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Disability Applications to the Social Security Disability Insurance Program near the Normal Retirement Age†

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Abstract

The literature estimating the effect of benefit levels on the Social Security Disability Insurance (DI) application decisions has not been able to separate the effect of Medicare coverage provided by the program on application decisions from the effect of cash-benefits, and therefore previous estimates are likely to be biased. In this research we compute the responsiveness of DI applications with respect to cash benefit levels focusing on the special age window between the Early and Normal Retirement ages, in which Medicare incentives are virtually non-existent. Additionally, we exploit the fact that for some cohorts of Americans (those born after 1937), DI benefits are comparatively more attractive than for previous cohorts, after the increase in the Normal Retirement age that started in the year 2000. This quasi-experimental approach allows us to more reliably estimate the effect of cash benefits on the decision to file for disability benefits.

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1. Introduction

The Social Security Disability Insurance (DI) program is the primary cash transfer program for the disabled in the United States. It provides partial earnings replacement to workers who lost earnings capacity due to severe and long-term disabilities. As of December of 2010 it provided benefits to over 8.2 million workers, and the program received a record 2.9 million applications in that year. There is an extensive literature estimating the effect of disability benefit levels on DI application decisions.[1] Existing studies almost exclusively focus on workers at ages below 62.[2] One reason for this is to avoid modeling the complex program incentives and individual decisions when the Social Security Old Age benefits start to be available at age 62. These studies have come to different conclusions about the magnitude of the responsiveness (elasticity) of DI application with respect to DI benefit levels.[3] The estimated elasticity varies widely from 0.2 (Bound, 1989) to 1.3 (Halpern and Hausman, 1986).

Another important benefit provided by the DI program is Medicare coverage two years after cash benefits are awarded. However, it is almost impossible to distinguish the effect of Medicare availability from the financial incentives. This important in-kind benefit is rarely modeled while estimating the effect of DI benefits on DI participation. Since Medicare is a federally-administered program, its benefits are standard for disability beneficiaries. There are few variations in its benefits across states or across individuals. Not being able to measure the effect of Medicare coverage on DI participation is a serious shortcoming as any estimation of the effect of DI cash benefits on DI application is likely to be biased upward.

In this paper, we take a different approach to estimating the elasticity of disability application behavior to DI cash benefit levels focusing on the special age window between the Early Retirement Age (ERA) and the Normal Retirement Age (NRA), and exploiting the fact that for Americans born after 1937 disability is comparatively more attractive than for previous

[1] Parsons (1980); Slade (1984); Haveman and Wolfe (1991); Halpern and Hausman (1986); Kreider (1998); Kreider and Riphahn (2000); Black et al. (2002); Bound and Burkhauser (2000).
[2] The sample in Slade (1984) includes age 58 to 63.
[3] Due to data limitations, most previous literature (except Kreider 1998, 1999a, 1999b, 2000) estimated the effect of DI benefits on DI participation instead of DI application. Because applicants are always more than awardees, the elasticity of DI application with respect to DI benefit levels is expected to be higher than the estimated elasticity of DI participation.

cohorts because of the increases in the Normal Retirement Age that started in 2000.[4] By exploiting the particular age window and the different incentives faced by the younger cohorts we implement a quasi-natural experiment to estimate the effect of cash benefits on DI applications without worrying about the possible biases caused by not considering the effect of Medicare incentives on applications or the potential drawbacks of using a reduced form specification to study changes in the incentive structure faced by individuals.

According to the Social Security Administration (SSA) Annual Statistical Supplement (2011), approximately 193,086 workers aged 62-64 applied for DI benefits in 2010 and 68,932 of them were awarded the benefits.[5, 6] DI applications between ERA and NRA (after age 62 and before NRA, [62, NRA)) are mainly driven by DI cash benefits and Medicare coverage cannot be the main reason for these ages to apply for disability. The reason is that the DI program grants Medicare coverage to disability awardees only two years after the date of award. Thus, a disability applicant between the ERA and the NRA, if approved, will get Medicare coverage only after staying for two years on the DI rolls, at which point they will almost surely have reached age 65 when Medicare coverage is automatically made available, regardless of whether they applied for disability.[7] Therefore an individual who applies for DI benefits between the ERA and the NRA does so mainly for cash benefits of the DI program. Thus, estimating the elasticity of DI application between the ERA and the NRA, when Medicare incentives of the DI program are virtually non-existent, helps separate out the Medicare incentive effect from the cash incentive effect.

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[4] This increased appeal of Disability benefits with respect to retirement is also used in Duggan, Singleton, and Song (2007), and also Coe and Haverstick (2010).

[5] We have calculated this using the number of beneficiaries at age 62-64 (68,932 according to the SSA Annual Statistical Supplement Table 6.C2) and ratio of awards to applications (35.7% in 2010 according to the SSA Annual Statistical Supplement Table 6.C7). It is assumed that all the ages were awarded at the same probability, which may have underestimated the probability at older age like age 62-64, therefore overestimated the number of applicants.

[6] The number of disability awardees, once including their eligible dependents, will be larger.

[7] On average it takes about one year for the disability applicant to hear about the decision on their status from the Social Security Administration. For an analysis of the delays in the system see Benítez-Silva et al. (1999). Strictly speaking the Medicare entitlement can be established retroactively as discussed in Bye and Riley (1989). In their study of 1987 recipients (we are not aware of any study using more recent data on this issue) they found that in a large percentage of cases this is what happened (as much as 40%). This means that even if we restrict attention to this age cohort there could be a residual health care incentive, suggesting that our findings could still include a possible upward bias because of this. There is a little-noted fact mentioned in Fronstin (2000) that cash benefits provided by DI program can be used by the awardees to purchase COBRA coverage during the two years waiting on the DI rolls for Medicare coverage.

In principle, this novel empirical design allows us to get more precise estimates of the elasticity of DI applications with respect to DI cash benefit levels. However, it is unclear that a reduced form model of application decisions could provide a reliable estimate of a policy change like a change in the cash benefit of disability programs without being subject to the classical Lucas Critique, which suggests that a new incentive structure would likely be linked with a new parameter set, making the prediction of the reduced form model inappropriate. Fortunately, one of the key provisions of the 1983 Amendments to the Social Security system, the increase in the Normal Retirement age for cohorts born after 1937, provides us with a natural experiment of the increases in the disability benefits in comparison with retirement benefits, and therefore an increase in the attractiveness of the cash benefits of the DI program in comparison with previous cohorts. This latter identification mechanism regarding exogenous increases in benefits, also applies in principle (although is more problematic) to an estimation using younger individuals (even though access to Medicare could be important for them), since they can expect higher benefits in comparison with future retirement benefits.

The comparison of the results using the older sample (age 62 to the NRA) with those using the younger sample allows us to separate the possible cohort effect biasing the estimation of the effects of increased (comparative) benefits. The idea is that if younger cohorts also are more likely to apply before having access to retirement benefits, that effect is likely to be a purely cohort effect, so the true effect of increased benefits is likely to be the difference between the effect computed for the older cohort and the younger cohort. Our findings indicate that the overall elasticity of the application probability with respect to increases in benefits is about 1.

Additionally, the data allows us to answer a long standing question about the supposed lack of interest in applying for the DI program once they have started to receive retirement benefits. We show that retirement benefits' recipients actually do apply significantly more than non-recipients, responding rationally to the fact that once an individual receives retirement, and conditional on a low attachment to the labor force, the application for DI is a free shot to permanently increase their benefits.

Disentangling the effects of DI cash benefits incentives and the effects of DI health insurance incentives is informative for policymakers. The SSA has implemented a series of policy changes since the inception of the DI program, including changing the financial incentives

(such as introducing a Trial Work Period, and changing the Substantial Gainful Activity level), and modifying the Medicare incentives (such as Expanded Availability of Health Care Services). However, the effects of those two types of policy changes have been very difficult to identify, and the effectiveness of those disability policy changes has been hard to evaluate. Our analysis of the DI application response to benefit levels sheds new light on the effect of DI cash benefit, and could be highly informative for policy makers while gauging the effectiveness of possible reforms to the disability programs.

The organization of the paper is as follows: Section 2 reviews previous research on the topic; Data used in this study and the construction of the sample and some variables used in the estimation is discussed in Section 3; Empirical estimation and identification strategies, as well as results are presented in Section 4; Section 5 concludes.

2. Literature Review

An enormous research effort has been devoted to understanding the financial incentives of DI program application. This should not come as a big surprise given the importance of this program that currently provides benefits to nearly 10.2 million disabled American workers and their dependents, and that awards new benefits to more than 1.4 million individuals. However, the DI system has not gone through too many changes in its benefit structure, making more difficult to find exogenous sources of variation to estimate a causal estimate of the effect of benefit levels on application decisions.

Leonard (1979) estimates the elasticity of DI participation with respect to DI benefit levels, focusing, due to data limitations, on the effect on the participation of DI. He includes in the estimating equation an interaction term of an estimated probability of passing the DI medical test and predicted DI benefits the individual may get according to the earning records. He also has in the regression a measure of past earnings. The author finds an elasticity of DI program participation with respect to disability benefit levels of around 0.35. Because the number of DI awards are usually less than that of DI applications, we infer that an elasticity of DI application with respect to benefit levels will likely be higher than 0.35.

Halpern and Hausman (1986) use data from the 1972 Survey of Disabled and Non-disabled Adults (SDNA) to estimate the responsiveness of DI applications to benefit levels and approval probabilities. The data has questions on DI application decisions, and allows the matching to

individuals' Social Security earnings records, likely delivering more precise estimates of the responsiveness of applications to DI benefits. In their model, an individual compares the utility from stopping work and applying for disability benefits with the utility from keep working. The model takes into account the uncertainty of passing the DI medical test if one decides to apply for disability benefits. If the disability applicant passes the test, he gains utility from receiving disability benefits and leisure (from not working). If the applicant is rejected by the medical test, he/she will return to work but face a reduced wage level as a penalty for staying out of labor force and losing human capital while applying for DI benefits. Halpern and Hausman estimate the award probability (the probability of passing the medical test) and the reduced wage levels of the rejected applicants separately before plugging them into the DI application estimation equation. However, they use the same sample to estimate the award probability and reduced wage levels, and to estimate the application probability, without correcting for possible sample selection biases Then Halpern and Hausman simulate the responsiveness of DI application to changes in benefit levels and screening stringency (award probabilities). They find that a 20 percent increase in DI benefit levels increases DI applications by 26 percent among males, equivalent to an elasticity of application with respect to disability benefit levels of 1.3. They also find that a 20 percent decrease in the probability for males to be accepted to DI program drives down the males' DI application probability by around 4 percent, which is equivalent to an elasticity of DI applications with respect to approval probabilities of 0.2.

Bound (1989) uses a sample of 45-59 years old men from the same data used by Halpern and Hausman and also the Social Security earnings records before the onset of disabilities. His estimate of the responsiveness of the DI application probability with respect to possible DI benefits is about 0.2.

Using the 1978 Survey of Disability and Work (SDW), Kreider (1998) measures the effect of DI benefit levels and the award probability on the application decisions. He calculates the lifetime value of the awarded DI benefits, and finds that a 10 percent increase in the benefit levels would increase applications by 7 percent, while a 10 percent increase in the award probability would increase DI applications by 6 percent, indicating a benefit elasticity of 0.7 and an award probability elasticity of 0.6, respectively. Kreider also discusses the possible reasons for the difference between his results and those of Halpern and Hausman. As mentioned earlier, Halpern and Hausman use the same sample to estimate the award probability as that to estimate

the application decisions without correcting for sample selection biases. Their procedure is very likely to have overestimated the award probability of those who do not apply for DI benefits, if they were to apply. Kreider accounts for the self-selection to apply while estimating the award probability. He finds that after correcting for selection biases, the difference gets much smaller between his and Halpern and Hausman's results of application responsiveness to DI determination stringency. Kreider also points out that Halpern and Hausman do not take into account the lifetime value of the DI application decision. Accounting for the potential wage growth that non-applicants will experience in the future seems important and explains the difference with previous results. Kreider emphasizes the importance of incorporating the lifetime nature of DI application, given that estimates of the disability application decision in a static or cross-sectional framework are likely biased.

Kreider and Riphahn (2000) approximate a dynamic structural model of DI applications through a series of reduced-form logit equations. They draw a sample of men and women aged 50-61 with some health limitations from the 1992 Health and Retirement Study (wave 1 of the longitudinal study). They analyze DI application decisions, including first time applications, re-applications, and appeals after rejection, of those not already on DI rolls in 1986. The estimates of application behavior are done over an eight-year period between 1986 and 1993. The simulation results show an elasticity of DI applications with respect to benefit levels of 0.51 for males and 0.75 for females. The elasticity of DI application with respect to approval rates is also found to be significantly different for men and women, 0.67 for men and 0.26 for women. Women's disability application decisions seem to be more responsive to changes in benefit levels than men, while men's decisions are more sensitive to screening stringency than women.

It is very difficult to identify the effect of changes in benefit amounts on DI application decisions directly through regional variations of benefit levels, since the DI program is a federal administered program and it follows the standard rules across states. Nevertheless, Black et al. (2002) identify the direct effect of financial incentives (the regional variation in economic conditions) on the DI/SSI application decision. They use panel data on 186 counties in Kentucky, Ohio, Pennsylvania and West Virginia and study the influence of the coal boom during the 1970s and the coal bust during the 1980s on the size of DI/SSI rolls. Their estimates imply an elasticity of the program payments with respect to regional area earnings of between -0.3 and -0.4. While we can presume that local economic conditions affect individuals' earning expectation and

expected employment opportunities, and therefore influence their DI application decisions, the estimated coefficient on the local earnings variable possibly reflects some other local financial factors than financial attractiveness of DI benefits as Black et al. acknowledged in their paper.

Table 1: Previous studies on elasticity of DI application decisions with respect to benefit levels

Study	Data	Sample	Elasticity
Leonard (1979)	1972 Social Security Survey of Disabled and Non-disabled Adults (SDNA)	45-54 years old men, 1972	0.35[a]
Halpern and Hausman (1986)	SDNA	Younger than age 50 men, 1972	1.3
Bound (1989)	SDNA	45-59 years old men, 1972	0.2
Kreider (1998)	1978 Social Security Survey of Disability and Work (SDW)	45-59 years old men, 1978	0.8
Kreider and Riphahn (2000)	1992 Health and Retirement Study (HRS)	50-61 years old, 1986-1993	Men:0.51 Women:0.75
Black et al. (2002)	County data (KY, OH, PA, WV)	1970-1993	0.3-0.4

[a] In this study, the elasticity is of DI *participation* (not application) with respect to benefit levels

Duggan, Singleton, and Song (2007) also exploit the exogenous changes in the retirement benefit structure resulting from the 1983 amendments to the Social Security Old Age Benefit to study the effects of disability benefit changes on the program. However, given the nature of the data they use they can only focus on the effects on those awarded disability benefits and not on applicants. Coe and Haverstick (2010) overcome this problem since they use the HRS, as we do, but they do not separate the sample between those with or without Medicare incentives, and therefore compute essentially an average effect of the increased in benefits which is likely to be biased upward also due to the pure cohort effect, compared with our cleaner identification strategy that tries to purge the estimates of both the Medicare incentive and the cohort effect.

3. Data

3.1 Sample construction and descriptive statistics

We use the ten available waves of the Health and Retirement Study (HRS), which cover the1992 to 2010 period. The HRS is a biennial survey and it samples individuals born between 1931 and 1941 and their spouses, as well as some additional cohorts that have been added in recent waves of the study. The data provides extensive information on health status, employment history, wealth, family structure and government transfers for a total of 30,405 respondents.

The survey questions about the DI program in the HRS include the timing of application, appeal and award, and the benefit amount received. One issue with the datasets is that it does not differentiate between the two public disability transfer programs, the DI program and the Supplemental Security Income (SSI) program, until wave 5 (year 2000). So when constructing the sample, we restrict the sample to the DI applicants and recipients whenever it is possible through other information in the sample. If we are not able to differentiate the type of program of the applicant we set the observation to missing.

We construct the sample including all the individuals who apply for DI benefits between 1992 and 2010. Those who apply but are rejected and then re-apply or appeal are treated as new applicants. In the age 62-64 sample, there are only a few re-apply or appeal cases. Not included in the sample are those who are already receiving DI benefits with their application timing unobserved over the study period.

In Table 3, we compare the observed characteristics of individuals aged 62-64 (in fact 62 to the NRA) with that of applicants ages 55 to 60. Among those 62-64 there is a slight higher proportion of applicants, as well as more males, but less married individuals. Interestingly, those 62-64 year-old are more likely to report worse health and work limitation, which is likely the product of their higher age. The older group seems to have better health insurance coverage but they also have higher out-of-pocket medical expenses. Their household wealth and income are much higher than younger applicants. The predicted probability to be granted DI benefits is lower for the 62-64 year-old applicants than applicants between ages 55 to 61, but the predicted benefits are quite similar.

It is important to emphasize the unconditional age profile of applications in our sample. As of age 51, around 1.1% of individuals apply for DI, and this percentage stays around the same up to age 55, when it starts to increase rather monotonically until it reaches a peak at about 1.8% at age 61, only to decrease slightly for ages 62 and 63, and increase again to about 2% at age 64. Interestingly, if we restrict attention to the age 62-64 window, it is key to emphasize that the

application decisions varies enormously by whether the individual has already started to receive retirement benefits. At age 62 those who are already receiving retirement are more than three times more likely to apply for DI benefits (1.56% vs. 0.45%), and at age 63 the percentage of applicants among those receiving retirement more than doubles that of those not receiving it (1.1% vs. 0.42%). By age 64, the numbers are equally striking at 0.99% and 0.54%. These results (which are unconditional, but suggestive of a major effect) come as somewhat of a surprise to us given some conventional wisdom among researchers that not enough individuals seem to take advantage of the fact that DI application is somewhat of a free shot to permanently increase their Social Security benefits for retirement recipients with low labor force attachment. Our evidence suggests that individuals are quite rational, and those already in the retirement program are much more likely to apply for benefits. We will see later on that these results survey including a long array of controls in the application equation.

Table 4 presents the comparison of DI applicants and non-applicants at age 62-64. There are fewer African Americans, fewer males, and also fewer married individuals among applicants than non-applicants, and the level of education of applicants is lower. The number of applicants who report work limitation is more than four times that of non-applicants who claim to be work limited, and more applicants report to be in poor health than non-applicants. As could be expected applicants report more doctor visits and hospital stays. While health insurance coverage levels are similar between the two groups, applicants' average out-of-pocket medical expenses are more than double those of non-applicants. The total household net wealth among applicants is less than one-third, and the total household income is less than two-thirds of that of non-applicants. In line what we describe in the previous paragraph, applicants are much more likely to be receiving retirement benefits (71% vs. 48%). The predicted probability of DI approval for non-applicants (conditional on their applying) is about one-fourth of that for applicants, although the non-applicants, if apply and approved, will get slightly higher (predicted) disability benefit amount than current applicants.

Finally, it is interesting to emphasize that applicants are much more likely to belong to the cohorts for whom DI benefits are comparatively more attractive than retirement benefits, with 89% belonging to these cohorts, while the percentage is only 53% among non-applicants.

3.2 Predicted Variables

Following the previous literature, we can consider that the DI application decision is a function of the expected benefit amounts, the expected probability of being approved, health status, other financial variables and some unobserved characteristics that affect one's work preference and may be related to some of the observed variables, such as age, gender, race, education, marital status and family structure. We also include regional dummies in the model to capture the local economic conditions that may affect people's expected earnings and therefore their DI application decisions. The regional dummies could also possibly proxy for the stringency of the local SSA offices in DI determination process, since the variations of DI award rates across states/regions are shown to be significant (See Yin, 2008).

Following Kreider and Riphahn (2000), we predict the probability of being granted DI benefits and the expected DI benefit amount (see Appendix Table A1 to A3 for the prediction results), both of which will be the explanatory variables in the main estimation equation of DI application. While estimating the probability of being approved, we control for the sample selection from application. The correction for selection biases from both application and award has been accounted for in the estimation of DI benefit amounts.[8]

We also predict the earnings of non-applicants as well as the expected retirement benefits, as shown in Tables A4 and A5 in the appendix.

An important additional variable in our estimation is the indicator for whether the individual is already receiving retirement benefits (for the age 62 to NRA sample), which we hope captures the fact that after receiving retirements benefits many individuals could find interesting to consider disability if they are not able or willing to work much, disability will provide higher lifetime benefits, the exact level of which will be a function of the time of application and receipt of benefits. Additionally, as discussed in the introduction, an essential variable to characterize the relationship between benefits and application probabilities is whether the individual was born after 1937, for whom DI is more attractive, compared with older cohorts, than retirement benefits. We capture this with a categorical variable which takes the value 0 if the person belongs to the cohort with an NRA of 65, and then takes the values 1 to 6, depending on whether the NRA of that cohort is 65 and two months, 65 and four months, and so on, until reaching an NRA of 66.

[8] In the application selection equation, the exclusion variable is the health insurance provided by the last employer, which affects employment decision and DI application decision but does not directly affect the DI award decision. In the approval selection equation, the exclusion variable is the work limitation indicator that influences the determination of DI eligibility but is not directly related to the calculation of one's DI benefit amount.

4. Identification and Estimation Results

The relationship between retirement benefits and disability benefits provides us with a quasi-experimental situation in which we can analyze the effects of an exogenous increase in comparative disability benefits for individuals who have retirement as an alternative. The key Social Security reforms (which determined the increase in the Normal Retirement Age) passed in 1983 by the first Reagan administration and implemented starting in 2000 do not directly affect disability benefits, but do affect the comparative attractiveness of disability with respect to retirement benefits.

For cohorts born up to 1937 the NRA was 65, meaning that at that age individuals would receive 100% of their Primary Insurance Amount (PIA), which is a piece-wise linear function of their Average Indexed Monthly Earning (AIME), which is essentially a summary measure of their history of earnings. However, the reforms spearheaded by the Presidential Commission presided by Alan Greenspan, determined an increase in the NRA to 66 during the last decade (and eventually to 67 for those born after 1954) by increasing the NRA by two months for the cohorts born after 1937. What this means is that for an individual considering applying for retirement and/or disability at age 62, the gain from applying for disability was historically 20%, because this was the actuarial reduction factor applied to the PIA for individuals claiming at the Early Retirement Age. However, for those born, for example, in 1938, who have a NRA of 65 and 2 months, the gain is not 20% but 20.83%. For those born between 1943 and 1954 who have a NRA of 66, the gain is not 20% but 25%.

Given the nature of the calculation of retirement benefits, the comparative increase in benefits from applying to disability is a bit higher if the person applies after age 62, so in the discussion below we will assume the increase in benefits is about 1 percentage point, when increasing the cohort variable of interest by one.[9]

We are not the first to notice this issue, or try to use it to estimate the effects of disability benefits changes on disability behavior, since Duggan, Singleton, and Song (2007), as well as Coe and Haverstick (2010) also use it, but we are the first to notice a number of issues that make

[9] The realized gain from applying and being awarded disability is a function also of whether the person has been receiving retirement benefits. For example, if someone (born after 1943) applied for retirement benefits at age 62 (say in 2005), and then a year later got into SSDI, their benefits will not be adjusted from 75% of the PIA to 100%, but from 75% to 95%, to account for the fact that they have received retirement benefits for a full year. This makes even more critical the need to control for whether the person is receiving retirement benefits as we do in our work.

previous results problematic. First, we separate the sample by age and concentrate on individuals 62 and older (but younger than the NRA) because they actually have access to both retirement benefits and disability benefits, so for these individuals the comparative attractiveness of disability is meaningful. Many researchers in the last decades have purposely avoided these older individuals because of the potential problem of having to account for the additional benefit structure coming from the Old Age Benefits program. Others, like those just mentioned above, have pooled the data by age, not separating those who actually face the comparative appeal of disability from those for whom is something that is years ahead. The latter is a key issue because it can potentially confound a pure cohort effect with a truly meaningful effect of facing a more appealing disability benefit structure.

Using individuals age 62 to the NRA has two bonuses, and these are key contributions of our work. First it provides for a cleaner estimation of the cash benefit effect of disability benefits, since for this sample the Medicare incentives are likely to be minor, given that individuals would receive Medicare anyway when they reach age 65. This is an important matter because again previous research has estimated a potentially confusing measure of the effects of benefit increases on the disability program because it included individuals for whom Medicare is likely to be quite an important matter. Second, we can control for whether the person is receiving retirement benefits which is an important matter for this age group, and provides for a discussion of an issue not well settled or understood among researchers, which is why more people apply for disability once they are receiving retirement and not working, since it is a kind of free shot at getting a higher lifetime benefit level.

Finally, we do not completely ignore the behavior at younger ages, because it provides for a nice quasi-natural experiment of a situation in which the cohort effect is likely to be predominant with respect to the effect of the true benefit (comparative) increase, given that it is not very likely that individuals well ahead of age 62 take into account the differential appeal of disability when deciding to apply for benefits, instead we believe that the estimation using younger individuals provides for a nice estimation of the pure cohort effect linked with belonging to those born after 1937.

In Table 5, we present the probit estimation results for our key specification, showing the marginal effects and standard errors, of the DI application for the sample of individuals in the age 62 to NRA range. Notice that we provide two types of marginal effects. One is what we call

Average Marginal Effects (AME), which instead of evaluating the marginal effect at the means of the exogenous variables, averages out the marginal effects at the actual values of the variables in the sample. The second set of marginal effects provides the more commonly reported Marginal Effects at the Means (MEM), which evaluates the effects keeping the other variables at their means. The reason for reporting both sets of marginal effects, even if asymptotically they are in principle equivalent, is that when in the presence of a large number of binary regressors it has been observed that they can provide fairly different results, being the MEM more problematic (see Bartus, 2005 for recent discussion). While the actual marginal effects reported are quite different depending on which calculation is provided, the key interpretation of our results in terms of elasticities is almost unaffected by this distinction.

As could be expected the indicator for having a health limitation has a large positive effect on the application decision, a classical result in the DI literature, and so does the self-reported health, where a positive effect indicates that those in worse general health are more likely to apply for benefits. More interesting is the large and significant effect of the variable that indicates that the individual is already receiving retirement benefits. This large effect is at odds with the perceived idea among researchers that individuals in this age group who receive retirement seem to be leaving money on the table by not applying for DI benefits, since it is their opportunity to permanently increase how much they receive from the Social Security Administration. We find that individuals react rationally to the incentive structure, which allows a free shot at the DI higher benefit structure, assuming the applicant does not mind the strict working and earnings requirements of the DI program.

A few health conditions are significant in the estimation, and having diabetes, cancer, and stroke appear as significant in the table. Notice that the predicted disability benefit has a very small effect, and insignificant, on the probability of applying, and the expected award probability has a slightly negative effect but it is not significant.

Finally, the indicator for belonging to the cohorts born after 1937, for whom DI benefits are comparatively more attractive, has a positive effect on the application decisions, and the interpretation of the coefficient is that a one percentage point increase in (comparative) benefits increases the application probability by 0.23 percentage points. For this age group the implied elasticity of benefits to the increased attractiveness of the DI program is quite large using the AME, but we will come back to the elasticity interpretation later.

The qualitative nature of the results is basically unaffected if we use the more traditional MEM measure to present the marginal effects, but quantitatively the differences are quite large, with all the marginal effects now much smaller, and the effect of the one percentage point increase in benefits on the application probability is now predicted to be only 0.03 percentage points.

Interesting as these results are, since they provide a fairly clean measure of increase in cash benefits free of Medicare incentives issues, they share a problem with those presented by previous researchers using the same identification source which exploits the exogenous increase in the appeal of disability benefits with respect to retirement benefits. The shared problem so far is that it is impossible to identify the effect of belonging to those born after 1937 from a pure cohort effect, which could potentially explain an increased interest in applying for disability benefits. What this means is that the marginal effects we have computed could indicate just that younger cohorts value disability more, irrespective of the fact that it provides a slightly better deal than for previous cohorts, compared with retirement. This problem could seem hard to solve, but that is what we try to do by estimating the same specification for a younger set of individuals, which even though belongs to the same cohorts, are observed when the comparison between retirement and disability benefits was unlikely to be the driving force of their application decisions because they were years away from being able to claim early retirement benefits. Table 6 concentrates on that younger group of individuals ages 55 to 60, for whom both financial and Medicare incentives could be present when considering their application to the DI program, but the Medicare incentive should not be especially different for cohorts born before or after 1937.

One of the key results for this group is the positive and significant effect of belonging to the post 1937 cohort for whom disability is more attractive in comparison with retirement. While these individuals are a few years away from retirement,(7 to 2 years away), this attractiveness results in a sizable effect on the probability of applying for DI benefits, which is however smaller in magnitude to the one observed for individuals 62 to the NRA.

Interestingly, since for this age group the Medicare incentives are the same whether the person belongs to the cohort or not, the interpretation of this cohort variable is free from health insurance considerations, and is somewhat free from comparisons between retirement and disability because these individuals are years away from having access to retirement benefits. That said, if we believe the Cohort_nra65+ variable in Table 6, captures a pure cohort effect,

then the estimated marginal effect, using either technique, should be subtracted from the estimate of this variable in Table 5, to find a cohort-free effect of the increase in comparative benefits.

Once we perform that exercise, interestingly the resulting marginal effects using both estimation methodologies are very similar. Using the AME, the cohort-free effect of facing a one percentage point increase in disability benefits has a 0.04001 percentage point effect on the application probability, while using the MEM the effect is 0.03227 percentage points. Once we have these measures, which provide what we consider the true effects of facing an increased comparative disability level of around one percentage point, we are ready to convert them into elasticities.

To convert them to elasticities, we have to compare them with the average probability of applying, and then compare the percentage increase in probability of applying with the percentage increase in comparative benefits for each increase in the independent variable Cohort_nra65+. The one percentage point increase in comparative benefits translates into a 5% increase in benefits (from a gain of 20% to a gain of 21% for applying to disability, is an increase of 5%), and the marginal effects presented above as a function of observed probabilities of applying for benefits translate into increases in 6.31% and 5.427% in the probability of applying. The implied elasticities therefore are 1.23 and 1.01, depending on the methodology to compute marginal effects. Interestingly this is quite similar to some of the previous literature, but not as high as what is found by pooling the data of younger and older individuals which mix the Medicare incentives as well as obscuring the role of the cohort effect as a separate factor explaining the coefficient of the key variable of interest.

In Tables A6 to A10 in the appendix we show the observed and predicted values for application probabilities by age, as well as the probability of approval of benefits. Additionally, we show the predicted and observed values of DI benefit amounts, earnings of non-applicants, as well as Social Security retirement income. Overall, the predictions are fairly close to the observed values, except for the retirement income and labor earnings for some ages. This fairly good performance of the model gives us some confidence on the estimation strategy we have followed in this research.

5. Conclusions and Discussion

This study takes advantage of a special age window [62, NRA) to study the effect on DI application decisions of changes in DI cash benefit amount, and compared them with the effect on a younger age group, also exploiting the fact that for individuals born after 1937 DI benefits are comparatively more attractive than retirement benefits than for older cohorts. This quasi-experimental approach allow us to separate out the effect of Medicare coverage offered by the DI program on application behavior, and therefore potentially more accurately measure the cash benefit incentive of applying to the DI program. We find a sizable effect of exogenous comparative changes in DI benefits on application decisions for those 62 to 64, but once we account for the possible purely cohort effect linked to the result the effect is somewhat smaller but still in line with previous work. The implied elasticity we find once we account for the purely cohort effect is about 1.

We also find the interesting result that those receiving retirement benefits are much more likely to apply for DI benefits between 62 and 64, suggesting that individuals respond very rationally to the *free-shot* provided by DI benefits for those already receiving retirement and with a low attachment to the labor force.

Due to data limitations, the work recency eligibility has not been accounted for in this study. Women are less likely to satisfy the recency work requirements of DI program (Leonesio et al. 2003), which may explain some of the non-applications to the program. Another issue, also endemic to all cross-sectional studies and studies using relatively short panels is that the estimates are only a short-run effect. The effect of policy changes may take time to be seen in people's responses. So the estimates in this study may underestimate the responsiveness of application decision to changes in policy variables in the long run. Moreover, if it is possible that the policy changes alter other parameters that govern people's behavior as Lucas (1976) suggests, reduced form models cannot capture the whole effect of policy changes. One possibility is to set up a life-cycle dynamic structural model that characterizes in detail the Social Security program incentives and estimate the effect of policy changes on behavior, focusing in this case on the induced entry (exit) effect of making disability benefits more (less) generous.[10]

[10] See Benítez-Silva, Buchinsky, and Rust (2003 and 2011).

Table 2. Variable Definitions

Variable	Definition
Age	Age at the time of interview
Normal Retirement Age	Age that the respondent receives full retirement benefits
Birth Cohort facing NRA 65+	Cohort born after 1937
NRA Category	=0 indicating birth cohorts facing NRA of 65 years old; =1 indicating birth cohort facing NRA of 65 and 2 months; =2 indicating birth cohort facing NRA of 65 and 4 months; =3 indicating birth cohort facing NRA of 65 and 6 months; =4 indicating birth cohort facing NRA of 65 and 8 months; =5 indicating birth cohort facing NRA of 65 and 10 months; =6 indicating birth cohort facing NRA of 66 years old.
Male	=1 if being a male
Black	=1 if being black
Married	=1 if married at the time of interview
Schooling	Years of schooling
Number of residents in HH	Number of residents in the household at the time of interview
Children	Number of children
Northeast	=1 if respondent lives in the Northeast
Midwest	=1 if respondent lives in the Midwest
West	=1 if respondent lives in the west
South	=1 if respondent lives in the south
Self-reported health	=1 excellent; =2 very good; =3 good; =4 fair; =5 poor
Health limits work	=1 if being work limited due to health problem
Health change	=1 much better; =2 somewhat better; =3 same; =4 somewhat worse; =5 much worse
ADLs	Sum ADLS where respondent reports any difficulty
IADLs	Sum IADLs where respondent reports any difficulty
Any hospital stays	=1 if had overnight hospital stay in previous 2 years
Any doctor visits	=1 if had doctor visit in previous 2 years
High blood pressure	=1 if have high blood pressure
Diabetes	=1 if have diabetes
Cancer	=1 if treated for cancer last year
Lung	=1 if ever diagnosed of lung disease
Heart	=1 if have heart problem
Stroke	=1 if ever had a stroke
Psychological	=1 if have psychological or emotional condition
Arthritis	=1 if ever diagnosed of arthritis
Any health insurance coverage	=1 if covered by any type of health insurance
Out-of-pocket medical expenses	Out-of-pocket medical expenses in previous 12 months
White collar	=1 if occupation is professional or managerial before onset of disability
Individual income	Sum of all individual income
Total household income	Sum of all household income
Net value of non-housing wealth	Sum of non-housing wealth less debt
Receiving Social Security retirement benefits	=1 if receiving Social Security Retirement Benefits
Predicted DI benefits	Predicted DI benefit amount
Predicted prob. Of DI approval	Predicted probability of being awarded if apply for DI benefits
Predicted earnings if not apply	Predicted annual labor income of non-applicants
Predicted retirement benefits	Predicted Social Security retirement benefit amount

Table 3. Descriptive Statistics: Age 62-NRA vs. Age 55-60

	Aged 62-NRA		Age 55-60	
	Mean	Std. Dev.	Mean	Std. Dev.
Apply for SSDI	0.83%		0.65%	
Age	63.1	0.9	57.1	1.4
Normal Retirement Age	65.4	0.4	65.6	0.4
Birth Cohort facing NRA 65+	0.53	0.50	0.73	0.44
NRA Category	1.50	2.00	1.86	2.02
Male	0.46	0.50	0.44	0.50
Black	0.16	0.36	0.16	0.36
Married	0.74	0.44	0.76	0.43
Schooling	12.3	3.2	12.6	3.1
Number of residents in HH	2.3	1.2	2.5	1.3
Children	3.4	2.2	3.2	2.0
Northeast	0.16	0.37	0.16	0.37
Midwest	0.24	0.43	0.25	0.43
West	0.17	0.37	0.18	0.38
South	0.43	0.50	0.41	0.49
Self-reported health	2.79	1.13	2.66	1.15
Health Limits Work	0.28	0.45	0.22	0.42
Health change	3.12	0.69	3.06	0.70
ADLs	0.24	0.76	0.19	0.67
IADLs	0.07	0.35	0.07	0.32
Any hospital stays	0.22	0.41	0.17	0.37
Any doctor visits	0.92	0.27	0.90	0.30
Any health insurance coverage	0.75	0.43	0.70	0.46
Out-of-pocket medical expenses	2,709	7,012	2,129	5,881
White collar	0.27	0.44	0.28	0.45
Individual income	17,874	39,199	32,446	71,740
Total Household Income	72,778	137,184	88,904	234,841
Net value of non-Housing wealth	140,603	1,263,318	101,103	505,262
Receiving Soc. Sec. Retirement Benefits	0.45	0.50	n/a	n/a
Predicted DI benefits	10,336	2,805	11,542	2,721
Predicted prob. Of DI approval	0.05	0.09	0.06	0.11
Predicted earnings if not apply				
N	18,481		30,473	

Table 4. Descriptive Statistics: Applicants vs. Non-applicants at age 62-NRA

	Applicants		Non-applicants	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	63.3	1.0	63.2	0.9
Normal Retirement Age	65.6	0.4	65.4	0.4
Birth Cohort facing NRA 65+	0.89	0.31	0.53	0.50
NRA Category	3.14	2.17	1.50	2.00
Male	0.35	0.48	0.46	0.50
Black	0.35	0.48	0.46	0.50
Married	0.61	0.49	0.75	0.43
Schooling	11.3	3.7	12.5	3.1
Number of residents in HH	2.4	1.4	2.3	1.1
Children	3.7	2.1	3.3	2.1
Northeast	0.16	0.37	0.16	0.37
Midwest	0.20	0.40	0.25	0.43
West	0.13	0.34	0.17	0.37
South	0.51	0.50	0.42	0.49
Self-reported health	3.9	0.9	2.6	1.0
Health Limits Work	0.88	0.33	0.21	0.41
Health change	3.42	0.86	3.09	0.66
ADLs	1.12	1.41	1.15	0.61
IADLs	0.25	0.59	0.05	0.30
Any hospital stays	0.50	0.50	0.19	0.39
Any doctor visits	0.97	0.17	0.92	0.28
Health insurance coverage	0.76	0.43	0.73	0.45
Out-of-pocket medical expenses	5,253	8,731	2,527	6,023
White collar	0.18	0.39	0.29	0.45
Individual income	6,677	27,362	20,080	41,133
Total Household Income	40,162	58,508	77,762	140,754
Net value of non-Housing wealth	38,892	201,715	153,404	1,343,226
Receiving Soc. Sec. Retirement Benefits	0.71	0.46	0.48	0.50
Predicted DI benefits	10,067	2,995	10,356	2,790
Predicted prob. of DI approval	0.17	0.09	0.04	0.07
N	136		16,211	

Table 5: Structural Application Equation. Individuals of Age 62 to NRA.

	Average Marginal Effect	Std. Err.	Marginal Effect at the Means	Std. Err.
Male	-0.0023	0.0032	-0.000356	0.000737
Black	0.00996**	0.0029	0.00205***	0.00096
Edu. Years	-0.00049	0.00032	-0.00007	0.00006
Married	-0.00243	0.0017	-0.00038	0.00045
South	-0.00095	0.0013	-0.00014	0.00026
Children	0.000458	0.00030	0.000068	0.00006
Health Lim. Work	**0.0455****	**0.0237**	**0.0087*****	**0.0073**
SR Poor Health	**0.0163****	**0.0069**	**0.00341*****	**0.00238**
SR Health Change	-0.00006	0.00087	-0.000001	0.00016
Health Insurance	0.00108	0.00162	0.00015	0.00027
Rec. Ret. Benefits	**0.00366****	**0.00167**	**0.000552***	**0.000335**
Predicted DI Ben.	1.17e-06	0.0000	1.73e-07	0.0000
Predicted Ret. Ben.	-5.23e-07	0.0000	-7.76e-08	0.00000
Pred. Award Prob.	-0.0243	0.022	-0.0036	0.0044
Pred. Earn. N-appl.	-2.38e-07	0.0000	-3.54e-08	0.0000
Total Wealth	-4.47e-09	0.0000	-6.63e-10	0.0000
Cohort NRA65+	**0.00233*****	**0.00034**	**0.0003441*****	**0.0001167**
High Bl. Pressure	0.00059	0.00159	0.000086	0.00029
Diabetes	0.00422**	0.00211	0.00065*	0.00048
Cancer	0.00663**	0.00304	0.00111**	0.00077
Lung Problems	-0.00335**	0.00142	-0.00045	0.00026
Heart Problems	0.00305	0.00199	0.00046	0.00042
Stroke	0.00896**	0.00365	0.00166**	0.00113
Psych. Problems	-0.00092	0.00154	-0.000135	0.00028
Arthritis	0.00411	0.0023	0.00051*	0.00034
Observed Prob.	0.0063404			
Log likelihood	-358.444			
Number of Obs.	12,933			
Pseudo R-squared	0.2784			

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively, for all tables.

Table 6: Structural Application Equation. Individuals Age 55-60.

	Average Marginal Effect	Std. Err.	Marginal Effect at the Means	Std. Err.
Male	-0.0068***	0.00157	-0.000091	0.00013
Black	-0.0023**	0.00084	-0.00002	0.000023
Schooling	-0.00023	0.00032	-2.65e-06	0.00000
Married	0.0021	0.00108	0.0000193	0.0000213
South	0.00195	0.00188	0.0000244	0.000041
Children	-0.00051**	0.000195	-0.000327	0.00026
Health Lim. Work	**0.0104***	**0.0063**	**0.00020**	**0.00026**
SR poor health	-0.0023**	0.00092	-0.0000198	0.000021
SR Health Change	0.00168***	0.00044	0.000018**	0.00001
Health Insurance	0.00032	0.00077	3.57e-06	0.000014
Predicted DI Ben.	3.86e-07	1.03e-06	4.35e-09	1.95e-08
Pred. Award Prb.	**0.048*** **	**0.0088**	**0.00054** **	**0.0005**
Pre. Earn. N-appl.	9.84e-08	0.00000	1.11e-09	0.0000
Total Wealth	-3.76e-09	0.00000	-4.24e-11	0.0000
Cohort NRA65+	**0.001938*** **	**0.000223**	**0.000021*** **	**0.00002**
High Bl. Pressure	-0.00091**	0.00062	-0.00001	0.000016
Diabetes	0.00303**	0.00127	0.000044*	0.000005
Cancer	-0.00045	0.0011	-4.89e-06	0.00001
Lung Problems	-0.00159**	0.00076	-0.000014	0.000017
Heart Problems	0.0022**	0.00115	0.00003	0.00004
Stroke	-0.0026**	0.00083	-0.00002	0.00002
Psych. Problems	**0.0033** **	**0.00129**	**0.00005* **	**0.00006**
Arthritis	0.0005	0.00088	5.8e-06	0.00001
Observed Prob.	0.029129			
Log likelihood	-193.067			
Number of Obs.	16,822			
Pseudo R-squared	0.4237			

Note: ***, **, and * indicate significance at the 1, 5, and 10 percent level, respectively, for all tables.

Appendix:

Table A1: Equation to Predict the DI Application Probability

	Age 62-NRA	Age 55-60
Age64pl	0.09	
	(0.08)	
Age		0.02
		(0.02)
Male	-0.06	-0.12*
	(0.09)	(0.07)
Black	0.41***	0.27***
	(0.09)	(0.07)
Years of schooling	-0.01	0.01
	(0.01)	(0.01)
Married	-0.05	-0.05
	(0.09)	(0.07)
South	0.04	0.10*
	(0.08)	(0.06)
White collar	0.03	-0.01
	(0.11)	(0.09)
Years of work	0.002	0.008***
	(0.003)	(0.003)
Self-reported poor health	0.37***	0.50***
	(0.10)	(0.08)
Health limits work	1.01***	1.36***
	(0.10)	(0.09)
ADLs	0.12***	0.10***
	(0.03)	(0.03)
Constant	-3.07***	-4.77***
	(0.20)	(1.25)
Log likelihood	-554.5	-883.0
Number of Obs.	15,752	28,306
Pseudo R-squared	0.224	0.293

Note 1: Standard errors are presented in parentheses.
Note 2: Age64pl =1 indicating age above 64. *Years of work* are the total number of self-reported years worked.
Note 3: ***indicates statistical significance at 1% significance level.

Table A2: Equation to Predict the DI Approval Probability, controlling for the DI application selectivity

	Age 62-NRA	Age 55-60
Age64pl	-0.20***	
	(0.05)	
Age		0.03***
		(0.01)
Male	0.16***	0.25***
	(0.05)	(0.04)
Years of schooling	-0.013*	0.0003
	(0.007)	(0.006)
Married	-0.16***	-0.14***
	(0.05)	(0.04)
South	0.11***	-0.008***
	(0.04)	(0.03)
White collar	-0.19***	-0.13***
	(0.06)	(0.05)
Years of work	-0.003**	-0.004***
	(0.002)	(0.001)
Self-reported poor health	0.30***	0.20***
	(0.07)	(0.06)
Health limits work	1.36***	1.48***
	(0.06)	(0.05)
λ_{apply}	-3.49**	-6.87***
	(1.55)	(1.31)
Constant	0.65	1.37
	(1.23)	(1.28)
Log likelihood	-1,975.3	-3,749.6
Number of Obs.	14,233	25,751
Pseudo R-squared	0.28	0.33

Note: ***indicates statistical significance at 1% significance level. **indicates statistical significance at 5% significance level. *indicates statistical significance at 10% significance level.

Table A3: Equation to Predict (ln of) DI benefits, controlling for the selectivity for application and approval

	Age 62-NRA	Age 55-60
Age	-0.01	0.004
	(0.03)	(0.02)
Male	0.42***	0.26**
	(0.05)	(0.12)
Black	-0.11*	-0.02
	(0.06)	(0.04)
Years of schooling	0.03***	0.04***
	(0.01)	(0.006)
Married	-0.06	0.04
	(0.05)	(0.07)
South	0.02	-0.14***
	(0.04)	(0.03)
White collar	-0.06	0.003
	(0.06)	(0.07)
Years of work	0.006***	0.003
	(0.002)	(0.003)
Self-reported poor health	0.06	-0.08
	(0.08)	(0.11)
Health limits work	0.38**	-0.20
	(0.16)	(0.31)
λ_{apply}	-3.92**	3.08
	(1.81)	(3.82)
$\lambda_{approval}$	3.60**	-1.15
	(1.44)	(2.56)
Constant	9.12***	6.90***
	(1.94)	(1.29)
Number of Obs.	1,212	1,523
Ajusted R-squared	0.16	0.12

Note: ***indicates statistical significance at 1% significance level. **indicates statistical significance at 5% significance level. *indicates statistical significance at 10% significance level.

Table A4: Equation to Predict (ln of) Labor Income of Non-applicants, controlling for the selectivity of not applying and work decision

	Age 62-NRA	Age 55-60
Age	-0.08***	0.02**
	(0.03)	(0.01)
Male	0.45***	0.51***
	(0.03)	(0.02)
Black	-0.09*	-0.15***
	(0.05)	(0.02)
Years of schooling	0.05***	0.07***
	(0.01)	(0.003)
Married	0.02	0.18***
	(0.05)	(0.02)
South	-0.05*	-0.06***
	(0.03)	(0.01)
White Collar	0.26***	0.24***
	(0.03)	(0.02)
Years of work	0.01	-0.01***
	(0.01)	(0.004)
Health limits work	-0.31***	-0.006
	(0.10)	(0.06)
$\lambda_{notapply}$	5.36	9.28***
	(3.65)	(1.63)
λ_{work}	-1.04	-5.55***
	(0.94)	(0.64)
Constant	10.27***	3.36**
	(3.41)	(1.34)
Number of Obs.	7,850	19,710
Adjusted R-squared	0.12	0.23

Note: ***indicates statistical significance at 1% significance level. **indicates statistical significance at 5% significance level. *indicates statistical significance at 10% significance level.

Table A5: Equation to Predict (ln of) Social Security retirement benefits

	Age 62-NRA	Age 55-60
Age	0.26***	0.02
	(0.01)	(0.02)
Male	0.26***	0.29***
	(0.02)	(0.05)
Black	-0.04*	0.03
	(0.02)	(0.06)
Years of schooling	0.02***	0.03***
	(0.003)	(0.01)
Married	-0.23***	0.0002
	(0.02)	(0.05)
South	-0.03**	0.03
	(0.02)	(0.05)
White collar	0.07***	0.24***
	(0.02)	(0.08)
Years of work	0.005***	0.001
	(0.001)	(0.002)
Health limits work	0.05***	0.20***
	(0.02)	(0.06)
Constant	-8.04***	7.04***
	(0.58)	(1.01)
Number of Obs.	7,858	821
R-squared	0.17	0.10

Note: ***indicates statistical significance at 1% significance level. **indicates statistical significance at 5% significance level. *indicates statistical significance at 10% significance level.

Table A6: Probability of application: observed and predicted by age

	observed	predicted
Age55	0.011	0.012
Age56	0.012	0.012
Age57	0.013	0.011
Age58	0.016	0.016
Age59	0.015	0.016
Age60	0.015	0.015
Age61	0.018	0.015
Age62	0.017	0.016
Age63	0.015	0.014
Age64	0.020	0.014

Table A7: Probability of approval: observed and predicted by age

	observed	predicted
Age55	0.059	0.076
Age56	0.069	0.078
Age57	0.072	0.080
Age58	0.080	0.094
Age59	0.088	0.097
Age60	0.085	0.096
Age61	0.095	0.099
Age62	0.098	0.096
Age63	0.104	0.074
Age64	0.093	0.074

Table A8: DI benefit amount: observed and predicted by age

	observed	predicted
Age55	8295.0	8624.7
Age56	8506.1	8610.8
Age57	8979.1	8560.6
Age58	9770.1	8688.9
Age59	8475.0	8656.5
Age60	9355.1	8607.4
Age61	8687.8	8588.1
Age62	8589.4	8867.4
Age63	8937.8	9484.6
Age64	10075.4	9253.5

Table A9: Labor earnings of non-applicants: observed and predicted by age

	observed	predicted
Age55	41350.1	24777.3
Age56	38362.5	24755.9
Age57	37833.2	24778.7
Age58	36668.5	21504.0
Age59	35528.9	21683.8
Age60	34613.9	21558.5
Age61	34122.0	21712.6
Age62	18148.2	19019.8
Age63	16345.1	17419.1
Age64	15434.1	16759.7

Table A10: Social Security retirement income: observed and predicted by age

	observed	predicted
Age55	7904.9	6497.1
Age56	7405.2	6502.3
Age57	8129.9	6524.4
Age58	8491.5	6660.2
Age59	7412.7	6669.8
Age60	7778.3	6672.8
Age61	7671.8	6686.8
Age62	5395.4	3708.4
Age63	7047.6	6006.2
Age64	8032.5	6059.3

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