THE EMPLOYMENT EFFECT OF TERMINATING DISABILITY BENEFITS

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<u>ABSTRACT</u>

While time out of work normally decreases subsequent employment, Social Security Disability Insurance (DI) may improve the health of disabled individuals and increase their ability to work. In this paper, I examine the employment of individuals who lost DI eligibility after the 1996 removal of drug and alcohol addictions as qualifying conditions. Approximately one-fifth started earning at levels that would have disqualified them for DI, an employment response that is large relative to their work histories. This response is largest for those who had received DI for 2.5-3 years, when it is 50% larger than for those who had received DI for less than one year and 30% larger than for those who had received DI for six years. A similar relationship between time on DI and the employment response is found among those whose primary disability was an addiction, mental disorder, or musculoskeletal condition, but not those with chronic conditions like heart or liver disease. The results suggest that a period of public assistance can maximize the employment of some disabled individuals.

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1. INTRODUCTION

Governments in many industrialized countries are trying to reduce the size of their disability insurance programs, and increase the employment of disabled individuals. In the United States, where six percent of 18 to 64 year olds receive federal disability payments through either Social Security Disability Insurance (DI) or Supplemental Security Income (SSI), recent efforts include providing disability beneficiaries with work incentives and employment support services through the "Ticket to Work" program, and mandating funds for medical reassessments of current beneficiaries (Social Security Administration (SSA), 2012a). In the United Kingdom, where the fraction of the working-age population receiving disability benefits is similar to the United States, reforms have resulted in reduced benefits, time limits and vocational support for beneficiaries judged capable of working (Berthoud, 2011). Many other European countries have also recently introduced policies to reduce their numbers of disability beneficiaries.[2]

Some of these policies aim to limit the number of new disability beneficiaries, while others try to return current beneficiaries to the workforce. The question of which type of policy maximizes labor force participation depends on how the work capacity of disability beneficiaries changes over time. There is widespread evidence that healthy individuals become less able to work the longer they are out of the labor force (e.g., Mincer and Ofek, 1982; Edin and Gustavsson, 2008; Kroft, Lange, and Notowidigdo, 2013).[3] This is not necessarily the case for recipients of disability insurance, however, as they receive cash and medical benefits that can improve their health (Herd, Schoeni and House, 2008; Card, Dobkin and Maestas, 2009; Finkelstein et al., 2012; Weathers and Stegman, 2012). If health improvements more than offset the skill loss and stigma associated with not working, return-to-work policies may result in higher employment than policies focused on limiting entry into disability insurance.

There is lack of evidence on how work capacity changes with the receipt of disability benefits. Most studies of the work potential of disability beneficiaries use the employment of denied applicants, and therefore provide estimates of beneficiaries' initial ability to work (e.g., Bound, 1989; von Wachter, Manchester and Song, 2011; Maestas, Mullen and Strand, 2013).

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[2] Other recent reforms include tightening eligibility criteria in Austria (Staubli, 2011) and Sweden (Karlstrom, Palme, and Svensson, 2008); removing restrictions on work activity in Norway (Kostol and Mogstad, 2012); and comprehensive reforms in the Netherlands that included stricter eligibility criteria and widespread reassessments of younger beneficiaries (Borghans, Gielen and Luttmer, 2013).

[3] This occurs for both job seekers and individuals who experience career interruptions for other reasons, and is due to a combination of the loss of work-related skills and stigma resulting from not working. There is evidence that disabled workers' employment also declines with time out of the labor force (Autor et al., 2011).

Recent studies by Kostol and Mogstad (2013) and Borghans, Gielen and Luttmer (2013) show that disability beneficiaries retain some capacity to work, although they use empirical approaches that do not allow them to examine how work capacity changed with disability benefit receipt.[4]

In this paper, I examine the employment effects resulting from a reform that resulted in a large number of individuals losing their eligibility for DI.[5] In March 1996, Congress removed alcohol and drug addictions as eligible conditions, including for those who did not have it as their primary disability. At the time, approximately 2.5% of DI beneficiaries had an alcohol or drug addiction that had contributed to their eligibility. Affected individuals could apply for continued eligibility on the basis of their other disabilities, and approximately 90% did so. Around half were judged to be eligible for DI, and continued to receive benefits. The remaining 65,000 individuals had their DI benefits terminated in January 1997 (Stapleton et al., 1998).[6]

This is the only large-scale termination of DI eligibility since major reforms in 1984. Figure 1 shows the annual exit rates out of DI between 1985 and 2010. Approximately one percent of beneficiaries exit annually due to no longer being disabled, apart from in 1997, when the rate more than doubled due to the terminations examined here. Figure 1 also shows that this rate has remained relatively constant, even as exit rates due to death or reaching normal retirement age have been declining, as beneficiaries have become younger and more likely to have low-mortality conditions (Autor and Duggan, 2003).

Using SSA administrative data and the tax earnings records covering approximately 75% of the DI beneficiaries affected by the policy change, I first show there was a large employment response after the removal of disability benefits. This is estimated using flexible differences-in-differences models with affected beneficiaries who remained on DI as the comparison group, as

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[4] Both studies use regression discontinuity designs that compare program entrants before and after rule changes. Kostol and Mogstad (2013) examine the effect of reducing disability insurance earnings penalties in Norway, while Borghans, Gielen and Luttmer (2013) examine a reduction in disability benefit generosity in the Netherlands. In both studies, the treatment effects apply to a specific cohort of beneficiaries.

[5] DI provides approximately 11 million disabled workers with cash benefits that, in 2011, averaged $1,110 a month, together with public health insurance through Medicare (SSA, 2012a). To qualify, individuals must have a disability or combination of disabilities that are judged to prevent them engaging in "substantial gainful activity," an income standard that is currently around $1,000 a month. More details about the DI program are provided in Section 2.1.

[6] These changes also affected beneficiaries on the means-tested disability benefit program, Supplemental Security Income (SSI). I focus on DI because they have much higher labor force participation prior to receiving benefits, and larger post-termination employment effects. It is also the larger and more expensive program. If I estimate how the employment effects vary with SSI receipt in a similar way as I do for DI, I find the employment effects also display an inverted-U shaped pattern: they are largest at approximately 3.5 years of benefit receipt, when they are approximately 30% larger than for those who received DI for less than one year and 17% larger than for those who received DI for six years. While these differences are precisely estimated, there is a lack of statistical power for doing the other analytical exercises presented in the paper.

they have similar characteristics and pre-treatment earnings histories to terminated beneficiaries. Employment is primarily measured in terms of the 1996 "substantial gainful activity" (SGA) earnings threshold ($8,602 per annum in 2011 dollars),[7] which is the level at which capacity for work was assessed. I find the fraction of terminated DI beneficiaries with annual earnings above this threshold increased by 22 percentage points following the termination of disability benefits, which is large relative to these individuals' work histories. The employment effects decline after four years, primarily because some individuals regain eligibility for disability benefits.

Individuals had received disability benefits for different lengths of time to prior to the terminations. After showing that different cohorts of beneficiaries had similar employment and health characteristics prior to receiving DI, I examine how the employment effects vary as a function of time receiving disability benefits. I find that there is an inverted-U shaped relationship between the size of the employment effects and time spent on DI. The employment response is highest among those who received benefits for approximately 2.7 years prior to termination, when it is 50% larger than the employment response of individuals who received benefits for nine months (the shortest period of receipt for anyone in the sample) and 31% higher than those who received benefits for six years.

An employment response initially increasing with time on DI is consistent with a period over which health improvements dominate the negative effects of time out of the labor force. It is not explained by variation in DI termination rates or in unemployment rates, by additional training while on DI, or by the changing characteristics of DI beneficiaries. Further evidence of the role of health improvement comes in three forms. First, I find an inverted-U shaped relationship between the employment effects and time on DI for those whose primary disability was an alcohol/drug addiction (46% of the sample), a mental disorder (22% of the sample) or a musculoskeletal conditions (15% of the sample) that, in each case, is precisely estimated and similar in magnitude to the results for the full sample. On the other hand, employment does not vary with time on DI in a group who most commonly had chronic physical disabilities as their primary disability, like heart disease, cirrhosis, and respiratory problem. This heterogeneity is consistent with research on how medical care can improve an individual's ability to work.

Second, I separately estimate the employment effects for those immediately awarded DI and for those awarded DI after successfully appealing an initial denial. There is evidence that

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[7] All dollars are in 2011 values, unless otherwise noted. Conversions are based on the CPI-U.

those awarded DI eligibility later in the determination process are, on average, healthier and more able to work than those awarded DI at earlier stages (Hu et al., 2001; von Wachter et al., 2011). Among those who had spent less than 1.5 years on DI, the employment response for immediately-accepted beneficiaries is lower than for initially-denied beneficiaries, which is consistent with this prior evidence. However, the employment response for the immediately-awarded group increases sharply with time on DI, so much so that the employment response among those who received DI for two to four years is larger in the immediately-accepted group than in the initially-denied group. Those in the poorest health when entering DI were the ones who worked the most after a period on DI, which further suggests that improving health is the mechanism through which employment increased with benefit receipt.

Third, I try to separate the changes in employment due to DI receipt from the changes due to being out of the labor force. Program-related health improvements should be a function of DI receipt, while skill loss, stigma and underlying changes in health should depend on the time since exiting the labor force and applying for disability benefits. Autor et al. (2011) show processing time has a large exogenous component due to staff productivity and workload differences.[8] I identify a subsample whose processing time is unrelated to personal characteristics, presumably because of processing differences outside of their control, and estimate their employment response as separate functions of time since applying for DI and time spent on DI. The employment effects are a decreasing function of time since applying for DI, and an increasing function of time receiving DI. While it not possible to determine whether it is the cash or medical benefits affecting work capacity,[9] the results do suggest that the initial increase in the employment effects is due to receiving DI rather than changes related to labor force exit.

In combination, the results suggest that the work capacity of individuals with addictions, mental disorders and musculoskeletal conditions initially improved while on DI; that those in the poorest health when applying for DI were the ones whose work capacity improved the most; and that DI receipt was the primary cause of this improvement. The findings are likely to be most relevant to the 19% of current DI beneficiaries with a history of substance abuse problems.[10,11]

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[8] The data they use is not available prior to 2005, and therefore not available for the sample used here.
[9] Many had access to Medicaid during the DI waiting period; nearly all had access to Medicare prior to termination.
[10] The policy change meant that, while applicants to DI could no longer count addictions among their disabilities, they could still apply on the basis of other disabilities. Moreover, many disability insurance systems in other countries still allow addictions to be considered as disabilities when it comes to gaining eligibility.

The findings are also likely to be relevant for understanding the work capacity of beneficiaries with mental disorders and musculoskeletal conditions as their primary disabilities, who account for more than half of current DI beneficiaries (SSA, 2012b). More generally, the findings suggest that return-to-work efforts may maximize the labor force participation of some disabled workers, and emphasize that changes in health and work capacity are important to consider when designing disability insurance policies to maximize the employment of disabled individuals.

2. POLICY BACKGROUND AND SAMPLE DESCRIPTION
2.1 THE REMOVAL OF ADDICTIONS AS DISABLING CONDITIONS

Alcohol and drug addictions became eligible conditions for Social Security Disability Insurance (DI) in the 1970s. Those with severe addictions could potentially obtain benefits on that basis alone, or addictions could be included as a contributing factor for applicants with other disabilities. Like other DI beneficiaries, medical eligibility was based on disabilities that prevented work above "substantial gainful activity" (SGA) levels, an income standard that is currently close to $1,000 per month. In addition, like current DI beneficiaries, cash benefits were provided five months after documented disability onset, Medicare was provided two years after documented onset, and earnings restrictions generally prevented work above SGA levels.[12,13] DI beneficiaries with addictions among their disabilities, known as "drug addict and alcoholic" (DA&A) beneficiaries, were also required to participate in treatment and be paid through responsible agents who could manage their money for them.[14]

The same medical standards apply to Supplemental Security Income (SSI), a federal disability program that provides benefits to disabled individuals with limited assets. It provides cash benefits and immediate eligibility to public health insurance through state-based Medicaid

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[11] Respondents to the National Survey of Drug Use and Health (NDSUH) are asked about Medicare eligibility, which is a reasonable proxy for DI receipt when the respondent is under 65 years of age. Among 22-64 year old respondents to the 2007 NSDUH, 19% of Medicare beneficiaries had substance abuse problems in the previous 12 months and/or had ever received substance abuse treatment. Author's population-weighted tabulations of the public-use data file (Substance Abuse and Mental Health Services Administration, 2009).
[12] There are additional conditions, such as normally working in employment covered by Social Security for at least five of the previous ten years. Cash payments are based on beneficiaries' past earnings and a progressive formula that replaces a larger share of the earnings of low wage workers. Disability onset can be up to 17 months prior to applying for DI (SSA, 2012a; 2012b).
[13] In practice, few DI beneficiaries have earnings that approach SGA levels. In December 2011, for example, 0.3% of DI beneficiaries had benefits withheld because of substantial work (SSA, 2012b).
[14] Currently, 11% of DI beneficiaries and 16% of those under 55 have their benefits handled by a responsible third party (known as "representative payees") (SSA, 2012b).

programs. Approximately 28% of DI beneficiaries receive SSI at some stage, most commonly during the waiting period for DI payments (Rupp and Riley, 2011). The majority of the DA&A DI beneficiaries with addictions also qualified for SSI, and therefore had access to cash and medical benefits while waiting for DI payments (Stapleton et al., 1998).

There were approximately 3,000 DA&A DI/SSI beneficiaries in the early 1980s. Major Congressional reforms in 1984 made it easier to gain eligibility for disability benefits on the basis of multiple conditions. This led to rapid growth in those gaining eligibility for disability benefits for addictions, so that by 1993 there were approximately 100,000 DA&A beneficiaries. Exit rates were low: of 20,000 DA&A beneficiaries who began to receive disability benefits in 1990, less than one percent had exited because of medical improvement by 1994 (Department of Health and Human Services, 1994). In response to the growing numbers, Congress passed changes in late 1994 to better monitor treatment and introduced a three-year time limit on receiving benefits. Numbers continued to grow and, before most of these changes had been implemented, legislation was passed on March 29, 1996, that removed alcohol and drug addictions as eligible conditions. Affected beneficiaries could apply to be reclassified on the basis of their other disabilities; those not reclassified would be terminated at the beginning of 1997. SSA informed 209,000 DI and SSI beneficiaries whose records indicated their eligibility was based on an addiction, which was 2.6% of all DI/SSI beneficiaries at the time.[15] Most applied for reclassification, and decisions were made in the latter half of 1996. Approximately half were reclassified and kept receiving their DI benefits, while the others had their benefits terminated at the beginning of 1997 (Stapleton et al., 1998; Hunt and Baumohl, 2003).

There were claims that the reclassification process was complex and somewhat arbitrary. Reclassification decisions required examiners to make judgments about the severity of other disabilities in the absence of a drug or alcohol addiction. Yet this is a difficult judgment to make because there is a lot of uncertainty about how substance abuse affects many other medical conditions, including mental disorders (Grant et al., 2004) and musculoskeletal conditions (Diamond et al., 1989). There were also a variety of issues involved in implementing this policy change. In a study commissioned by SSA, Stapleton et al. (1998) reported: (1) significant variation across offices in the effort to explain the reclassification process; (2) a lack of medical documentation for determining eligibility; (3) the use of temporary examiners to cope with the

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[15] Approximately 45% of those sent termination notices were receiving DI (Stapleton et al., 1998).

increased examination workload; (4) claims that the examinations were too brief; and (5) claims that some examiners held strong views about substance abuse that influenced their decisions.[16] The report also found no sharp differences in the demographic and other characteristics of terminated and reclassified individuals.

There are several studies of the employment effects of these terminations, although none use SSA administrative data or explore how employment varied by time receiving disability benefits. Orwin et al. (2004) used employment records of affected beneficiaries in Washington State and found employment increased by 10 percentage points after these terminations, although they could not distinguish between terminated and reclassified beneficiaries. Campbell, Baumohl and Hunt (2003) analyzed the formal and informal employment of 661 participants in a study that interviewed former SSI beneficiaries across nine cities. Around half were employed two years after the terminations, and 12% were earning more than the cash benefits they lost. Finally, Chatterji and Meara (2010) use pooled cross-sections of the 1994-2002 National Survey of Drug Use and Health – formerly called the National Household Survey on Drug Abuse – and a triple-difference interaction between the probability of SSI usage, likely substance abuse and an indicator for the post-policy change to estimate the effects of the terminations. They found increases in labor force participation and employment in a group with a broad definition of substance abuse, but not among a more narrowly-defined group.[17]

2.2 DATA AND SAMPLE

Former DI DA&A beneficiaries were identified using historical extracts of SSA administrative data. DA&A records were periodically extracted from the Supplemental Security Record, the system used to manage SSI, and the March and June 1996 extracts were located for

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[16] There is evidence that disability determinations partly depend on who reviews the case. Recent studies find varying allowance rates for similar cases among disability examiners (Maestas et al., 2013) and Administrative Law Judges (French and Song, 2013).

[17] The NDSUH and its antecedent have inherent limitations that made it difficult for Chatteri and Meara to explore the interaction between disability benefits and employment. Respondents are not asked about their past use of disability benefits, so the authors use characteristics correlated with SSI receipt and substance abuse problems in the 1994-1996 period to identify those in later waves who may have been affected by the terminations. However, their 1994-1996 sample includes individuals with substance abuse problems who were receiving benefits only on the basis of other disabilities, a group unaffected by the policy change. This may explain why the characteristics of their 1994-1996 sample of likely DA&A beneficiaries is different from those of the actual DA&A beneficiaries reported by Stapleton et al. (1998).

this project. Comparisons with Stapleton et al. (1998) indicate that approximately 75% of DI DA&A beneficiaries can be tracked using the June extract.

SSA staff used Social Security numbers in the June 1996 extract to produce up-to-date extracts of the Supplemental Security Record, Master Beneficiary Record, 831 File and Master Earnings File. In combination, these provide a complete history of an individual's receipt of SSA program activity; taxable earnings; impairments; and various demographic characteristics, such as sex, age and education. Information from the 831 File is available from 1989, while the other data is available from 1981 or earlier. All of the datasets track these individuals through 2008.[18]

A sample was created of individuals aged 30 to 61 years on January 1st 1997, the date the terminations took effect. The lower age limit restricts the sample to those aged at least 22 years in 1989, when education and other time-varying information was first recorded, while the upper limit removes those eligible for retirement benefits from age 62. The sample was also limited to those who first received benefits between January 1st 1989 and April 1st 1996, and those receiving DI payments in the second quarter of 1996.

The characteristics of the 51,274 individuals who met these criteria are provided in Column 1 of Table 1. Approximately 80% of the sample is male. The only information on addiction is whether the beneficiary was addicted to alcohol, drugs, or both alcohol and drugs. Approximately 58% have only an alcohol addiction, 15% have only drug addictions, and 27% have both alcohol and drug addictions.[19] As discussed in the introduction, there is information on the primary condition that meant individuals could not work. The most common primary disabilities were alcohol/drug addictions (46%), mental disorders (22%), and musculoskeletal conditions (15%). The average time receiving DI payments before 1997, which includes periods of SSI payments if those were received during the DI waiting period, is 2.9 years. The average disability benefits paid in 1996 are $10,485.[20] Relative to the overall DI beneficiary population in 1996, DA&A beneficiaries were slightly younger and disproportionately male.[21]

The sample is divided into those terminated as a result of the policy and those reclassified based on other disabilities. Memos to Social Security offices in California indicate that disability

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[18] Data preparation details are provided in an appendix. Unfortunately, the datasets do not contain information on who applied to be reclassified in 1996.

[19] The most common drugs addictions are cocaine and heroin. While the specific drug addiction was not in their SSA administrative file, Stapleton et al. (1998) had access to additional information on type of addiction.

[20] The average disability benefits paid in 1995 for those entering prior to 1995 are similar to these values.

[21] In 1996, males made up 60% of DI beneficiaries and the average age was 49 years (SSA, 1997).

beneficiaries terminated as a result of this policy should be assigned a disability cessation code in January 1997.[22] Tabulations confirm that these codes, which are rarely used, are used extensively in January 1997. A person is considered terminated as a result of the policy if, in January 1997, they had a newly-assigned cessation code and received no disability payments. A person is considered to have been successfully reclassified if, in January 1997, they were in current payment status and received disability payments. Approximately nine percent of the sample did not meet either definition; they are not included in either group.[23]

The characteristics of terminated and reclassified DI beneficiaries are shown in Columns 2 and 3 of Table 1, respectively. Compared to the reclassified group, terminated beneficiaries are younger by an average of 2.7 years and more likely to have had an addiction as their primary disability. The termination rate for those with an addiction as their primary disability is 52%, compared to 31% for mental disorders, 34% for musculoskeletal conditions, and 32% for other disabilities. Terminated beneficiaries are also relatively more likely to be male, more likely to be black, and less likely to have an addiction that was only alcohol. On average, they had also been on DI for 4.5 months less than reclassified beneficiaries. All of these differences are statistically significant at the five percent level, which is not surprising given the large sample size.

Despite these differences, terminated and reclassified beneficiaries are similar in terms of their pre-treatment earnings histories. One way to compare the similarity of the two groups is by looking at their earnings trends in the years before entering DI, when their earnings are unconstrained. The average W-2 earnings of terminated and reclassified beneficiaries, which include wages but not self-employment earnings, are shown in Figure 2 for the eight pre-DI years and the year of DI entry.[24] The two groups are similar in terms of these earnings trends, with average absolute differences in their annual earnings of $272, or three percent of their average annual earnings over this period.

Earnings trends are also shown for 1981-2008 in Panel A of Figure 3. Terminated and reclassified beneficiaries have similar annual earnings trends up to 1996, the year the policy

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[22] These memos are available at: http://www.dhcs.ca.gov/services/medi-cal/eligibility/Pages/1996ACWDLs.aspx.
[23] These are probably a mix of people who: exited for other reasons, had an unusual program status in January 1997, or were terminated as a result of the policy but were assigned a rare termination code instead of the right code. Assuming that those assigned rare codes in January 1997 are terminated beneficiaries leads to similar results.
[24] These are calculated by re-arranging the years in relation to when individuals entered DI. For example, for someone first receiving DI in 1991, the value of earnings one year before DI is from 1990 and from two years before is from 1989, while for someone beginning on DI in 1993 the equivalent years are taken from 1992 and 1991, respectively.

change was announced. This is the case even though there are large declines in earnings over this period, as individuals steadily stop working and apply for DI. The average earnings difference across the two groups is $664 in 1990, around seven percent of average earnings for that year. This gap changes by $100 between 1990 and 1995, while the average earnings of both terminated and reclassified beneficiaries declines by more than $8,000 over the same period. As shown in the next section, pre-treatment trends become even more similar once controlling for age differences. The similarity of the earnings histories is likely due to the unusual and complex nature of the reclassification process, as described in the previous section, where reasonably similar individuals received different judgments about their continued DI eligibility.

A second striking feature of the mean annual earnings plotted in Panel A of Figure 3 is the large increase in the earnings of terminated beneficiaries from 1996 while there is little change in the earnings of reclassified beneficiaries who continue to get DI payments. The difference in the mean earnings of terminated and reclassified DI beneficiaries is $4,509 in 1997, peaks at $6,333 in 2000, and declines to $3,367 by 2008. The continued interaction between earnings and the disability programs helps to explain the decline in terminated beneficiaries' average earnings after 2000. The fractions of terminated and reclassified individuals who had received a disability payment before and after the end of the DA&A category are shown in Panel B of Figure 3. Vertical lines are drawn at the end of 1996, when the last pre-termination disability payments were made. Terminated beneficiaries steadily re-enter DI or SSI throughout the 1997 to 2008 period, and 52% of terminated beneficiaries receive post-1996 Social Security payments by 2008.[25] The decline in terminated beneficiaries' earnings after 2000 is mainly due to this re-entry, as individuals are again subject to program earnings limits. There is little decline in earnings after 2000 among those who do not again receive disability benefits. It is difficult to interpret these patterns, as the re-eligibility of terminated beneficiaries may be due to poor health, limited employment prospects, or a combination of both. In any case, it does help to explain why the earning effects start to dissipate four years after the terminations occurred.

3. ESTIMATING THE AGGREGATE EMPLOYMENT EFFECTS

Before examining the role of time on disability benefits, I estimate the aggregate employment effects due to the termination of disability benefits. This is done using flexible

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[25] About two percent of terminated beneficiaries first reappear as a recipient of retirement insurance or old-aged SSI.

differences-in-differences regressions, where the employment of those who lost their disability benefits is judged relative to those who retained them. Binary employment outcomes are used, as we are primarily interested in how the terminations affected how many individuals were working.[26] The main threshold is based on SGA, as it is the level at which work capacity is assessed; anyone earning above SGA for a sustained period will lose DI eligibility. The annualized 1996 SGA level is equal to $8,602 in 2011 dollars. An added benefit of using this level is that it is close to the average DI payments made in 1996, and so provides some idea of how many individuals "replaced" their benefits via wage earnings. Results using alternative employment thresholds are discussed below.

Both logit and linear probability regression equations are used. The relative advantage of the logit is that modeling the outcome variable as a latent variable better approximates the statistical properties of a binary variable. In a difference-in-differences context, however, the relative advantage of the linear probability model is that common unobservable trends between treated and comparison groups are differenced out, while this does not happen with a nonlinear specification. Both specifications produce similar results, suggesting that the relative disadvantages are not particularly problematic in this context.

Data from 1989 to 2008 are used, which includes seven years of data before the terminations were announced (1989-1995), the year that the policy was announced (1996), and twelve years after the terminations occurred (1997-2008). Letting y_{it} denote the employment outcome for the ith person in the tth year, the first equation estimated is a logit specification:

$$P[y_{it} = 1] = exp(W_{it}\gamma)/[1 + exp(W_{it}\gamma)] \tag{1}$$

Where $W_{it}\gamma = \alpha + \theta_t + X_{it}\lambda + TERM_i\beta_0 + \sum_{\substack{t=1989 \\ t \neq 1995}}^{2008} D_t * TERM_i\beta_t.$

The constant is represented by α, and θ_t is a complete set of time fixed effects that capture common time shocks in employment. The vector X_{it} contains time-varying individual characteristics, and initially represents two sex-specific cubic functions in age that control for age-related changes in employment. The variable $TERM_i$ is a dummy variable equal to one if an individual had their DI benefits terminated and zero otherwise, and absorbs permanent

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[26] Using earning is also complicated by the large number of observations with zero earnings. Using earnings as the dependent variable, which should lead to consistent estimates, leads to similar results to those presented using employment outcomes in terms of the similarity of the pre-treatment trends, a large post-termination response, and how the treatment effects vary by time spent on DI.

differences between terminated and reclassified beneficiaries. Time-varying differences between terminated and reclassified beneficiaries are identified by the interaction of $TERM_i$ with time dummy variables D_t, which are equal to one in year t and zero otherwise. The reference year is 1995, the year before the terminations were announced. Terminated beneficiaries may have responded to the policy change in 1996 if they sought work once they found out that their application had been unsuccessful. There are 19 coefficients of interest β_t that measure the annual differences in the probability of employment of terminated and reclassified beneficiaries, relative to 1995. I estimate standard errors allowing for heteroskedasticity and an arbitrary correlation in errors for each individual.

These coefficients, expressed as marginal effects, are presented in Column 1 of Table 2.[27] The permanent difference between the employment probabilities of terminated and reclassified beneficiaries is estimated to be 2.3 percentage points, which is statistically significant at the one percent level. Annual differences in employment during the pre-treatment period are small, with an annual difference of 1.7 percentage points in 1989, and estimated annual differences of less than one percentage point between 1990 and 1994. These coefficients are precisely estimated, with standard errors of 0.4 percentage points or less. In 1996, the year the policy change was announced, the relative fraction of terminated beneficiaries who are employed rises to 3.4 percentage points. Once disability payments cease in 1997, this difference rises 17.9 percentage points. The difference in employment probabilities increases to 22.8 percentage points in 1999 and remains similar in 2000, then steadily decline to 9.5 percentage points by 2008. All of these post-termination employment differences are statistically significant at the one percent level.

As discussed above, the time and group differences are not constant in the logit specification. For this reason, a linear probability model is also used to estimate the annual employment differences between terminated and reclassified beneficiaries:

$$y_{it} = \alpha + \theta_t + X_{it}\lambda + TERM_i\beta_0 + \sum_{\substack{t=1989 \\ t \neq 1995}}^{2008} D_t * TERM_i\beta_t + u_{it} \qquad (2)$$

The variables and the treatment of standard errors are as previously described. The main coefficients of interest are again the 19 β_t coefficients, which are presented in Column 2 of Table

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[27] Ai and Norton (2003) recommend that marginal effects for the interaction terms be calculated as the double differences in the estimated probabilities when each dummy variable equals one as compared to when it is zero, while Puhani (2011) recommends using the difference in the estimated probabilities with and without the coefficient on the interaction term. The calculated marginal effects are similar using either method; the former is reported in Table 2. Standard errors are calculated using the delta method.

2. The results are similar: the annual employment differences are one percentage point or less in the pre-treatment period of 1989 to 1994; the relative employment of terminated beneficiaries' rises once the terminations occurred and peaks at 22.8 percentage points in 1999 (the same value as in the logit analysis); the employment differences then decline to 8.8 percentage points in 2008. Calculated standard errors are 0.5 percentage points or less.

The results from adding more time-invariant individual characteristics to equation (2) are presented in Columns 3 to 6 of Table 2. I include, in turn, controls for individuals' demographic characteristics (race, sex, state of residence, age at termination); health characteristics (primary disability, addiction type); their DI program activity (year applied, year started DI, level at which benefits were awarded); and their work history (combination of years employed for the five years before applying for DI). Adding these controls shrinks the estimated permanent differences between terminated and reclassified beneficiaries, so that β_0 is no longer statistically significant at conventional levels. The annual differences in the employment probabilities do not change. Figure 4 shows the β_t coefficients before and after adding these controls, from Columns 2 and 6 of Table 2 respectively. The largest difference in any of the coefficients is 0.4 percentage points.

Different employment thresholds are used to understand the intensity of the employment response. Doubling the SGA employment threshold to annual earnings above $17,204 results in a peak employment response of 14.3 percentage points in 2000, which declines to 6.9 percentage points by 2008. Halving the threshold to $4,301 results in a peak employment response of 27.0 percentage points, and a response in 2008 of 7.6 percentage points.[28] These results suggest that those who start working do so with some intensity, although the use of even higher thresholds suggests that few terminated beneficiaries make more than $20,000 per annum.

I impose a functional form on the post-termination employment response in order to make it easier to examine heterogeneity. Equations (1) and (2) have 12 coefficients that characterize the post-termination employment effects. After inspecting these coefficients for a variety of subgroups, it became clear that the post-termination employment effects generally follow the pattern already described: the relative employment of terminated beneficiaries rises in 1996 and 1997, is highest from 1998 to 2000, and declines from 2000 to 2008. Given this, the

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[28] A 2008 employment response of 7.6 percentage points when half of 1996 SGA is the threshold is odd, given that the equivalent coefficient is 8.8 percentage points using the 1996 SGA threshold. This suggests that the occasional earnings of reclassified beneficiaries at below-SGA levels obscure some of the persistence in employment among terminated beneficiaries, and reinforces the value of using a threshold that distinguishes employment from DI participation. These results are available in an appendix.

interactions between $TERM_i$ and the post-1997 year dummy variables are replaced by two variables: (1) $SHIFT_{it}$ is equal to one if $t \geq 1998$ and the individual is a terminated beneficiary, and zero otherwise; and (2) $DECLINE_{it} = t - 1999$ if $t \geq 2000$ and the individual is a terminated beneficiary, and zero otherwise.[29] The dummy variables for the years 1996 and 1997 are retained, as are the dummy variables for the years 1989 to 1994. The regression specification now becomes:

$$y_{it} = \alpha + \theta_t + X_{it}\lambda + TERM_i\beta_0 + \sum_{\substack{t=1989 \\ t \neq 1995}}^{1997} D_t * TERM_i\beta_t + SHIFT_{it}\delta_1 + DECLINE_{it}\delta_2 + u_{it} \quad (3)$$

The main coefficients of interest are now δ_1, which measures the post-termination employment effects across 1998 to 2000, and δ_2, which measures the trend in the employment effects from 2000 to 2008.[30] The estimates for these two coefficients are presented in Column 1 of Table 3. The $SHIFT_{it}$ coefficient is 22.0 percentage points, close to the peak employment response using the more flexible specification. The $DECLINE_{it}$ coefficient is -1.6 percentage points, reflecting the annual decline in employment from 2000 to 2008. Both coefficients are statistically significant at the one percent level. The average of the six coefficients resulting from the interactions between $TERM_i$ and the 1989-1994 dummy variables is also shown. It is 0.3 percentage points, with a standard error of 0.3 percentage points, showing the similarity of the pre-termination trends in this specification.

Results for disability-based subgroups are presented in the remaining columns of Table 3. There are four groups based on an applicant's primary disability when applying for DI: alcohol/ drug addictions, mental disorders, musculoskeletal conditions, and other physical conditions.[31] The $SHIFT_{it}$ coefficients are similar for those with alcohol/drug addictions, mental disorders, musculoskeletal conditions, with respective coefficients of 22.4, 23.1, and 22.6 percentage points.[32] These coefficients are approximately 25% higher than the $SHIFT_{it}$ coefficient of 18.1 percentage points for the group with other physical disabilities. While the coefficient on

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[29] Jacobson, Lalonde and Sullivan (1993) imposed a functional form on the post-policy changes in earnings of displaced workers to get a better idea of the evolution of the differences across demographic groups. von Wachter, Song and Manchester (2011) uses a similar approach. I tested plausible alternative specifications, such as estimating $DECLINE_{it}$ starting from 1999 or 2001. The differences across groups are similar in these alternate regressions.

[30] Differences across groups in the 1996 and 1997 coefficients are hard to interpret, as they may reflect timing differences of the reclassification process rather than just differences in the timing of the employment response.

[31] The final group consists primarily of beneficiaries with heart disease, cirrhosis and respiratory conditions. Those with neurological condition as primary disabilities, which are 2.6% of the sample, are not included in any group. Adding them to the mental disorders group generates similar results to those shown here and in subsequent analyses.

[32] The $SHIFT_i$ coefficients are also similar by addiction type. Those with an alcohol addiction have a coefficient of 20.7 percentage points, while the coefficient for those with only drug addictions is 21.6 percentage points.

DECLINE$_{it}$ is slightly smaller for this group than for the other three groups, their employment response is lower than the other three groups throughout the post-termination period.

The results suggest many DI beneficiaries affected by this policy were able to work. The employment effects are large relative to these individuals' work histories, although many terminated beneficiaries do not report taxable wage earnings after 1996. Taxable earnings are likely to understate employment, as some terminated individuals reported having informal earnings (Campbell et al., 2003). While the administrative data does not contain information on these earnings, formal employment should reflect overall employment differences by time on DI.[33] The results also point to disability-related differences in the employment effects. These may reflect health changes, which are examined in the next section.

4. THE ROLE OF TIME SPENT RECEIVING DISABILITY BENEFITS

I now examine how the employment effects differ by the time individuals had spent on DI. In addition to estimating how employment effects vary by time on DI for the full sample, this relationship is estimated for subsamples based on the type and initial severity of their disability. I consider whether the results can be explained by differences across beneficiary cohorts, and also use robustness exercises to control for the influence of beneficiary cohort effects.

The effect of time receiving disability benefits is estimated by adapting equation (3). Time on disability benefits, *DI_TIME$_i$*, is the length of time between the month when an individual first received benefits and when the terminations occurred in January 1997. To allow the employment effects to vary nonlinearly with *DI_TIME$_i$*, three cubic terms of *DI_TIME$_i$* are separately interacted with all of the variables identifying employment differences between terminated and reclassified beneficiaries throughout the sample period. That is,

$$y_{it} = \alpha + \theta_t + X_{it}\lambda + TERM_i\beta_0 + Z_{it}\varphi_0 + DI\_TIME_i * Z_{it}\varphi_1$$
$$+ DI\_TIME_i^2 * Z_{it}\varphi_2 + DI\_TIME_i^3 * Z_{it}\varphi_3 + u_{it} \qquad (4)$$

Where $Z_{it}\varphi_{(n)} = \sum_{\substack{t=1989 \\ t \neq 1995}}^{1997} D_t * TERM_i\beta_{(n)t} + SHIFT_{it}\delta_{(n)1} + DECLINE_t\delta_{(n)2}$.

In addition to the coefficients on *SHIFT$_{it}$* and *DECLINE$_{it}$*, the other coefficients of interest are those resulting from the interactions between these two variables and the three cubic

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[33] It is likewise difficult to determine the aggregate income and consumption effects. Meyer and Mok (2013) find that, in addition to earnings, disabled individuals consume out of personal savings, support from family, and cash and in-kind government transfers. Beyond SSA payments, there is no information on other forms of support.

terms of DI_TIME_i. Estimates of these eight coefficients for the full sample are presented in Column 1 of Table 4. The coefficient (standard error) on $SHIFT_{it}$ is 0.069 (0.022), which means that the estimated employment effect is 6.9 percentage points without any disability benefits. All three coefficients from the interactions between $SHIFT_{it}$ and the DI_TIME_i terms are statistically significant at the one percent level, suggesting the increase in post-termination employment does vary nonlinearly with DI receipt. In contrast, none of the coefficients from the interactions between $DECLINE_{it}$ and the DI_TIME_i terms are statistically significant, even at the five percent level. Together, these results suggest that the time on disability benefits affected the number of individuals returning to work but not the subsequent decline in the employment effects.

For this reason, I focus on how the total shift in employment varies as a function of time on DI by calculating the nonlinear combination of the four coefficients related to the $SHIFT_{it}$ variable at different values of DI_TIME_i, and calculating standard errors using the delta method. This total shift in employment is plotted in Figure 5 for values of DI_TIME_i between nine months, the shortest period of DI receipt prior to the terminations for anyone in the sample, and six years, beyond which the confidence intervals become wide and uninformative. The 95% confidence intervals are shown in dashed lines.

Figure 5 shows an inverted-U relationship between the employment effects and time spent on DI. The post-termination shift in employment is 16.3 percentage points for those who received DI for nine months. It is increasing with DI receipt up to 2.7 years, when the total shift in employment peaks at 24.6 percentage points, or 50% higher than those on DI for nine months. The employment effects are smaller for those who received DI for longer than 2.7 years, and the total shift in employment is 18.8 percentage points for those who had six years on DI. The 95% confidence intervals show these differences to be statistically significant.

To begin to understand the source of these differences, results for the four disability-based subgroups used previously (alcohol/drug addictions, mental disorders, musculoskeletal, and other physical conditions) are presented in Columns 2 to 5 of Table 4. Except for those with non-musculoskeletal physical conditions as their primary disability, which has a similar sample size to the musculoskeletal group, all of the interactions between $SHIFT_{it}$ and DI_TIME_i, $DI\_TIME_i^2$, and $DI\_TIME_i^3$ are statistically significant at least at the five percent level. In contrast, none of the interactions between $DECLINE_{it}$ and DI_TIME_i, $DI\_TIME_i^2$, and $DI\_TIME_i^3$

are statistically significant at the five percent level for any of the four groups. Therefore I again focus on how the peak employment response varies as a function of time on DI.

The total shift in employment for different values of DI_TIME_i is shown in Figure 6 for these four groups. Panel A shows the results for those with addictions and those with mental disorders. Both sets of results display an inverted-U relationship between time on DI and the post-termination employment effects. For the addiction group, the total shift in employment is largest for those who had been on DI for approximately 2.75 years, when it is 24.6 percentage points. This is 50% larger than those who had received DI for nine months. For the mental disorders group, the largest total shift in employment is 26.7 percentage points at approximately 2.5 years of DI receipt, which is approximately 60% larger than those who were on DI for nine months. Panel B shows the results for those with musculoskeletal conditions and those with non-musculoskeletal physical disabilities. For the musculoskeletal group, the largest shift in employment is 26.1 percentage points for those on DI for 2.25 years, which is 60% larger than those on DI for nine months. For the group with non-musculoskeletal physical disabilities, the relationship between the total shift in employment and DI receipt is quite flat, with a 12% increase in the total employment shift between those on DI for nine months and the estimated peak at 2.25 years of DI receipt. Unlike the differences for the other three groups, these changes are not statistically significant at the five percent level.

It was shown in Table 3 that terminated beneficiaries with non-musculoskeletal physical disabilities had an aggregate employment response that is 25% lower than the other three groups. The results in this section suggest those differences come from the employment effects changing with DI receipt for the other three groups, but not this group. This heterogeneity points to the role of health changes, especially as there is evidence that medical care can increase the employment of individuals with alcohol/drug addictions (Hubbard, Craddock, and Anderson, 2003), mental disorders (Cook et al., 2005), and musculoskeletal conditions (Garthwaite, 2012).

A potential concern is that individuals have different levels of initial human capital and health that generate these inverted-U shaped patterns in post-termination employment. This does not appear to be the case. For different cohorts, the fraction employed two and five years before first receiving DI is shown in Panel A of Figure 7.[34] Employment histories are similar across

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[34] For this exercise, annual earnings are converted into 2011 dollars using the National Wage Index, which measures the average changes in wages in the United States and so takes account of wage growth.

cohorts of beneficiaries, with newer beneficiaries having slightly higher pre-DI employment rates. For example, five years before first receiving DI, the employment rates are between 45% and 48% across the four cohorts who had spent three years or less DI prior to the terminations. If anything, these measures of human capital indicate that initial differences may have made it less likely that individuals who received DI for between two and three years would work more than individuals who had received DI for a shorter period.

As a measure of initial health, mortality rates during the first year of DI receipt are shown in Panel B of Figure 7. These are also similar across beneficiary cohorts. The overall average mortality rate in the first year of DI receipt is 2.4%, and each year of DI entrants have an average mortality rate that is within 0.3 percentage points of the overall average.

Figure 7 shows that cohorts started out quite similar in terms of their health and ability to work. Furthermore, the employment effects display a similar inverted-U shape in additional analyses that try to limit the role of any beneficiary cohort effects. These include estimating equation (4) with controls for state-level unemployment rates at the time of application, and limiting the sample to individuals in states with below-median growth in DA&A numbers after 1989.[35] The employment effects cannot be explained by differences in the termination rates by time on DI.[36] Additional training while on DI is also not a plausible explanation. There is no evidence of vocational training in Stapleton et al. (1998) or any other report, and the mean years of education reported during the reclassification process in 1996 is the same as the mean years of education reported when applying for DI.[37]

Increases in employment over the first 2.5–3 years of DI receipt are consistent with health improvements initially dominating any negative effects of being out of the labor force.

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[35] First, given that some of the observable characteristics of DA&A beneficiaries changed as the program grew, to further rule out compositional effects equation (4) is estimated for subsamples based on those changing characteristics (which are sex, race and addiction type). Second, given changes to the DA&A program were passed in August 1994 and implemented between March 1995 and March 1996, the regression is estimated without individuals applying in August 1994 and later. An inverted-U relationship is also present in these analyses. These results are available in an appendix.

[36] The termination rate is 47% for those on DI for a year or less, 47% for those on DI for 13-24 months, and 43% for 25-36 months. Differences across beneficiary cohorts are primarily a function of age: in a logit model where termination is used as the dependent variable and age controls are used, coefficients on dummy variables measuring time on DI suggest that time on DI only predicts termination for those with more than three years of DI receipt (when probability of termination is slowly decreasing with more time). Moreover, the termination rates of individuals who had received disability benefits at the first determination stage are the same across those on DI for three years or less, and the inverted-U shape pattern is even more distinct in that sample (see Column 1 of Table 5).

[37] Reclassification applications generated 831 File entries for about 62% of the sample. Average reported education in these applications was 11.03 years. This group's average education when applying earlier for DI was 11.01 years.

Additional analysis is now done to further examine the role of changing health, and determine the channels through which such changes occurred.

4.1 DIFFERENCES BY INITIAL HEALTH

DI applicants differ in the severity of their disabilities. In the literature on health as human capital, medical technology is commonly modeled as repairing health capital (Grossman, 1972). If the employment patterns are due to health changes, then the employment response should vary by how healthy individuals were before they received DI.

While the SSA administrative data do not contain direct measures of individuals' health status, there is information about how easily individuals gained eligibility for disability benefits that can serve as a measure of initial health. Hu et al. (2001) finds that individuals judged to be disabled at earlier stages of the DI determination process have, on average, more severe disabilities than those awarded eligibility at later stages. Such health differences do seem to affect employment. von Wachter et al. (2011) estimates that, prior to receiving DI, those awarded eligibility at earlier stages are less able to work than those awarded eligibility at later stages.

Information from the 831 File can be used to identify those awarded eligibility at three stages: (1) after their initial determination by medical examiners in state-level Disability Determination Services (DDS) offices; (2) after reconsideration by a different set of DDS disability examiners; and (3) by an Administrative Law Judge or at a higher-level hearing.[38] In this sample, 44% were awarded DI at the initial stage, 11% were awarded DI after reconsideration, and 45% were awarded DI at the hearings level. As noted previously, a relatively high fraction of DA&A beneficiaries were awarded DI at the hearings level (Stapleton et al., 1998). Individuals in these groups have similar employment histories before they applied, which suggests their non-health human capital should have been similar when first getting DI.[39]

Focusing on the "Initial Award" and "Hearings Award" groups, a version of equation (4) is used to examine how initial health affects the relationship between the employment effects and

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[38] Applicants denied at the DDS level can request a hearing with an Administrative Law Judge, and then appeal to the Social Security Appeals Council, to the U.S. District Court, and finally to the U.S. Circuit Court of Appeals. Around one third of DI awards are made through one of these ways, with nearly all of them made by Administrative Law Judges (SSA, 2012a).

[39] Focusing on the Initial Award and Hearings Award groups, the respective fractions employed each year prior to applying for DI are: five years before applying: 49.4% and 50.9%; four years before applying: 46.1% and 48.9%; three years before applying: 41.1% and 44.6%; two years before applying: 35.2% and 37.3%; and one year before applying: 26.2% and 27.6%. Average education is also similar: 11.1 (Initial Award) vs. 11.0 years Hearings Award.

time on DI.[40] Non-overlapping dummy variables identifying the two groups are separately interacted with all of the variables in equation (4) that account for employment differences between terminated and reclassified beneficiaries throughout the sample period. The main coefficients of interest come from the interaction between these group identifiers and $SHIFT_{it}$, and between these group identifiers, $SHIFT_{it}$ and the three DI_TIME_i variables.

These coefficients are shown in Table 5, with results for the Initial Award and Hearings Award groups in Columns 1 and 2, respectively. The coefficient (standard error) on $SHIFT_{it}$ for Initial Award group is 0.003 (0.032), compared to 0.117 (0.037) for the Hearings Award group. This suggests that employment prior to DI would have been higher for those awarded eligibility at later stages, which is consistent with von Wachter et al. (2011). To see if these differences persist over time, each group's nonlinear combination of four coefficients related to the $SHIFT_{it}$ variable are calculated for different values of DI_TIME_i, and presented in Columns 1 and 2 of Table 5. At nine months of DI receipt, the Initial Award group's total shift in employment is 13.1 percentage points. This almost doubles to 25.5 percentage points at three years of DI receipt. In comparison, while the Hearings Award group's total shift in employment is higher after nine months of DI receipt, when it is 19.1 percentage points, there is less of an increase with time on DI and the total shift in employment peaks at 23.5 percentage points. The differences between the Initial Award and Hearings Award group coefficients are presented in Column 3 of Table 5, together with standard errors calculated using the delta method. The relatively low employment for the Initial Award group at nine months of DI receipt is different from the Hearings Award group at a one percent level of statistical significance, as is their relatively high employment at three and four years of DI receipt. The other differences are imprecisely estimated. The peak employment response for the Initial Award group is two percentage points higher than the peak for the Hearings Award group.[41]

The results suggest that the most clearly disabled individuals at the time of application improved the most, so much so that their employment is higher than those initially denied benefits after a period of benefit receipt. As shown in the remaining columns of Table 5, similar patterns are present in the mental disorder and musculoskeletal subsamples. DA&A termination

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[40] The Reconsideration group is omitted for clarity and because reconsiderations are not always offered (Autor et al., 2011). As would be expected, the results for this group generally lie between the results for the other two groups.
[41] The longer average time between applying and receiving DI for the hearings award group than the initial award group may cause the earlier peak. The role of time since application is considered in the next section.

rates further support health improvement being behind these patterns; they are higher for initial awardees (44%) than hearings awardees (31%). Those most readily defined as disabled when they applied for DI were least likely to be defined as disabled when reassessed some time later.

5. SEPARATING THE EFFECTS OF DI APPLICATION AND RECEIPT

Changing work capacity due to skill losses and any exit-related health changes should be a function of time since application, while health changes due to benefit receipt should be a function of time on DI. Both time since applying for DI and time on DI need to be exogenous to the individual in order to empirically separate these effects. In this section, I identify a subsample whose time between applying for and receiving DI is unrelated to their own characteristics, making it likely that the time it took to award eligibility was a function of SSA processing times. Using this subsample, I estimate the changes in the post-termination employment effects as separate functions of time since applying for DI and the time spent on DI. While it is difficult to be sure that these estimates will represent precise causal relationships, the exercise should provide some idea about the general nature of the relationships.

The speed with which DI applications are processed is highly variable, and depends on actions by SSA staff, medical experts, and the applicants themselves. DI applications are filed in local SSA field offices. Staff members check for non-medical eligibility, which depends on an applicant's earnings history, age, and type of employment. They then send the case to a DDS office, where staff assess the medical evidence and make an initial determination on whether the applicant meets the disability standards for DI. Additional medical evidence may be sought at this stage. Once a decision is made, the case is returned to the field office and the applicant is informed of the outcome. Successful applicants will start to receive benefits, while unsuccessful applicants must decide whether and how to appeal their denial.[42]

SSA processing times have a strong influence on how long individuals must wait between applying and receiving an initial decision. Autor et al. (2011) obtained information on processing times by DDS disability examiners. They found that the average examiner spent three months reviewing a case, and that processing times varies by 2.2 months for examiners at the 10th percentile compared to the 90th percentile of examiner processing times. Applicant

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[42] Applicants may choose whether to have legal representation and provide more evidence to support their claim, as well as whether to persist with appeals if they keep receiving denials.

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characteristics explain a small amount of this variation, and the relationship between examiner processing time and overall waiting time is close to one-to-one. A 1993 study by the SSA Office of Workforce Analysis found that between 16 and 26 employees handle a claim before an initial decision is communicated to the applicant (SSA, 1994). Similar variation among other these other employees in how quickly they process claims may lead to substantial differences in the speed of initial determinations that are outside the control of applicants themselves.

Information on month of application is available, making it possible to calculate the time between applying and receiving DI for each individual in the sample.[43] The distribution of this is shown in Figure 8 for those awarded eligibility at the first disability determination stage (i.e., the Initial Award sample). It shows the distribution for those receiving their decision within 18 months, which covers 97% of the Initial Award sample. There is a right tail in the time to award, although the pattern is reasonably symmetric around a modal time of five months for those who received DI within two to nine months.

I use a regression to examine the relationship between individual characteristics and time to award for the 17,416 Initial Award beneficiaries who received their first disability payments between two and nine months after applying for DI.[44] Time to award is used as the dependent variable, and is regressed against variables measuring: sex (a dummy variable for male, with female as the reference group); race (dummy variables for white, black, other race, with missing/inconsistent race coding as the reference group); age (age, age squared, and age cubed); whether the individual had a drug addiction (with alcohol only as the reference group); primary disability (dummy variables for addiction, musculoskeletal, and other physical, with mental as the reference group); time receiving DI prior to January 1997; whether terminated from DI in January 1997; and five separate dummy variables identifying whether the individual was employed in each of the five years prior to applying for DI (where employment is defined as earning more than 1996 SGA levels). A complete set of SSA field office fixed effects are also included, to remove constant differences in processing times across offices. I allow for an arbitrary correlation in errors at the field office level.

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[43] This is measured in terms of their first disability payments, so sometimes are SSI payments made during the waiting period for DI.

[44] The identifiers for disability examiners that are used by Autor et al. (2011) and Maestas et al. (2013) are neither present in my dataset, nor available during this period. Prior to 2005, the dataset containing these identifiers was periodically deleted from SSA servers.

Results for this regression are presented in Column 1 of Table 6. Only two of 18 coefficients are statistically significant at the five percent level: the coefficient on the male dummy variable is negative and statistically significant at the one percent level, suggesting that the waiting time for males was approximately three days shorter than for females, while the musculoskeletal dummy variable is positive and statistically significant at the one percent level. To remove the influence of those characteristics, the regression is re-estimated using the 12,924 males without musculoskeletal conditions, who make up 75% of the observations. These results are presented in Column 2 of Table 6. Only the coefficient on the dummy variable identifying whether an individual was employed five years before applying for DI is statistically significant at the five percent level. The strength of this relationship may be spurious, particularly as it is one of five employment indicators, and the one that is most distant from DI entry.

Within this second sample of nearly 13,000 individuals, a wide variety of observable characteristics are not predictive of how long individuals in this group had to wait between applying for and receiving DI. Given that the sample sizes should be sufficient for identifying any relationships between time to award and individual characteristics, I examine the separate influence of time since applying for DI and time on DI within this sample on the assumption that both were determined exogenously. This is done by adding variables measuring the time since applying for DI to equation (4), which was used to estimate how the employment effects varied as a function of time on DI. Time since applying for disability benefits, AP_TIME_i, is the length of time between the month when an individual applied for DI benefits and the terminations in January 1997. Like for DI_TIME_i, I allow the effects to vary nonlinearly by including three cubic terms of AP_TIME_i and separately interacting them with all of the variables identifying employment differences between terminated and reclassified beneficiaries throughout the sample period. The equation becomes:

$$y_{it} = \alpha + \theta_t + X_{it}\lambda + TERM_i\beta_0 + Z_{it}\varphi_0 + DI\_TIME_i * Z_{it}\varphi_1 + DI\_TIME_i^2 * Z_{it}\varphi_2 \quad (5)$$
$$+DI\_TIME_i^3 * Z_{it}\varphi_3 + AP\_TIME_i * Z_{it}\varphi_4 + AP\_TIME_i^2 * Z_{it}\varphi_5 + AP\_TIME_{i_i}^3 * Z_{it}\varphi_6 + u_{it}$$

As before, $Z_{it}\varphi_{(n)} = \sum_{\substack{t=1989 \\ t \neq 1995}}^{1997} D_t * TERM_i\beta_{(n)t} + SHIFT_{it}\delta_{(n)1} + DECLINE_t\delta_{(n)2}.$

The primary coefficients of interest are the seven related to $SHIFT_{it}$: $SHIFT_{it}$ by itself, the three interactions between $SHIFT_{it}$ and the DI_TIME_i terms, and the three interactions between

$SHIFT_{it}$ and the AP_TIME_i terms. Like before, the time variables have no influence on how the employment effects decline.

Table 7 presents estimates using this equation for males without musculoskeletal conditions who received an initial award within two to nine months of applying. To first establish this sample displays a similar inverted-U relationship between employment effects and time spent on DI, Column 1 shows the coefficient on $SHIFT_i$ and the three coefficients related to $SHIFT_{it}$ and DI_TIME_i without including AP_TIME_i (i.e., using equation (4)). All three coefficients from the interaction terms are statistically significant at the one percent level and similar in magnitude to those presented for the Initial Award group in Column 1 of Table 5, suggesting that the employment response for this sample is similar as for previous samples.

Column 2 of Table 7 shows the results using equation (5), where the employment effects can also vary as a function of time since application. Two of the three coefficients measuring the relationship between $SHIFT_{it}$ and DI_TIME_i are statistically significant at the five percent level. It is easiest to interpret these coefficients by describing how the total shift in employment changes as a function of time on DI. This is shown in Panel A of Figure 9 along with 95% confidence intervals. The employment effects increase during the first three years of DI receipt, after which they are reasonably constant. The increases are statistically different from zero at the five percent level, although the 95% confidence intervals are wide. Similar calculations are made using the three coefficients describing how the shift in employment varies as a function of time since applying for DI. This is presented in Panel B of Figure 9. Confidence intervals are set at the 90% level, as 95% confidence intervals cross zero for all values of AP_TIME_i but do not at the 90% level. There is a persistent decline in the employment effects as a function of time since applying, which primarily occurs in the first two years after applying. The decline in the employment effects for those with more than three years of DI receipt is due to changes related to AP_TIME_i eventually dominating changes related to DI_TIME_i.

That the changes that are a function of time since exiting the labor force, measured by time since applying for DI, are negative, is consistent with the studies cited in the introduction that show that work capacity declines with time out of the labor force. What is different is that the receipt of disability benefits has a positive effect on employment. Given individuals receive

cash and medical benefits but not other support that may enhance human capital, like training, improved health is the likely mechanism through which these program effects operate.[45]

Importantly, the point estimates suggest that the employment effects due to DI receipt initially more than offset the effects of exiting the labor force. A similar picture emerges from examining the raw employment rates of the terminated DI beneficiaries within this subsample. Those who applied in 1994, who had received disability benefits for 2-3 years before the terminations occurred, had annual employment rates in 1998 to 2000 similar to their 1991 rate, three years before they applied for DI.

6. CONCLUSION

Reducing the fiscal burden associated with disability insurance requires policies that decrease the inflow into these programs, increase the outflow, or decrease the generosity of the benefits provided. Understanding the employment implications of different policies requires knowledge of how disabled workers' human capital changes with the receipt of disability benefits, which is difficult to determine because beneficiaries have incentives to understate their true work capacity in order to maintain their program eligibility.

The widespread loss of DI benefits studied here provides a rare opportunity to understand how work capacity does change by observing the work activity of disabled individuals after different periods of benefit receipt. Approximately 22% of terminated beneficiaries started working at levels above the "substantial gainful activity" earnings standard used by SSA to judge eligibility for DI. This level of labor force re-attachment is large relative to terminated beneficiaries' work histories, and especially surprising given that they received no formal vocational support to help them re-enter the labor force (Stapleton et al., 1998).

More importantly, individuals' capacity to work appears to have been enhanced by receiving disability benefits for 2-3 years. The most plausible explanation for this is that DI improved individuals' health-related human capital by more than any loss of skills or increasing stigma associated with being out of the labor force. Several additional analyses provide support

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[45] It is difficult to identify the relative importance of the cash and medical benefits. All beneficiaries received cash payments, and nearly all had access to Medicare or Medicaid prior to termination. While DI beneficiaries face a two year waiting period for access to Medicare, it is backdated to when the onset of the disability can be established, which can be up to 17 months prior to the application date. In this sample, the average gap between starting to receive disability benefits and gaining Medicare eligibility is around one year. Moreover, most received Medicaid, normally at the start of their time receiving disability benefits.

for the role of health improvement, including a finding that the largest increases in the employment effects with time on DI occurred among individuals with relatively poor initial health when they entered DI. The cash and medical benefits provided by the program appear to be the reason that, unlike most other individuals, these disability beneficiaries' capacity to work increased with time out of the labor force.

While there is a possible interaction between cash payments and addiction, the fact that the estimates are similar across individuals addicted to alcohol and those addicted to drugs suggests that the response did not result from a strong interaction between substance abuse and disability payments, as the cash required to sustain a heavy alcohol addiction is very different to heavy heroin or cocaine addictions (Rhodes et al., 2000). Moreover, the similarity of the employment effects across those with addictions, mental disorders and musculoskeletal conditions as their primary disability suggests that there are large and identifiable groups of current beneficiaries for whom the findings are likely to be informative.

The findings suggest ways in which current return-to-work initiatives may be made more effective in the United States and elsewhere. DI beneficiaries are currently scheduled to have medical reassessments (called "continuing disability reviews") every one, three or seven years, depending on the severity and likely improvement of their disability. In order to deal with resource constraints and backlogs, many of these reviews are either waived or in the form of a mailer that contains six questions about recent health work and training. Responses to this mailer generate a full reassessment in 2.5% of cases, while full reassessments themselves generate terminations in approximately three percent of cases (SSA, 2011). While there is some profiling in terms of who is sent a mailer and who is subject to a full reassessment, the findings here suggest a more focused role for medical reassessments. Comprehensive reassessments after two or three years of benefit receipt may have better chances of terminations than earlier and later reviews, and be a sensible way to allocate scarce resources. Moreover, the findings show that judgments about the severity of disabilities at the time of application may not hold over time, and in fact those judgments may reverse if those in the worst health experience the greatest improvement in health while receiving disability benefits.

A relationship between time receiving disability benefits and capacity to work has important implications for interpreting studies that use the earnings histories of rejected applicants to estimate the likely employment of those who successfully become beneficiaries

(e.g., Bound, 1989; von Wachter et al., 2011; Maestas et al., 2013). While these studies provide precise estimates of the employment potential of accepted applicants at the point they are applying for DI, the dynamic effects identified here suggest we should be cautious about using that design to identify the potential employment of all disability beneficiaries.

The findings also speak to fundamental questions about how disability insurance programs might be reformed. Most are structured as permanent disability programs. This puts the onus on examiners performing the medical reassessments to show beneficiaries no longer meet the eligibility standard, which creates legal and political issues that may explain why relatively few individuals lose eligibility in this way. Likewise, the low take-up of vocational support likely reflects the risks involved in giving up a relatively certain stream of disability benefits (Autor and Duggan, 2003). The inverted-U shaped employment effects estimated here, combined with the relatively high employment among those gaining eligibility early in the disability determination process, suggest that providing public assistance through an acute period of poor health may be the most effective way to maximize labor force participation of some disabled individuals.

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Figure 1 Social Security Disability Insurance Termination Rates by Reason, 1985-2011
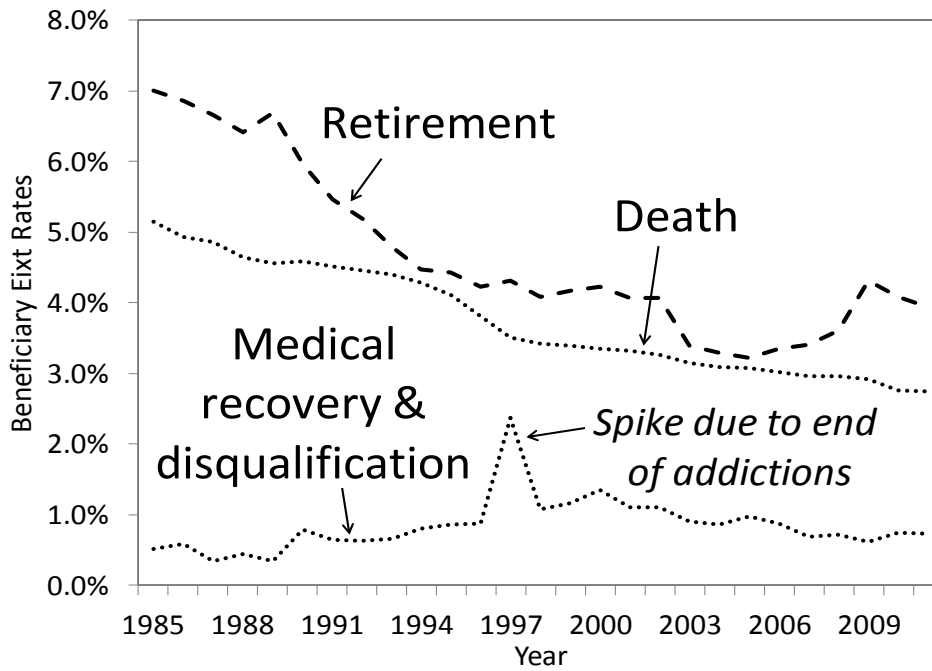
Source: Annual Statistical Supplements to the Social Security Bulletin [various years].

Figure 2 Mean Annual Earnings in Relation to DI Entry, Terminated vs. Reclassified
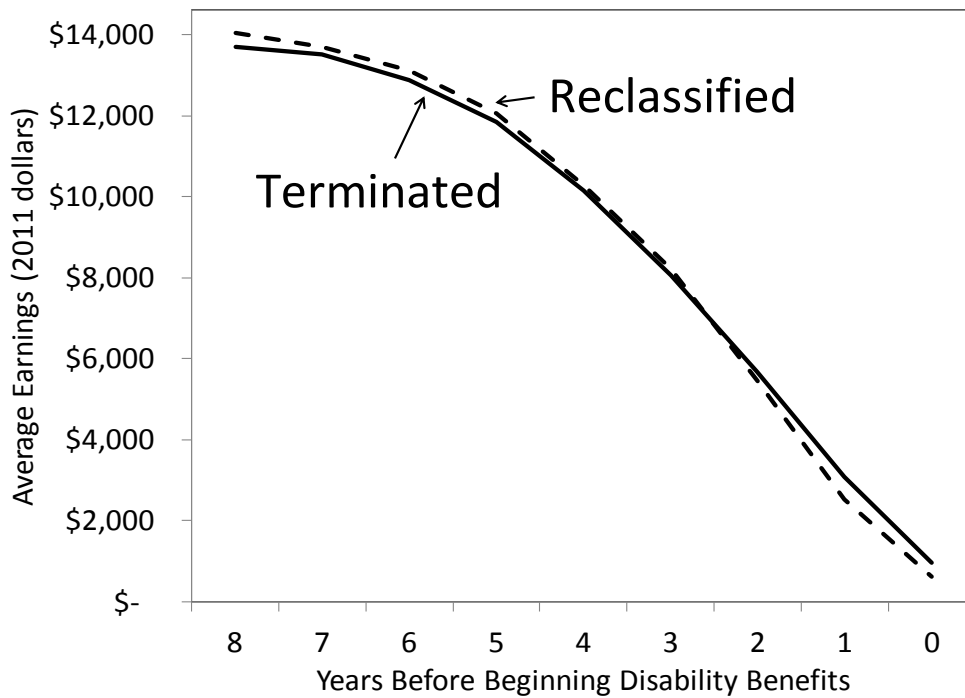
Figure 3 Mean Annual Earnings and Program Entry, Terminated vs. Reclassified, 1981-2008
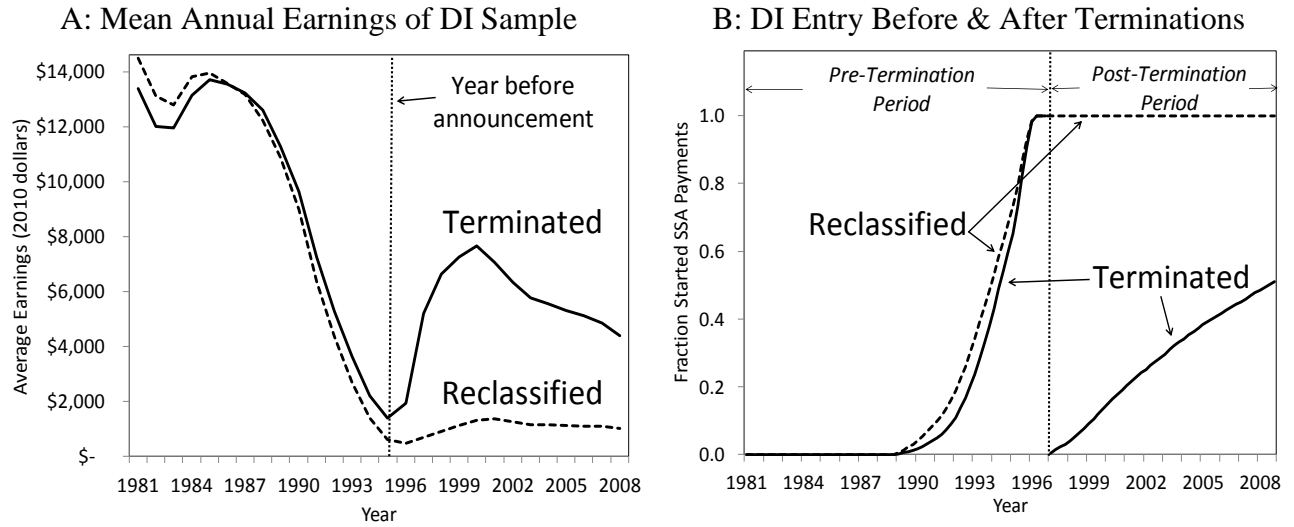
A: Mean Annual Earnings of DI Sample

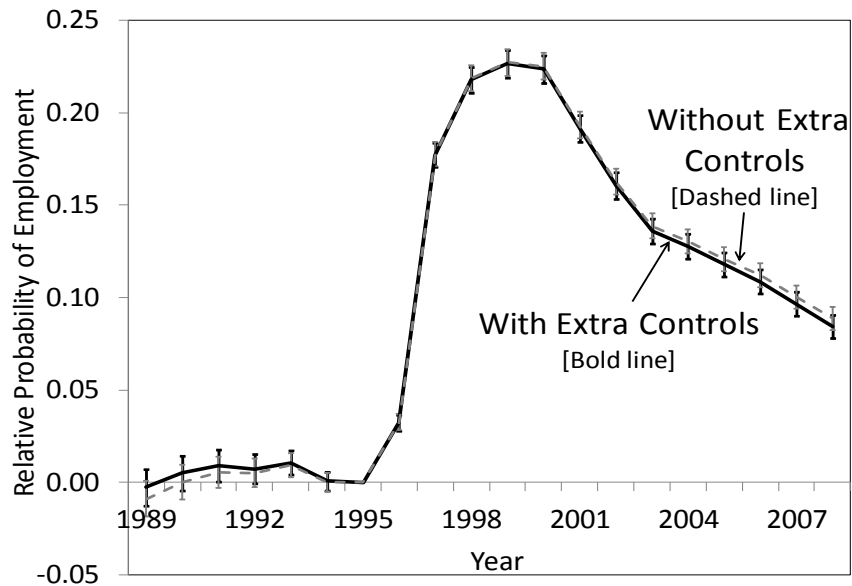B: DI Entry Before & After Terminations

Figure 4 Estimates of Terminated Beneficiaries' Relative Probabilities of Employment


Regressions are based on equation (2) in text. The coefficients from Column 2 of Table 2 are presented as a grey dashed line. The coefficients from Column 6 of Table 2, which are from a regression with additional controls for individuals' demographic, health, program history and work history characteristics, are presented as a bold black line. Vertical bars are 95% confidence intervals. Both regressions have 930,500 observations.

Figure 5 Total Employment Response by Time on Disability Benefits
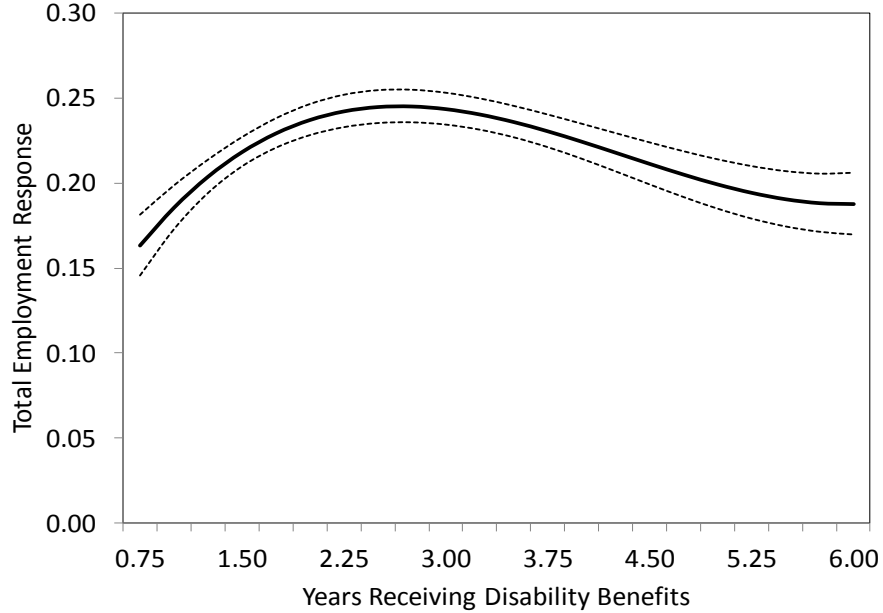
The figure shows the full effect of the post-termination increase in employment for different values of *DI_TIME$_i$*. These are nonlinear combinations of the four coefficients related to *SHIFT$_{it}$* presented in Column 1 of Table 4. The 95% confidence intervals are shown in dashed lines.

Figure 6 Total Employment Responses by Time on Disability Benefits, Differences by Primary Disability When Applying for DI
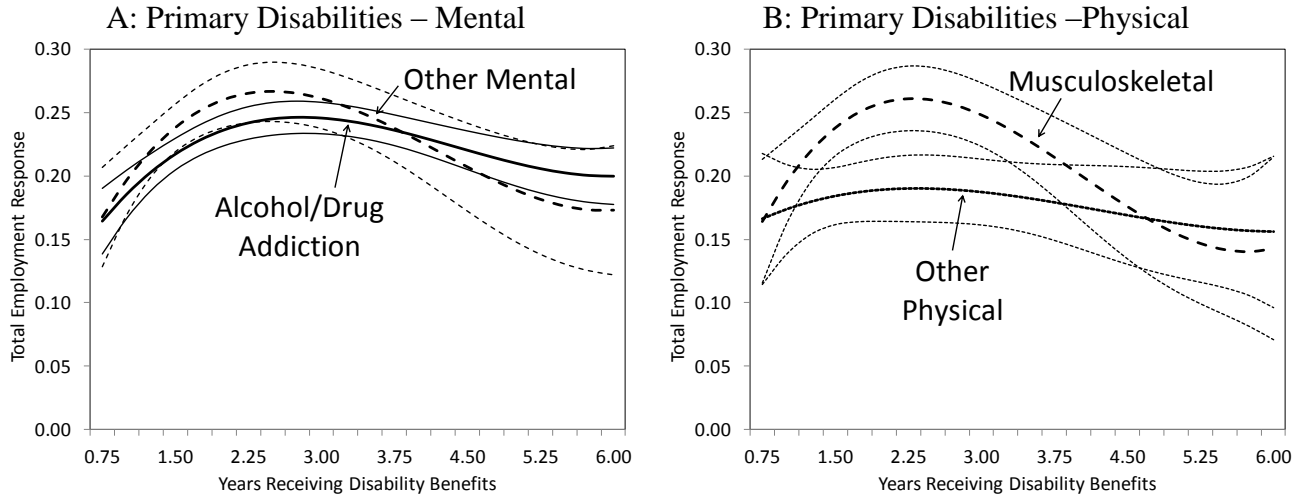
The figure shows the full effect of the post-termination increase in employment for different values of *DI_TIME$_i$*. These are the nonlinear combinations of the four coefficients related to *SHIFT$_{it}$* for each subgroup that are presented in Table 4. The 95% confidence intervals are also shown.

35

Figure 7 Initial Employment and Health Characteristics for Different DI Beneficiary Cohorts

A: Fraction Earning>1996 SGA Prior to
Receiving Disability Benefits

B: Mortality Rates the Year After
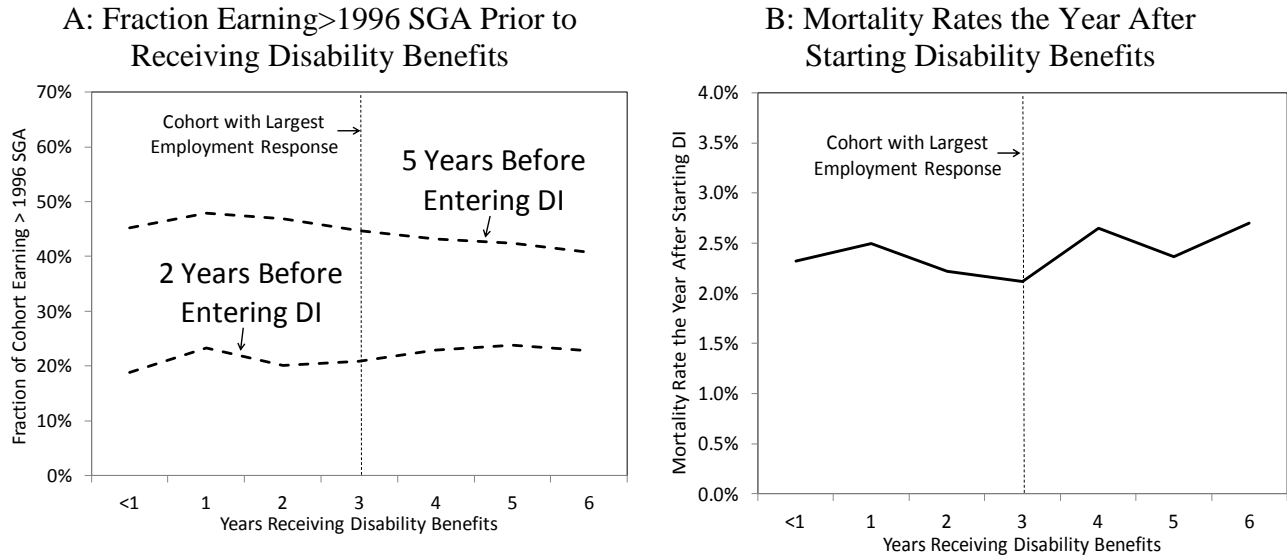Starting Disability Benefits

Figure 8 Distribution of Time to Award for Individuals Awarded DI Eligibility
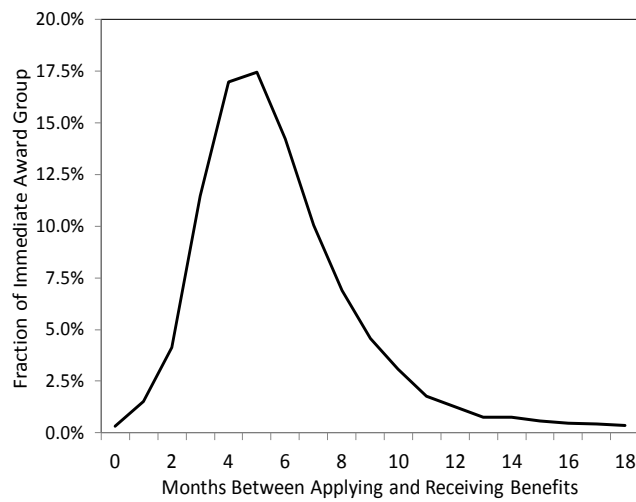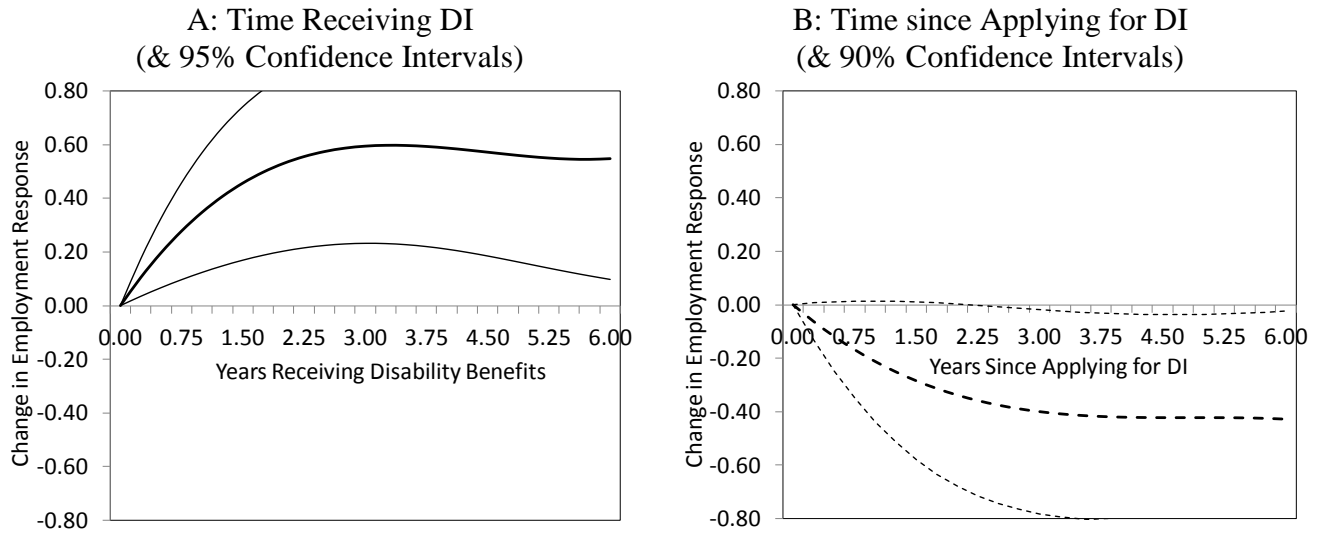At First Stage within 18 Months of Date of Application

Figure 9 Changes in the Employment Response as a Function of Time since
Application and Time Receiving Disability Benefits

A: Time Receiving DI
(& 95% Confidence Intervals)

B: Time since Applying for DI
(& 90% Confidence Intervals)

The figures show the full effect of the post-termination increase in employment for different
values of time on DI and time since applying for DI. These are the nonlinear combinations of the
coefficients (and standard errors) presented in Column 2 of Table 7. For Panel B, 90%
confidence intervals are used because the 95% confidence intervals cross zero.

Table 1 Characteristics of DA&A DI Beneficiaries at the Time of Program Termination

	All (1)	Terminated (2)	Reclassified (3)
Demographics			
Male	80%	82%	78%
Female	20%	18%	22%
White	58%	52%	62%
Black	33%	39%	29%
Other race	7.8%	8.0%	7.6%
Age in Jan 1997 (years)	43.4	41.9	44.6
(Std. dev.)	(7.62)	(6.90)	(7.93)
Education (years)	11.0	11.1	11.0
(Std. dev.)	(2.03)	(1.92)	(2.10)
Type of addiction			
Alcohol only	58%	54%	62%
Alcohol and drugs	27%	30%	24%
Drugs only	15%	16%	14%
Primary disability when applying			
Alcohol/drug addiction	46%	58%	38%
Mental disorders	22%	16%	26%
Musculoskeletal condition	15%	13%	17%
Other disabilities	17%	13%	19%
Neurological condition	2.6%	2.1%	2.9%
Digestive condition	2.3%	1.6%	2.6%
Respiratory	1.9%	1.3%	2.4%
Other disabilities	7.1%	6.3%	8.1%
DI program involvement			
Time on disability benefits (years)	2.92	2.74	3.13
(Std. dev.)	(1.62)	(1.57)	(1.66)
1996 federal benefits ($ in 2011)	$10,485	$10,259	$10,729
(Std. dev.)	(3,054)	(2,947)	(3,109)
Observations	51,274	19,229	27,296

There are 4,749 individuals who could not be classified as having kept or lost benefits as a result of the policy; these individuals are not included in either group. Race is missing or inconsistent for 1.6% of the sample, and education is missing for 6.1%; these fractions are similar within the terminated and reclassified groups. Payments in 1996 are converted to 2011 dollars using the CPI-U.

Table 2 Estimates of Terminated Beneficiaries' Relative Probabilities of Employment
Based on Annual Earnings > 1996 Substantial Gainful Activity ($8,602)

	Logit Model (1)	Lin. Prob. Model (2)	+ Demog. Controls (3)	+ Disability Status (4)	+ DI History (5)	+ Work History (6)
$TERMINATED_i$	0.023***	0.021***	0.019***	0.017***	0.011***	0.004
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
$TERMINATED_i$ x						
1989	-0.017***	-0.004	-0.004	-0.004	-0.003	-0.003
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
1990	-0.009***	0.004	0.004	0.004	0.005	0.005
	(0.003)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
1991	-0.003	0.008	0.008	0.008	0.009	0.009**
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
1992	-0.002	0.007	0.006	0.007	0.007	0.007
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
1993	0.004	0.010***	0.010***	0.010***	0.010***	0.011***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
1994	-0.002	0.0004	0.0004	0.0004	0.001	0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)
	--	--	--	--	--	--
1996	0.034***	0.032***	0.032***	0.032***	0.032***	0.032***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
1997	0.179***	0.178***	0.178***	0.178***	0.177***	0.177***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
1998	0.219***	0.219***	0.219***	0.219***	0.218***	0.218***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
1999	0.228***	0.228***	0.228***	0.227***	0.227***	0.226***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
2000	0.226***	0.225***	0.225***	0.225***	0.224***	0.224***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
2001	0.194***	0.193***	0.193***	0.193***	0.192***	0.191***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
2002	0.165***	0.163***	0.163***	0.162***	0.161***	0.161***
	(0.002)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
2003	0.142***	0.138***	0.138***	0.138***	0.137***	0.136***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
2004	0.134***	0.130***	0.130***	0.130***	0.128***	0.127***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
2005	0.126***	0.121***	0.121***	0.121***	0.119***	0.118***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
2006	0.117***	0.112***	0.112***	0.112***	0.110***	0.109***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
2007	0.106***	0.100***	0.100***	0.100***	0.098***	0.096***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
2008	0.095***	0.088***	0.088***	0.088***	0.086***	0.084***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
R-sq.	--	0.127	0.132	0.151	0.235	0.322

** denotes $p < 0.05$, *** denotes $p < 0.01$. Standard errors are in parentheses and allow for within-person correlation in errors. All regressions have 930,500 observations. See text for details.

Table 3 Regression Estimates of the Aggregate Employment Effects

	All (1)	Alc./drug addiction (2)	Mental disorders (3)	Musculo-skeletal (4)	Other physical (5)
		Primary Disability When Applying for DI			
Sum of β_t for 1989-1994	0.003	-0.005	0.020***	0.016**	-0.005
	(0.003)	(0.004)	(0.007)	(0.007)	(0.008)
$SHIFT_{it}$	0.220***	0.224***	0.231***	0.226***	0.181***
	(0.003)	(0.005)	(0.008)	(0.009)	(0.009)
$DECLINE_{it}$	-0.016***	-0.016***	-0.018***	-0.018***	-0.014***
	(0.0004)	(0.001)	(0.001)	(0.001)	(0.001)
R-squared	0.347	0.347	0.349	0.344	0.333
Observations	930,500	429,120	204,840	139,800	132,840

** denotes p<0.05, *** denotes p<0.01. The variable $SHIFT_{it}$ equals one for years $t \geq 1998$, and zero otherwise. The variable $DECLINE_{it}$ equals $t - 1999$ for years $t \geq 2000$, and zero otherwise. Standard errors are in parentheses and allow for within-person correlation in errors. See text for details.

Table 4 Regression Estimates of the Employment Effects by Time on DI

	All (1)	Alc./drug addiction (2)	Mental, not addiction (3)	Musculo-skeletal (4)	Other physical (5)
		Primary Disability When Applying for DI			
$SHIFT_{it}$	0.069***	0.076**	0.042	0.024	0.133
	(0.022)	(0.030)	(0.052)	(0.068)	(0.070)
$SHIFT_{it}$ x DI_TIME_i	0.155***	0.145***	0.210***	0.238***	0.057
	(0.024)	(0.031)	(0.057)	(0.080)	(0.079)
$SHIFT_{it}$ x $DI\_TIME_i^2$	-0.042***	-0.038***	-0.060***	-0.072***	-0.017
	(0.007)	(0.009)	(0.018)	(0.027)	(0.025)
$SHIFT_{it}$ x $DI\_TIME_i^3$	0.0033***	0.003***	0.0048***	0.0060**	0.0017
	(0.0006)	(0.001)	(0.0016)	(0.0026)	(0.0024)
$DECLINE_{it}$	-0.016***	-0.021***	-0.013**	-0.006	-0.013
	(0.003)	(0.004)	(0.006)	(0.008)	(0.008)
$DECLINE_{it}$ x DI_TIME_i	-0.002	0.003	-0.004	-0.015	-0.003
	(0.003)	(0.004)	(0.007)	(0.009)	(0.009)
$DECLINE_{it}$ x $DI\_TIME_i^2$	0.0006	-0.001	0.0009	0.0048	0.0015
	(0.0008)	(0.001)	(0.0021)	(0.0027)	(0.0026)
$DECLINE_{it}$ x $DI\_TIME_i^3$	-0.0001	0.00005	-0.00005	-0.0004	-0.0002
	(0.0001)	(0.00009)	(0.00020)	(0.0002)	(0.0003)
R-squared	0.358	0.360	0.357	0.353	0.342
Observations	930,500	429,120	204,840	139,800	132,840

** denotes p<0.05, *** denotes p<0.01. The variable $SHIFT_{it}$ equals one for years $t \geq 1998$, and zero otherwise. The variable $DECLINE_{it}$ equals $t - 1999$ for years $t \geq 2000$, and zero otherwise. DI_TIME_i measures the years on disability benefits before the terminations occurred in January 1997. Standard errors are in parentheses and allow for within-person correlation in errors. See text for details.

Table 5 Employment Response by Time on Benefits and by Level Benefits Were Awarded

	Full Sample			Primary Disability was Mental (Not Addiction)			Primary Disability was Musculoskeletal		
	Initial Award (1)	Hearings Award (2)	Initial – Hearings (3)	Initial Award (4)	Hearings Award (5)	Initial – Hearings (6)	Initial Award (7)	Hearings Award (8)	Initial – Hearings (9)
$SHIFT_{it}$	0.003	0.117***		-0.042	0.086		0.099	0.019	
	(0.032)	(0.037)		(0.081)	(0.075)		(0.163)	(0.074)	
$SHIFT_{it}$	0.209***	0.129***		0.261***	0.185**		0.115	0.258***	
x DI_TIME_i	(0.033)	(0.042)		(0.086)	(0.088)		(0.191)	(0.085)	
$SHIFT_{it}$	-0.053***	-0.043***		-0.063**	-0.062**		-0.011	-0.087***	
x $DI\_TIME_i^2$	(0.009)	(0.014)		(0.025)	(0.029)		(0.063)	(0.028)	
$SHIFT_{it}$	0.004***	0.004***		0.004**	0.006**		-0.002	0.008***	
x $DI\_TIME_i^3$	(0.001)	(0.001)		(0.002)	(0.003)		(0.006)	(0.003)	

Total Shift in Employment for DI_TIME_i at:

9 months	0.131***	0.191***	-0.060***	0.121***	0.192***	-0.071	0.178***	0.166***	0.012
	(0.014)	(0.014)	(0.019)	(0.033)	(0.027)	(0.042)	(0.059)	(0.028)	(0.065)
1 year	0.163***	0.207***	-0.045***	0.161***	0.214***	-0.053	0.201***	0.197***	0.004
	(0.01)	(0.009)	(0.014)	(0.023)	(0.018)	(0.029)	(0.039)	(0.019)	(0.044)
2 years	0.239***	0.235***	0.003	0.263***	0.251***	0.011	0.272***	0.249***	0.023
	(0.006)	(0.007)	(0.009)	(0.016)	(0.016)	(0.022)	(0.03)	(0.014)	(0.033)
3 years	0.255***	0.225***	0.029***	0.289***	0.230***	0.059**	0.301***	0.223***	0.079**
	(0.007)	(0.008)	(0.010)	(0.018)	(0.018)	(0.025)	(0.029)	(0.015)	(0.032)
4 years	0.235***	0.200***	0.034***	0.266***	0.184***	0.082***	0.281***	0.165***	0.115***
	(0.007)	(0.011)	(0.013)	(0.02)	(0.025)	(0.032)	(0.038)	(0.02)	(0.042)
5 years	0.201***	0.184***	0.018	0.22***	0.147***	0.073	0.201***	0.126***	0.075
	(0.01)	(0.015)	(0.018)	(0.029)	(0.034)	(0.045)	(0.059)	(0.026)	(0.064)
6 years	0.179***	0.199***	-0.020	0.175***	0.152***	0.023	0.052***	0.151***	-0.099
	(0.012)	(0.019)	(0.023)	(0.035)	(0.045)	(0.057)	(0.116)	(0.036)	(0.122)
R-squared	0.359			0.357			0.353		
Observations	824,920			180,400			127,340		

** denotes p<0.05, *** denotes p<0.01. Initial Award includes individuals awarded DI at the first stage of the disability determination process, while Hearings Award were denied eligibility for DI. The variable $SHIFT_{it}$ equals one for years $t \geq 1998$, and zero otherwise. The variable $DECLINE_{it}$ equals $t - 1999$ for years $t \geq 2000$, and zero otherwise. DI_TIME_i measures the years on disability benefits before the terminations occurred in January 1997. Standard errors are in parentheses and allow for within-person correlation in errors. See text for details.

Table 6 Role of Characteristics in Time to Award, Initial Awardees with Time of 2-9 Months

	All (1)	Males, Musculo. not Primary (2)
Demographic Characteristics		
Male	-0.008***	--
	(0.003)	
White	0.003	-0.007
	(0.010)	(0.012)
Black	0.015	0.007
	(0.011)	(0.011)
Other Race	0.013	0.003
	(0.012)	(0.013)
Age	0.0002	0.002
	(0.0135)	(0.015)
Age^2	0.00001	-0.00003
	(0.00031)	(0.00036)
Age^3	-1.8×10^{-7}	-1.8×10^{-7}
	(2.4×10^{-6})	(2.7×10^{-6})
Health/program Characteristics		
Drug Addiction	-0.0002	0.001
	(0.0023)	(0.003)
Addiction is Primary Disability	0.002	0.003
	(0.004)	(0.004)
Musculoskeletal is Primary Disability	0.018***	--
	(0.006)	
Other Physical is Primary Disability	0.005	0.006
	(0.007)	(0.007)
Time Receiving Disability Benefits	0.001	0.0003
	(0.001)	(0.0017)
Terminated from DI in 1997	0.0005	-0.00004
	(0.0026)	(0.00289)
Employment Characteristics		
Employed (1 yr Before Applying)	-0.003	-0.005
	(0.003)	(0.004)
Employed (2 yrs Before Applying)	-0.00002	-0.0003
	(0.00315)	(0.0035)
Employed (3 yrs Before Applying)	-0.003	-0.001
	(0.003)	(0.003)
Employed (4 yrs Before Applying)	-0.001	0.002
	(0.002)	(0.003)
Employed (5 yrs Before Applying)	-0.005	-0.008**
	(0.003)	(0.003)
R-squared	0.230	0.243
Observations	17,416	12,924

** denotes $p<0.05$, *** denotes $p<0.01$. The regression includes a full set of SSA office fixed effects. Standard errors are in parentheses and allow for arbitrary correlation in errors at the SSA office level. Employment is measured in terms of earning more than the 1996 SGA. See text for details.

Table 7 Employment Response by Time on Disability Benefits and Time since Application, Those Awarded DI at First Stage, 2-9 Months after Applying

	(1)	(2)
$SHIFT_{it}$	-0.010	0.080
	(0.040)	(0.074)
$SHIFT_{it}$ x DI_TIME_i	0.218***	0.446***
	(0.039)	(0.154)
$SHIFT_{it}$ x $DI\_TIME_i^2$	-0.054***	-0.106**
	(0.011)	(0.047)
$SHIFT_{it}$ x $DI\_TIME_i^3$	0.004***	0.008
	(0.001)	(0.004)
$SHIFT_{it}$ x APP_TIME_i		-0.263
		(0.179)
$SHIFT_{it}$ x $APP\_TIME_i^2$		0.054
		(0.048)
$SHIFT_{it}$ x $APP\_TIME_i^3$		-0.004
		(0.004)
R-squared	0.358	0.358
Observations	272,320	258,480

** denotes p<0.05, *** denotes p<0.01. The variable $SHIFT_{it}$ equals one for years $t \geq 1998$, and zero otherwise. The variable $DECLINE_{it}$ equals $t - 1999$ for years $t \geq 2000$, and zero otherwise. DI_TIME_i measures the years on disability benefits before the terminations occurred in January 1997, while AP_TIME_i measures the year since applying for disability benefits before January 1997. Standard errors are in parentheses and allow for within-person correlation in errors. See text for details.