legislation, three cohorts that were fully affected by the first change (1943 to 1945), and five cohorts that were partially affected (1938 to 1942).

There are 167,068 men and 155,720 women in our sample born during this eleven-year period. Many of these individuals died relatively early in their lives and thus are unlikely to have been affected by changes in the generosity of social security retirement benefits. We therefore do not include them in our analysis sample. Similarly some individuals are not insured for DI benefits because of insufficient labor force attachment or are awarded benefits at young ages. We exclude these individuals as well. More specifically, we focus on individuals in our one percent sample who survive to the year that they turn 55, are insured for DI benefits in that year, and are not receiving DI benefits then. We are therefore assuming that the change in the generosity of retirement benefits will only influence behavior at or beyond the age of 55.

Tables 1 and 2 provide information about the men and women, respectively, who are in the full one-percent sample and born during the 1935 to 1945 period. As the first table shows, approximately 64 percent of men born in each year during this period are included in our sample. This fraction is quite steady over time, ranging from a low of 63.7 percent for the 1937 cohort to a high of 64.9 percent for the 1943 cohort. This suggests that the composition of the individuals in our sample is not changing to a significant extent over time. Of those who are excluded, most are simply not insured for benefits because they have insufficient covered earnings from the time that they are 45 to 55 years of age.[18] The fraction that die by their 55th birthday declines over the period, from 9.6 percent for the 1935 cohort to 8.1 percent for the 1945 cohort, though this is

[18] Technically, an individual is considered to be insured for DI benefits if he/she has (1) twenty quarters of work credits during the preceding ten years and (2) at least one credit for each calendar year after the year of attaining 21. The amount of earnings needed for one credit varies across years (e.g. $290, $520, and $780 in 1980, 1990, and 2000, respectively) and the maximum number of credits for any one year is four.

almost fully offset by a corresponding increase in the share that are receiving DI benefits at that age, which rises from 4.8 percent to 6.1 percent.

As Table 2 demonstrates, the fraction of women in the full sample who meet our inclusion criteria does change substantially over time. For example, just 51.5 percent of the women born in 1935 are included in our sample whereas 59.8 percent of those born in 1945 are. This change is fully explained by the decrease in the fraction of women who are not insured for DI benefits, which falls from 41.4 percent to 31.9 percent. This decline is driven by the increase in employment among women. Because these changes may be correlated with changes in the composition (both observable and unobservable) of the women included in our sample, we focus on men in the empirical analyses that follow. Consistent with the changes for men, the fraction of women who die before their 55th birthday declines substantially while the fraction enrolled in DI increases by an even larger amount.[19]

It is worth noting that changes during our study period in the number of individuals that appear in the one-percent sample correspond fairly closely with changes in the number of live births during the same period. Because of immigration and other factors, one would not expect a one-for-one relationship but if one takes the ratio of individuals in our sample to the number of live births (divided by 100) in these same years it starts at 1.19 for the 1935 cohort, increases to 1.22 for the 1940 cohort, and declines to 1.20 for the 1945 cohort.[20] This suggests that there are not substantial changes in the one-percent sample during our study period resulting from the Social Security Administration's own inclusion criteria.

[19] The rise of women on the DI rolls reflects both a general increase in DI insured status due to increased labor force participation increase as well as an increased incidence of DI entitlement among DI insured women (see OACT Note #118, 2005)

[20] According to the National Center for Health Statistics publication *Vital Statistics of the United States* there were 2.155 million births in 1935, 2.360 million in 1940, and 2.735 million in 1945.

IV. Identification Strategy

In this section we describe our strategy for estimating the effect of the generosity of retirement benefits on DI enrollment. The intuition of our approach is straightforward. Individuals who would have claimed social security retirement benefits under the initial program parameters that were in place for individuals born in 1937 or earlier will find it less attractive to do so as these benefits become less generous. One response to this change would be to apply for DI benefits, which were 25 percent more generous than early retirement benefits for a person born in 1937 but 33.3 percent more generous for his counterpart born just six years later. Unfortunately we do not have DI application data linked to our one-percent sample and thus cannot estimate this margin of response. But to the extent that some of those induced to apply for DI are awarded benefits, this will appear in our administrative data.

For at least three reasons, the effect of the policy change on behavior would be likely to increase with age. First, the change in the present value of retirement benefits resulting from the policy change increases with age because of the corresponding reduction in discounting. Second, health tends to decline with age[21] and thus the probability that an application results in an award will tend to increase with age as well. Given that there is some cost associated with applying for DI benefits, there is an option value to delaying the application until the award probability increases to a sufficient level. Third, the average opportunity cost of applying for benefits is also declining with age. This is both because a person can not be working at the time that he/she applies for DI benefits and because average earnings decline rapidly with age.[22]

[21] Appendix Figure 1 plots age-specific mortality rates for near-elderly men. To the extent that average health is correlated with this measure it suggests that health declines with age among those in their fifties and early sixties.

[22] A fourth reason is that the average individual will become more aware of the purchasing power of his social security benefits, the adequacy of his savings, and the availability of DI benefits as he ages.

This trend can be seen graphically in Figures 4 and 5. The first of these displays the fraction of men born in 1937 with non-zero earnings in each year between the ages of 25 and 64. The 1937 cohort was the last one that could receive 80 percent of benefits at the age of 62. The figure differentiates between individuals who claim retirement benefits before their 63rd birthday and those who claim later and excludes individuals who are enrolled in DI. As this figure demonstrates, the fraction of men who are not working increases with age and this is especially true for individuals who claim retirement benefits when they first become available. For example, among men who claim retirement benefits at the age of 62, 29 percent had zero earnings at the age of 60 versus 20 percent at the age of 54. The data for average indexed earnings in Figure 5 tell a similar story. For example this average falls from $33,118 at the age of 50 to just $18,240 at the age of 60 for the early claimers. The returns to working for men who eventually claim early retirement benefits decline rapidly with age, which strongly suggests that the cost of applying for DI does as well.

Our baseline specification for the sample of 107,092 males described above relates the probability that individual j is receiving DI benefits in year t to his age, the calendar year, and the ratio of early retirement to DI benefits as specified in the following equation:

$$(2)\quad DI_{jt} = \beta * \left(\frac{OA_{jt}}{DI_{jt}} \right) + \delta * DI_{j,t-1} + \sum_{a=56}^{64} \lambda_a * I(Age_{jt} = a) + \sum_{\tau=1991}^{2003} m_\tau * I(Year_{jt} = \tau) + \varepsilon_{jt}$$

In this equation, the OA/DI ratio varies by cohort and is equal to the ratio of OA to DI benefits at the early retirement age of 62. This variable ranges from .80 to .75 among individuals born between 1935 and 1945 (see Figure 2). We include a full set of age and year effects to control for the fact that the probability of DI enrollment increases with age and that DI enrollment changes from one year to the next in response to macroeconomic conditions and other factors. Given that DI enrollment is essentially an absorbing state, we also include an indicator variable

to control for program participation by the individual in the previous year.[23] The coefficient of particular interest is β, which captures the relationship between the OA/DI ratio and the probability of DI enrollment. If the reduction in the generosity of retirement benefits induces some individuals to apply for DI and some of these applications result in awards then one would expect a negative sign on this coefficient. Because the effect is likely to vary with age, we also estimate specifications that include interactions between the person's age[24] and the OA-DI ratio as follows:

$$(3)\ DI_{jt} = \beta * \left(\frac{OA_{jt}}{DI_{jt}}\right) + \theta * \left(\frac{OA_{jt}}{DI_{jt}}\right) * \left(Age_{jt}\right) + \delta * DI_{j,t-1} + \sum_{a=56}^{64} \lambda_a * I(Age_{jt} = a) + \sum_{\tau=1991}^{2003} \mu_\tau * I(Year_{jt} = \tau) + \varepsilon_{jt}$$

If this effect does increase with age then one would expect a negative estimate for θ as well. We also estimate a companion set of specifications in which we drop individuals after the first year that they receive DI benefits.

Table 3 provides information on the number of observations used in our empirical specifications below. We include up to nine observations for each person corresponding to each age between 56 and 64. Some individuals will die over this period and thus are excluded in certain years. All other individuals remain in the sample until the year that they turn 64 or until our most recent year of data, whichever comes first. As the table demonstrates, the panel is unbalanced both because some of the individuals die before they reach the age of 64 and because some individuals have not reached the age of 64 by the year 2003. The total number of person-year observations in our sample is 715,968.

[23] Wooldridge (2001) suggests including the lagged dependent variable in this type of model as a way to control for omitted factors that may be related to the explanatory variable of interest (in this case the OA/DI ratio).
[24] In our specifications we subtract 56 from the age to facilitate calculation of the implied effect at each age.

V. Empirical Results

A. The Effect of the OA/DI Ratio

In the first two specifications of Table 4, we summarize the results from probit specifications of equations (2) and (3) that use the sample of men born between 1935 and 1945 who were not enrolled in DI in the year that they turned 54, were insured for DI in the year that they turned 55 and were still alive in that year. It is worth noting that in all cases the standard errors are corrected to account for the fact that the OA/DI ratio varies only by year-of-birth. In the first specification we assume that the effect of the OA/DI ratio does not vary with age. The estimate for β has the predicted (negative) sign – as retirement benefits become less generous people are more likely to be on DI – but it is not statistically significant. The estimate for δ is positive and significant, implying that individuals who are enrolled in DI in year t are significantly more likely than their counterparts to be on DI in the next year. This is not surprising given the very low exit rate from DI. For example if one excludes exits because of death or conversion to retirement benefits at the full retirement age, less than 1.1 percent of DI recipients exited the program in 2003 (SSA, 2004).

In the second specification of Table 4 we add as an explanatory variable the interaction between the OA/DI ratio and the individual's age. We subtract 56 from the age in this interaction so that the implied effects can be easily calculated. The estimate for the main effect remains insignificant but the estimate for θ is negative and statistically significant at the one percent level. This suggests, consistent with our predictions above, that the effect of the declining generosity of social security retirement benefits increases with age. In the third specification we add a second interaction with age (minus 56), which "turns on" only for the ages 61 to 64. The estimate for this coefficient on this interaction is negative, suggesting that the

effect of retirement benefit generosity accelerates with age, though the estimated effect is not statistically significant. When we add an additional interaction with age that allows the slope to differ beyond the early retirement age of 62 in specification (4), we find that there is a significant increase.[25]

The results from the first four specifications suggest that the falling generosity of social security retirement benefits has differentially affected men in their sixties. This is further confirmed by the results summarized in specification five, which show that the effect of the OA/DI ratio is significantly greater for men between the ages of 61 and 64 than for men at younger ages. In the sixth and final specification, we include an interaction of the OA/DI ratio with four different age indicator variables to provide a further test for heterogeneous effects by the age of the individual. The magnitude of the estimated effects increases with age at an accelerating rate, with the effect especially significant for 63 and 64 year old men.[26] The estimate of -4.990 on this final interaction implies an increase of 1.3 percentage points in the probability of DI enrollment for a 63 or 64 year old man once the policy is fully implemented.[27]

One possible concern with our results is that they could be driven by model misspecification. For example it could be the case that DI receipt among 64-year olds is trending up more rapidly over time than it is for 56-year olds. If this were true then the assumption that

[25] This is similar to the acceleration observed by Meyer (1990) of the exit rate from unemployment as the date of unemployment insurance benefit exhaustion approaches.

[26] It is worth noting that the number of DI awards is actually lower at the ages of 63 and 64 than at the ages of 61 and 62. For example in 1999 there were twice as many DI awards to 61 and 62-year olds as to 63and 64 year olds. One plausible explanation for this is that most individuals do not apply for DI if they have already claimed retirement benefits even though they could do so. It may also partially reflect the fact that there is a two-year waiting period for Medicare eligibility, and thus if one becomes entitled to DI benefits at the age of 63 or 64 than the individual will not receive Medicare any earlier than they otherwise would. Despite this baseline difference, our findings suggest that 63 and 64 year olds are increasingly likely to receive DI because of the increase in the FRA.

[27] The estimates for the older ages are less precisely estimated than for the younger ones because of the smaller number of observations. For example we have only six cohorts (1935 to 1940) of data for 63 year olds versus eleven for each age between 56 and 58. An additional reason that we have fewer observations at older ages is that individuals are dropped from the sample if they die and thus there are fewer individuals from a given cohort still remaining at 64 than at 60 or 58.

the changes over time that are attributable to other factors do not vary with age, which is implied by our inclusion of just one indicator variable for each calendar year, could be violated. While there is no perfect way to probe on this assumption given that a person's year of birth is our main source of variation, we test its reliability by estimating a companion set of specifications on a "placebo sample" of men born between 1927 and 1937. These men were not affected by the legislation that reduced the generosity of retirement benefits though we assume that they were. Specifically, we assume that the legislation takes effect eight years earlier than it actually does, so that the 1927-29 cohorts are untreated, the 1930-34 cohorts are partially treated, and the 1935-37 cohorts are fully treated. We construct the sample in the same way assuming that we have just data through 1995. Thus the imbalance caused by missing data for the older cohorts is similar in the two samples as shown in Appendix Table 1.

The results from specifications with this different sample are summarized in columns (7) through (12) of Table 4. In contrast to our results for the sample of men born between 1935 and 1945 who were actually affected by the 1983 legislation, the first specification that includes only the main effect yields a positive estimate for β, though as before the estimate is statistically insignificant. More importantly, the second specification provides no evidence for an effect that increases with age. The estimate of -.031 is more than an order of magnitude smaller than the corresponding estimate in column (2) and is statistically insignificant. The results for the next four specifications are similar in that they provide no evidence of a significant relationship between the OA/DI ratio and DI enrollment for the placebo sample. The contrast between the two sets of specifications summarized in this table strongly suggests that we are capturing a causal effect of the declining generosity of retirement benefits on DI enrollment.

We probe further on the robustness of our findings by estimating a companion set of specifications in which we drop individuals after their first year of DI enrollment and thus consider the effect of the OA/DI ratio on flows into the DI program.[28] The results from these specifications are summarized in the first six columns of Table 5. Consistent with the previous results, this table shows a negative relationship between the generosity of retirement benefits and DI awards with this effect increasing at an accelerating rate with age. For example, the estimated effect for a 61-62 year old male is almost twice as large as for a 59-60 year old male but less than one-third the effect for a 63-64 year old male.[29] As shown in the next six columns, the results are qualitatively similar if we estimate these same specifications as linear probability models rather than as probits.

We next investigate whether the magnitude of this effect varies with an individual's earnings. For three reasons, one might expect a larger response from individuals with low earnings. First, the average low-wage worker is likely to be in worse health than his counterpart with higher earnings and thus may have a greater chance of qualifying for DI. Along this same line, the opportunity cost of applying for DI might be lower for low-wage workers because they are less likely to be working. And finally, social security will account for a larger fraction of post-retirement income for this group and thus a decline from 80 to 75 percent of full benefits would have a bigger effect on income for this group.

On the other hand, those with low lifetime earnings will have lower life expectancy and thus the gain in present value terms of qualifying for DI will be lower. For example, as we show in Table 6, among men born in 1937 who claimed retirement benefits in 1999, the mortality rate

[28] Deaton (1997) argues that if one includes a lagged dependent variable as a regressor and errors are serially correlated then coefficient estimates may be biased. Dropping individuals after DI entitlement instead of including the lagged dependent variable essentially models the rate of DI entitlement conditional on never having been entitled.
[29] There are slightly more observations in these specifications than the previous ones because we are no longer controlling for lagged DI enrollment and thus include an age 55 observation for all individuals in the sample.

of individuals in the lowest quintile of average indexed monthly earnings is more than three times greater than the corresponding rate for those in the highest quintile. Thus in present value terms a change from 80 to 75 percent would be larger for those individuals with higher earnings. It is not clear whether this effect would more than offset the effects described above.

The specifications summarized in Table 7 shed light on this issue. The first four specifications are estimated for workers with average indexed monthly earnings (averaged over earnings from age 24 to 54) below their respective cohort median in the year that they reach the age of 54 while the next four summarize the analogous specifications for workers with high earnings. For neither group is the estimate for the main effect in the first specification statistically significant, though it is more negative for the low-income group. The second pair of specifications shows that DI enrollment is significantly negatively related with the interaction between the OA/DI ratio and the individual's age, but this is not the case for high earners. Similarly, the results from the fourth and final specification for each group show that the estimated effect becomes more negative with age for low earners but not for high earners. For this latter group, three of the four coefficient estimates in the final specification are positive, though the estimates are small and statistically insignificant.

Taken together, our estimates suggest that the declining relative generosity of social security retirement benefits is leading to an increase in DI enrollment. This effect increases rapidly with age and appears to be more important for low-income workers.

B. The Long-Run Effect on DI Enrollment and on Social Security Expenditures

One can use our estimates to determine how many additional men were on the DI rolls in the 2003 calendar year because of the change in the generosity of social security retirement

benefits. We can also estimate how many additional men will eventually be receiving DI once the full retirement age is equal to 67 for all cohorts. In both cases we exclude the mechanical effect that results from the increase in the range of ages during which a person can receive DI benefits.

We begin by estimating the effect on DI enrollment in the 2003 calendar year. In that year, individuals between the ages of 61 and 64 were only partially treated by the policy change described above because they were born between 1939 and 1942. Those who were 60 years old or younger were fully exposed in the sense that they could receive just 75 percent of their PIA when they reached the age of 62. We estimate the change in the probability of DI receipt for each individual in our sample in that year as follows:

$$(4) \quad \hat{\eta}_{jt} = \Phi\left[(OA/DI)_j, x_{jt}; \hat{\beta}\right] - \Phi\left[80, x_{jt}; \hat{\beta}\right]$$

The first term is set equal to the probability of DI receipt given each individual's OA/DI ratio and the latter term represents this same probability if that OA/DI ratio was instead 80 percent. These values are then averaged for each cohort in 2003 to calculate the implied change in the probability of DI receipt given that cohort's OA/DI ratio.[30]

According to our estimates, an additional 11,935 men between the ages of 56 and 64 were receiving DI benefits in 2003 as a result of the declining generosity of retirement benefits. If, however, one takes our estimates and holds fixed the age distribution of the individuals in our sample, the long-run effect is approximately four times greater at 41,956. We estimate that if the full retirement age increased from 65 to 67, the probability that a 61 or 62-year old male is receiving DI would increase from 8.6 to 9.2 percent[31] while the change for 63 and 64-year olds

[30] In calculating the change in probabilities we use the point estimates from specification 6 of Table 4.
[31] These numbers are somewhat lower than the actual fraction on DI because it excludes individuals on DI at the age of 55 and who were still alive and enrolled in the program at these ages.

would be even greater, increasing from 10.0 to 11.6 percent. Thus the induced beneficiaries would account for approximately 14 percent of male DI recipients in their mid sixties. But the contribution to overall DI enrollment is small. At the end of 2003 there were 3.23 million men receiving DI benefits and thus induced beneficiaries accounted for just 0.3 percent of this group. Once implemented the decline in the generosity of social security retirement benefits is estimated to increase DI enrollment among men by 1.3 percent.

For at least four reasons, our estimates are likely to understate both the short and long-run effects of the declining OA/DI ratio on DI enrollment by a substantial amount. First, we do not consider the effect of the policy change on DI receipt among women in this analysis. To the extent that women respond to the increased financial incentive to apply for DI then our estimates will understate the true effect.[32] A second reason that we are likely understating the effect is that some individuals who end up on DI because of the declining generosity of retirement benefits will still be receiving DI when they are 65 and 66 years old. Third, we have assumed in our analysis that the policy change has no effect on the behavior of those ages 55 and younger. To the extent that forward-looking individuals consider their future benefits from social security, this effect may be non-trivial. And finally, the number of individuals in their early sixties is projected to increase substantially in the years ahead. This is both because the number of births increased substantially from the late 1930s to the early 1950s and also because more people are surviving into their sixties and thus are possible DI recipients.

What do our findings imply about the extent to which the induced increase in DI enrollment will offset the projected savings from the increase in the full retirement age?

[32] It is indeed plausible that the effect of the increase in the financial incentive to apply for DI is larger for women, both because of their longer life expectancy and because of the lower average opportunity cost of applying for benefits resulting from their lower labor force participation.

To estimate this we make a number of simplifying assumptions. First, we assume that individuals induced to enroll in DI have the same average primary insurance amount and the same average mortality rates as those who still claim retirement benefits. This will lead us to bias up the offset given that DI recipients tend to have lower lifetime earnings and that they tend to have higher mortality rates. Second, we assume that those induced to enroll in DI would otherwise have claimed social security retirement benefits at the age of 62. With these assumptions, the increase in DI enrollment would offset just 3.9 percent of our estimate of the decline in OASDI expenditures resulting from the policy change.[33] While this amount is not insignificant in dollar terms, it does not significantly alter the improvement in social security's fiscal imbalance resulting from the rise in the full retirement age.

VI. Conclusion

In 1983 the federal government passed legislation that would gradually increase the age at which individuals could receive full retirement benefits in an effort to reduce the imbalance between long-run OASDI revenues and expenditures. Because no corresponding changes were made to the social security disability insurance (DI) program, the increase in the full retirement age will increase the financial incentives for individuals to apply for DI benefits. Individuals born in 1937 or earlier would receive 25 percent more if they were awarded DI benefits than if they claimed early retirement benefits at the age of 62, but that difference is set to increase to 43 percent for individuals born in 1960 or later.

[33] Suppose that all individuals have a PIA of $1000 and claim retirement benefits at the age of 62. The policy change would lead to a $100 reduction in monthly OASDI expenditures for the 98.7 percent who are not affected by the policy and a $200 increase in monthly OASDI expenditures for the 1.3 percent who are affected. Thus instead of declining by $100 per person expenditures would instead decline by $96.10 per person. Because of the assumption of identical mortality rates, the percentage is the same in the short and the long run.

The findings presented in this paper suggest that this change will lead to a modest increase in the number of individuals who receive DI benefits. This effect was significantly greater for individuals at or above the early retirement age and for individuals with relatively low earnings over their lifetimes. While it is clearly difficult to estimate the eventual effect of the policy change given that it is not yet fully implemented and given that many other factors are likely to change over time, our estimates suggest an additional 42,000 male DI recipients in the long-run. This forecast holds fixed the age distribution of men insured for DI benefits at 2003 levels and would represent an increase of just 1.3 percent in the number of men receiving DI benefits at the end of 2004. If one were to account for the aging of the baby boom population, the effect of the policy change on women, and the effect on individuals under the age of 55, the overall effect would likely be somewhat larger.

In this paper we explore just one response to the increase in the full retirement age and the reduction in the generosity of retirement benefits at the age of 62. To the extent that this legislation has reduced the present value of social security wealth for near-elderly individuals born in 1938 or later, it may increase labor supply for these cohorts. On the other hand, the actuarial adjustment to OASDI benefits beyond the early retirement age has become less generous as a result of this legislation. The magnitude of this change is substantial, with a 25 percent reduction from 5/9 of a percentage point in the PIA per month to just 5/12 of a percentage point per month. Whether the price or the income effect will dominate is theoretically ambiguous and represents an important area for future research.

References

Autor, D., and M. Duggan. 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *Quarterly Journal of Economics* 118(1): 157-205.

Benitez-Silva, H, M. Buchinsky, H. Chan, J. Rust, and S. Sheidvasser. 1999. "An Empirical Analysis of the Social Security Disability Application, Appeal, and Award Process," *Labour Economics*, 6, 147-178.

Black, D., K. Daniel, and S. Sanders. 2002. "The Impact of Economic Conditions on Participation in Disability Programs: Evidence from the Coal Boom and Bust." *American Economic Review*, 27-50.

Bound, J. 1989. "The Health and Earnings of Rejected Disability Insurance Applicants." *American Economic Review*, 482-503.

Bound, J. 1991. "The Health and Earnings of Rejected Disability Insurance Applicants: Reply." *American Economic Review*, 1427-1434.

Bound, J. and R. Burkhauser. 1999. "Economic Analysis of Transfer Programs Targeted on People with Disabilities," in Orley Ashenfelter and David Card, eds., *Handbook of Labor Economics*, Volume 3 (Amsterdam: North-Holland).

Bound, J., J. Cullen, A. Nichols, and L. Schmidt. 2004. "The Welfare Implications of Increasing Disability Insurance Benefit Generosity." *Journal of Public Economics*, 2487-2514.

Bound, J., T. Stinebrickner and T. Waidman , 2004. "Using a Structural Retirement Model to Simulate the Effect of Changes to the OASDI and Medicare Programs." University of Michigan Retirement Research Center Working Paper.

Deaton, A. 1997. *The Analysis of Household Surveys: A Microeconometric Approach to Development Policy*. Johns Hopkins University Press, Baltimore, MD.

Diamond, P. and E. Sheshinski. 1995. "Economic Aspects of Optimal Disability Benefits." *Journal of Public Economics*, 1-23.

Duggan, M. and S. Imberman. 2006. "Why are the DI Rolls Skyrocketing? The Contribution of Population Characteristics, Economic Conditions, and Program Generosity," forthcoming in D. Cutler and D. Wise, eds., *Health in Older Ages: The Causes and Consequences of Declining Disability among the Elderly*.

Duggan, M. and M. Kearney. 2005. "The Impact of Child SSI Enrollment on Household Outcomes: Evidence from the SIPP." NBER Working Paper.

Garrett, Bowen, and Sherry Glied. 2000. "Does state AFDC generosity affect child SSI participation?" *Journal of Policy Analysis and Management*, 275-95.

Gruber, J. and J. Kubik. 2005. “Health Insurance Coverage and the Disability Insurance Application Decision.” *Journal of Public Economics*, forthcoming.

Gruber, J. 2000. “Disability Insurance Benefits and Labor Supply.” *Journal of Political Economy*, 1162-1183.

Gruber, J. and J. Kubik. 1997. “Disability Insurance Rejection Rates and the Labor Supply of Older Workers.” *Journal of Public Economics*, 1-23.

Gustman, A. and T. Steinmeier. 2005. “The Social Security Early Entitlement Age in a Structural Model of Retirement and Wealth.” *Journal of Public Economics*, 441-463.

Hausman, J. and J. Halpern. 1986. “Choice under Uncertainty: The Decision to Apply for Disability Insurance.” *Journal of Public Economics*, 131-161.

Kreider, B. 1999. “Social Security Disability Insurance: Applications, Awards, and Lifetime Income Flows.” *Journal of Labor Economics*, 784-827.

Kubik, J. 2003. “Fiscal Federalism and Welfare Policy: The Role of States in the Growth of Child SSI.” *National Tax Journal*, 61-79.

Kubik, J. 1999. “Incentives for the identification and treatment of children with disabilities: The Supplemental Security Income program.” *Journal of Public Economics*, 187-215.

Meyer, B. 1990. “Unemployment Insurance and Unemployment Spells.” *Econometrica*, 757-782.

Parsons, D. 1980. “The Decline of Male Labor Force Participation.” *Journal of Political Economy*, 117-134.

Parsons, D. 1991. “The Health and Earnings of Rejected Disability Insurance Applicants: Comment.” *American Economic Review*, 1419-1426.

Rupp, K. and D. Stapleton. 1995. “Determinants of the Growth in the Social Security Administration’s Disability Programs: An Overview.” *Social Security Bulletin*, 43-70.

Schmidt, L. and P. Sevak. 2004. “AFDC, SSI, and Welfare Reform Aggressiveness: Caseload Reductions vs. Caseload Shifting." *Journal of Human Resources* 39(3): 792-812.

U.S. General Accounting Office, 1998. "Social Security Reform: Raising Retirement Ages Improves Program Solvency but May Cause Hardship for Some." *Testimony before the Special Committee on Aging, United States Senate.* Washington, D.C.

U.S. Social Security Administration. 2005. Annual Statistical Supplement to the Social Security Bulletin. Office of Research, Evaluation, and Statistics. SSA Publication No. 13-11827.

Wooldridge, J. 2001. *Econometric Analysis of Cross Section and Panel Data.* MIT Press, Cambridge, MA.

Figure 1: % U.S. Residents 25-64 Receiving Disability Insurance Benefits: 1985-2005

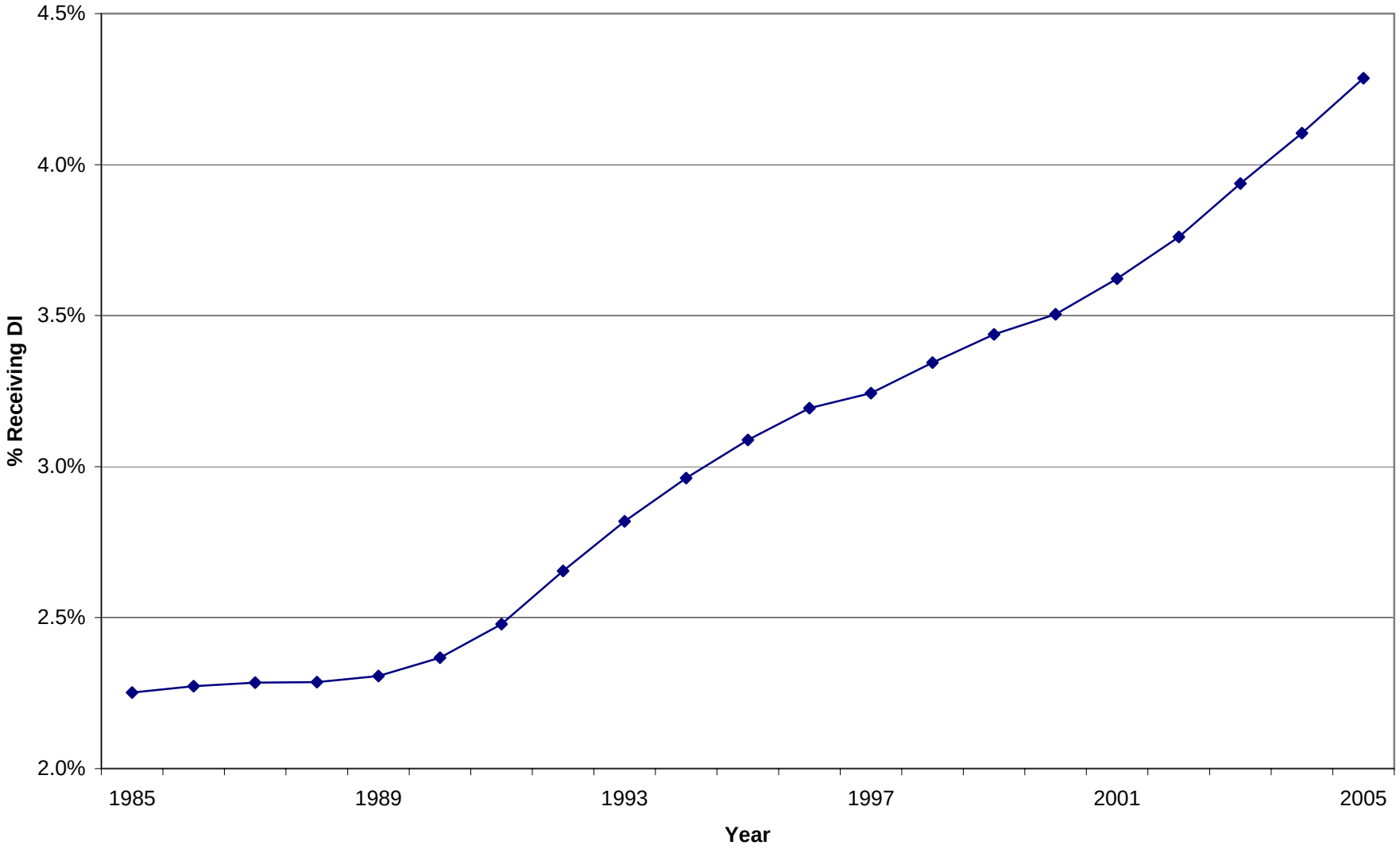


Figure 2: % of Full Retirement Benefits when Claiming at Age 62 by Year-of-Birth

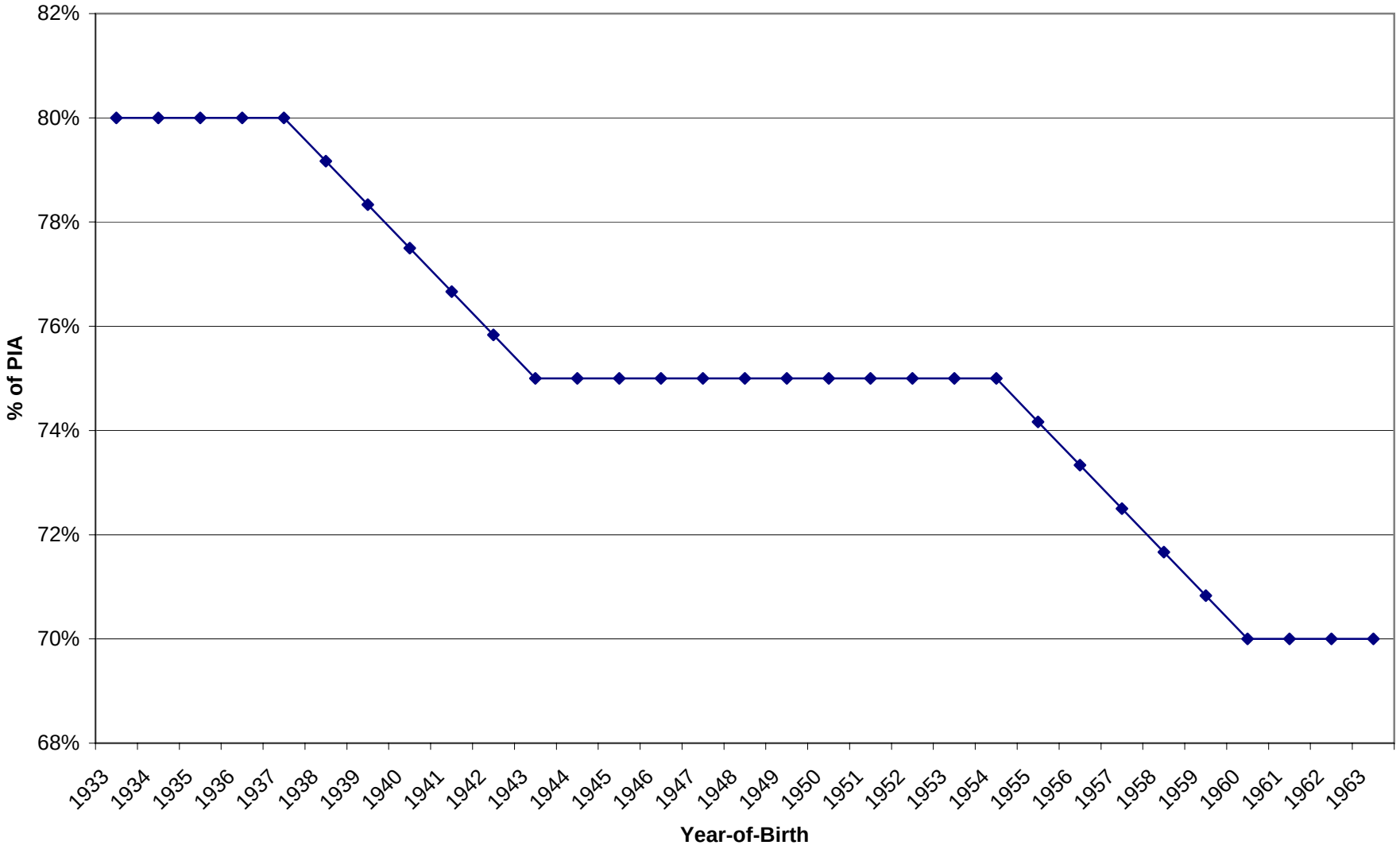


Figure 3: 2003 Formula for PIA as a Function of Average Indexed Monthly Earnings

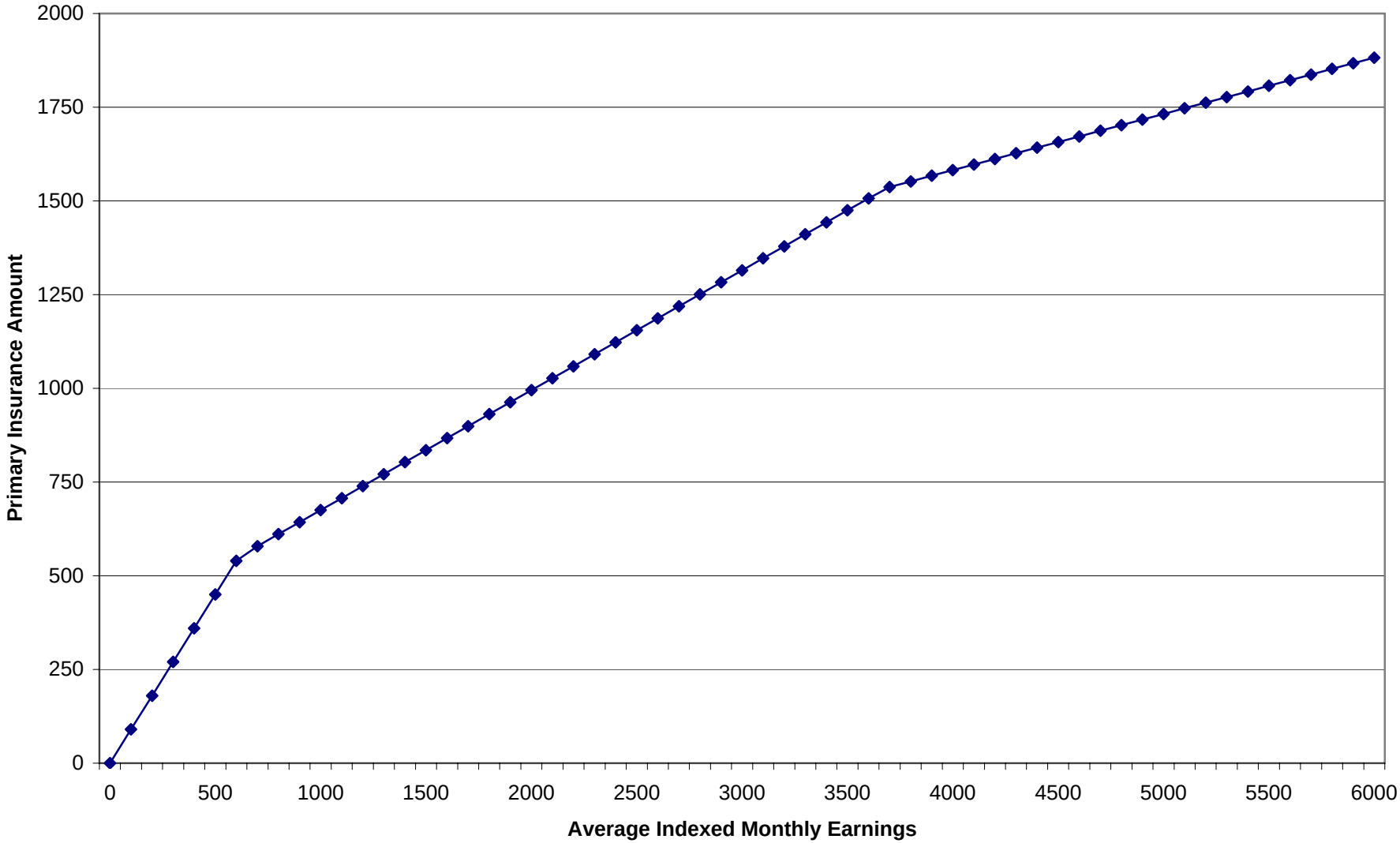


Figure 4: % of Men born in 1937 with Zero Earnings by Age

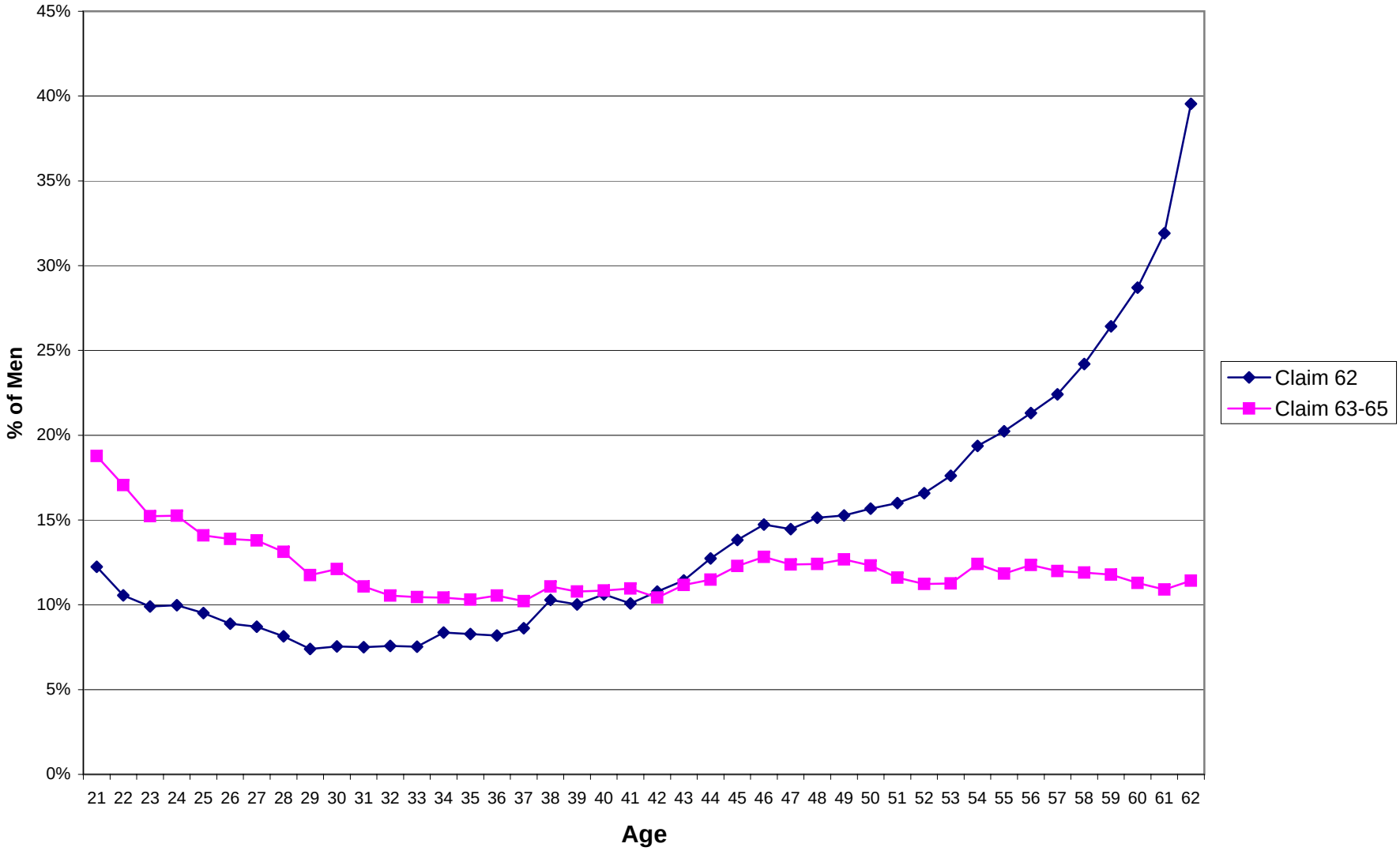


Figure 5: Indexed Annual Earnings for Men born in 1937 by Age of OA Claiming

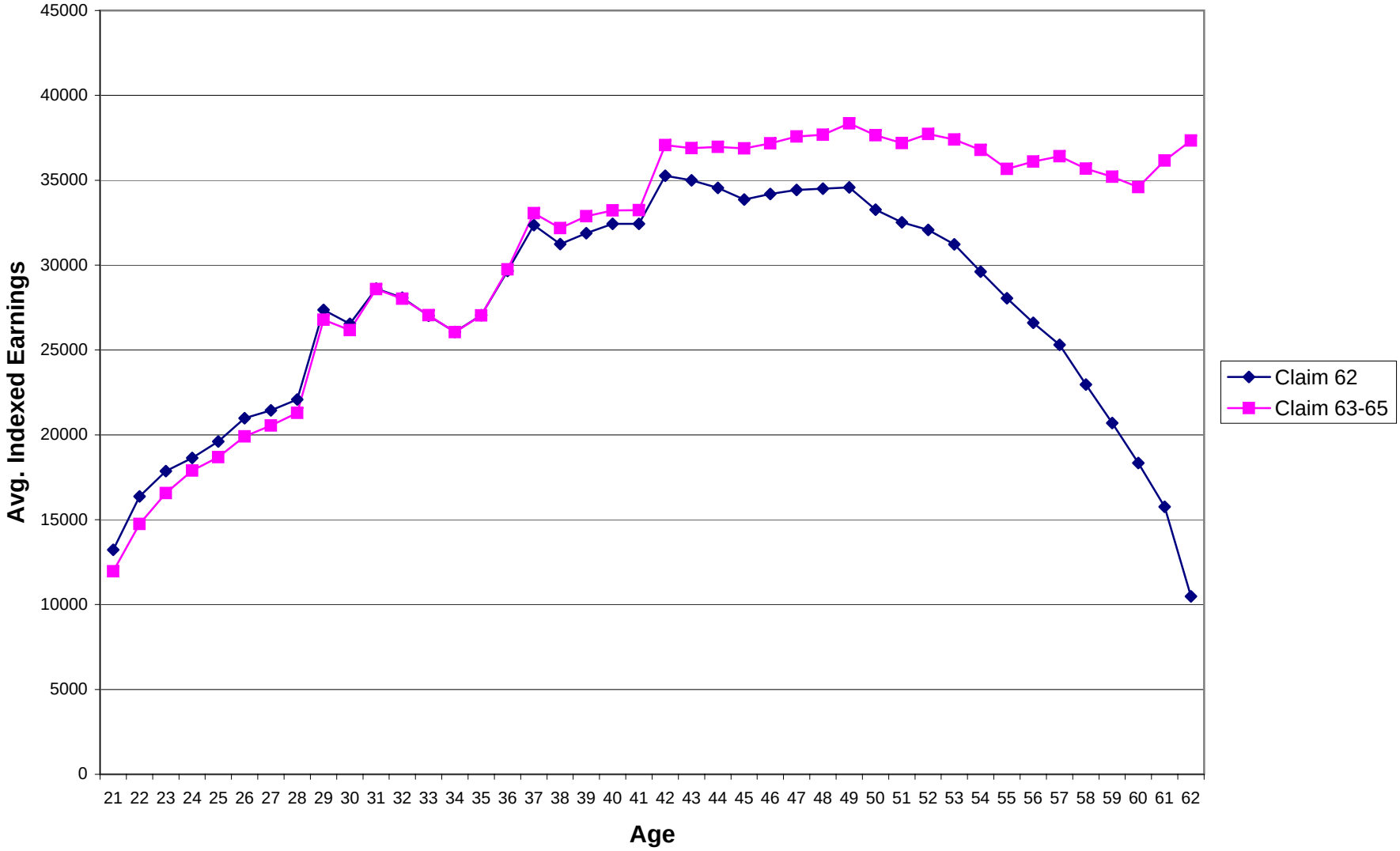


Table 1: Continuous Work History Sample Characteristics of Men from Birth Cohorts 1935 to 1945

Year of Birth	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
(OA/DI) Ratio at age 62 (factored by 100	80	80	80	79.167	78.333	77.5	76.667	75.833	75	75	75
Total Obs in CWHS	13,382	13,410	13,509	13,979	14,215	14,860	15,053	17,169	17,629	16,927	16,935
Included in Subsample (1)	8,570	8,549	8,607	8,968	9,082	9,513	9,619	11,047	11,447	10,884	10,806
% of Total Sample	64.04	63.75	63.71	64.15	63.89	64.02	63.90	64.34	64.93	64.30	63.81
Excluded from Subsample	4,812	4,861	4,902	5,011	5,133	5,347	5,434	6,122	6,182	6,043	6,129
% of Total Sample	35.96	36.25	36.29	35.85	36.11	35.98	36.10	35.66	35.07	35.70	36.19
Reason for Exclusion											
% Not DI Insured at 55	21.60	22.18	22.07	21.82	21.79	21.96	21.52	21.85	21.10	21.89	21.94
% DI Entitled at age 54	4.75	5.23	4.83	4.99	5.61	5.62	5.73	5.32	5.77	6.03	6.11
% OA Entitled at age 54	0.01	0.05	0.07	0.03	0.02	0.00	0.00	0.00	0.00	0.00	0.00
% Deceased at age 55	9.59	8.78	9.32	9.01	8.68	8.41	8.85	8.49	8.19	7.78	8.14

Source: Authors' calculations from the Social Security Administration's Continuous Work History Sample (CWHS), which is a random one percent sample of all individuals granted a Social Security number. Entitlement status, covered earnings, and quarters of coverage are recorded on an annual basis. We define "at age 55" to be interpreted as the year in which an individual turns age 55. (1) The subsample includes all men in the one percent sample who are not DI entitled at age 54, who are non-deceased at age 55, and who are DI insured at age 55. An individual must have 20 quarters of DI covered earnings during the past 40 quarters (10 years) to be DI insured. DI insured status at age 55 was determined by summing the annual quarters of coverage, ranging from 0 to 4, over ages 45 to 54.

Table 2: Continuous Work History Sample Characteristics of Women from Birth Cohorts 1935 to 1945

Year of Birth	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
(OA/DI) Ratio at age 62 (factored by 100)	80	80	80	79.17	78.33	77.5	76.66	75.83	75	75	75
Total Obs in CWHS	12,257	12,350	12,665	13,319	13,121	14,007	14,276	16,076	16,327	15,569	15,753
Included in Subsample (1)	6,307	6,575	6,812	7,415	7,240	7,830	8,212	9,343	9,599	9,239	9,421
% of Total Sample	51.46	53.24	53.79	55.67	55.18	55.90	57.52	58.12	58.79	59.34	59.80
Excluded from Subsample	5,950	5,775	5,853	5,904	5,881	6,177	6,064	6,733	6,728	6,330	6,332
% of Total Sample	48.54	46.76	46.21	44.33	44.82	44.10	42.48	41.88	41.21	40.66	40.20
Reason for Exclusion											
% Not DI Insured at 55	41.40	39.57	39.58	36.59	37.25	36.30	34.27	33.64	32.39	32.16	31.89
% DI Entitled at age 54	2.99	3.07	2.98	3.71	3.70	4.11	4.56	4.32	5.05	4.93	4.88
% OA Entitled at age 54	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
% Deceased at age 55	4.13	4.11	3.63	4.02	3.87	3.70	3.64	3.93	3.76	3.57	3.42

Source: Authors' calculations from the Social Security Administration's Continuous Work History Sample (CWHS), which is a random one percent sample of all individuals granted a Social Security number. Entitlement status, covered earnings, and quarters of coverage are recorded on an annual basis. We define "at age 55" to be interpreted as the year in which an individual turns age 55. (1) This subsample includes all women in the one percent sample who are not DI entitled at age 54, who are non-deceased at age 55, and who are DI insured at age 55. An individual must have 20 quarters of DI covered earnings during the past 40 quarters (10 years) to be DI insured. DI insured status at age 55 was determined by summing the annual quarters of coverage, ranging from 0 to 4, over ages 45 to 54.

Table 3: Subsample Size by Age and Year of Birth - Males from Birth Cohorts 1935-1945

Year of Birth	1935	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	Total
Age												
56	8,520	8,502	8,563	8,922	9,034	9,462	9,589	11,008	11,396	10,842	10,771	106,609
57	8,458	8,449	8,507	8,864	8,975	9,409	9,548	10,961	11,357	10,790	10,725	106,043
58	8,402	8,384	8,442	8,813	8,911	9,365	9,500	10,883	11,295	10,725	10,658	105,378
59	8,338	8,307	8,357	8,764	8,843	9,311	9,440	10,828	11,224	10,660		94,072
60	8,279	8,243	8,289	8,697	8,775	9,248	9,384	10,763	11,150			82,828
61	8,205	8,151	8,205	8,634	8,702	9,164	9,313	10,659				71,033
62	8,115	8,048	8,114	8,535	8,626	9,062	9,228					59,728
63	8,009	7,951	8,012	8,451	8,527	8,929						49,879
64	7,908	7,840	7,905	8,329	8,416							40,398
Total	74,234	73,875	74,394	78,009	78,809	73,950	66,002	65,102	56,422	43,017	32,154	715,968

Source: Authors' Calculations from the Continuous Work History Sample. The subsample includes all individuals who are not DI entitled at age 54, who are non-deceased at age 55, and who are DI insured at age 55. An individual must have 20 quarters of DI covered earnings during the past 40 quarters (10 years) to be DI insured. Individuals are dropped from the sample only because of death. The line at the bottom indicates the year in which our data is truncated. For example we only have data up through the age of 62 for individuals born in 1941.

Table 4: The Effect of the OA / DI Ratio on DI Enrollment

	A. Males Born 1935-1945						B. Males Born 1927-1937					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(OA/DI)	-0.218 [1.313]	0.697 [0.697]	0.563 [0.729]	0.394 [0.732]	-0.112 [1.105]		0.548 [0.496]	0.611 [0.614]	0.586 [0.675]	0.475 [0.707]	0.554 [0.517]	
(OA/DI)*(Age-56)		-0.458 [0.129]***	-0.373 [0.166]**	-0.357 [0.159]**				-0.031 [0.099]	-0.016 [0.210]	-0.005 [0.205]		
(OA/DI)*(Age-56)*I(Age>=61)			-0.105 [0.126]	-0.024 [0.143]					-0.018 [0.169]	0.028 [0.191]		
(OA/DI)*(Age-56)*I(Age>=63)				-0.437 [0.121]***						-0.255 [0.162]		
(OA/DI)*I(Age>=61)					-1.264 [0.646]*						-0.075 [0.527]	
(OA/DI)*I(Age>=56 & Age<=58)						0.002 [0.890]						0.701 [0.740]
(OA/DI)*I(Age==59|Age==60)						-0.575 [0.996]						0.227 [0.712]
(OA/DI)*I(Age==61|Age==62)						-1.290 [1.149]						0.475 [0.742]
(OA/DI)*I(Age==63|Age==64)						-4.990 [1.456]***						-1.223 [1.046]
DI Receipt, t-1	5.099 [0.049]***	5.099 [0.049]***	5.099 [0.049]***	5.100 [0.049]***	5.099 [0.049]***	5.100 [0.049]***	4.883 [0.032]***	4.883 [0.032]***	4.883 [0.032]***	4.882 [0.032]***	4.883 [0.032]***	4.882 [0.032]***
# Observations	715968	715968	715968	715968	715968	715968	635501	635501	635501	635501	635501	635501
Pseudo R^2	0.7059	0.7059	0.7059	0.7059	0.7059	0.7059	0.6825	0.6825	0.6825	0.6825	0.6825	0.6825

Dependent variable in all probit specifications is equal to one if person receives DI disabled worker benefits during the year and zero otherwise. The data set used in the first six specifications consists of annual observations for all men in the one percent sample born between 1935 and 1945, insured for but not receiving DI benefits in the year that they turn 54, and alive at the beginning of the year that they turn 55. The data set used in the next six specifications uses the same selection criteria for men born between 1927 and 1937 in the one percent sample. Observations were dropped upon death only. An individual is DI insured if he has earned 20 quarters of coverage over the past 10 years. Regressions include age and year fixed effects. Standard errors are clustered by year of birth and are included in parentheses.

Table 5: The Effect of the OA/DI Ratio on DI Entry for Men Born 1935-1945

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(OA/DI)	-0.828	-0.144	-0.357	-0.518	-0.717		-0.031	-0.009	-0.019	-0.026	-0.026	
	[1.222]	[0.934]	[1.027]	[1.010]	[1.114]		[0.038]	[0.030]	[0.034]	[0.034]	[0.035]	
(OA/DI)*(Age-55)		-0.258	-0.148	-0.138				-0.008	-0.003	-0.002		
		[0.133]**	[0.166]	[0.160]				[0.004]**	[0.005]	[0.005]		
(OA/DI)*(Age-55)*I(Age>=61)			-0.149	-0.082					-0.006	-0.004		
			[0.110]	[0.116]					[0.004]	[0.004]		
(OA/DI)*(Age-55)*I(Age>=63)				-0.391						-0.011		
				[0.117]**						[0.004]**		
(OA/DI)*I(Age>=61)					-1.133						-0.042	
					[0.601]*						[0.020]**	
(OA/DI)*I(Age==55|Age==56)						-0.623						-0.028
						[0.961]						[0.031]
(OA/DI)*I(Age==57|Age==58)						-0.672						-0.025
						[1.104]						[0.036]
(OA/DI)*I(Age==59|Age==60)						-1.116						-0.036
						[1.075]						[0.034]
(OA/DI)*I(Age==61|Age==62)						-1.769						-0.060
						[1.243]						[0.040]
(OA/DI)*I(Age==63|Age==64)						-5.342						-0.163
						[1.611]***						[0.048]***
Pseudo R2	0.0037	0.0037	0.0038	0.0038	0.0037	0.0038	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005
Observations	786788	786788	786788	786788	786788	786788	786788	786788	786788	786788	786788	786788

Dependent variable in all specifications is equal to one if person receives DI disabled worker benefits during the year and zero otherwise. The first six specifications are estimated as a probit while the last six are estimated as linear probability models. The data set used in all specifications consists of annual observations for all men in the one percent sample born between 1935 and 1945, insured for but not receiving DI benefits in the year that they turn 54, and alive at the beginning of the year that they turn 55. Observations were dropped upon death only. An individual is DI insured if he has earned 20 quarters of coverage over the past 10 years. Regressions include age and year fixed effects. Standard errors are clustered by year of birth and are included in parentheses.

Table 6: AIME Distribution for Men Born in 1937 and who Claim OA Benefits at 62

AIME Decile	Mean AIME	Mean PIA	Monthly Benefit	% Deceased by 12/2003
1	$531 (194)	$422 (118)	$337	13.29%
2	$1,144 (165)	$659 (52.7)	$527	11.09%
3	$1,700 (144)	$837 (46.0)	$670	9.15%
4	$2,154 (124)	$982 (39.7)	$786	8.91%
5	$2,559 (112)	$1,112 (35.95)	$890	6.96%
6	$2,909 (98.1)	$1,224 (32.0)	$979	5.66%
7	$3,239 (86.5)	$1,359 (40.7)	$1,087	4.57%
8	$3,547 (95.1)	$1,490 (30.2)	$1,192	4.58%
9	$3,884 (107)	$1,554 (16.1)	$1,244	4.57%
10	$4,281 (116)	$1,614 (17.4)	$1,291	4.13%

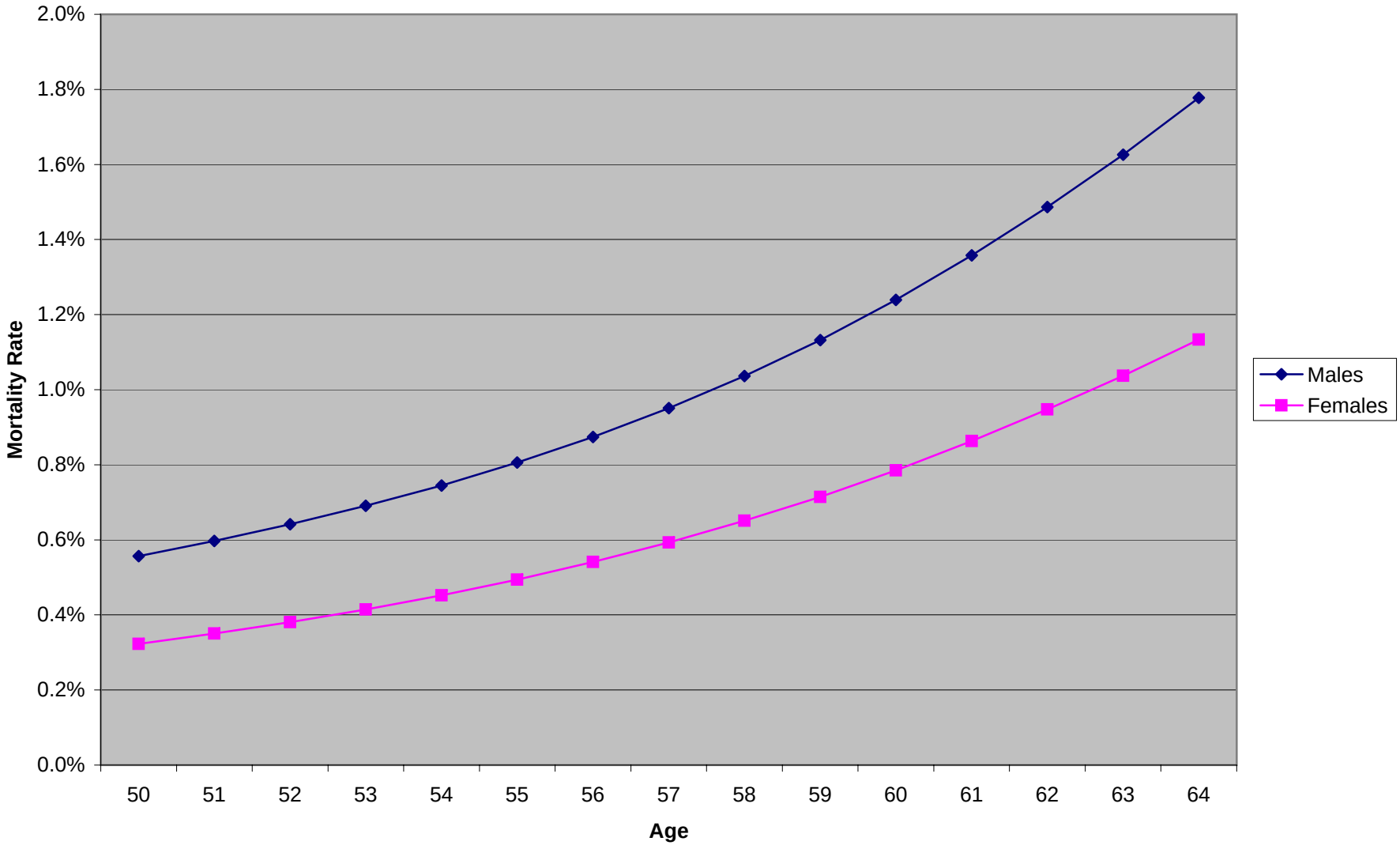
Table lists the average AIME (average indexed monthly earnings) for all men in the one percent sample born in 1937 who claim social security retirement benefits in the year that they reach the age of 62. Individuals are sorted into deciles based on their AIME. The AIME values were calculated using the highest 35 years of earnings before age 62 indexed to the average wage in the year of attaining age 60 and were not adjusted for non-entitled months after attaining age 62. Monthly benefit is the average monthly retirement benefit after first claiming. Mortality probabilities reflect the fraction who were born in 1937, claim retirement benefits in 1999, and die by the end of 2003.

Table 7: The Effect of the OA/DI Ratio for Low and High Income Men

	Men Below the Average AIME				Men Above the Average AIME			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(OA/DI)	-0.721 [1.605]	0.612 [0.848]	-0.567 [1.355]		0.595 [1.327]	0.852 [1.118]	0.637 [1.256]	
(OA/DI)*(Age-55)		-0.659 [0.172]***				-0.131 [0.236]		
(OA/DI)*I(Age>=61)			-1.777 [0.960]*				-0.518 [0.846]	
(OA/DI)*I(Age>=56 & Age<=58)				-0.251 [1.047]				0.391 [1.078]
(OA/DI)*I(Age==59|Age==60)				-1.217 [1.378]				0.475 [1.363]
(OA/DI)*I(Age==61|Age==62)				-2.355 [1.745]				0.361 [1.207]
(OA/DI)*I(Age==63|Age==64)				-5.609 [2.179]**				-4.112 [2.054]**
DI Receipt, t-1	4.983 [0.062]**	4.984 [0.063]**	4.983 [0.063]**	4.984 [0.063]**	5.250 [0.056]**	5.250 [0.056]**	5.250 [0.056]**	5.251 [0.056]**
Pseudo R2	0.7042	0.7042	0.7042	0.7042	0.7031	0.7031	0.7031	0.7031
Observations	355,900	355,900	355,900	355,900	360,068	360,068	360,068	360,068

Dependent variable in all probit specifications is equal to one if person receives DI disabled worker benefits during the year and zero otherwise. The data set used in the first four specifications consists of annual observations for all men in the one percent sample born between 1935 and 1945, insured for but not receiving DI benefits in the year that they turn 54, alive at the beginning of the year that they turn 55, and below the median AIME for their cohort in the year that they turn 55. The data set used in the next six specifications uses the same selection criteria except that the men must be above the median AIME for their cohort in the year that they turn 55. Observations were dropped upon death only. An individual is DI insured if he has earned 20 quarters of coverage over the past 10 years. Regressions include age and year fixed effects. Standard errors are clustered by year of birth and are included in parentheses.

Appendix Figure 1: Average Age-Specific Annual Mortality Rates for the Near Elderly in 2001



Appendix Table 1: Placebo Subsample Size by Age and Year of Birth - Males from Birth Cohorts 1927-1937

Year of Birth	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937	Total
Age												
56	8,807	8,685	8,436	8,512	8,177	8,115	8,064	8,153	8,520	8,502	8,563	92,534
57	8,737	8,603	8,360	8,440	8,128	8,075	8,009	8,117	8,458	8,449	8,507	91,883
58	8,666	8,532	8,286	8,368	8,065	8,005	7,938	8,065	8,402	8,384	8,442	91,153
59	8,588	8,432	8,209	8,297	7,999	7,934	7,870	7,987	8,338	8,307	8,357	81,961
60	8,479	8,340	8,121	8,216	7,927	7,866	7,776	7,901	8,279	8,243	8,289	72,905
61	8,381	8,256	8,027	8,135	7,849	7,767	7,701	7,812	8,205	8,151	8,205	63,928
62	8,257	8,158	7,911	8,018	7,759	7,662	7,599	7,718	8,115	8,048	8,114	55,364
63	8,128	8,003	7,792	7,883	7,645	7,545	7,497	7,607	8,009	7,951	8,012	46,996
64	7,991	7,872	7,644	7,760	7,510	7,423	7,388	7,479	7,908	7,840	7,905	38,777
Total	76,034	74,881	72,786	73,629	71,059	62,969	54,957	48,035	41,997	33,642	25,512	635,501

Source: Authors' Calculations from the Continuous Work History Sample. The subsample includes all individuals who are not DI entitled at age 54, who are non-deceased at age 55, and who are DI insured at age 55. An individual must have 20 quarters of DI covered earnings during the past 40 quarters (10 years) to be DI insured. Individuals are dropped from the sample only because of death. The line at the bottom indicates the year in which we truncate our data for consistency with the actual subsample described in Table 3. For example we only include data up through the age of 62 for individuals born in 1933.