

**Trends in Employment and Earnings of Allowed and Rejected Applicants
to the Social Security Disability Insurance Program¹**

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Abstract

Longitudinal administrative data show that younger rejected male applicants to the Disability Insurance (DI) program exhibit substantial labor force attachment. Similarly, a significant fraction of rejected applicants with low-mortality impairments such as back pain and mental health problems is employed. While we confirm that employment rates of older rejected applicants are low, continuing increases in the share of younger and low-mortality beneficiaries will raise the potential employment of DI beneficiaries. Three findings support economic inducement to apply. Mean pre-application earnings have been falling, rejected applicants experience pre-application declines in earnings, and beneficiaries whose first application was rejected at the DDS level but who ultimately received benefits exhibit substantial employment.

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I. Introduction

The number of individuals receiving federal Social Security Disability Insurance (DI) has increased dramatically since the early 1980s. During the same period, the characteristics of applicants and new beneficiaries have changed significantly. Applicants have become younger, healthier, more likely to apply because of non-terminal conditions such as back pain or mental health, and more likely to be female.² These trends have led to a rapid increase in projected program costs, since Medicare benefits and earnings replacement will have to be paid over increasingly longer-lasting lifespans (e.g., Autor and Duggan 2006).

At the same time, important changes in the economic environment and DI program were underway. First, the economic situation and labor force participation of lower skilled men continued to decline. Second, changes in the screening process for determining eligibility for DI made it easier to obtain benefits based on conditions difficult to clearly identify on medical terms alone such as back pain or depression. These concurring developments have fuelled the concern that the generosity of DI increasingly induces low-income workers to apply for and sometimes receive benefits, and that some of these beneficiaries would be able to work in the absence of the program. A growing number of papers indeed suggest that some workers in difficult economic conditions exit the labor force to apply for and often receive DI benefits (e.g., Rupp and Stapleton 1995, Black, Daniel, and Sanders 2002). This pattern has intensified since the mid-1980s (Autor and Duggan 2003).³ Since such economically motivated applicants on average should be of better health, these results would imply that some of them would work in the absence of DI.

In contrast with this notion, a long-standing result by Bound (1989) suggests that at least among older male beneficiaries, few are likely to work in the absence of DI. To obtain an estimate of the potential labor force attachment of new DI beneficiaries in the absence of DI, Bound (1989) suggested using employment of rejected DI applicants as a counterfactual. Bound's argument was that rejected applicants are more similar to new beneficiaries than the typical worker, but are also likely to be in better health; thus, their labor force attachment constitutes an upper bound for employment behavior of new beneficiaries. Using data covering the mid to late 1970s, he found that the employment rate of older male rejected DI applicants was quite low.⁴ This finding has been

² E.g., see Bound and Burkhauser (1999), Martin and Davies (2004), and Duggan and Imberman (2006) for a description of the trends in disability, DI receipt, and labor force participation.

³ This extends an earlier literature that has related declining male labor force participation since the 1960s to the increases in DI rolls (e.g., Parsons 1980), see Stapleton et al. (1998) for an overview.

⁴ Bound (1989) focuses on male applicants ages 45-64 since this constituted the majority of applicants in the 1970s.

replicated for the early 1990s and extended by work exploiting different features of the DI system to obtain more precise counterfactuals (e.g., Bound, Burkhauser, and Nichols 2003, Chen and van der Klaauw 2008, Maestas and Yin 2008).

In this paper, we provide new evidence on the employment and earnings of allowed and rejected DI applicants before and after the year of application. Our findings are based on a large longitudinal data base heretofore not used for disability research. Our data contain administrative information on DI application and receipt as well as earnings before and after application spanning the period from 1978 to 2004. We use these data to replicate Bound's estimates for different demographic and impairment groups and over time. In addition, we provide information on the dynamics of earnings before and after application for workers admitted at different stages of the application process. We use these findings to try to reconcile some of the seemingly contrasting findings in the literature, and to obtain a more detailed and nuanced picture of how the presence of DI may affect labor force participation.

We first replicate Bound's seminal result for male applicants ages 45-64 and show that his main conclusion is stable over time and robust to many alternative specifications.⁵ We then extend Bound's analysis to male applicants ages 30-44. While these younger applicants constituted a small fraction in Bound's sample, they have grown to about a third of new DI beneficiaries and more than half of rejected applicants today. For young rejected applicants we find significant post-application employment. Similarly, we show that employment of rejected applicants who applied based on mental health or musculoskeletal conditions is non-negligible. Since the share of these groups of applicants has been increasing over time, our results imply the overall employment potential of new DI beneficiaries has risen. These findings also suggest that for this growing fraction of beneficiaries, the results from a counterfactual analysis in the spirit of Bound do not conflict with the literature indicating a potentially important degree of moral hazard.⁶

Several additional new and robust findings relate to the interaction of labor market conditions and application to DI. First, average pre-application earnings of applicants have been declining over time relative to non-applicants, especially for rejected applicants, who traditionally

⁵ Prior analyses replicating Bound (1989) have mainly focused on the early 1990s without analyzing yearly developments up to the late 1990s; have not presented differences in employment of rejected applicants by age, impairment, industry, or earnings groups; and have not controlled for prior average earnings, prior industry, or employment trends prevailing for non-applicants as we do here.

⁶ Younger rejected applicants may work more than older rejected applicants because they are healthier, because they benefit over a longer horizon from returning to the labor force, or because they have less access to alternative sources of income replacement.

have had lower earnings than DI beneficiaries. Second, rejected applicants experience pre-application dips in employment and earnings over a number of years; on the other hand, earnings and employment drops for allowed applicants are concentrated in the year prior to application. Third, even for young rejected applicants who return to the labor force, earnings losses are permanent and substantial when compared to similar non-applicants. These findings are not mainly driven by composition changes, are robust to detailed regression controls, and hold within industry, earnings, and impairment groups. Such results are consistent with the notion that DI increasingly has attracted economically less successful workers, and that at least some fraction of these applicants has been screened out during the application process. The findings also suggest that the application to DI itself might be costly in terms of depressed earnings for rejected applicants returning to the labor force.⁷ We cannot exclude that some rejected applicants are truly disabled, and that our findings are partly driven by worsening economic conditions for less healthy workers.⁸

Last, we find that beneficiaries whose application was allowed following the Disability Determination Services (DDS) screening of the first application have a much higher propensity to work than applicants allowed during that DDS screening.⁹ Beneficiaries who are allowed at later stages or after subsequent application (labeled “hearings level allowed” in this paper) suffer from impairments and economic circumstances that do not clearly identify them as unable to engage in gainful employment. They are thus the group most likely to be able to work among new beneficiaries. This is consistent with the view that a non-negligible fraction of applicants may have been induced to apply for DI by economic conditions and is thus potentially able to work. Our finding does not challenge the result that a substantial fraction of older DI recipients may not be able to engage in substantial work as indicated by the counterfactual employment rates we present.

Section II briefly describes our data and trends in the DI system. Section III replicates Bound’s (1989) analysis for older and younger male DI applicants, and presents results by impairment, industry, and earnings groups. Section IV presents additional results on pre- and post-

⁷ Based on data from the Survey of Income and Program Participation matched to Social Security earnings records, Bound, Burkhauser, and Nichols’ (2003) Figure 1 also implies that rejected applicants have lower pre-application earnings and experience a larger dip prior to application than allowed applicants.

⁸ Benitez-Silva, Buchinsky, and Rust (2004) report estimates suggesting that a non-negligible fraction of rejected applicants to disability insurance are disabled. Bound and Burkhauser (1999) suggest that disabled applicants are particularly affected by adverse trends in the labor market.

⁹ The application process for DI benefits proceeds as follows. Applications first go to the Disability Determination Services (DDS) at the state level. Both the initial review and “reconsideration” of initial denials occur at the DDS level. A denied applicant may then appeal a denial at the hearings level where decisions are made by administrative law judges, Appeals Councils, and Federal Courts. For more information, see Lahiri, Vaughan, and Wixon (1995).

application earnings of DI applicants, and Section V presents new evidence on characteristics of DI beneficiaries whose first application was rejected at the early stages of the process. Section VI briefly discusses the trends we find in light of a stylized economic model of DI application.

II. Social Security Data and Trends in Federal Disability Insurance

To study the economic outcomes of applicants to Social Security Disability Insurance (DI), we merged several administrative data sources. The first is a 1% sample of all initial applications to DI from 1978 onwards. This file contains information on the applicant (such as age, gender, education and impairment) as well as information on the decision at the Disability Determination Services (DDS) level that includes the initial stage and the reconsideration phase.¹⁰ Since many applications are decided in the later hearings stages of the decision process, to discern whether applicants actually received DI benefits, we merged to this data information on final benefit receipt from the Social Security Administration's (SSA) Master Beneficiary Record (MBR).¹¹ Doing so allows us to identify applicants who were awarded benefits at the DDS level, those whose claims were finally rejected, and those who were rejected at the DDS level but eventually received benefits. Since the application status of the first two applicant groups is relatively unambiguous, we will limit our main analysis to DDS-level allowed and finally rejected applicants in our main analysis.¹² We will return to the intermediate group below.¹³ To measure employment and earnings of DI applicants we merged to our sample information from uncapped annual salaries recorded on workers' W-2s

¹⁰ The 831 File contains information on all new and repeat applications to DI; there is no information on decisions made during the hearings-levels part of the review process or on applications rejected initially because of technical issues (such as failure to meet the employment criterion).

¹¹ The 831 File was merged with the MBR, the Master Earnings File (MEF), and the Numident at the Social Security Administration using Social Security numbers, gender, and age. For a more detailed description of these data sources and the merge, see our longer predecessor paper Von Wachter, Song, and Manchester (2008).

¹² Specifically, we define an application to be "rejected" if a worker does not receive benefits within ten years of his first application. This classification of rejected applicants comes close to that used by Bound (1989); he classifies as new beneficiaries individuals who are receiving DI benefits, and as rejected applicants those reporting to have at some point applied but currently are not receiving benefits (see his footnote 12). Since on average workers in his data have applied for DI four years prior to the survey, the majority of rejected applicants are likely to be final rejections.

The final allowance rates we obtain using this procedure in Table 1 refer to a given cohort of applicants. They are larger than the final allowance rates based on applications and allowances in a given year typically published by the Social Security Administration. The final allowance rates in Table 1 are on the same order of magnitude as the final allowance rates calculated in Benitez-Silva, Buchinsky, Chan, Rust, and Sheidvasser (1999) using information on all stages of the adjudication process within a cohort of applicants obtained from the Health and Retirement Survey.

¹³ For those rejected at the DDS level but eventually receiving benefits, we do not know whether they appealed their decision in the hearings phase of the application process or whether they reapplied. A small fraction of hearings-level beneficiaries may thus have returned to work prior to reapplication and were awarded benefits during the DDS phase of the subsequent application process. If they appeal, we do not know at which stage beyond the DDS level a hearings-level beneficiary eventually was awarded benefits; similarly, we do not know at which stage a denied applicant was rejected.

contained in SSA's Master Earnings File (MEF).¹⁴ This provides longitudinal earnings information before and after DI application ranging from 1978 to 2004. Based on this information, below we will call a worker employed if he has any positive earnings in a given calendar year.

Trends in the basic characteristics of our sample have been documented in detail elsewhere (e.g., Duggan and Imberman 2006, Social Security Administration 2008), so we will be brief. Our sample consists of all first-time DI applicants who filed a claim between 1981 and 1999. "New beneficiaries" refers to DI beneficiaries in our sample who became newly enrolled in the DI program. The number of male new beneficiaries (which we also refer to as "Allowed" applicants) between the ages of 30 and 64 has grown substantially since 1981 (see Figure 1, Panel A).¹⁵ In addition, an important fraction of initial applicants, between 20% and 40% depending on the age of applicants, do not receive DI benefits (labeled "Rejected"). The figure also shows that although a majority of new beneficiaries was awarded benefits during the adjudication phases at the DDS level ("DDS-level allowed"), a sizeable fraction of new beneficiaries received allowances during the later stages or following subsequent application ("Hearings-level allowed"). Panel B displays the fraction of individuals ages 30-44 among these groups. The pattern clearly demonstrates that although older men remain the main target group for DI, the age of new beneficiaries has been falling rapidly over time. Among male beneficiaries, the share aged 30-44 grew about 75% from 1982 to 1992 and has stayed relatively high. Particularly relevant for our purposes, a non-negligible and increasing share of rejected applicants tends to be younger – whereas men ages 30-44 constituted about 45% of rejected applicants in 1982, this figure rose to 60% in 1992 and has remained above 50% since then.

Another trend that has received attention is the continuing increase in the number of applicants to DI with impairments associated with low mortality, in particular musculoskeletal conditions and mental health. This increase is only partially a consequence of the changing age structure and holds within age groups as well (e.g., Duggan and Imberman 2006, Social Security Administration 2008). We will return to this trend in Table 2 below. Last, partially due to increasing DI coverage driven by rising labor force participation, the number of women among applicants and new beneficiaries has increased rapidly as well. For reasons of space, and because men were the main subject of an important part of the prior literature, we focus on men here. Our longer working

¹⁴ This is likely to understate employment since we miss non-W-2 sources of labor income, chiefly self-employment income. For a detailed discussion of earnings information from the Master Earnings File, see Kopczuk, Saez, and Song (2007).

¹⁵ We exclude ages 29 or lower from our analysis because we are interested in measuring pre-application average earnings on a consistent basis. Limiting our sample to applicants ages 30-64 also ensures that the majority of workers in our sample are disability insured. Including younger ages would strengthen the points we make.

paper replicates and discusses our main results for women (von Wachter, Song, and Manchester 2008).

III. Replicating Bound's Results for Older and Younger Male Applicants

A. Male Applicants Ages 45-64

We use the merge between different administrative data sets to replicate as closely as possible the main table of Bound's (1989) seminal analysis (his Table 2; see our Table 1). To be comparable with Bound, we initially limit ourselves to male applicants ages 45 to 64 in 1982. The first columns of Panel A of Table 1 show our employment measure for workers applying to DI in 1982. The table also shows our measure of employment for a 0.2% random sample of non-applicant males in the same age range.¹⁶ Two years after application, only 40.4% of rejected applicants have any positive earnings. Since we do not have information on hours worked, we also show the fraction of workers with earnings above a minimal threshold (defined as one quarter's worth of full-time earnings at the 2000 minimum wage). Only 31.6% of rejected applicants have earnings beyond the minimal threshold, compared to 70.2% of non-applicants.¹⁷ These numbers are similar in magnitude to the fraction of rejected applicants that was found working in Bound's study.¹⁸ In addition to employment, Panel A also shows average annual earnings and median positive earnings for rejected applicants. Median earnings of rejected applicants are an order of magnitude lower than those of non-applicants. As we will see below, this is in part due to significant earnings differences existing

¹⁶ Non-applicants are drawn from the Master Earnings File. We restricted applicants and non-applicants to be disability insured. In addition, to ensure a minimal attachment to the labor force (chiefly for the non-applicants), we required all workers to have any amount of positive earnings at least once during 1978 to 1981. This restriction has no bearing on our results, and mainly affects the employment level of non-applicants. The year 1982 was chosen because it allows us to impose minimal amount of information on earnings prior to application. This also avoids using the MEF years 1978-1980 too heavily in our analysis because they have a high fraction of imputed values (see Kopczuk, Saez, and Song 2007).

¹⁷ In results not shown, we found that the patterns in Table 1 and Figure 3 hold if we exclude workers above age 54; thus, the patterns are not simply driven by retirement.

¹⁸ An exact comparison is made difficult by the different nature of the data. In Bound's *1978 Survey of Disability and Work*, 69.3% of the population reported being employed at the survey date, whereas 86.7% reported having worked at some point in 1977; among rejected applicants, 28.7% reported being employed at the survey date, and 40.4% report having worked at some point in 1977. Since labor force participation rates for older men were falling during the period, the fraction with positive earnings in 1984 is expected to be lower than 86.7%, but perhaps not as low as 73.3% (given the small fraction of applicants, the fact that we use non-applicants instead of an estimate of the population has little bearing on the comparison). The understatement is likely due to the absence of self-employment earnings in our data. This may also lead us to understate somewhat employment of rejected applicants, but this is unlikely to affect our overall conclusions.

prior to application. However, the earnings loss for rejected applicants during application is still very high.¹⁹

In keeping with Bound's (1989) main table, we also report limited information on the demographic characteristics available from the administrative data (again see Table 1). The median age of rejected applicants is 55 years, slightly younger than beneficiaries allowed at the DDS level and older than non-applicants. Rejected applicants are more likely to be non-white and less educated (available only starting in 1987).²⁰ The administrative data do not contain information on the health status of applicants. However, we merged individuals' date of death from the Numident file maintained by the Social Security Administration.²¹ The evidence from death rates confirms Bound's conclusion that rejected applicants are less healthy than the overall population; their death rate two years after initial application to DI is about 50% higher than the rate for non-applicants. The lower health status is not surprising since they are more likely to be drawn from a population with low earnings, low education, and less likely to be white. However, as in Bound, the table also shows that rejected applicants are in much better health than new beneficiaries, among whom a large fraction dies within four years of application.

The difference in mortality between allowed and rejected applicants can be attributed in part to differences in the distribution of impairments recorded on the DI application. In Table 2, we report information on the primary impairment code – available on a consistent basis starting in the mid-1980s – to be as comparable as possible to the self-reported health conditions reported in Bound.²² The majority of applicants apply for DI due to health conditions in the musculoskeletal system (e.g., back problems), circulatory system (e.g., cardiovascular diseases), mental disorders, and

¹⁹ See Figure 3 for average earnings excluding individuals with zero earnings. Note that in 2000 dollars, median 1977 earnings for the population in Bound's Table 2 would be \$39,000 (using CPI inflation published by the Bureau of Labor Statistics), similar to what we find for non-applicants. Bound's scaled-up earnings number is \$14,840 for rejected applicants, which is higher than what we find. These differences could well be part of a secular decline in average (pre and post application) earnings we find for rejected applicants, and may arise from changes in the DI system during that period (see von Wachter, Song, and Manchester (2008)). The difference does not affect the overall similarity of our findings for older men with the results in Bound. The low incidence and amount of positive earnings we find for new beneficiaries is also close to that reported in Bound.

²⁰ Information on education is available for DI applicants only on the 831 file.

²¹ This file contains information on date of death for individuals with a valid Social Security number. Its coverage is considered reliable starting from the late 1970s and is better for men and older individuals (see Hill and Rosenwaike 2002).

²² In contrast to Bound who allows multiple impairments per person, we only record the main impairment on the DI application (i.e., we do not use information from the secondary impairment code available in the administrative data). The advantage of the administrative data is that the impairment is presumably documented by medical examination and thus on more solid grounds. On the other hand, in response to administrative requirements it may not fully correspond to the actual health status of an individual. Comparing our impairment distribution to Bound's, the relative ranking is similar with the exception of conditions relating to the respiratory and digestive system; this may be due to the different time period (1986 vs. 1977) and because some of these conditions may be less frequent as primary impairment classes.

neoplasms (e.g., cancer). Rejected applicants are much less likely to have cancer or circulatory problems, two impairments with high mortality rates.

As mentioned at the outset, since the late 1970s both the administration and rules governing federal DI and the characteristics of applicants and new beneficiaries have changed in important ways. To assess whether the results on employment of older men are stable over time, Panel A of Figure 2 shows the fraction of years worked in the five years following application by year of application from 1981 to 1999 for different groups. Whereas post-application employment of older rejected applicants and beneficiaries allowed at the DDS level stayed roughly flat until the early 1990s, it has increased about ten percentage points since then. This is also shown in Panel A of Table 1, which replicates the basic Bound results for applicants in 1997. At the same time, the table reveals older DI applicants have become healthier as well (and, as we will see below, poorer).

We abstract from fluctuations in single years and show the evolution of average labor force attachment for workers applying in the four time periods 1982-1987, 1987-1992, 1992-1997, and 1997-2002, respectively, in Figure 2.²³ Panels A and B focus on older men. The upward shift in employment after application for rejected applicants is apparent in Panel A, but it is also clear that the increase also affects these workers prior to application. Consistent with the pattern for non-applicants in Figure 2, this suggests the rise may be partially due to aggregate trends in labor force participation of older workers. In general, the patterns confirm an impression of broad stability in the main pattern of pre/post employment and earnings for older men over time. The dynamic pattern of employment and earnings before and after application will be discussed in detail in Section IV.

Despite the upward trend in employment during the 1990s, overall labor market attachment of older rejected applicants to DI is still weak. Thus, it is fair to say that the picture that emerges for older men applying to DI in the 1980s and 1990s is quite similar to that found by Bound (1989) for the late 1970s. Rejected applicants have limited attachment to the labor force and low earnings. They are more likely to be nonwhite, younger, and less skilled than new beneficiaries. They are also healthier than the majority of new beneficiaries, but less healthy than the overall population. Thus, were employment and earnings of rejected applicants to be taken as an upper bound for the

²³ Again, we focus only on applicants who were either awarded benefits at the DDS level or finally rejected, postponing the discussion of the more ambiguous hearings-level beneficiaries to Section V. The age restriction in the figures still refers to the baseline year (e.g., 1982, 1987, and 1992 for the three groups of application years, respectively). We maintain this restriction to be able to impose similar criteria for non-applicants in a regression analysis (preliminary results are discussed in von Wachter, Song, and Manchester 2008). This implies the actual age at application lies above the stated age-ranges. Replicating the figures with age at application gives very similar results.

potential behavior of new beneficiaries in the absence of DI, their predicted labor force attachment would be weak.

B. Male Applicants Ages 30-44

Younger men have constituted an increasing fraction of DI applicants and new beneficiaries. To analyze what impact this might have on our assessment of the potential employment of DI beneficiaries, the lower panel of Table 1 replicates Bound's analysis for men ages 30-44 applying to DI in 1982 and 1997; the lower panels of Figures 2 and 3 show the dynamic pattern of employment and earnings. The numbers in the table and figure imply the following key findings: (1) the employment rate of rejected applicants after application is 50-60%, down from 70-80% prior to application; (2) compared to pre-application earnings, average earnings after application and rejection decline; however, they remain considerably higher than that of older rejected applicants; (3) overall, these patterns are broadly stable over time, with the exception of an upward trend in employment in the 1990s and a drop in average earnings of rejected applicants in the mid-1980s discussed in Section IV.

Overall, we reach a different conclusion for young rejected DI applicants than we had for older men; the labor force attachment of young rejected applicants remains substantial following application despite significant losses in earnings. Given that the age of applicants has continued to decline, this result will be important when assessing trends in the potential work behavior of new beneficiaries. The apparent stability in the pattern we find despite large changes in the number of young applicants and in the DI system suggests that the average employment levels we present may be a good guide for the future behavior of younger applicants.²⁴

Employment rates of younger rejected applicants should be higher than those of older workers for several reasons. On the one hand, younger rejected applicants may be healthier than their older counterparts. On the other hand, they may face stronger incentives to return to the labor force. For example, they have fewer options to replace lost income than older workers, an important fraction of whom can draw on pension benefits (Bound, Burkhauser, and Nichols 2003). Younger rejected applicants also benefit from reentry to the labor force over a longer period of time. They are likely to face smaller losses in occupation, industry, or firm specific human capital, and benefit more from reinvesting in specific human capital (Charles 2003).

²⁴ Preliminary evidence suggests that the positive trend in employment for older and younger rejected DI applicants seen in the 1990s has reversed in the first years of the 21st century, suggesting that it may have been partly a cyclical phenomenon.

Our core findings are robust to several important sensitivity checks that go beyond what has been presented in the existing literature. For brevity, we only summarize our main results here and leave further discussion to Section IV, a short appendix, and our longer working paper. First, the employment and earnings patterns after application are robust to including regression controls for average earnings and industry prior to application, controls for age, and, in so far as available, controls for impairment code. Thus, our findings are not affected by changes in observable characteristics of allowed and rejected applicants over time. This conclusion also holds if we compare allowed and rejected applicants with very similar prior career histories – those who had the same employer in the four years prior to application.

Second, our results are robust to the inclusion of a control group of non-applicants with similar average earnings, age, and industry affiliation. Thus, our analysis of employment of rejected applicants, its contrast with allowed applicants, and its comparison over time is not driven by employment trends in specific industry or earnings groups. Overall, the results imply that our findings for older and younger male applicants hold within relatively narrow groups of workers and are not mainly driven by changes in group composition or group-specific trends.

C. Employment by Impairment Group

In addition to the reduction in age of DI applicants, another important trend that is likely to affect potential employment of new beneficiaries is the increasing importance of non-terminal impairments such as musculoskeletal or mental health conditions. The share of these impairments has been rising within our two broad age groups (see the first four columns of Table 2). Examining the average employment rate of allowed and rejected DI applicants before and after application by impairment type for 1987 and 1997 suggests some heterogeneity in employment after application by impairment class (see the middle columns of Table 2).²⁵ Both among older and younger rejected and allowed DI applicants, those with musculoskeletal conditions, mental health conditions, and injuries are most likely to work.²⁶ Thus, the observed time-trends in impairment types suggest that potential

²⁵ Unfortunately, information on impairments of both denied and allowed disability applicants from the 831 file only begins to be reliable in 1986. Therefore, the table shows application years 1987 and 1997, though the trends displayed began at least in the early 1980s (Social Security Administration 2007). We average employment and mortality over different application years for space reasons. We do not find apparent group-specific trends in addition to the trends in employment and mortality described in Subsections A and B for the full sample.

²⁶ Monthly earnings by a DI beneficiary above a certain amount trigger the start of a “trial work period” during which benefits are paid. The trial work period covers up to nine months (not necessarily consecutive) in a rolling 60-month period. In 2006, a month in which earnings exceeded \$620 was considered a month of services for an individual's trial work period. A 3-month grace period follows in which benefits are paid even if monthly earnings exceed an amount known as “substantial gainful activity” (SGA). During the following 33 consecutive months, DI benefits are paid only in

employment will rise. We can also see that young applicants work more independent of impairment, suggesting that the apparent age differences in impairments is unlikely to explain differential work behavior among older and younger applicants. Despite the observed heterogeneity among impairment classes, our main results are not driven by any particular group.

Examining applicants by industry of employment, level of earnings, and post-application mortality rates leads to three further results (again see Table 2). First, declines in the fraction of applicants coming from manufacturing sectors are likely to have reduced employment rates of allowed and rejected applicants. Second, changing fractions of high-earning applicants has led to increases in employment after application for older workers and to declines for younger workers and will be discussed in the next subsection. Finally, differences in group-specific mortality rates, shown in the last two columns of Table 2, are as expected. Overall, those groups of workers with the lowest 10-year mortality rates have the highest employment rate, whether rejected or allowed.

D. The Role of Composition Changes

The previous sections have demonstrated considerable heterogeneity in post-application employment among rejected DI applicants. In this section, we assess the impact of changes in the distribution of applicant characteristics on the *overall* predicted employment of DI beneficiaries. We proceed as follows. For each age and impairment group, we follow Bound's approach and take the employment of rejected applicants as the upper bound of the employment of new beneficiaries. We obtain aggregate predicted employment (\hat{e}_t^{DI}) by reweighting group-specific employment rates (e_{gt}^R) of rejected applicants by the shares among allowed applicants (s_{gt}^{DI}). Since the distribution of age and impairment codes differs among rejected and allowed applicants, this approach yields a more accurate upper bound in employment than the aggregate employment rate of rejected applicants. To then assess the role of changes in, say, the age-impairment distribution among allowed applicants, we can compare \hat{e}_t^{DI} with a measure constructed holding population shares constant (\tilde{e}_t^{DI}). We thus obtain the following two measures of predicted employment

$$\hat{e}_t^{DI} = \sum_{g=1}^G e_{gt}^R s_{gt}^{DI} \quad \text{and} \quad \tilde{e}_t^{DI} = \sum_{g=1}^G e_{gt}^R s_{g0}^{DI},$$

where G is the number of groups we choose.

months with earnings (net of impairment-related work expenses) less than SGA. The monthly SGA amount for statutorily blind individuals for 2006 was \$1450. For non-blind individuals, the monthly SGA amount for 2006 was \$860.

We examine the result of the decomposition exercise for average employment rates among all male applicants ages 30-64 (see Figure 4). Here, the groups (g) we consider are five age groups. The top line represents the actual employment rate of rejected applicants, trending upward in large part because of the changes within age-groups shown in Figure 2 and an increasing fraction of younger workers among rejected applicants. The second line shows \hat{e}_t^{DI} , the potential employment of allowed applicants predicted by the employment rates of rejected applicants, weighted by the age shares among the allowed. This line is lower, since allowed applicants are typically older, and older rejected applicants work less. The third line represents \tilde{e}_t^{DI} , which holds age-shares constant. The difference between \hat{e}_t^{DI} and \tilde{e}_t^{DI} reflects the contribution of changes in age-shares to the overall evolution of predicted employment. The gap between the two lower lines widens until the early 1990s to about 5 percentage points, reflecting the rise in the share of young applicants. Thus, ignoring this trend, one would have missed the majority of the observed increase in potential employment indicated by \hat{e}_t^{DI} .²⁷

Next we replicate this exercise for age, impairment, and earnings groups, but now separately for the broad age-groups we have worked with so far (see Table 3). We only present the measures for every five application years from 1982 to 1997. The first row again shows the employment rate of rejected applicants shown in Table 1. Rows (2) to (9) show predicted employment for allowed applicants for different groups, as well as predicted employment at constant shares. Differing age and impairment distributions (rows 2 and 4) among rejected and allowed tend to lower predicted employment, whereas different distribution of earnings tends to raise it (row 6), although the results differ somewhat by age-class. On net, reweighting employment by age, impairment, and earnings shares of new beneficiaries tends to lower predicted employment somewhat for older workers (row 9 vs. row 1), and more strongly for younger workers. Holding age, impairment, and earnings shares constant tends to lower predicted employment for older workers only slightly (say, row 9 vs. row 8), whereas the effect is larger among younger workers, especially from the mid-1980s to the early 1990s.

²⁷ Unfortunately, our lack of reliable data on impairments prior to 1986 makes a further decomposition into age-impairment groups prior to 1987 difficult. In Table 3, we show the effect of changes in impairment shares starting from 1987. Table 3 shows the effect by broad age-groups. Since holding impairment shares constant has the opposite effect for young and old applicants, for the full sample the effect of holding impairment shares constant is negligible. Given important legislative changes occurred in the mid-1980s, we suspect this would be different if we were able to compare the early to mid-1980s.

Overall, although changes in age-structure and impairment shares tend to lead to higher predicted employment, declines in mean earnings tend to offset this pattern. The main effect from changes in the characteristics of DI applicants we find derives from changes in the overall age-structure among all male applicants shown in Figure 4. Future increases in the share of younger beneficiaries or of low-mortality impairments will likely further increase predicted employment. However, our results also suggest that it is important to analyze these trends in conjunction with the evolution with other characteristics, such as beneficiaries' changing economic backgrounds.

IV. Additional Evidence on Earnings of Applicants

The previous sections have argued that continuing changes in the composition of DI applicants and new beneficiaries can have important implications for our assessment of potential employment outcomes of DI recipients. However, our data reveal potentially important patterns *within* groups of applicants that are relevant to this question as well. These patterns are the more relevant as they may affect our interpretation of the counterfactual employment rates derived in the previous section. Here, we again summarize the most salient results, leaving a discussion of details to our longer working paper.

With the exception of a small leveling-out during the DI retrenchment in the early 1980s, average earnings of new DI beneficiaries has declined relative to non-applicants until the early to mid 1990s. Figure 5 shows average earnings of male DI applicants by application status and age group in the five years *prior* to application. For older workers in particular, average earnings of allowed applicants were similar to those of non-applicants in the early 1980s but significantly lower in the late 1990s. Although rejected applicants have long had lower average earnings than new beneficiaries, pre-application earnings have declined relative to non-applicants for both age-groups. These trends are consistent with the notion that DI applicants have been increasingly drawn from the pool of economically less successful workers.

Rejected applicants in particular may apply to DI because of adverse economic conditions. Figure 3 shows that especially older rejected applicants experience declines in employment rates and earnings prior to application, a pattern that is roughly stable over time and robust to detailed regression controls.²⁸ Such a dip is not present for allowed beneficiaries. Our longer working paper shows that these patterns hold within industry, earnings, or impairment class, and thus cannot be

²⁸ Estimates for the application years 1987-1992 and for 1997-2002 are very similar and are omitted only to make the figure more readable. They can be obtained by request from the authors.

attributed to any particular group of applicants.²⁹ Our regression analysis confirms that these findings are not due to industry- or earnings-specific employment trends (Figure 6).

Among rejected applicants with positive earnings, earnings reductions relative to the pre-application level are considerable, irrespective of age-groups (again see Figure 3). The loss is particularly large for older rejected applicants who work. The rebound apparent for younger applicants is driven by a common age-profile in earnings. The estimated earnings loss becomes large and *permanent* once we introduce a control group of non-applicants with similar age, earnings, and industry affiliation.³⁰

The robustness of the large and permanent earnings loss for younger applicants over time and to the inclusion of detailed regression controls is quite striking. In Figure 6 we show coefficients from a distributed lag regression model of the impact of application before and after the actual application date in the spirit of Jacobson, Lalonde, and Sullivan (1993) and Krueger and Kruse (2003).³¹ Again, despite some expected heterogeneity in earnings losses, these patterns also hold within industry, earnings, or impairment classes.

²⁹ See von Wachter, Song, and Manchester (2008) Figures 7 to 10.

³⁰ Bound, Burkhauser, and Nichols (2003) show that the decline in labor earnings of rejected disability applicants is stronger than that of total family income; the majority of the offset comes through pension and Social Security benefits (other than SSI) suggesting younger applicants may also see substantial declines in family income.

³¹ See the detailed discussion in our longer working paper (von Wachter, Song, and Manchester 2008). In brief, let y_{it} stand for either annual employment (a dummy for positive earnings in a given year) or annual earnings (in \$1000 deflated by the CPI at 2000 prices). Then we estimate the following distributed lag model

$$y_{it} = \alpha + \theta_t + \gamma X_{it} + \delta ALD_i + \beta DEN_i + \sum_{k \geq -8}^{\leq 10} \delta^k D_{it}^k ALD_i + \sum_{k \geq -8}^{\leq 10} \beta^k D_{it}^k DEN_i + u_{it}$$

where i indexes individuals and t indexes calendar years; X_{it} captures individual characteristics; the dummies D_{it}^k indicate the k -th year before or after application to disability; and ALD_i and DEN_i are dummies for whether an individual i is an allowed or rejected disability applicant.³¹ The parameter δ^k (β^k) measures the *change* in employment or earnings of allowed (rejected) applicants in the k -th year before and after application to DI relative to the baseline and *relative* to the change over time for non-applicants (captured by unrestricted year dummies θ_t). In addition, all of our models include a fourth order polynomial in both current age and average annual earnings during the baseline period. The models were estimated separately by gender and by broad age groups. To address the concern that remaining heterogeneity among rejected applicants, new beneficiaries, and non-applicants may affect our comparison, we extended the basic model in several ways. First, we included effects for the two-digit industry of the baseline job, effects for the employer of the baseline job, and effects for earnings class to make sure that the comparison is not affected by differences in economic background of allowed and rejected workers. Second, we replaced the single time trend by interactions of year-dummies with two digit baseline industry, earnings class, and earnings class-industry groups. This ensures that the comparison of the *evolution* of earnings and employment of allowed and rejected workers is made with workers in similar industry or earnings cells. The estimates of δ^k and β^k for this final specification for older and younger men are shown in Figure 6. As in Figure 3, estimates for the application years 1987-1992 and for 1997-2002 are very similar and are omitted to make the figure readable.

The foregoing results suggest that the counterfactual employment measures discussed in the previous section might understate the overall impact of DI on employment for two reasons. First, by construction the counterfactual makes a statement about employment *conditional* on application for and receipt of DI benefits. If DI leads some workers to quit the labor force to apply for benefits, the counterfactual is valid for this specific question but cannot be taken as a statement of the overall impact of DI on labor force participation. In so far as the trends in pre-application earnings are suggestive of an increasing role of economically induced DI applicants, they suggest Bound's measure is likely to increasingly understate the potential impact of the DI system on labor force participation as beneficiaries become younger.

Second, the employment of rejected applicants provides a valid upper bound on employment of new beneficiaries only if the application process itself does not affect employment and earnings. This condition requires that the low employment rate and low earnings of rejected applicants is due to bad health or due to generally poor labor market prospects, but *not* due to factors associated with the application to DI itself. While certainly possible, estimates from the literature on job displacement suggest that earnings losses on the order of magnitude that we find for younger applicants could result to a large extent from the effect of job separation alone (e.g., Jacobson, Lalonde, and Sullivan 1993, von Wachter, Song, and Manchester 2007). Less healthy workers are likely to be particularly affected by adverse employment shocks (e.g., Bound and Burkhauser 1999). If this is the case, then the counterfactual employment measures are likely to *understate* what would happen had workers never applied for DI. However, they may still represent valid bounds for the counterfactual of whether a worker currently receiving benefits would work were his benefits terminated.³²

V. Additional Evidence on Employment of Beneficiaries

The foregoing sections have reconfirmed existing results and provided new findings on the potential employment status and the economic background of new beneficiaries. However, by their nature, the counterfactuals we discuss must remain suggestive. Our administrative data enable us to

³² The question of whether the application process to DI itself affects the employment potential of workers has been debated (e.g., see the exchange in Bound (1991) and Parsons (1991)). In particular, calculations presented in Bound (1991) suggest that time lost due to application to DI in the late 1970s was small. Benitez-Silva et al. (1999) show time spent out of the labor force was larger in the 1990s, especially for applicants appealing the initial decision. Nevertheless, it is more likely that losses in firm-specific skills or rents drive earnings losses at job separation, not time out of employment. The fact we see losses with respect to long-term pre-application earnings for younger rejected applicants that have substantial labor force attachment may cast additional light on this question. Estimates from the literature on displaced workers suggests that separating from the job alone, independent of time spent out of the labor force, is likely to reduce workers long-run earnings by 20% to 40%, depending on workers' age.

go beyond Bound's original approach and provide direct evidence on employment behavior of new beneficiaries. To do so, we analyzed labor force attachment of individuals whose application is rejected at the DDS level of the disability review process but who are awarded benefits during the hearings phase or following subsequent application. Compared to applicants allowed at the DDS level, hearings-level applicants have medical conditions that are much less likely to correspond exactly or be equivalent to medical conditions in SSA's listing of impairments. In addition, during the initial screening they are more likely determined to be able to find employment equivalent to their pre-disability employment.³³ As noted at the outset, these applicants constitute a high fraction among all new beneficiaries, especially among younger men.

Hearings-level beneficiaries clearly exhibit characteristics making them more likely to be able to engage in gainful activity. They are younger (Figure 1, Panel B) than applicants allowed at the DDS level, they are more likely to be affected by musculoskeletal and mental health conditions, and they have considerably lower mortality rates than applicants allowed at the DDS level (Table 1). They also exhibit higher employment and earnings prior to application than ultimately rejected applicants (Table 1). These applicants also bear some sign of being economically motivated applicants, since their pre-application earnings are lower than those allowed at the DDS level and have been declining over time (Figure 5). However, they do not exhibit pre-application employment declines the way finally rejected applicants do.

The post-application employment rate for hearings-level beneficiaries is high relative to beneficiaries allowed at the DDS level (see Table 1 and Figure 3). The average five-year employment rate has fluctuated around 25% for older applicants (compared to about 10% for DDS-level allowed applicants), and 35-40% for younger applicants (compared to about 20-25% for DDS-level allowed applicants). Among all allowed applicants, this group clearly stands out as having the highest potential labor force attachment. Median earnings for those who work is non-negligible and, for older workers, near the maximum earnings limits allowed by the DI rules. Earnings levels are about 50% of what rejected applicants earn, but double that of DDS-level allowed applicants. Our results suggest that there are large groups of individuals among DI recipients with considerable potential employment, even among older applicants.

VI. Discussion

³³ For a detailed description of the different stages of the DI application process see Lahiri, Vaughan, and Wixon (1995). Martin and Davies (2004) provide some evidence of significant increases in employment among all beneficiaries that match the trends we find in Figure 2 (see their Table 2).

The patterns we presented have potentially important implications for the modeling of application to DI in the context of the labor market. To see this, it is helpful to consider our findings in light of a stylized model of job search in the spirit of Autor and Duggan (2003). In the basic model, workers follow the Bellman principle to decide whether to apply to DI in any given period based on the present discounted value of utility from health and income.³⁴ To better explain the phenomena just described, it is useful to add three additional features to the model. First, to better analyze the characteristics of allowed and rejected applicants, we let the probability of receiving benefits be a function of health. Second, to have some rejected applicants return to the labor force, we introduce a source of non-stationarity into the model such as learning about the application process, changes in technology that facilitate work, mean reversion in health, or a budget constraint. Third, to make the application decision more realistic, we assume workers face a known wage reduction upon reentry into the labor market after unsuccessful DI application.

A basic comparative static exercise then yields the following findings. First, rejected applicants have lower average pre-application earnings and better health than allowed applicants, who in turn have lower average earnings than non-applicants. Second, liberalization in screening reduces average earnings and raises health of both allowed and rejected applicants. Third, a mean preserving spread of the earnings distribution lowers average earnings of both allowed and rejected applicants. Yet a decline in economic conditions of all workers, such as a strong recession, at given screening stringency would raise the earnings and health of allowed applicants. Fourth, a key implication is that rejected applicants only return to work if their optimization problem changes in a significant way; this may be because health improves, technology advances facilitate work, they cannot finance continuing the application process, or they learn that their true allowance probability is lower.³⁵

The levels of pre-application earnings of applicants we described in Figure 5 are consistent with the basic implications of the model. The trends shown in the same figure are also consistent with liberalization in screening and an increase in inequality occurring in the early to mid-1980s. The fact that a non-negligible fraction of rejected applicants returns to work despite large earnings losses is indicative of potentially important changes in individuals' assessment or their actual ability to carry

³⁴ To focus on the main economic mechanisms, Autor and Duggan's (2003) model treats the complex institutional features of the DI system in a highly stylized fashion.

³⁵ In the latter case, at a fixed wage discount, application to DI is essentially a real options problem much akin to what Jovanovic (1979) describes for jobs. Thus, higher uncertainty in the admission process raises potential 'try-out' behavior that is optimal from the worker's point of view, but may be wasteful from society's perspective because of the lost output involved.

on the application process. Overall, the results are suggestive of an environment where individuals decide to apply for DI given both their health and economic opportunities in the face of uncertainty about the outcome of the application process. Useful extensions would derive predictions for the characteristics of applicants who appeal the DDS-level rejection, and for the specific circumstances that lead rejected applicants to return to the labor force.³⁶

VII. Conclusion

We provide evidence that younger rejected male DI applicants exhibit substantial labor force attachment. Similarly, applicants with low-mortality impairments such as back pain and mental health problems exhibit substantial labor force attachment. We show that continuing increases in the share of younger beneficiaries or beneficiaries with these impairments will further raise the potential employment of workers receiving DI benefits. We also provide new results on the level and dynamics of earnings of different applicant groups before and after application. These results confirm that an increasing number of individuals may have applied for DI because of worsening economic conditions. This is consistent with our finding of substantial employment among beneficiaries whose application was rejected at the DDS level.

³⁶ For an attempt to model the application and award process explicitly see Benitez-Silva, Buchinsky, and Rust (2003).

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Regression Appendix

To summarize the regression results shown in the figures and to display standard errors, we follow Jacobson et al. (1993) and Krueger and Kruse (1995) and impose a parsimonious but flexible functional form on the evolution of employment and earnings before and after application. This parameterization also gives us a convenient way to assess differences in the comparison between allowed and rejected workers across groups (e.g., by industry or education), and to test for the significance of these differences.

Specifically, we split the pattern into a dip prior to application, a drop during application, and a recovery following application. Thereby, the ‘dip’ is captured by a variable that is a linear trend -5 to -2 years prior to application and zero elsewhere; the ‘drop’ is captured by a dummy variable that is equal to one starting two years after application and zero before; the ‘recovery’ is captured by a variable that is linear starting three years after application and zero elsewhere. To obtain an estimate of the difference in allowed and rejected workers with respect to non-applicants, instead of a main effect we also include a dummy for the base period. If k indexes the years before and after application, we have

$$\begin{aligned} base^k &= 1 \text{ if } k < -6, \quad = 0 \text{ else} \\ dip^k &= -(k + 6) \text{ if } -5 \leq k \leq -2, \quad = 0 \text{ else} \\ drop^k &= 1 \text{ if } k \geq 2, \quad = 0 \text{ else} \\ rec^k &= k - 2 \text{ if } k \geq 2, \quad = 0 \text{ else} \end{aligned}$$

Our basic model can then be rewritten as

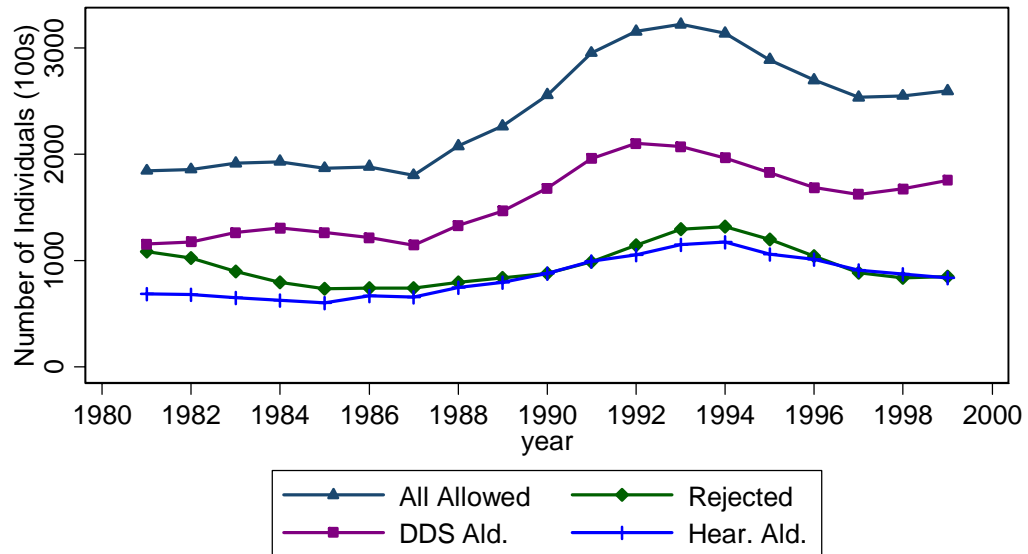
$$\begin{aligned} y_{it} = & \alpha + \theta_t + \gamma X_{it} + \delta^0 base_{it}^k ALD_i + \delta^1 dip_{it}^k ALD_i + \delta^1 drop_{it}^k ALD_i + \delta^1 rec_{it}^k ALD_i + \\ & \beta^0 base_{it}^k DEN_i + \beta^1 dip_{it}^k DEN_i + \beta^1 drop_{it}^k DEN_i + \beta^1 rec_{it}^k DEN_i + u_{it} \end{aligned} \quad (2)$$

where we are particularly interested in the difference in the patterns of base, dip, drop, or recovery for allowed and rejected workers, over time, and across sub-samples of the population. These are captured by the two quadruplets of parameters $(\delta^0, \delta^1, \delta^2, \delta^3)$ and $(\beta^0, \beta^1, \beta^2, \beta^3)$.

Appendix Table 1 displays the parameter estimates and corresponding standard errors for the sample of older and younger men. To help assess the impact of the regression controls, we first estimated the effects without covariates (see our longer working paper). The estimated baseline differences relative to non-applicants clearly show the need to control for pre-application differences

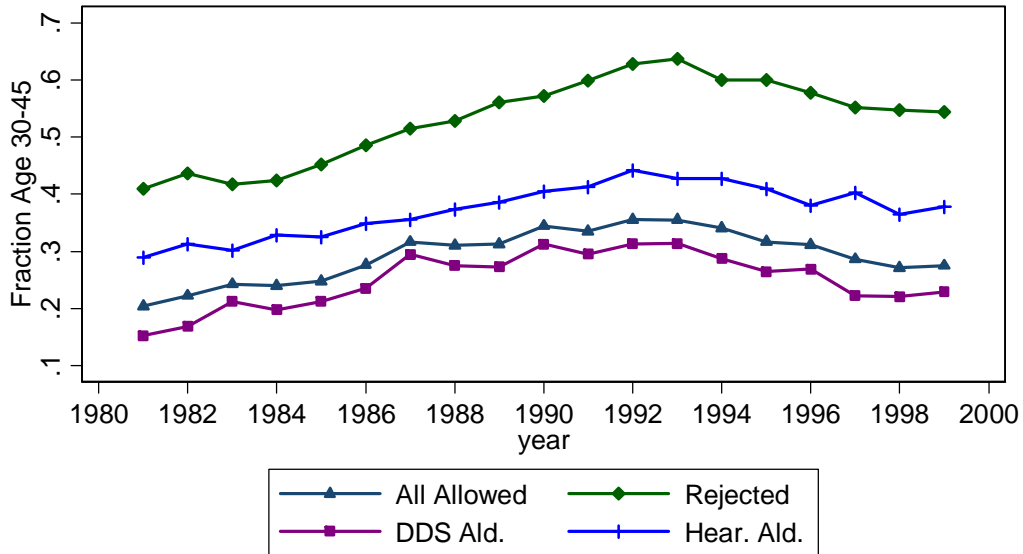
in employment and earnings among applicant groups and non-applicants. Once this is done, overall the numbers in the table confirm the results obtained from Figure 6 based on estimates of annual dummies before and after application. We conclude that the results from the descriptive section are robust to including a control group of non-applicants and narrowing the comparison among groups of applicants with similar pre-application earnings and industry affiliation. However, we also find that ignoring age-related trends in earnings would risk misstating some of the pattern, especially for younger workers.

Figure 1, Panel A: Number of Allowed and Rejected Applicants to DI Men Age 30-64



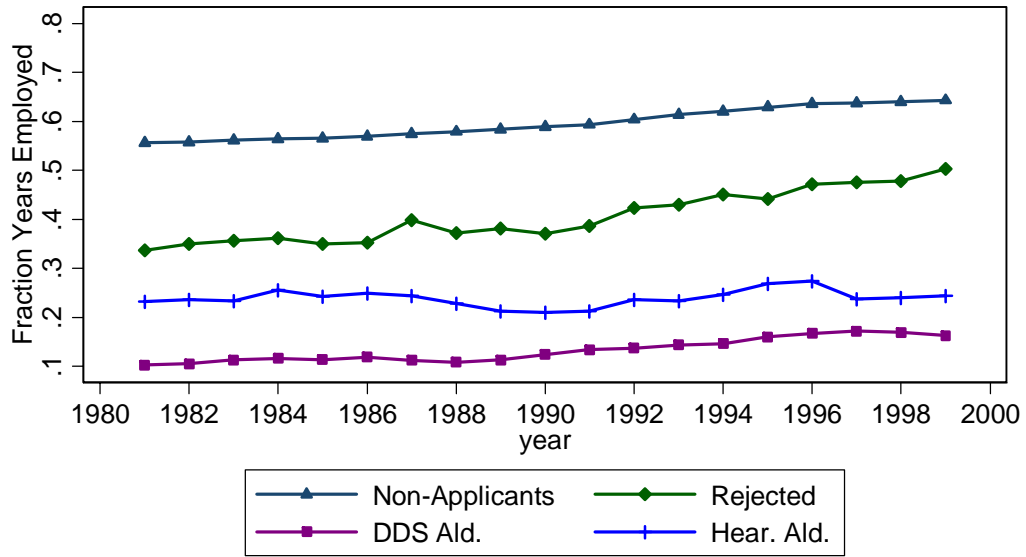
Source: 1% Files of Social Security administrative data (see text).
 Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text).

Figure 1, Panel B: Fraction Allowed and Rejected DI Applicants in Age Range 30-44 among 30-64 Year Olds



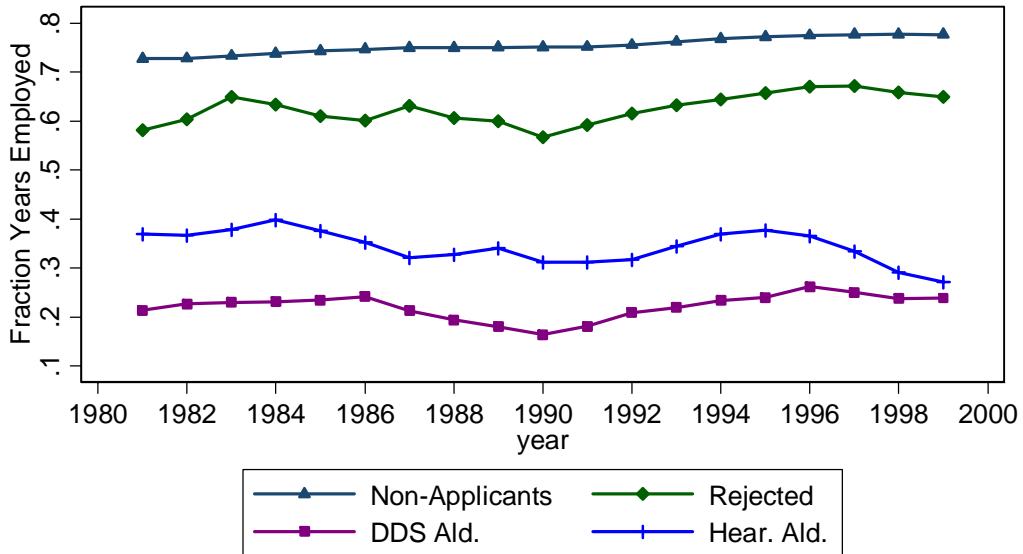
Source: 1% Files of Social Security administrative data (see text).
 Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text).

Figure 2, Panel A: Fraction Years Employed in Five Years Post-Application
All DI Applicants, Allowed, and Rejected Applicants, Men Age 45-64



Source: 1% Files of Social Security administrative data (see text).
Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text).

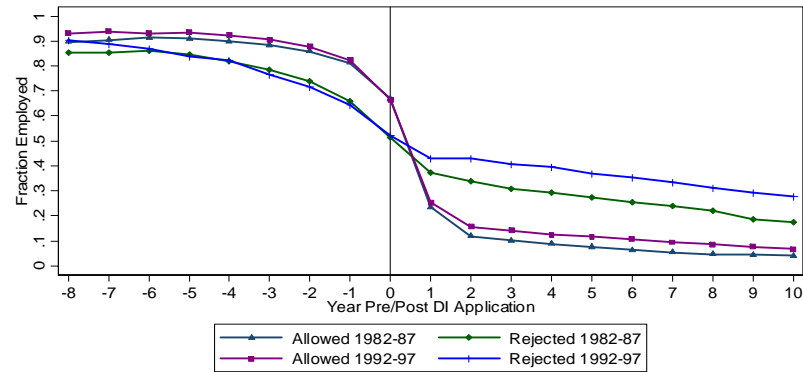
Figure 2, Panel B: Fraction Years Employed in Five Years Post-Application
All DI Applicants, Allowed, and Rejected Applicants, Men Age 30-44



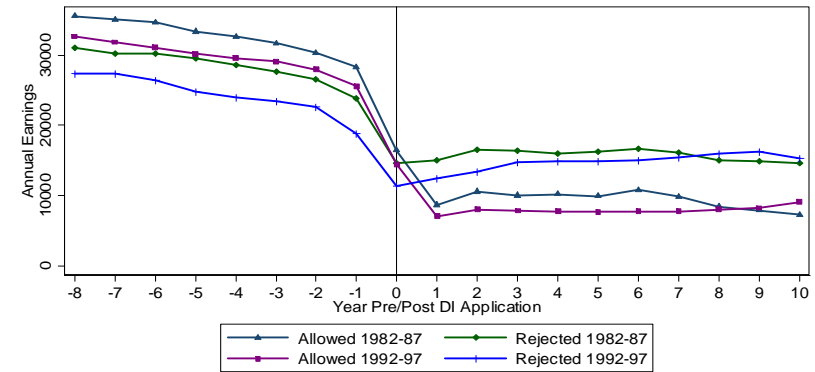
Source: 1% Files of Social Security administrative data (see text).
Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text).

Figure 3: Average Annual Employment and Earnings for Allowed and Rejected Male DI Applicants Before and After Application for Disability Insurance

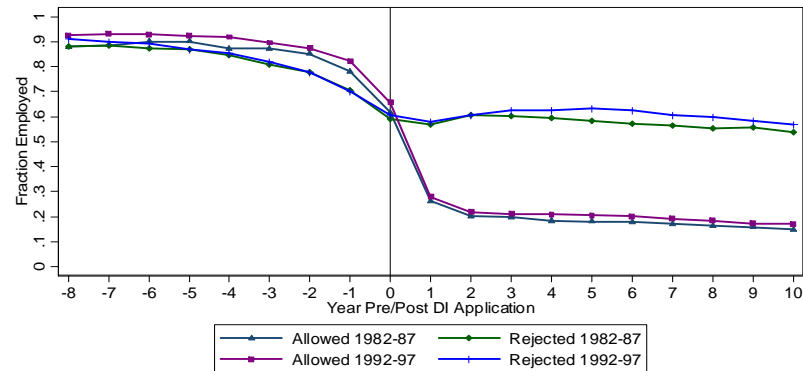
Panel A: Annual Fraction Employed Allowed and Rejected Applicants, Age 45-64



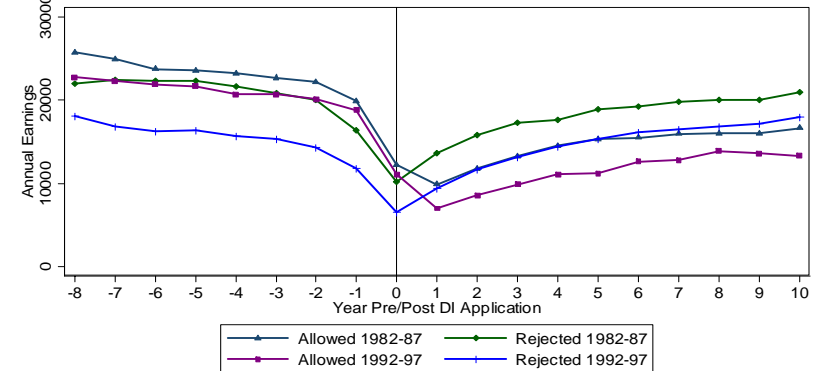
Panel B: Positive Annual Earnings (\$1000) Allowed and Rejected Applicants, Age 45-64



Panel C: Annual Fraction Employed Allowed and Rejected Applicants, Age 30-44



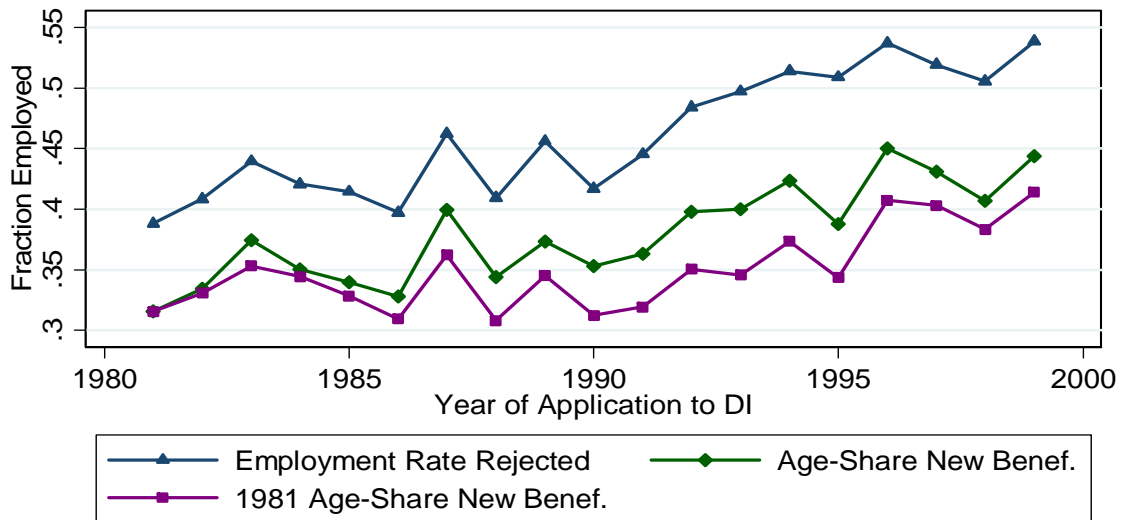
Panel D: Positive Annual Earnings (\$1000) Allowed and Rejected Applicants, Age 30-44



Source: 1% Files of Social Security administrative data (see text).

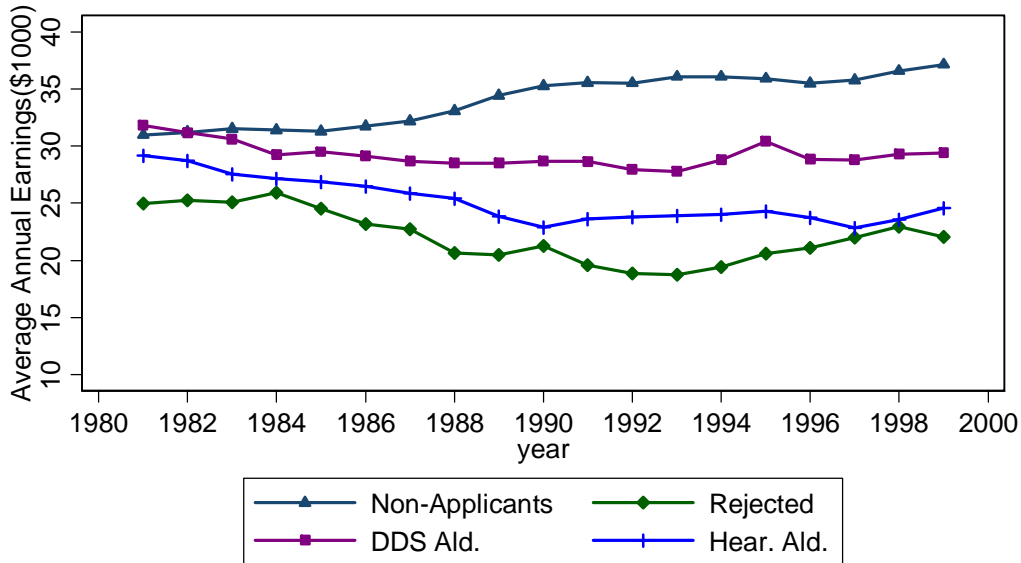
Notes: Allowed refer to DDS Level Allowed Beneficiaries, Rejected refer to finally rejected applicants (see text).

Figure 4: Predicted Employment of New Male DI Beneficiaries Age 30-64, Prediction Based on Employment of Rejected Applicants



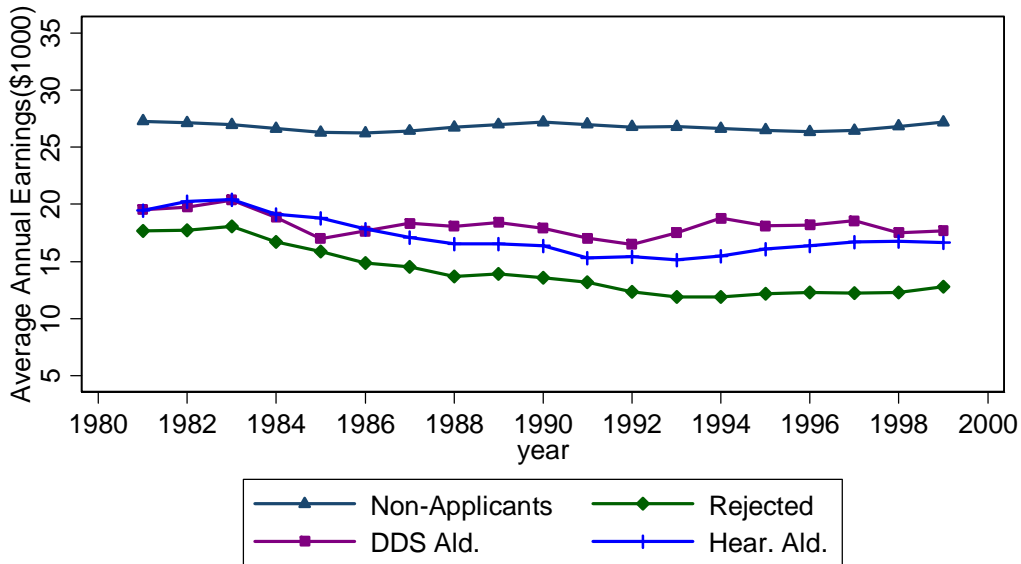
Source: 1% Files of Social Security administrative data (see text).
 Notes: Line labeled 'Age-share of new beneficiaries' reweights age-specific employment of rejected applicants by current age-share of new DDS-level allowed beneficiaries. Line labeled '1981 age-share of new beneficiaries' reweights age-specific employment of rejected applicants by 1981 age-share of new new DDS-level allowed beneficiaries.

Figure 5, Panel A: Average Annual Earnings Pre-Application of All DI Applicants, Allowed, and Rejected Applicants, Men Age 45-64



Source: 1% Files of Social Security administrative data (see text).
 Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text). Earnings in 2000 prices adjusted by CPI.

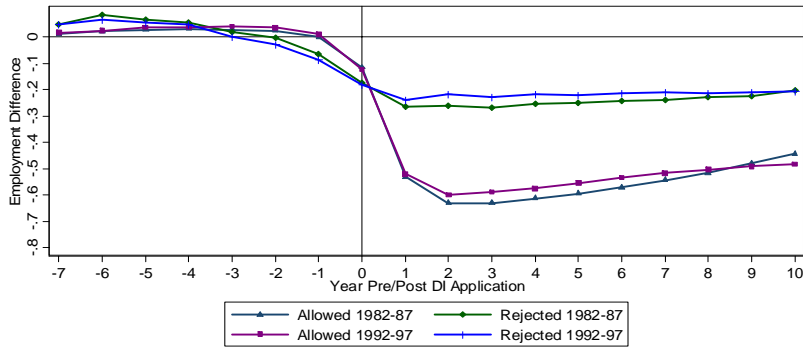
Figure 5, Panel B: Average Annual Earnings Pre-Application of All DI Applicants, Allowed, and Rejected Applicants, Men Age 30-44



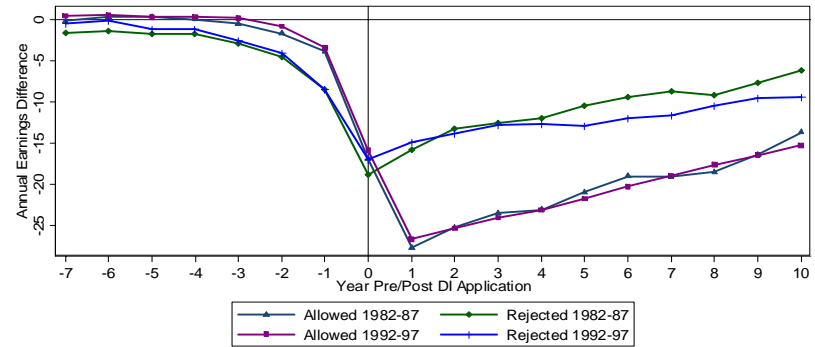
Source: 1% Files of Social Security administrative data (see text).
 Notes: Labels refer to rejected applicants, DDS Level Allowed Beneficiaries, and Hearings Level Allowed Beneficiaries (see text). Earnings in 2000 prices adjusted by CPI.

Figure 6: Difference in Employment and Earnings Between Allowed or Rejected and Non-Applicants Before and After DI Application, Men, Full Specification

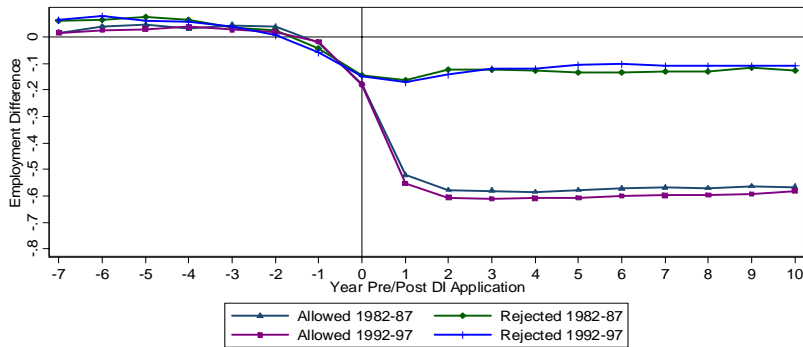
Panel A: Difference in Fraction Employed Relative to Non-Applicants, Age 45-64



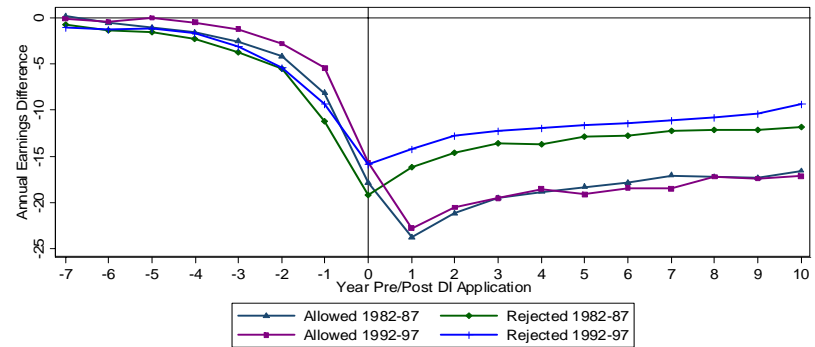
Panel B: Difference in Positive Annual Earnings (\$1000) Relative to Non-Applicants, Age 45-64



Panel C: Difference in Fraction Employed Relative to Non-Applicants, Age 30-44



Panel D: Difference in Positive Annual Earnings (\$1000) Relative to Non-Applicants, Age 30-44



Source: 1% Files of Social Security administrative data (see text).

Notes: Allowed refer to DDS Level Allowed Beneficiaries, Rejected refer to finally rejected applicants (see text). Regression specification includes a quartic in age, a quartic in baseline average annual earnings, and year dummies interacted with ten dummies for earnings class prior to application and twelve industry dummies (see text for details).

Table 1: Employment, Earnings, and Other Characteristics of Rejected Male Disability Insurance Applicants

Application Year	1982				1997			
	Non-Applicants	Rejected Applicants	DDS Level Allowed Beneficiaries	Hearings Level Allowed Beneficiaries	Non-Applicants	Rejected Applicants	DDS Level Allowed Beneficiaries	Hearings Level Allowed Beneficiaries
Panel A: Men Age 45-64 at Application Year								
<u>Labor Supply and Earnings 2 Years After Application</u>								
Percent Positive Covered Earnings	73.3	40.4	9.6	25.4	82.2	52.6	17.9	24.5
Percent Earnings Above Minimum Amount ^(a)	70.2	31.6	6.3	18.4	78.5	42.7	10.4	17.5
Average Annual Earnings (\$1000)	34759	6672	1254	3785	46699	7639	1415	2475
Median Positive Annual Earnings (\$1000)	37000	10000	4500	8000	35000	10000	3000	5000
<u>Demographics</u>								
Median Age at Application	52	55	56	52	50	54	50	52
Percent Non-White	11.1	20.6	14.3	17.8	18.4	21.1	23.2	23.3
Median Years of Schooling	--	--	--	--	--	17	19	14
<u>Fraction Dead After Application</u>								
Fraction Dead 2 Years After Application	4.5	7.6	34.8	4.4	2.6	3.4	23.1	3.0
Fraction Dead 4 Years After Application	6.1	11.9	42.9	9.7	3.6	6.7	31.0	4.6
<u>Number of Observations</u>	151945	582	961	472	204205	386	1245	526
Panel B: Men Age 30-44 at Application Year								
<u>Labor Supply and Earnings 2 Years After Application</u>								
Percent Positive Covered Earnings	82.9	59.8	25.0	41.4	87.7	69.6	26.1	36.9
Percent Earnings Above Minimum Amount ^(a)	79.5	50.7	13.8	25.6	84.6	57.4	12.9	24.5
Average Annual Earnings (\$1000)	36725	10393	2702	5541	40666	8440	2988	3640
Median Positive Annual Earnings (\$1000)	37000	10000	2000	5000	32000	8000	2000	5000
<u>Demographics</u>								
Median Age at Application	33	34	35	36	26	38	29	28
Percent Non-White	17.9	28.4	24.5	20.0	12.0	12.0	12.0	12.0
Median Years of Schooling	--	--	--	--	--	18	27	13
<u>Fraction Dead After Application</u>								
Fraction Dead 2 Years After Application	1.3	3.6	23.5	4.2	0.9	2.3	18.3	2.0
Fraction Dead 4 Years After Application	1.7	4.9	28.6	7.0	1.2	4.6	21.6	4.8
<u>Number of Observations</u>	189920	450	196	215	286955	474	356	355

Source: 1% Files of Social Security administrative data (see text).

Notes: Earnings are in 2000 dollars adjusted by the CPI. Applications refer to initial application to receive benefits from Social Security Disability Insurance (DI). "Rejected applicants" are those applicants who are rejected at the DDS stages of the screening process and do not receive benefits within ten years of initial application. "DDS Level Allowed Beneficiaries" are those applicants who are awarded benefits during the DDS stages of the screening process. "Hearings Level Allowed Beneficiaries" are those applicants who are rejected at the DDS stages of the screening process but receive benefits within ten years of application.

^(a) The minimum earnings threshold used corresponds to earnings from three months of full time employment at 2000 minimum wages.

Table 2: Employment and Earnings of Rejected Disability Insurance Applicants by Characteristics, Different Age-Groups (Men)

Application Year or Application Status Before/After Application	Fraction at Application by Application Year				Fraction Positive Annual Earnings (Mean over Multiple Application Years)				Fraction Dead 10 Years Post Application (Mean over Multiple Application Years)	
	All New	Rejected	All New	Rejected	All New Beneficiaries		Rejected Applicants		All New	Rejected Applicants
	Beneficiaries	Applicants	Beneficiaries	Applicants	All New	Post	Pre	Post	Beneficiaries	Post
	1987		1997		Pre	Post	Pre	Post	Post	Post
Panel A: Male Workers Age 45-64 at First Application:										
<u>Primary Health Condition at Application</u>										
Musculoskeletal System	26.1	36.4	31.5	41.4	91.7	14.6	82.6	34.5	6.9	5.2
Circulatory System	31.2	31.1	25.7	23.8	91.1	12.1	82.5	28.9	17.7	11.8
Mental Disorders/Nervous System	8.1	8.0	11.7	13.2	90.5	14.9	81.4	33.1	12.5	8.8
Respiratory System	9.3	7.6	7.2	4.9	90.8	8.3	77.6	18.6	24.8	14.2
Neoplasms	18.1	5.2	17.0	5.6	90.9	3.4	82.3	26.9	8.6	12.8
Infectious Diseases	1.6	1.4	1.2	1.3	91.4	8.2	80.7	31.4	11.8	11.3
Injuries	5.6	10.3	5.7	9.8	89.9	12.7	83.2	40.5	10.2	6.2
<u>Industry of Employment Prior to Application</u>										
Manufacturing	61.3	54.7	53.7	46.5	95.5	14.0	90.5	35.0	14.2	9.6
Services	38.7	45.3	46.3	53.5	92.0	11.8	84.0	30.5	13.4	10.3
<u>Average Earnings Prior to Application</u>										
High (Above Median)	60.2	46.3	62.1	47.4	96.4	13.5	92.6	35.7	12.8	8.3
Low (Below Median)	39.8	53.8	37.9	52.6	82.0	8.5	70.2	25.7	14.4	11.2
Panel B: Male Workers Age 30-44 at First Application										
<u>Primary Health Condition at Application</u>										
Musculoskeletal System	27.1	44.1	31.6	48.8	90.9	21.0	87.0	60.7	3.4	2.2
Circulatory System	14.5	9.5	12.5	8.7	91.1	17.6	84.3	52.0	12.8	6.0
Mental Disorders/Nervous System	23.3	20.1	26.1	19.0	89.4	23.6	82.6	54.4	7.2	4.5
Respiratory System	3.1	3.1	2.6	2.9	90.1	15.0	83.0	43.2	14.6	5.4
Neoplasms	10.6	1.5	11.1	1.7	90.8	8.0	84.7	59.4	8.6	4.5
Infectious Diseases	11.7	2.1	6.2	2.7	90.3	11.0	82.7	41.6	16.3	9.0
Injuries	9.7	19.6	9.9	16.2	89.7	24.9	87.2	64.9	5.5	2.4
<u>Industry of Employment Prior to Application</u>										
Manufacturing	32.0	31.0	28.9	27.1	94.0	22.4	90.7	63.5	8.3	3.5
Services	25.9	24.4	29.8	30.7	91.0	21.3	85.9	57.0	8.9	4.4
<u>Average Earnings Prior to Application</u>										
High (Above Median)	41.7	29.2	42.3	27.7	96.1	21.9	94.2	67.8	8.1	3.0
Low (Below Median)	58.3	70.8	57.7	72.3	85.8	18.4	80.2	53.1	9.1	4.2

Notes: Earnings are in 2000 dollars adjusted by the CPI. Applications refer to initial application to receive benefits from Social Security Disability Insurance (DI). "Rejected applicants" are those applicants who are rejected at the DDS phases of the screening process and do not receive benefits within ten years of initial application. "All New Beneficiaries" in this table refer to all applicants who are eventually awarded benefits (either in the DDS phases or at the hearings level).

Source: 1% Files of Social Security administrative data (see text).

Table 3: Predicted Employment of New Beneficiaries Based on Employment of Rejected Applicants at Population Characteristics of New Beneficiaries and At Constant Population Characteristics Over Time, Men Age 30-64

Year of Application	Male Workers Age 45-64 at Application				Male Workers Age 30-44 at Application			
	1982	1987	1992	1997	1982	1987	1992	1997
(1) Employment, Rejected Applicants	40.4	48.1	44.8	52.6	59.8	70.9	59.7	69.6
(2) Predicted Employment, Reweighted by Age-Shares	38.9	46.9	42.2	51.1	59.8	70.8	59.4	69.2
(3) <i>Predicted Employment, Constant Age-Shares</i>	<i>38.9</i>	<i>46.8</i>	<i>41.3</i>	<i>50.0</i>	<i>59.8</i>	<i>70.8</i>	<i>59.5</i>	<i>69.9</i>
(4) Predicted Employment Rejected Beneficiary, Reweighted by Age-Impairment-Shares	--	48.5	41.4	52.0	--	73.9	53.5	61.0
(5) <i>Predicted Employment, Constant Age-Impairment Shares</i>	--	<i>48.6</i>	<i>40.0</i>	<i>50.5</i>	--	<i>73.8</i>	<i>60.5</i>	<i>62.7</i>
(6) Predicted Employment Allowed, Reweighted by Age-Earnings-Shares	44.6	48.9	45.1	54.9	61.8	71.6	61.4	71.8
(7) <i>Predicted Employment, Constant Age-Earnings Shares</i>	<i>44.6</i>	<i>49.4</i>	<i>44.4</i>	<i>53.0</i>	<i>61.8</i>	<i>72.4</i>	<i>62.8</i>	<i>72.6</i>
(8) Predicted Employment, Reweighted by Age-Earnings-Impairment Shares	--	38.1	38.2	48.3	--	58.1	43.8	53.2
(9) <i>Predicted Employment, Constant Age-Earnings-Impairment Shares</i>	--	<i>38.4</i>	<i>38.5</i>	<i>47.0</i>	--	<i>58.5</i>	<i>46.5</i>	<i>53.8</i>

Notes: Employment in the first row is employment in the second year after application of rejected applicants to DI. The following rows reweight employment of different groups of rejected applicants by the share of the corresponding group among new beneficiaries. The groups are five age-groups in rows 2 and 3; five age groups interacted with 14 impairment groups in rows 4 and 5; five age groups interacted with 4 earnings groups in rows 6 and 7; and five age groups interacted with 4 earnings groups and 14 impairment groups in rows 8 and 9. These weighted averages are recalculated holding the value of the shares constant at their 1982 level in rows 3, 5, 7, and 9 (shown in italics). Shares of new beneficiaries refer to shares of new beneficiaries allowed at the DDS level.

Source: 1% Files of Social Security administrative data (see text).

Appendix Table 1: Employment and Earnings Differences Before and After Application to SSDI Relative to Non-Applicants, Effects for Initially Allowed Beneficiaries and Rejected Applicants, Alternative Age-Groups

Age-Group	Men Age 45-64						Men Age 30-44					
	1982-1987		1987-1992		1992-1997		1982-1987		1987-1992		1992-1997	
Application Years	Rejected Applicants	DDS-level Allowed Beneficiary	Rejected Applicants	DDS-level Allowed Beneficiary	Rejected Applicants	DDS-level Allowed Beneficiary	Rejected Applicants	DDS-level Allowed Beneficiary	Rejected Applicants	DDS-level Allowed Beneficiary	Rejected Applicants	DDS-level Allowed Beneficiary
A. Employment												
Baseline Difference vs. Non-Applicants	0.089 (0.033)	0.043 (0.024)	0.061 (0.026)	0.041 (0.015)	0.090 (0.022)	0.056 (0.014)	0.055 (0.007)	0.050 (0.007)	0.061 (0.007)	0.052 (0.005)	0.068 (0.005)	0.049 (0.005)
Dip Before Application	0.013 (0.009)	0.025 (0.007)	0.019 (0.007)	0.028 (0.005)	0.003 (0.006)	0.025 (0.004)	0.016 (0.002)	0.028 (0.002)	0.016 (0.002)	0.024 (0.002)	0.017 (0.002)	0.025 (0.002)
Drop at Application	-0.162 (0.037)	-0.633 (0.026)	-0.212 (0.032)	-0.565 (0.022)	-0.227 (0.025)	-0.616 (0.019)	-0.098 (0.008)	-0.526 (0.011)	-0.131 (0.007)	-0.567 (0.010)	-0.097 (0.007)	-0.549 (0.009)
Recovery After Application	0.005 (0.008)	0.005 (0.005)	-0.005 (0.006)	-0.005 (0.004)	-0.001 (0.005)	-0.008 (0.004)	-0.004 (0.001)	-0.001 (0.002)	0.000 (0.001)	-0.004 (0.002)	-0.002 (0.001)	-0.002 (0.002)
B. Annual Earnings (\$1000)												
Baseline Difference vs. Non-Applicants	-0.952 (1.196)	2.404 (1.304)	0.199 (0.821)	-0.169 (0.558)	-0.019 (0.589)	-0.299 (0.552)	0.230 (0.230)	0.565 (0.244)	0.018 (0.141)	-0.068 (0.152)	0.065 (0.133)	0.139 (0.185)
Dip Before Application	0.036 (0.283)	-0.310 (0.355)	-0.747 (0.220)	-0.367 (0.243)	-1.007 (0.199)	-0.283 (0.174)	-0.552 (0.074)	-0.306 (0.076)	-0.982 (0.074)	-0.569 (0.080)	-0.536 (0.056)	-0.136 (0.062)
Drop at Application	-12.202 (1.638)	-28.826 (1.915)	-11.834 (1.035)	-24.380 (1.383)	-17.050 (1.530)	-29.292 (1.784)	-12.675 (0.561)	-23.310 (0.851)	-13.549 (0.534)	-23.187 (0.901)	-12.380 (0.604)	-22.626 (0.995)
Recovery After Application	0.484 (0.336)	0.643 (0.351)	-0.306 (0.203)	-0.010 (0.262)	-0.146 (0.289)	-0.391 (0.351)	-0.226 (0.105)	-0.237 (0.156)	-0.267 (0.099)	-0.672 (0.167)	-0.159 (0.117)	-0.539 (0.212)

Notes: Authors' calculations from 1% Files of Social Security administrative data (see text). The sample consists of non-applicants, finally rejected applicants, and applicants who were awarded benefits during the DDS stages (see text). For definitions of baseline, dip, drop, and recovery see equation (2) in the text. The full model includes a quartic in age, and a quartic in average earnings in the four years prior to the base year; in addition, the model includes year effects interacted with ten dummies for earnings class prior to application and twelve industry dummies. Standard errors clustered at the year-earnings class-industry level are in parentheses.