The Employment Effects of Social Security Disability Insurance in the Past 25 Years: A Study of Rejected Applicants Using Administrative Data

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Abstract

We use administrative longitudinal data on earnings, impairment, and mortality to replicate and extend Bound's seminal study of rejected applicants to federal Disability Insurance (DI). We confirm Bound's main result that rejected older male applicants do not exhibit substantial labor force participation. We show this result is stable over time, robust to more narrow control groups, and similar within gender, impairment, industry, and earnings groups. However, we also find that younger rejected applicants have substantial employment after application. To what extent this translates into potential employment for new beneficiaries depends on which group among them is considered "on the margin" of receiving DI. If we use initially rejected applicants – a large and growing fraction of new beneficiaries – the resulting counterfactual employment rate for younger applicants is low, too. We also find that rejected applicants bear signs of economically induced applicants. DI appears to induce a growing number of less successful workers to apply, an important fraction of which ends up without benefits and non-employed.

1. Introduction

There have been large and continuing increases in the number of individuals receiving federal Social Security Disability Insurance (DI) since the system was conceived in its current form in the 1950s and 1960s. During the same period, labor force participation of older and lower-skilled men has fallen steadily, with a slow-down only in the 1990s. These parallel developments have led to the recurring questions of whether the generosity of DI induces low-income workers to apply for and sometimes receive benefits, and whether these individuals would work in the absence of DI.[1] 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, Bound (1989) found that the employment rate of older male rejected DI applicants was quite low.[2] This suggests few new beneficiaries would be expected to work in the absence of DI.

Since Bound's seminal analysis, the federal DI system has undergone significant changes. Reforms of the process of determination of eligibility starting with the 1984 Amendments have made the screening process more favorable to applicants and made the system more accessible for individuals suffering mental health conditions. During the same period, the labor market prospects of low-skilled workers have declined. Partly as a

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[1] See, e.g., Bound and Burkhauser (1999) for a description of the trends in disability, DI receipt, and labor force participation, as well as a summary of the main recurring themes of the literature.
[2] Bound (1989) focuses on male applicants age 45-64 since this constituted the majority of applicants in the 1970s.

result of these changes, the number of new beneficiaries has increased rapidly during the 1980s and 1990s; applicants and new beneficiaries have become younger, healthier, and more likely to suffer from back pain and mental health problems (e.g., Duggan and Imberman 2006). Similarly, we show that average earnings of applicants have fallen, especially during the mid-1980s. The question as to whether workers are induced to apply to DI because of economic conditions and perhaps leave the labor force as a result is thus more pressing than ever (e.g., Autor and Duggan 2006). However, the increasing heterogeneity within the group of applicants makes it more difficult to find an appropriate counterfactual for potential employment behavior of new beneficiaries. Similarly, the changing composition of applicants and the shifts in the DI system imply the original analysis by Bound (1989) needs to be updated.

In this paper, we replicate Bound's analysis for older male DI applicants for the 1980s and 1990s and extend it to encompass younger workers and women. We merge several administrative data sources providing us with detailed longitudinal information on earnings, impairments, and mortality of new DI beneficiaries, rejected DI applicants, and non-applicants covering the period from 1978 to 2004. The data allow us to deepen Bound's original analysis in several ways; we can assess whether our main comparison is robust to using workers with very similar characteristics to generate counterfactuals; we can study differences by key groups (e.g., impairment groups); and we can analyze earnings and employment dynamics before and after application. Access to administrative data also leads us to exploit institutional features of the application process to provide a tighter bound on labor force participation in the spirit of Bound (1989).

Our results confirm Bound's (1989) finding that rejected male applicants age 45-64 have weak labor force attachment; in fact, despite differences in the nature of the data, for the early 1980s our numbers are very similar to his. This finding is very stable over time despite large changes in the DI system. It also holds for female applicants and within impairment, industry, or earnings groups. Similarly, it is not altered when we control for the systematic ex-ante differences between new beneficiaries and rejected applicants that we find. If we were to use employment of rejected applicants as an upper bound, we would predict little labor force attachment in the absence of DI for the traditionally largest group of beneficiaries.

We also find that younger rejected applicants, whether male or female, continue to have reduced but substantial labor force attachment after application to DI. Again, this result is stable over time and very robust across sub-groups. Since the average age of applicants and new beneficiaries has been declining over time, this finding has potentially important implications. To assess how high implied potential employment rates for younger new beneficiaries are, we can use our data to isolate the fraction of new beneficiaries whose application was initially rejected and use it as estimate of beneficiaries who were "on the margin" between receiving and not receiving DI.

A large and increasing fraction of applicants who are initially rejected in the administrative adjudication of their claim is later awarded benefits through judicial review. The loss in earnings potential and health condition of these applicants is not deemed to be sufficiently strong during the initial screening of their case. We show that the mortality rate of these new beneficiaries is very similar to that of finally rejected applicants and much lower than immediately accepted new beneficiaries. We argue it is

this group to which the counterfactual employment behavior of rejected applicants is most likely to apply. If we apply Bound's counterfactual to the fraction of those new beneficiaries who were initially rejected, the potential employment rate of new beneficiaries is on the lower side for younger individuals as well.

Last, we find that the rejected applicants and to some extent initially rejected new beneficiaries bear some signs of workers who have been induced to apply to DI because of worsening economic conditions. The average earnings prior to application of both of these groups has been declining, especially in the early to mid 1980s; we also find average pre-application earnings and employment of rejected applicants is considerably lower than that of new beneficiaries; this gap widens significantly in the years just prior to application, especially for older applicants.

These findings contribute to two questions that have motivated an important and growing literature. First, our results speak to the question of whether a substantial fraction of new beneficiaries would be in the labor force in the absence of DI. We significantly extend Bound's original analysis to show that his results for older male applicants are stable over time, robust to the use of much more detailed control groups, and similar between impairment groups. However, we also show that the changing decomposition of DI applicants is likely to change Bound's original conclusion that DI is unlikely to reduce labor force participation. This answer will depend on potential employment behavior of younger new beneficiaries, and which among these are deemed more likely to be "on the margin" of working.

Second, our findings confirm that DI appears to induce some workers to apply because of adverse economic conditions (e.g., Stapleton and Rupp 1995, Autor and

Duggan 2003). We are the first to study pre-application employment and earnings dynamics to show that rejected applicants bear characteristics of workers with difficult labor market status. Our results suggest for male applicants of all ages this pattern became stronger in the mid 1980s. Among new beneficiaries, especially those initially rejected but later allowed appear to be increasingly less economically successful and healthier. To better understand the labor market effects of federal DI, further examination of these groups is likely to yield important insights.

The outline of the paper is as follows. In the next section, we analyze employment and earnings of rejected older male DI applicants and contrast it to that of non-applicants; we first compare our results to that of Bound (1989), and then study the evolution of employment before and after application and over time; we also compare workers with very similar prior employment histories to assess the robustness of the results to pre-application differences in employment and earnings. In the third section, we replicate these results for younger workers and for women. In the fourth section, we study different earnings, industry, and impairment groups. In the fifth section, we analyze characteristics of initially rejected new beneficiaries. We then use these workers to present alternative counterfactual employment rates. The last section concludes.

2.   Employment and Earnings of DI Applicants from 1978 to 2004 – Older Men

To study the economic outcomes of applicants to 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 application (such as age, gender, education and impairment of the applicant) as well as information on the decision up to

the reconsideration phase.[3] Since many applications are decided in later stages of the

decision process, to obtain information on whether applicants actually received DI, we

merged on final benefit receipt from SSA's Master Beneficiary Record (MBR).[4] This

allows us to identify applicants who were awarded benefits immediately, those whose

claims were finally rejected, and those who were initially rejected but eventually received

benefits. Since the application status of the first two applicant groups is relatively

unambiguous, we will limit our main analysis to initialyl allowed (termed "new

beneficiaries") and finally rejected applicants.[5] We will return to the intermediate group

below.[6]

The information on employment and earnings we use is derived from uncapped

annual salaries recorded on workers' W-2s and contained in SSA's Master Earnings File

(MEF). A worker is called employed if he or she has any positive earnings in a given

calendar year. This is likely to understate employment, since we miss non-W-2 sources of

labor income, chiefly self-employment income.[7] In Table 1, we use the merge between

different administrative data sets to replicate as closely as possible the main table of

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[3] The 831 File only contains information on all new applications to DI; there is no information on repeated applications or applications decided in the judicial part of the review process.

[4] The so-called 831 File was merged to the MBR, the 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 (2007a).

[5] This classification of rejected applicants comes close to that used by Bound (1989); he classifies as new beneficiaries individuals that are receiving DI benefits, and as rejected applicants those reporting to have at some point applied and that are currently not receiving benefits (see his footnote 12). Since on average workers in his data have applied to DI four years prior to the survey, the majority of rejected applicants are likely to be final rejections.

[6] Unfortunately, we do not know at which stage beyond the administrative reconsideration stage an initially rejected applicant eventually got awarded benefits; similarly, we do not know at which stage a denied applicant accepted the rejection. We define an application to be "rejected" if a worker does not receive benefits within ten years of his first application. For those rejected initially, we do not know whether they appealed their decision in the judicial phase of the reconsideration or whether they reapplied. Some of initially rejected applicants may thus return to work prior to reapplication.

[7] For a detailed discussion of earnings information from the Master Earnings File see Kopzcuk, Saez, and Song (2007).

Bound's (1989) seminal analysis (his Table 2). The first columns of Table 1 show our employment measure for workers applying to DI in 1982. To be comparable with Bound, we limit ourselves to male applicants age 45 to 64 in 1982. The table also shows our measure of employment for a 0.2% random sample of male workers in the same age range drawn from the MEF.[8] 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.[9] These numbers are of similar magnitude as the fraction of rejected applicants that were found working in Bound's study.[10]

In addition to employment, Table 1 also shows average annual earnings and median positive earnings for rejected applicants. Median earnings of rejected applicants are an order of magnitude lower than that of non-applicants. As we will see below, this is in part due to significant earnings differences existing prior to application. However, the

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[8] We restricted applicants and non-applicants to be insured by DI. In addition, to ensure a minimal attachment to the labor force (chiefly for the non-applicants), we required all workers to have any amount positive earnings at least once in 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 to have a minimal amount of information on earnings prior to application. This also avoids using the MEF years 1978-1980 too heavily in our analysis, which have a high fraction of imputed values (see Kopzcuk, Saez, and Song 2007).

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

[10] 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.

earnings loss for rejected applicants during application is still very high. Two years before to two years after application, the difference in average earnings is between 40% and 50% (not taking into account earnings trends for non-applicants).[11] The low earnings and large earnings losses confirm the results in Bound (1989) that rejected older male DI applicants have a low degree of labor force attachment, especially relative to non-applicants. The non-trivial amount of employment among initially denied new beneficiaries fades and is likely to be due to our way of dating DI receipt (see the last section and Appendix figure 6).

In keeping with Bound (1989)'s main table, Table 1 also reports limited information on demographics available from the administrative data. Median age of rejected applicants is 55 years, slightly younger than new beneficiaries and older than non-applicants. Rejected applicants are more likely to be non-white, and less educated (available only starting in 1987).[12] As discussed at the outset, glancing across columns, the table confirms that from 1982 to 1992 applicants have become younger and are increasingly more likely to be non-white. This holds for all applicants, but also within the group of older men.

The administrative data do not contain information on the health status of applicants. However, we were able to merge individuals' date of death from the

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[11] See Figure 3 for average earnings including zeros, and Appendix figure 4 for the median of positive 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. The same figure 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 (2007a). 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.

[12] Information on education is available only for DI applicants from the 831 file.

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Numident file maintained by the Social Security Administration.[13] 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 a little less

than double 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 they are in much

better health than new beneficiaries, among whom a large fraction dies within four years

of application. The annual mortality rate of rejected applicants increases smoothly with

age.[14] Glancing across columns, the table confirms evidence that mortality rates of

applicants have been falling over time, especially in the 1990s.

The difference in mortality between allowed and denied applicants can be

attributed in part to differences in the distribution of impairments recorded on the DI

application. In Table 1, we grouped and listed 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.[15] The majority of

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[13] 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).

[14] The difference in annual mortality rates between new beneficiaries and rejected applicants is high in the first five to six years after application and then fades (see Figure 6). As a benchmark, the annual mortality rates for male workers in Pennsylvania age 55 born around 1930 with stable attachment to the labor force from 1974 to 1979 is about 1% (von Wachter and Sullivan 2007). Over three years (from 1982 to 1984) this leads to a cumulated death rate of 3%. This is a bit lower than what we see in the first column of Table 1 for non-applicants with much weaker labor force attachment (whose average age is 54.6), but within the same ballpark.

[15] 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.

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 neoplasms (e.g., cancer). Rejected applicants are much less likely to have cancer or circulatory problems, two impairments with high mortality rates. As further discussed below, beneficiaries that who initially denied are much more likely to have musculoskeletal conditions than applicants awarded benefits immediately, leading them to have much lower mortality rates as well.

Overall, a highly similar picture emerges for older men applying to DI in 1982 as found in 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, are younger, and are 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 potential behavior of new beneficiaries in the absence of DI, their predicted labor force attachment would be at best weak.

However, as discussed at the outset, since the late 1970s there have been strong changes in the administration and rules governing federal DI; during the same time, the number of older men applying to DI has increased (Figure 1, Panel A), and they have become younger and healthier.[16] Using the longitudinal nature of our data we can also show that they have become poorer over time. Figure 2 (Panel A) displays average annual earnings in the five years before application for all applicants, all new

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[16] Figure 1 displays the number of applicants, all new beneficiaries, and finally rejected applicants in our sample for men by age-group; the corresponding numbers for women are shown in Appendix Figure 3. Note that Figure 1 and 2 display age up until 54 for the older age-groups instead of age 64; the pattern are very similar once the older age-group is included (the figures were being generated when the working paper went into press for the RRC conference).

beneficiaries, and finally rejected applicants. With the exception of a rebound during the DI retrenchment in the early 1980s, average earnings of DI applicants and in particular of rejected applicants has declined in the early to mid-1980s. It is natural to ask whether these changes in characteristics have had an impact on the employment behavior of rejected DI applicants.

Table 1 shows our measures of employment and earnings after application for male applicants age 45-64 in 1987 and in 1992. The table suggests at best minor changes in the fraction of rejected applicants with any or minimal annual earnings that may be well be attributable to fluctuations in single calendar years. Median earnings of rejected applicants have declined from 1982 to 1987, and have since then remained essentially unchanged. The change is likely to correspond to the general trend in average pre-application earnings of rejected applicants noted in Figure 2, rather than reflecting a significant change in post-application labor force attachment. The *change* in employment and earnings at application has remained stable over time.

To abstract from fluctuations in single years and to show the entire dynamic pattern of employment and earnings before and after application, Figure 3 displays the evolution of average labor force attachment for workers applying in 1982-1987, 1987-1992, and 1992-1997, respectively.[17] Panels A and B focus on older men and contain several important results. First, averaging over multiple application cohorts confirms a low degree of employment and earnings for rejected applicants; at best, it appears

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[17] Again, we focus only on applicants that were either awarded benefits immediately or finally rejected, postponing the discussion of the more ambiguous initially rejected beneficiaries. 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 2007a). This implies the actual age at application lies above the stated age-ranges. Replicating the figures with age at application gives very similar results.

evidence from single years in Table 1 tends to overstate participation. Second, employment and earnings after rejection are surprisingly stable over time. The most apparent change is the reduction in pre-application earnings of denied DI applicants we already noted in Figure 2.[18] With this exception, employment and earnings of new beneficiaries and rejected applicants have remained virtually unchanged, at least since the early 1980s. The evidence in Bound suggests the pattern was similar in the late 1970s as well.

Another important result of Figure 3 is the dynamic pattern before and after application. Employment and earnings of rejected applicants are lower than that of new beneficiaries prior to application; these workers seem to be less successful in the labor market to begin with. This impression is strengthened when we consider the evolution of earnings and employment before application. Rejected applicants experience particular declines in earnings and employment around the year of application. However, the gap between new beneficiaries and rejected applicants begins to widen three to four years prior to application in what appears to be a significant pre-application dip in labor market success. Almost two thirds of the decline in earnings appears to be completed prior to application. Employment and earnings for new beneficiaries falls very steeply around application (though some early trend in earnings is apparent for new beneficiaries as well).[19]

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[18] More variability in earnings 8 to 5 years prior to application is to be expected, since for these years we have fewer observations.

[19] A small part of the pattern in Figure 3 can be attributable to aging and an overall economic trend. We will control for age and year effects in revision of this paper (for preliminary results see von Wachter, Song, and Manchester 2007a). There, we also discuss statistical significance of the displayed dynamic pattern.

The differences in pre-application employment and earnings observed in Figures 1 and 3 raise the question of whether we are comparing apples and oranges. Rejected applicants may face very different labor market prospects than new beneficiaries prior to application; in this case, their employment experience after application may be less relevant as a counterfactual for potential employment patterns of new beneficiaries. One way to address the question to what extent the patterns in Table 1 and Figure 3 are driven by pre-application differences is to compare rejected applicants and new beneficiaries with similar employment histories. Within a more narrow group, rejected applicants are more likely to yield a relevant counterfactual or upper bound for the behavior of new beneficiaries.

Figure 4 shows the evolution of employment and earnings for allowed and denied DI applicants who were employed at the same employer in the four years prior to the respective base period (e.g., for 1982, we required stable employment from 1978 to 1981, etc.).[20] For these workers, initial employment rates are close to 100% by construction. Yet, even among this stable group of workers, rejected applicants experience a stronger dip in employment prior to application than new beneficiaries (Panel A). Similarly, employment rates post-application are again quite low. Annual earnings prior to application are now similar (Panel B). Both groups experience a small pre-application decline in earnings; however, post-application earnings of rejected applicants are as low

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[20] The MEF contains the Employer Identification Number (EIN) for each earnings amount recorded on the workers' W-2. We chose the EIN from which a worker had the most earnings in any given year as the main EIN, and classified workers as 'stable' if this EIN did not change in the four years prior to the relevant base period. Some slippage arises for workers temporarily switching employers or for multiple job holders, but correcting for such patterns affects job mobility rates only marginally (Von Wachter, Song, and Manchester 2007b). Appendix Figure 2 shows the fraction of so-defined 'stable' workers among all denied and allowed DI applicants over time for our three baseline periods. As expected, new beneficiaries are more likely to have been employed at the same firm prior to the base period. There is no strong time trend apparent from the figure, though a slight age-gradient is apparent.

as for the full sample (Figure 3). As a result, rejected applicants with stable prior employment experience much larger losses in earnings; we will return to this point when we analyze high-wage or manufacturing workers in Section 4.

Overall, we believe it is fair to summarize our results for older male applicants to DI as follows:

(1) rejected applicants do work, but little and at low earnings;

(2) these patterns have been stable for applicants in years 1982 to 1997;

(3) there is a pre-application dip in employment for rejected applicants, and a smaller pre-application decline for earnings;

(4) the patterns we find do not appear to be driven by heterogeneity among allowed and denied applicants, but hold within more narrow groups of workers.

The evidence presented here is supportive of Bound's (1989) original assessment of the work behavior of rejected DI applicants. If we follow Bound's claim that employment of denied applicants represents an upper bound for that of new beneficiaries, it appears unlikely that a majority of older male beneficiaries – the traditional target group for DI –would work in the absence of DI. However, our results also suggest that rejected applicants are worse off economically to begin with, and particularly so in the period immediately prior to application. With respect to our initial questions, it appears that a) it is unlikely that DI strongly reduces labor force participation among older men; and b), it is likely that DI attracts applications from workers in difficult economic times, thereby distorting incentives. The evidence presented here suggests that a substantial fraction may be screened out at application.

However, any assessment of DI based on older men must remain partial because of an increasing fraction of younger and female applicants. Even within the group of older workers, we are comparing individuals with very different impairments and labor force histories, raising the question of whether a statement based on the average rejected applicant is meaningful. We turn to these questions in Sections 3 and 4.

3.   The Employment Behavior of Rejected Younger and Female DI Applicants

Applicants and beneficiaries have become progressively younger over time; from Table 1, the share of men ages 30-44 among men above 30 doubled from 1982 to 1992, and has increased further since then (Appendix Figure 2). 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, they were about 55% in 1992. Thus, especially when studying employment of denied applicants, one has to include younger workers.

Table 2 replicates Table 1 for men age 30-44; the lower panels of Figure 3 show the dynamic pattern of employment and earnings.[21] The numbers in the table and figure imply the following findings; (1) the employment rate of rejected applicants after application is 50-60%, down from 70-80% prior to application; (2) pre-application earnings of rejected applicants are lower than that of new beneficiaries, especially since the mid-1980s; (3) compared to pre-application earnings, average earnings after application and rejection decline; however, they remain considerably higher than that of older rejected applicants; (4) there is a clear widening of the gap between allowed and

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[21] The choice of age 30 as a cut-off was mainly to ensure that we have a significant number of pre-application years to measure employment and to ensure that the majority of workers is covered by DI.

denied applicants in pre-application employment (and somewhat for earnings); (5) these patterns are very stable over time, again with the exception of a drop in average earnings of rejected applicants in the mid-1980s (see also Figure 2, Panel B).

Since the comparison among all younger allowed and denied applicants to DI may be difficult due to differential pre-earnings trends, we again replicated the pattern for workers with strong labor force attachment prior to application (Figure 4). While employment post-application for rejected applicants remains higher than for the full sample (70-80%), the decline in earnings is now larger.[22] While there is an apparent rebound in earnings in the years after application, it is partly due to a positive age-gradient common to all workers. The evolution of employment and earnings prior to application is now more similar, with less of a pre-application gap between groups. Again, with the noted exception the pattern are very stable over time.

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

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[22] If we only consider the median of positive earnings, workers in the full sample experience a full recovery, whereas those in the 'stable' sample suffer a loss of about 25-30% (see Appendix figure 4). However, this does not take into account counterfactual increases in earnings due to a common positive age-gradient.

The fraction of female applicants in our sample has increased steadily from 35% in the late 1970s to about 50% in the late 1990s (Appendix Figure 2). This increase mirrors a continuing increase in female labor force participation, leading to wider DI coverage among women. Female applicants may differ from men in a variety of ways, including their labor force history prior to application and the options they face in the labor market after an unsuccessful application to DI. Table 3 and 4 and Figure 5 replicate our analysis for older and younger women.

The analysis of women further helps to draw a consistent pattern of employment and earnings of allowed and denied DI applicants during the period under study. Our results are best summarized considering Figure 5. First, rejected female applicants age 45-64 have low post-application employment and earnings (Panels A and B). Second, for older applicants there is a widening gap in employment and earnings between new beneficiaries and rejected applicants prior to application. Third, female applicants age 30-44 maintain a substantial amount of employment after rejection, albeit at reduced earnings. Though earnings are low, they are non-negligible, especially for those with positive earnings. Fourth, the patterns just described are very stable over time. It is worth noting that in contrast to men, rejected female applicants have not experienced a decline in earnings in the early to mid 1980s.[23]

Overall, our analysis confirms results in Bound (1989) regarding a limited labor force attachment for older DI applicants. However, a considerable fraction of younger male and female applicants continue to work. We also find that rejected applicants have

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[23] This pattern, shown in Appendix Figure 3 (Panels C and D), is perhaps not surprising given increasing participation of women during this period (automatically increasing average earnings in the years prior to application). An increase in the gap between rejected female applicants and new beneficiaries starts to appear in the 1990s.

lower pre-application employment and earnings, especially in the years prior to application. It appears that economically less successful male and female workers are drawn to DI.

4. Employment and Earnings of Rejected DI Applicants by Earnings Class, Industry, and Impairment Group

Tables 1-4 reveal considerable heterogeneity among DI applicants. If this translates into different earnings after application, rejected applicants as a group may not yield a meaningful counterfactual for employment behavior. Similarly, it would be helpful to know whether there are exceptions to the general employment and earnings pattern we just described, or whether they are dominated by any particular sub-group of applicants. For this purpose, we exploited the sample size of our administrative data and replicated our analysis for several relevant sub-groups.[24]

The first sub-groups we considered were workers whose average annual earnings in the four year prior to the relevant baseline (1982, 1987, or 1992) were above or below the median. This is interesting because low-wage workers face higher replacement rates from DI, and lack of labor market opportunities is itself a criterion in the adjudication of DI claims. Figure 7 and Table 5 show earnings and employment before and after application for males; for ease of exposition, we take averages over application years spanning 1982 to 1997.[25] Considering Figure 7, we find that among rejected applicants, low-earners experience a larger pre-application decline in employment and earnings,

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[24] For the sake of brevity we limit our discussion to men. The patterns for women are summarized in Table 6.

[25] We take the average over application years 1982-1997, weighted by the group size. We have analyzed our three groups of application years separately as well, finding again that the pattern is stable over time. The only exception is an increase of employment and earnings for both groups in 1992-97.

especially for older men. On the other hand, rejected high-earners lose part of their earnings-premium vis-à-vis low-earners (all of it for older men). These patterns confirm that low-earning applicants may be driven to DI because of their economic situation. We also find that for both groups, labor force attachment of rejected applicants is quite low for older men, and reduced but non-negligible for younger men. This confirms that the patterns found in the main section are not driven by applicants coming from a particular range of the income distribution.

Figure 8 shows the evolution employment and earnings for male applicants whose main employment prior to application to DI was in manufacturing or services.[26] The comparison is relevant because manufacturing is a traditionally high-wage sector with declining employment and used to be a employer of middle- and lower-skilled older men. Employment in the service sector has been growing, partly absorbing low-skill employment at lower wages. Despite these differences, the patterns are surprisingly similar between these sectors, and similar to what we found in the main analysis. Employment before and after application is largely the same; it falls more strongly prior to application for rejected applicants, and is low for older and non-negligible for younger rejected applicants after application. As expected, earnings levels prior to application are higher for both allowed and denied applicants coming from manufacturing; again, this results in considerably larger earnings losses for high-wage applicants after an unsuccessful application. The overall picture is one of similarity between applicants from

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[26] The classification we use is 1-digit 1980 Standard Industry Code (SIC). We analyzed the industry distribution among allowed and denied applicants and its evolution over time, and did not find noticeable differences or changes at the 1-digit level.

the two main industry groups, independently of whether we consider older or younger applicants.[27]

Perhaps the most interesting comparison is between applicants in different impairment groups; the current sample includes applicants whose different impairments suggest very different potential labor force attachment. For example, average health and ability to work may differ significantly between rejected applicants whose primary impairment was mental health or circulatory conditions. Similarly, adjudication of the severity of disability and a worker's potential gainful activity is much clearer in some groups (e.g., neoplasms) than in others (e.g., musculoskeletal conditions). This is reflected in the rejection rate and the rate at which rejected workers appeal, and is likely to have an impact on the average type of rejected claimants. How these different factors influence labor force attachment is hard to predict ex-ante.[28]

Figures 9 and 10 display the development of earnings and employment for male applicants in the most relevant impairment classes; Table 5 presents corresponding summary statistics. Figure 9 shows patterns for applicants with mental health and musculoskeletal conditions, the two most common impairments for all age-groups. Figure 10 shows the most common age-specific impairments – neoplasms and circulatory system for older applicants, injuries and circulatory system conditions for younger applicants.

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[27] We have analyzed changes over time as well without finding noticeable differences. This of course does not imply there may be important developments in more narrowly defined industries during particular time periods (e.g., Black, Daniel, and Sanders 2002).
[28] On the one hand, those applicants rejected in an easy-to-screen impairment class such as neoplasms should be of better health than workers in hard-to-screen impairments (where the probability of mistake is higher); on the other hand, workers in the latter group might be more healthy to begin with, and the uncertainty in the screening process might further attract applications from healthier individuals.

To summarize, all the main patterns we have found so far are replicated within impairment classes. Especially among older applicants, the behavior of both allowed and rejected applicants between impairment codes is surprisingly similar, with at best nuanced differences. For younger applicants, we see some differences in overall earnings levels as might be expected; for example, rejected applicants with mental health conditions have lower average employment and earnings before and after application than applicants with musculoskeletal conditions (Figure 9, Panel D). Similarly, denied workers applying to DI because of an injury fare better after application than, say, workers applying because of conditions affecting the circulatory system.

One of the factors behind reductions in employment after an unsuccessful application to DI may be the health status of rejected applicants. On average rejected applicants have substantially lower mortality rates after application than new beneficiaries, but higher mortality rates than non-applicants (Figure 6). However, this difference is unlikely to be large enough to explain employment gaps between rejected applicants and the overall population. Table 7 shows that there are some important differences in mortality by impairment class. On average, impairment groups with lower mortality tend to have somewhat higher employment rates. However, the magnitude of the employment decline appears too large and too uniform across impairment groups to be explained by differential declines in health status. Instead, it is likely that once applicants have left the labor force to satisfy the work requirement of a DI application, an important fraction never returns to work.

5.   The Characteristics of Initially Rejected New Beneficiaries

A large and growing fraction of individuals whose applications are initially rejected during the administrative phase of the disability review process are awarded benefits during the judicial review of their cases.[29] These are workers whose disability neither corresponds exactly nor is equivalent to a list of common impairments; they are also deemed to be able to find equivalent pre-disability employment during the initial screening. It is thus natural to ask whether these beneficiaries would be more likely to work in the absence of DI. In particular, finally rejected applicants might constitute a better counterfactual for these beneficiaries, since they can be more rightly considered "on the margin" of receiving DI or not. This section briefly discusses the characteristics of these "reversed" applicants, and discusses how they can be used to construct counterfactual employment figures for disability beneficiaries.

Tables 1 through 4 show that initially denied new beneficiaries have much lower mortality rates than immediately allowed beneficiaries. Indeed, their mortality is much closer to (and sometimes lower than) that of rejected applicants. This derives partly from the fact that a high fraction applies for DI because of conditions affecting the musculoskeletal system. In fact, the majority of new beneficiaries with musculoskeletal conditions are initially rejected (e.g., Table 1). Appendix figure 5 shows that "reversals" have somewhat lower average earnings prior to application than regular new beneficiaries, especially during the 1990s. Yet, their earnings are always higher than that of finally rejected applicants. Similarly, their employment and earnings do not dip prior

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[29] The fraction of initially denied new beneficiaries was 30% (40%) for 30-44 (45-54) year old men in the early 1980s, and 40% (60%) from the late 1980s onwards (Appendix figure 5). The current figures for the older age group do not include 55-64 year olds, but the pattern including older workers are very similar (the figures were being generated when the working paper went into press for the RRC conference).

to application as in the case of rejected applicants (Appendix figure 6). Initially rejected new beneficiaries look more like regular new beneficiaries rather than finally rejected applicants in terms of their pre-application employment dynamics.[30]

Overall, the decline in average pre-application earnings and the low post-application mortality rate suggests that some initially rejected new beneficiaries may be economically motivated. Yet, they clearly distinguish themselves from finally rejected applicants in terms of both earnings level and employment dynamics prior to application. Thus, we believe it is fair to say that while the evidence is perhaps suggestive, we cannot say we have found a smoking gun indicating that a majority of initially rejected new beneficiaries are induced to apply to DI because of economic conditions.

5.1 A Counterfactual Exercise Based on Initially Denied New Beneficiaries and Finally Rejected Applicants

Whatever the conclusion from the foregoing analysis, the fact that their applications of initially denied new beneficiaries were denied in the first stages of the disability review process implies that their health status and employment potential were deemed better than that of the typical new beneficiary. This and similar mortality rates indicate that the employment behavior of finally rejected applicants may be a better counterfactual for potential employment of initially rejected new beneficiaries than for regular new beneficiaries. Yet, if we attach at least some significance to the outcome of the judicial review, we can assume that the employment potential of the majority of initially rejected new beneficiaries is lower than that of finally rejected applicants.

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[30] For two to three years after application, their employment and earnings remain higher than that of immediately allowed new beneficiaries; this is likely to be due to the fact that our way of measuring final benefit receipt (through entries in the Master Beneficiary Record), is not able to exclude applicants who work after their first application is denied and then re-apply successfully in the course of a few years.

Based on these considerations, in the following we treat the proportion of initially rejected new beneficiaries as an estimate of the fraction of all new beneficiaries that are "on the margin" of receiving DI; it is reasonable to assume that these beneficiaries are the ones most likely to exhibit some labor force attachment in the absence of DI. To predict employment in the absence of DI, we follow Bound (1989) and use the work behavior of finally rejected applicants as an upper bound for the employment rate of this group. The counterfactual employment rate of new beneficiaries in different age or gender groups is then easily calculated as

$$\Pr\{\text{Working} \mid \text{New Beneficiary}\} \leq \\ \Pr\{\text{Working} \mid \text{Finally Rejected}\} \times \Pr\{\text{Initially Rejected} \mid \text{New Beneficiary}\}.$$

For example, according to Appendix figure 5, in the 1990s about 40% of all new beneficiaries among men age 45-54 were initially rejected. Based on this fraction and average post-application employment of rejected applicants from Figure 3, the potential employment rate for this age-group would be at most 8% (20% times 40%). For younger male applicants, the comparable fraction would be at most 21% (30% times 70%). Clearly, these numbers can be no more than approximate, not least because a proper counterfactual would take into account pre-application differences in earnings and employment. Nevertheless, this exercise gives a useful indication of the orders of magnitude involved. Overall, the predicted potential employment rates of new beneficiaries appear very low for older workers; although an order of magnitude greater, they cannot be called large for younger applicants.

An obvious drawback and limitation of this approach is that it understates employment behavior of those new beneficiaries that were immediately awarded benefits.

While these applicants were either of lower health or were deemed to not be able to pursue a substantial gainful activity, some of them may nevertheless be able to work. One approach to incorporate their employment into the counterfactual just constructed is to use the actually observed employment rate of initially awarded new beneficiaries. This is likely constitutes a *lower* bound of these beneficiaries' work potential.

$$\Pr\{\text{Working} \mid \text{New Beneficiary}\} \leq$$
$$\Pr\{\text{Working} \mid \text{Finally Rejected}\} \times \Pr\{\text{Initially Rejected} \mid \text{New Beneficiary}\}$$
$$+ \Pr\{\text{Working} \mid \text{Initially Accepted}\} \times \Pr\{\text{Initially Accepted} \mid \text{New Beneficiary}\}$$

Again eyeballing Figure 3, we would obtain as counterfactual employment rates

$$\text{Men Age 45-64: } (20\% * 40\%) + (10\% * 60\%) = 8\% + 6.0\% = 14\%$$

$$\text{Men Age 30-44: } (30\% * 70\%) + (20\% * 30\%) = 21\% + 6.0\% = 27\%$$

These numbers are higher than what we had before, but still relatively low. Given our treatment of initially awarded beneficiaries, these numbers should probably be treated as lower bounds. However, they are indicative of how the approximation introduced by Bound can be affected by disaggregating the group of new beneficiaries into more specific groups about whose potential labor force status additional information is available.

There are two ways to interpret these simple counterfactuals. First, they can be viewed as counterfactual employment for new beneficiaries in the absence of the DI system altogether; this would be in the spirit of Bound's (1989) original interpretation. Such an interpretation requires that the low employment rate of rejected applicant is due to bad health or due to generally low labor market prospects, but *not* due to factors associated with the application to DI itself. A second interpretation views the

counterfactual as prediction of what would happen in the case of a rejection or termination of benefits of a new beneficiary. In this case, it does not matter what affects employment of rejected applicants; in particular, the application process itself could lower their employment prospects.

In the second case, counterfactual employment rates in the absence of DI altogether would likely be higher than what is predicted above for two reasons. First, counterfactual employment rates of new beneficiaries would probably be predicted to be higher had they never gone through the DI application process; given that the predicted fraction of new beneficiaries deemed "on the margin" is below 50% (Appendix figure 5), this is unlikely to make a very big difference.[31] Second, in this scenario in the absence of DI a higher fraction of rejected applicants would work as well. How big the effect of the application process for DI itself is on labor force participation is difficult to answer without more detailed information on health or random assignment of the decision to apply for DI.

The point of this discussion is twofold. First, because we only consider initially rejected new beneficiaries as an estimate of beneficiaries "on the margin" of working, in neither scenario is a high fraction of new beneficiaries likely to work. Due to this approach the counterfactual employment rates we presented are also lower than those implied by Bound (1989). Second, a full account of the employment effects of the DI system would benefit from a closer analysis of rejected applicants. On the one hand, it is

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[31] E.g., numbers in Figure 3 Panel B for younger male workers show that employment in prior to DI is about 85%, implying an employment rate of 25.5% (30% times 85%) in the absence of DI, an improvement of 4.5% relative to the previous counterfactual of 21%. From Panel A, for older male workers the new counterfactual upper-bound employment rate would be 36% (40% times 80%), an bigger increase vis-à-vis the initial counterfactual; however, this number does not take into account the negative age-gradient in employment rates during that period, and is still lower than Bound's original estimates.

likely that the DI application process itself imposes a significant cost on rejected workers and on society in terms of lost employment and earnings. On the other hand, it implies that the employment effects of DI could be reduced by inducing rejected applicants to return to the labor force. This may yield more cost-effective ways of limiting potential adverse effects of DI on employment rates of workers who would be in the labor force were it not for a potentially unsuccessful application to DI.

6. Conclusion

We have used administrative data comprising earnings, impairment, and mortality information for a sample of DI applicants and non-applicants covering 1978 to 2004 to replicate and extend Bound's (1989) seminal analysis of rejected DI applicants. We confirm Bound's main result that the constituency typically served by DI – men age 45-64 – does not have substantial employment after rejection. This holds independently of gender, industry, prior wage or impairment type. It also holds for workers with very similar prior employment history, and is thus unlikely to be driven by pre-application differences in earnings and employment. We also show that these patterns are very stable over time. Thus, with respect to older male applicants, Bound's original conclusion holds; it appears unlikely that their employment rate would rise significantly in the absence of federal DI.

However, our further results suggest one has to be careful not to generalize from this group to all new DI beneficiaries. An increasing fraction of DI applicants is younger than 45 and in better health. We show that these applicants maintain substantial labor force attachment after rejection, albeit at a lower rate than before application. Thus, for younger DI beneficiaries, we cannot exclude potentially substantial labor force

attachment based on rejected applicants. If rejected applicants constitute an upper bound, this bound is substantial. Yet, we have also argued that the importance of this finding depends on who among new beneficiaries is deemed as most likely to be "on the margin" between receiving and not receiving DI. In the paper, we have exploited the institutional features of the process of determination of benefit eligibility to use the fraction of new beneficiaries who were initially rejected as an estimate of such "marginal" applicants. Even though a substantial and increasing fraction of new beneficiaries had their applications rejected initially, the resulting counterfactual for labor force participation of younger new beneficiaries is again low**.**

We also found signs that economically less successful workers are drawn to apply to DI. A substantial fraction of these workers appear to be screened out during the application process; this results in rejected applicants having lower pre-application earnings and employment than new beneficiaries. The gap increases in the years prior to application, and is larger for older applicants. This evidence appears to confirm that DI leads low-wage workers to leave the labor force and apply to DI. Since rejected applicants bear considerable losses in employment and earnings, this process imposes substantial costs on these workers and on society as a whole in terms of lost output.

The large losses in average employment and earning at application that we find suggest that the application to DI in itself may be costly for workers. From a labor economics perspective, the temporary but substantial departure from the labor force that an application requires could well explain part of the substantial losses we find. In this case, using employment of rejected applicants as an upper bound makes a statement about counterfactual employment of new beneficiaries *were they rejected*, not of their

employment in the absence of DI altogether. This also implies that the exclusive focus on new beneficiaries when trying to understand the employment effects of DI may miss part of the story. Those more at risk of being drawn out of the labor force by DI are workers on the margin between receiving and not receiving DI; our finding suggests many of these applicants end up rejected and without a job.

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