CENTER for RETIREMENT RESEARCH at BOSTON COLLEGE

CHARACTERISTICS AND EMPLOYMENT OF APPLICANTS FOR SOCIAL SECURITY DISABILITY INSURANCE OVER THE BUSINESS CYCLE

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Abstract

This study investigates the relationship between fluctuations in the short-term unemployment rate and characteristics of applicants for Social Security Disability Insurance. Using administrative records of the universe of applicants between 1991 and 2008, we find that almost all of the increase in applications and allowances during recession periods is due to increasing applications and allowances of people whose applications are either rejected or determined by vocational factors. People who apply during economic downturns also have lower income and assets at the time of application and lower earnings several years after application. Further decomposition results suggest that difficult macroeconomic conditions during the time of application account for the negative relationship between the unemployment rate and post-application earnings and employment.

1 Introduction

The number of applications and awards for Social Security Disability Insurance (DI) increase with the unemployment rate (Rupp and Stapleton 1995). Figure 1 displays this relationship for applications for the years 1991 to 2008. These stylized facts have prompted concerns that, during recessions, DI draws people with moderate disabilities out of the labor market who temporarily struggle to find employment but may be able to find valuable work once the recession is over.[1] If so, then temporary assistance programs would be better suited for these people to reintegrate them into the labor market. Yet very little is known about whether applicants during economic downturns are different from those who apply during good economic times, and how such compositional changes could relate to applicants' employment prospects.[2]

In this paper, we use administrative records of the universe of all people who apply for DI between 1991 and 2008 to examine how their composition changes during boom and busts. We find that almost all of the increase in the number of total applications and allowances during recessions is due to an increase in applications that are initially rejected or that are determined by vocational factors. The share of applicants and beneficiaries who jointly apply for Supplemental Security Income (SSI) also increases with the unemployment rate. Because SSI is a means-tested program, this finding implies that a greater share of applicants have low incomes and assets at the time of application.

We then examine how earnings and employment of applicants change over the business cycle. Based on Bound (1989), we use earnings and employment of denied applicants as a proxy for earnings and employment of all applicants if they were not in the program. Our analysis reveals that denied applicants who apply when the unemployment rate is high have higher earnings and employment in the past, but lower earnings and employment during the years shortly before and after application.

[1] See for instance `http://usatoday30.usatoday.com/news/opinion/editorials/story/2012-02-02/disability-Social-Security-recession/52940278/1` (last accessed 03/25/2013).

[2] One exception is Coe and Rutledge (2013), who investigate at changes in the composition of applicants for DI between 2000 and 2010 using various population surveys.

These findings suggest the possibility of two opposing effects determining earnings and employment differences of applicants over the business cycle. On the one hand, applicants who apply during recessions are less disabled and therefore have higher earnings and employment in the past as compared to other applicants. On the other hand, they apply during difficult economic times and therefore struggle more to find valuable employment around the time they apply for DI. This interpretation also helps explain the found compositional changes over the business cycle. Because of the first effect, people who apply during economic downturns are more likely to be rejected because they lack a severe health impairment or because they can perform past work, but because they struggle in the labor market, they are also more likely to be eligible for SSI when applying for DI.

To further understand the role of changing applicants' characteristics versus economic conditions, we decompose earnings and employment changes between recession and non-recession years of denied applicants 5 years after application into these two components. Changes in characteristics of applicants by themselves would imply that denied applicants who apply during a recession have higher earnings and employment five years after application than denied applicants who apply during a non-recession period. However, the negative effect of difficult macroeconomic conditions outweights this positive effect, resulting in the observed negative relationship between the unemployment rate and earnings or employment 5 years after application.

The rest of the paper is organized as follows. We first briefly describe the DI program and discuss related literature and hypotheses. We then explain the data and methodology used for this study, followed by a presentation of the main results, discussion and concluding remarks.

2 An overview of the DI program and its application process

DI is the largest federal insurance program against loss of income due to a disability. Since its inception in 1956, the number of beneficiaries has steadily increased from

150,000 in 1957 to 8.6 million in 2011, interrupted only by a slight decrease during the mid-1980s when Congress passed changes that tightened program eligibility rules (Bound and Waidmann 2002; Social Security Administration 2012).

Applicants for DI can also apply for SSI if they pass that program's income and asset test.[3] Applications for DI are determined by a five-stage procedure. At the first two stages, applicants with too high earnings (stage 1) and no severe health impairment (stage 2) are rejected. At the third stage, applicants with a health impairment included in a list of specific medical conditions are allowed.[4] This list includes severe medical conditions such as blindness, epilepsy, or inoperable tumors. If the applicants' health impairment is not on this list, then at stage 4 the case worker examines whether the applicant can do work he or she has done in the past. If so, the claim is denied; if not, the application moves to step 5, where the applicants' residual work capacity is evaluated.

For the subsequent analysis, we treat information about the determination stage as an indicator for a person's level of disability and work capacity. At one extreme, claimants whose applications rejected at stage 2 or 4 are likely to have less severe disabilities and a higher work capacity than other applicants. At the other extreme, claimants whose application is allowed at stage 3 arguably suffer from more severe disabilities than other claimants. Finally, claimants whose application is determined at stage 5 fall somewhere in between.

Denied applicants can ask Social Security to reconsider their case, and almost all of them do so. For instance, in 2005 almost 90 percent of all initially denied applicants appealed at the reconsideration stage (Autor and Duggan 2010). However, only a small minority of them (13 percent in 2005) are awarded benefits at this stage. Those still

[3] The current asset limit is $2,000 for individuals and $3,000 for couples. Assets include accessible resources such as defined-contribution retirement accounts, but excludes a claimant's house or car. The income limit depends on a claimant's sources of income. It is required that the claimant would qualify for some dollar amount of SSI to meet the income test. See `http://www.worksupport.com/topics/ssifaq.asp#qualify` (last accessed 03/25/2013).

[4] For the list of medical conditions see `http://www.ssa.gov/disability/professionals/bluebook/AdultListings.htm` (last access 03/25/2013).

not awarded benefits can further appeal the decision to the administrative law judge, appeal council, and federal court level. The majority of all denials that reach the administrative law judge level are reversed (69 percent in 2005), but the waiting time for decisions at this level often extends from several months to even over a year. Only a small number of claimants rejected at this stage further appeal the decision, and most of them are not successful. Overall, the average processing time of an application is around six months, but the lengthy appeals process implies that a small fraction of applications are not determined even two to three years after applications.

3 Related literature and hypotheses

Conceptually, our study builds on Autor and Duggan (2003). They distinguish between applicants who apply for DI irrespectively of economic circumstances because of a severe health impairment and applicants who have some kind of health impairment that may qualify them for DI, but who do not consider applying for benefits as long as they have work. Once they lose their job, however, applying for DI is more attractive for them than trying to find a new job. They call this group "conditional applicants" and show that reforms in the mid-1980s have likely increased the fraction of applicants that fall in this group.

In a recent paper, von Wachter et al. (2011) find that this shift toward conditional applicants has affected average earnings and employment of DI claimants. As in Bound (1989), they use earnings and employment of denied applicants two years after application as an upper bound for the hypothetical earnings and employment of beneficiaries if they were not in the program. Extending Bound's analysis from the late 1970s, they document changes to the composition of applicants between 1978 and 2006 and find that applications from people ages 30 to 44 have become increasingly common. Because younger denied applicants have higher earnings and employment two years after application than their older counterparts, they conclude that average employment and earnings of denied applicants and of beneficiaries if they were not in the program has

increased over time.

Our study applies Autor and Duggan's framework to the business cycle. Because job losses occur more frequently during recessions, we expect that the share of conditional applicants increases during economic downturns. However, displaced workers (i.e., workers who are permanently laid off due to their firm's failure or plant closure) suffer from severe and long-term earnings losses (e.g., Ruhm 1991; Jacobson et al. 1993). Conceivably, these earnings losses are more severe during economic downturns when macroeconomic conditions are dire. This suggests that compositional changes toward more conditional applicants may not result in higher average employment and earnings of applicants during recessions.

This discussion has several testable implications for characteristics and earnings of applicants. Table 1 summarizes these hypotheses. Similar to von Wachter et al. (2011), we expect that younger people apply more frequently during economic downturns, which implies a negative relationship between the unemployment rate and average age of applicants. For education attainment, we hypothesize that conditional applicants have a higher level of education than other applicants because severity of a disability tends to be negatively related to educational attainment. However, it is also possible that applying for DI after job loss is a more attractive option for less educated workers than for highly educated workers because they would receive higher DI benefits relative to future earnings. The relationship between the unemployment rate and educational attainment of applicants is therefore not clear.

Predictions for joint DI/SSI applications is also unclear. On the one hand, compositional changes toward less disabled applicants imply a negative relationship of joint DI/SSI applications and the unemployment rate. This is because people with less severe disabilities tend to have higher income and assets. On the other hand, if the negative consequences of losing a job are more pronounced during economic downturns, then more applicants who apply during a recession might qualify for SSI.

In terms of initial determination, we expect that the number and share of applications determined at stages 2, 4, and 5 rises during economic downturns. By contrast,

we think that the *number* of applications determined at stage 3 is unrelated to the unemployment rate. Because diagnosis groups such as musculoskeletal impairments and mental disorders are typically determined at stages 2, 4, and 5, we also expect the share of applications from these diagnosis groups to increase with the unemployment rate. By contrast, diagnosis groups such as circulatory impairments or neoplasms are typically determined at stage 3 and we therefore anticipate that the number of applications from these groups does not vary much over the business cycle.

Changes in applicants' characteristics and changes in economic conditions are also likely to affect earnings and employment of applicants. Specifically, we expect average earnings and employment during the years *before* application to be positively related to the unemployment rate, reflecting compositional changes toward applicants with less severe disabilities. However, the relationship between earnings or employment during the years *after* application and the unemployment rate is ambiguous because of the negative effect of a job loss could be more severe during economic downturns.

A final set of hypotheses concerns the application process, i.e., application duration and determination. If more conditional applicants apply during economic downturns and their applications are determined at later stages of the application process (e.g., stage 5), then this changing composition will also result in a longer application duration and fewer cases being allowed. However, it is possible that case workers process claims differently during recessions and booms. For instance, it may take them longer to process a claim during a recession because they have a large number of claims. However, it is also plausible that they process each claim quicker in such circumstances. Concerning determinations, case workers might be more lenient during difficult economic times if they think that denied applicants will struggle in the labor market, or they might be more strict if they believe that more fraudulent claims are filed. Altogether, the relationship between the unemployment rate and application duration and determination is unclear.

4 Data

Our primary data source is the Disability Research File (DRF). The Social Security Administration creates the DRF file by combining several administrative records related to DI applications (831 files, MBR records, etc.) with the goal of providing researchers with accessible, consistent, and comprehensive information about DI applicants. The DRF contains the beginning date, duration, and outcome of applications. Because the initial earnings test is not recorded in the administrative files used for the DRF, only applicants who pass the first stage of initial application are included. Another 10 percent of all applications have an unknown determination stage. Basic demographic information as recorded in administrative files is included in DRF as well. In creating the DRF, SSA also matches application records to yearly summary earnings for the years 1980 to 2010.

Based on this information, we create a number of variables for our analysis. These are:

- Characteristics of applicants: age, sex, classified as being white, educational attainment (high-school drop-out, high-school graduate, college graduate), whether they apply jointly for DI and SSI, determination stage of initial application, and diagnosis groups as defined by RAND's manual (neoplasms, diseases related to endocrine systems and nutrition, blood diseases, mental disorder and retardation, nervous disorders and diseases related to the senses, circulatory diseases, respiratory diseases, digestive disease, genito-urinary diseases, diseases related to the skin, and other diagnosis groups).[5]

- Application outcomes: application duration, outcome of initial determination, and final application outcome.

- Earnings: earnings (including zero earnings) and employment (defined as any positive earnings during one year) ten years before to five years after application.

[5] See Panis et al. (2000).

- Other information: state of applicant, state unemployment rate, and state population age 20 to 64.

For our analysis, we primarily use data that covers applications from 1991 to 2008. DRF files prior to 1991 do not exist, and DRF records after 2008 have a growing percentage of open applications as well as right-censored earnings for some of the years following application. However, we extend our analysis to the years 2009 and 2010 as a robustness check. DRF records after 2010 are currently not available. We include all adults between the ages of 18 to 65 and use the full universe of applicants for our analysis – more than 22.7 million records.

Based on individual-level filing dates, we create time series with quarterly and yearly frequencies for the economy as a whole and for each state. We use yearly frequencies for earnings and employment because they are only observed on an annual basis. For other variables, we experimented with month as frequency as well, but found that higher frequencies do not add any benefit to our analysis. For each frequency, we calculate characteristics of applicants who apply during the respective quarter or year. For earnings, we include past earnings up to 10 years before and up to 5 years after the year of application. All earnings are expressed in 2010 values using the CPI-U. This panel is then matched to population numbers to express the number of applications as population percentages.

5 Methodology

5.1 Aggregate-level regressions

To establish the relationship between the unemployment rate and characteristics of applicants, we specify the following model:

$$y_{st} = \beta_0 + \beta_1 ue_{st} + \eta_s + \eta_t + \eta_s \cdot t + \varepsilon_{st} \tag{1}$$

where y_{st} denotes outcomes of interest (e.g., age of applicants, percentage of applicants without a high-school degree, etc.) per time period t and in state s, ue_{st} is the unemployment rate, η_s are state fixed-effects, η_t are year fixed effects, $\eta_s \cdot t$ are state-specific linear time trends and ε_t is the error term. Including both state fixed effects and state fixed effects interacted with a linear time trend controls for level and long-term trend differences across states.[6] The coefficients β_1 measures the association between short-term fluctuations in the unemployment rate and applicants' characteristics.

Aside from applicants' characteristics, we also examine the relationship between the unemployment rate and application outcomes (i.e., application duration, acceptance at initial and final determination). For these outcomes, however, it is important to also control for applicants' characteristics because characteristics might change with the unemployment rate and also affect application outcomes. For instance, if more conditional applicants apply during economic downturns, then this compositional change in itself implies a negative relationship between the unemployment rate and acceptance rates. We control for such confounding factors by including applicants' characteristics as additional controls:

$$y_{st} = \mu + \beta_1 ue_{st} + \gamma x_{st} + \eta_s + \eta_t + \eta_s \cdot t + \varepsilon_t \quad , \tag{2}$$

where x_{st} are characteristics of applicants who apply in state s at time t. We present all regression results for the level of dependent variables to measure marginal effects of short-term changes in the unemployment rate on the outcome of interest. We report all level results in basis points, i.e. the number of applications per 10,000 people. We also report regression results using the log of the outcome variable to obtain semi-elasticities. For all regressions, we use weights equal to the number of applicants in a state as fraction of all applications in one period t. We prefer weighted regressions because we want to estimate statistics for the application population (Solon et al. 2013). Finally, we cluster standard errors at the state level to account for correlated

[6] See for instance Hellerstein and Morrill (2011) for an similar approach in the context of divorce risk over the business cycle.

error terms within states.

5.2 Decomposition

For the decomposition, we use semi-parametric decomposition methods similar to Barsky et al. (2002) and DiNardo et al. (1996). We prefer this approach over parametric approaches because it does not require different model specification depending on the type of outcome variable (i.e., continuous versus binary).

We write average earnings or employment for denied applicants who apply at time t as follows:

$$\bar{y}_t(x|T=t) = \int (y|X=x, T=t) \cdot dF(x|T=t) \quad , \tag{3}$$

where $\bar{y}_t(x|T=t)$ are average earnings or employment of denied applicants at time $T=t$, $(y|X=x, T=t)$ are earnings or employment conditional on observable characteristics X at a time t, and $F(x|T=t)$ is the cumulative distribution function over values of x for these individuals.

The fundamental idea of any decomposition method is to add and subtract a term that measure the outcome of one group if they had the same characteristics of another group. For semi-parametric decompositions, this involves replacing the conditional outcome function of one time period or group with the conditional outcome function of another time period or group. For instance, by replacing the conditional outcome function for time period $T=t_2$ with the conditional outcome function for a different time period $T=t_1$ in equation 3, we obtain the following expression:

$$\bar{y}_{t_1}(x|T=t_2) = \int (y|X=x, T=t_1) \cdot dF(x|T=t_2) \quad . \tag{4}$$

We can interpret the term $\bar{y}_{t_1}(x|T=t_2)$ as counterfactual earnings or employment of denied applicants who applied in period $T=t_2$ if they had applied (and got rejected) in period $T=t_1$. This interpretation is only valid if denied applicants who applied in

period $T = t_1$ do not differ systematically in unobserved characteristics from denied applicants who applied in period $T = t_2$. In the literature, this assumption is known as the *conditional independence assumption* (Fortin et al. 2011).[7] We think that this assumption is reasonable in the context of our study because we look at changes over short periods of time and because we control for earnings up to ten years before job loss (aside from other individual characteristics). Because earnings trajectories summarize people's skills and abilities, it is unlikely that people with the same past earnings and other individual characteristics differ systematically in unobserved characteristics.

Using counterfactual earnings or employment, the difference in earnings or employment between $T = t_1$ and $T = t_2$ can be decomposed by adding and subtracting the term $\bar{y}_{t_1}(x|T = t_2)$:

$$\begin{aligned} \bar{y}_{t_2}(x|T = t_2) - \bar{y}_{t_1}(x|T = t_1) = \;\; \Delta\bar{y}(x) = \\ \big[\bar{y}_{t_2}(x|T = t_2) - \bar{y}_{t_1}(x|T = t_2)\big] + \big[\bar{y}_{t_1}(x|T = t_2) - \bar{y}_{t_1}(x|T = t_1)\big] \end{aligned} \tag{7}$$

where $\Delta\bar{y}(x)$ is the overall earnings or employment difference and the first difference of the decomposition measures the contribution of changing macroeconomic conditions on the overall earnings or employment difference. The expression is the difference in

[7] For calculating counterfactual outcomes in practice, we need to re-express equation 4. Similarly to Barsky et al. (2002), we re-write this expression as follows:

$$\begin{aligned} \bar{y}_{t_1}(x|T = t_2) = \int (y|x, T = t_1) \cdot dF(x|T = t_2) \\ \int (y|x, T = t_1) \cdot \psi_{t_1}^{t_2} \cdot dF(x|T = t_1) \; . \end{aligned} \tag{5}$$

This equation shows that counterfactual earnings or employment are just an weighted average of earnings of people in period $T = t_1$ with weights $\psi_{t_1}^{t_2}$. These weights are:

$$\psi_{t_1}^{t_2} = \frac{P(T = t_2|x)/P(T = t_2)}{P(T = t_1|x)/P(T = t_1)} \quad , \tag{6}$$

Estimates for weights $\psi_{t_1}^{t_2}$ can be obtained by pooling denied applicants from both periods and estimating a model that predicts period $T = t_2$ applications conditional on observed characteristics (i.e., $P(T = t_2|x)$).

earnings or employment of denied applicants who applied in period $T = t_2$ and their counterfactual earnings or employment if they had applied in period $T = t_1$ instead (but had the same characteristics). We call this part of the decomposition the business cycle effect and denote it by Δ_{bc}.

The second difference of the decomposition measures the compositional component, denoted by Δ_{comp}. It is the difference in earnings or employment due to changes in applicants' characteristics between the two time periods, evaluated at earnings or employment of the first time period.

In our empirical analysis, we present results for the decomposition as shown in equation 7, using recession years as the second time period and non-recession years as the first time period (whether or not the second time period follows after the first time period). We use earnings or employment five years after application because some applications might still be in process two or three years after they are filed. However, we also calculate decompositions using earnings and employment 2 years after application as a robustness check.

6 Results

In this section, we first present our main findings for characteristics of applicants and their applications. We then examine how earnings and employment of denied applicants change over the business cycle. We have also conducted various alternative regressions and decompositions as robustness checks (see appendix A). They do not imply any major differences as compared to the main results presented here.

6.1 Characteristics of applicants and applications

Table 2 displays results for characteristics of applicants. We also report mean values for each variable to better assess the magnitude of the results.[8] Mean values and

[8] Mean values are weighted averages over all time periods and states for the years 1991 to 2008 and therefore represent average values of the applicant population.

level results for populations are expressed in basis points (i.e., number of applications per 10,000 people). The first row shows that a one percentage point increase in the unemployment rate increases applications by 0.5 basis points, which is equivalent to a 3.1 percent increase. This result is similar to those of earlier studies that report magnitudes ranging from 2 to 6 percent (Rupp and Stapleton 1995).

Interestingly, average age of applicants remains almost unchanged over the business cycle. Similarly, the coefficient for high-school drop-outs is positive but almost equal to zero. The fraction of applicants who also apply for SSI increases during times of high unemployment, indicating that marginal applicants tend to have lower levels of current income and assets as they apply for DI benefits.

Concerning stages of application, the number of applications determined at stages 2, 4, and 5 is positively related to the unemployment rate. By contrast, the number of stage 3 applications remains almost unchanged over the business cycle. These results imply that essentially all of the increase in the number of applications can be attributed to an increase in applications from conditional applicants. Looking at the share of applicants for each application stage, we can see that the share of applicants rejected at stage 2 or 4 increases with the unemployment rate, but the share of stage 5 applicants decreases with the unemployment rate, which seems puzzling. One possible interpretation is that case workers shift determinations from stage 5 to stage 2 and 4 to shorten the determination process during recession periods when there are a lot of claims.

The results so far suggest that more people with moderate disabilities apply when the unemployment rate is high. Therefore, one would also expect that the fraction of applicants with musculoskeletal impairments or mental disorder increases with the unemployment rate. However, we do not find supportive evidence for such a compositional change. Interestingly, the number of applications with circulatory impairments and neoplasms is also positively related to the unemployment rate.[9] Apparently, these

[9] The share of applications with circulatory impairments is even positively related to the unemployment rate, whereas the share of applications with neoplasms is negatively related to the unemployment rate.

diagnosis groups are heterogeneous and include applicants with serious and less serious disabilities.

Table 3 presents regression results for application outcomes. The table first shows mean values, then results for regressions with state-specific fixed effects, and results for regressions that also include applicants' characteristics. Both the application duration and the application success rate are negatively related to the unemployment rate. The coefficient for application duration is more negative when other covariates are included, whereas the coefficient for application success is less negative in this case. Apparently, applicant groups that apply more frequently during economic downturns have on average a longer application processing time and lower application success chance. Still, coefficients for application duration and determination remain negative even after controlling for such compositional changes, suggesting that case workers process claims quicker and tend to be slightly more strict during economic downturns.

Because applications determined at stage 2 and 4 are rejected, it is conceivable that the observed increase in the number of conditional applicants only affects the composition of denied but not accepted applicants. Table 4 presents regression results of applicants' characteristics separately for accepted and denied applicants. As expected, the number of denied applicants increases much more strongly with the business cycle than the number of accepted applicants. However, the number and share of stage 2 and 4 applications that are ultimately allowed also increases with the unemployment rate. This shows us that these applicants still manage to get into the program, albeit only after appealing the initial rejection. The appeal process seems to be more effective for stage 4 applications than for stage 2 applications because the share of accepted and denied stage 2 applications increases with the unemployment rate, whereas only the share of accepted but not denied stage 4 applications is positively related to the unemployment rate. Together with stage 5 applications, almost all of the increase in the number of allowances can be attributed to an increase in the number of stage 2, 4, and 5 applications.

The percentage of people who jointly file an application for DI and SSI varies

positively with the unemployment rate both for accepted and denied applicants. The magnitude of these coefficients is quite similar, albeit slightly smaller for accepted applicants. For diagnosis groups, we do not see any evidence for compositional changes for either accepted or denied applicants.

The results so far generally support the hypothesis that a higher share of applicants with moderate disabilities apply for DI during recessions. This result is consistent with findings by Coe and Rutledge (2013), who use the Health and Retirement Study as well as the Survey of Income and Program Participation. Our results also suggests that the changing composition of applicants implies a changing composition of beneficiaries over the business cycle. We also find that joint DI/SSI applications increase during recessions. This seems puzzling because better health is typically linked to higher income. In the next section, we will investigate earnings and employment vary over the business cycle and how compositional changes versus changes in economic conditions affect average earnings and employment.

6.2 Earnings and employment

6.2.1 Aggregate-level results

We first estimate panel regressions with earnings or employment of denied applicants from ten years prior to the year of application through five years after as dependent variables. Appendix table 1 presents means and regression results and figures 2 (for earnings) and 3 (for employment) display coefficients and confidence intervals from this table. Coefficients on unemployment for the level of earnings regressions (figure 2a) are about zero ten years before application; they quickly become positive and attain their highest magnitude five to six years before application. Coefficients then get smaller, start being negative two years before application, and remain negative for all subsequent years. Apparently, applicants who apply during times of high unemployment rates tend to have higher earnings several years before claiming DI benefits than those who apply under lower unemployment levels, but lower earnings shortly before and during

the years after application. Figure 2b shows results for log of earnings as dependent variables. For most years except for the immediate years after application, coefficient values are modest, ranging between -2 and 2 percent of earnings. Coefficients for the years after application also decrease in magnitude, suggesting that the negative relationship between the unemployment rate and post-application earnings fades out over time.

Figure 3 shows corresponding results for employment. Coefficients exhibit the same pattern as earnings regressions. The unemployment rate is slightly positively associated with employment several years before application but negatively associated with employment starting 4 to 2 years before application and during the years after application. The negative relationship between the unemployment rate and post-application employment is small, about -1 two years after application (-2 in log terms) and less than -0.5 five years after application (less than -1 in log terms).

6.2.2 Decomposition

In this section, we present results for the decomposition analysis. We choose two years for the 1990 recession (1991 and 1992) and three years for the 2001 recession (2001 to 2003). The average unemployment rate is 7.2 for the first recession and 5.5 for the second. We compare these recession periods with the intermittent non-recession years, specifically, the years 1996 through 1999, where the unemployment rate was on average 4.8.

Table 5 presents decomposition results for earnings. The first four columns show year and earnings for the recession and non-recession period. The last three columns show the overall earnings difference between recession and non-recession periods (denoted by Δ), the business cycle component (Δ_{bc}), and the compositional component (Δ_{comp}). As expected, earnings differences are negative for most years. The average earnings difference between recession and non-recession years is -456 dollars, which is larger than expected from figure 2.[10] Relative to earnings in recession years, the over-

all earnings difference is -5 percent. The business cycle component is negative for all years and in most cases larger than the overall difference (on average -845 dollars); the compositional component is positive for most cases. The results suggest an important role to employment prospects over the business cycle. Specifically, the business cycle component in itself would reduce earnings by 10 percent relative to earnings of denied applicants who apply during recession years – about twice the overall earnings difference. Compositional changes can only partially offset this strong negative business cycle effect; on average, they halve the earnings difference implied by the business cycle component.

Looking more closely at the different combinations, one can first see that earnings differences are smaller for the 1990 recession years than for the 2001 recession years (-290 dollars versus -566 dollars), which is a bit surprising given the higher unemployment rate for the earlier recession. Part of the reason for this finding might be that we do not have data for the year 1990, the first year of the earlier recession. A second difference across decompositions is that overall earnings differences as well as business cycle components tend to be larger for earlier non-recession years than for later non-recession years. This suggests that applicants who applied in 1996 and 1997 benefited the most from the strong labor market in subsequent years.

Table 6 presents corresponding results for employment. The average employment difference is only -0.3 and only negative for 1996 and 1997 as non-recession years. The average business cycle component is 0.7. Apparently, employment differences over the business cycle only have a small effect on earnings differences. In other words, denied applicants who apply during recessions primarily struggle to find better-paying jobs (as opposed to any job) compared to their peers who apply during good economic times.

[10] One possibility is that the relationship between the unemployment rate and earnings is non-linear, which is not captured by the panel regressions. They also include state-specific fixed effects that eliminate some of the variation between the unemployment rate and earnings.

7 Discussion and conclusion

Combining the different results, the following picture emerges. People who apply during recessions appear to be less disabled than people who apply during non-recessions. As a result, they are more likely to be rejected at stage 2 and 4 of initial determination. However, because of the appeal process, a fraction of these applicants still manages to get into the program, resulting in a positive relationship between the share of new beneficiaries from the stages and the unemployment rate.

We also find a negative relationship between the earnings of denied applicants during the years after application and the unemployment rate. Together with the positive relationship between the unemployment rate and the share of joint DI/SSI applications, these results suggest that applicants who apply during recessions suffer from income and asset losses around the time of application because of economic conditions. Finally, our decomposition results indicate that changes in the composition of applicants by itself would result in a positive relationship between the unemployment rate and post-application earnings and employment. However, the business cycle effect is negative and dominates the compositional effect, resulting in an overall negative relationship between earnings or employment and the unemployment rate.

These findings support and expand on the concept put forth by Autor and Duggan (2003). Our results show that essentially all of the increase in applications and allowances during recessions can be attributed to an increase in applications of conditional applicants, whose application is determined at stage 2, 4, or 5. However, we do not find a positive relationship between earnings of denied applicants several years after application and the unemployment rate; to the contrary, average earnings and employment of denied applicants appears to be negatively related to the unemployment rate. This suggests that Autor and Duggan's framework needs to be extended to incorporate how economic conditions affect job prospects of applicants. If, as our decomposition results suggests, the very reason conditional applications rise during recessions – losing a job – is related to lower job prospects during such times, then a rise

in conditional applications during economic downturns does not necessarily imply an increase in average earnings and employment of denied applicants post application.

This study also complements the findings reported by von Wachter et al. (2011) for long-term changes in the composition and work capacity of applicants. By contrast, we find no evidence that younger workers apply more frequently during recessions and that the work capacity of applications during economic downturns is higher. These differences highlight that changes to the economic versus policy environment have distinct effects on the disability program. Specifically, von Wachter et al. (2011) examine compositional changes following policy reforms of the program making the program more accessible to people with difficult to determine health impairments. For our study, the policy environment remains relatively unchanged, and most of the composition changes occur due to short-term changes in the economic environment.

Our results also have important policy implications. They highlight that the employment prospects of applicants are not just a function of their individual characteristics but also of the macroeconomic environment. This is why less disabled applicants who apply during economic downturns and who are denied may not have higher post-application earnings and employment. The disability program is not well suited to respond to these short-term changes in economic conditions and the resulting changes in the composition of applicants. Specifically, our results show that many of the additional applications during recessions are quickly rejected, only to end up on the program after the appeals process.

Instead of going through the lengthy appeals process that might further diminish their chances of finding new employment, it would be much more beneficial to provide short-term financial support together with re-employment services to them. As recent research suggests, providing temporary assistance to people out of work can dissuade some of them from applying for DI benefits, at least in the short term (Lindner 2011; Lindner and Nichols 2012; Rutledge 2011). However, the negative business cycle effect also highlights that people who apply during recessions face severe barriers to employment even if they are on average less disabled than people who apply during

non-recession periods. Providing adequate training and other services to reintegrate these people into the labor market instead of letting them into the DI program is therefore a challenging endeavor.

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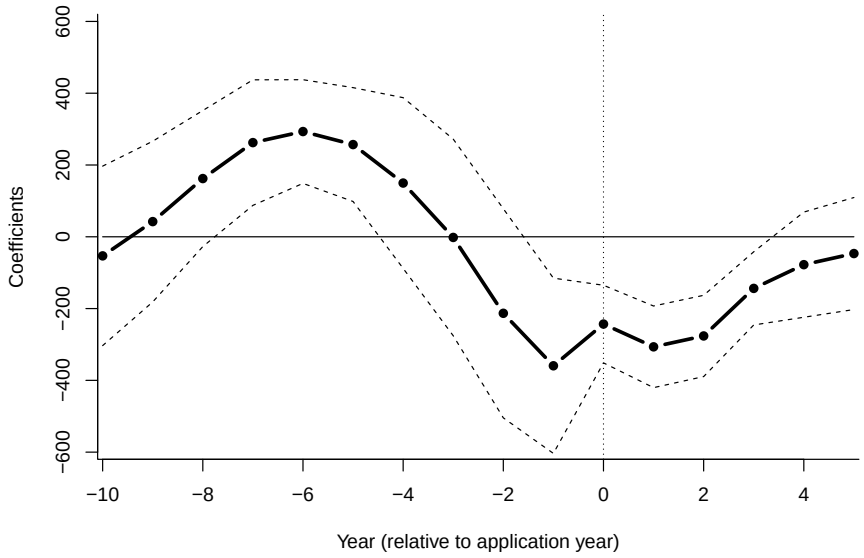
Figure 1: Number of applications for DI and the unemployment rate, 1991-2008

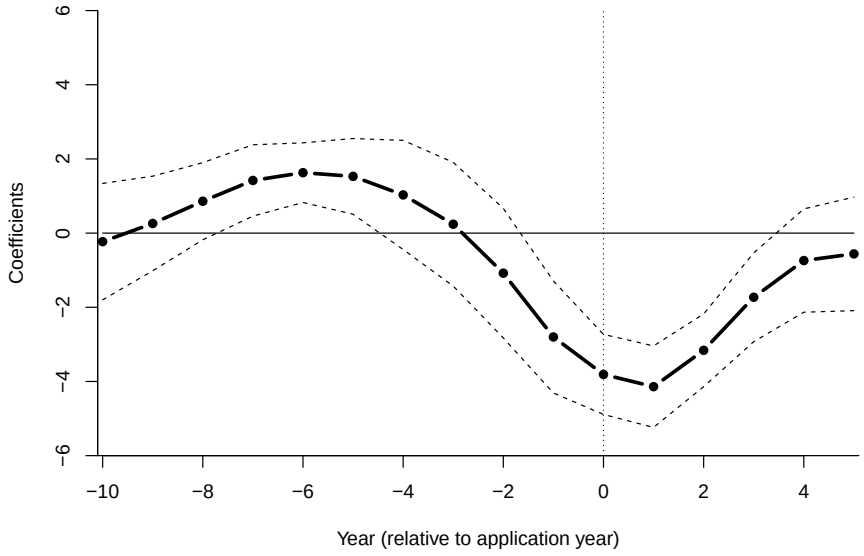
Notes: This figure shows trends in the unemployment rate and applications per population for DI. The unemployment rate (striped line) is expressed in percentage points as shown by the left y-axis. Applications per population for DI (solid line) are expressed as one hundredth of a percentage point, or one part per ten thousand (basis points) as shown by the right y-axis. Population is the number of people age 20 to 64. Both trends are by calendar quarters and seasonally adjusted.

Figure 2: Regression results for earnings of denied applicants and the unemployment rate

(a) Level of earnings



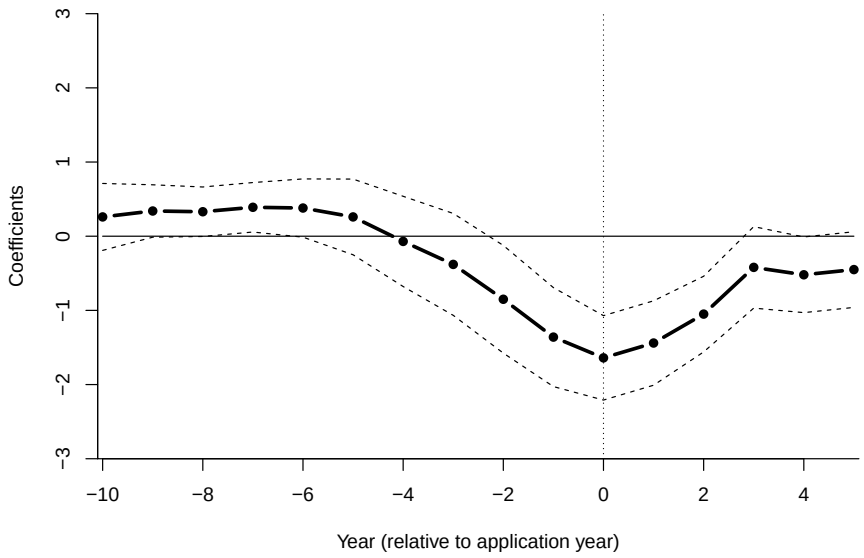
(b) Log of earnings



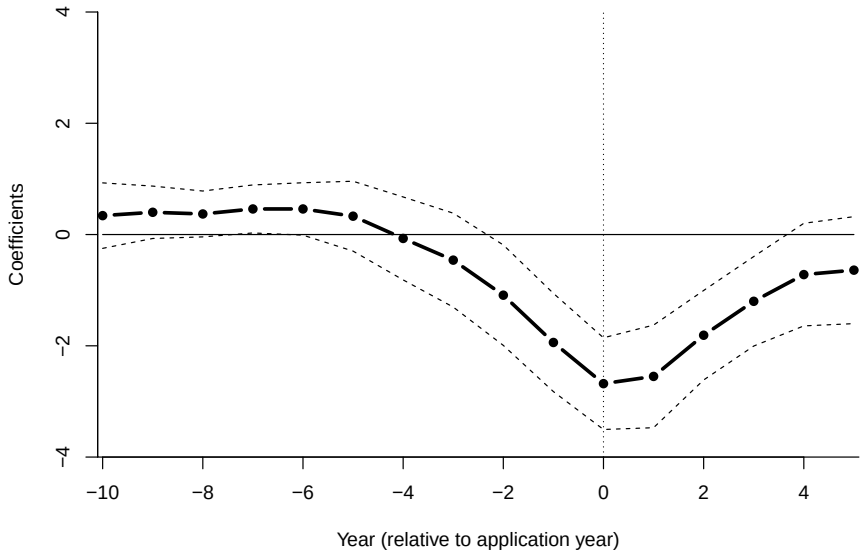
Notes: These figures display the relationship between the unemployment rate and past and future earnings of denied applicants. Each point represents results from a separate regression with earnings during year X relative to the application year as dependent variable, where X is the number on the x-axis, ranging from 10 years before to 5 years after the year of application. Regressions include the unemployment rate as well as state fixed-effects, year fixed effects, and state fixed effects interacted with linear time trends. Points show estimates for the unemployment rate. Figure 2a shows results for level or earnings and figure 2b shows results for log of earnings. Striped lines indicate 95 percent confidence intervals. All standard errors are clustered at the state level.

Figure 3: Regression results for employment of denied applicants and the unemployment rate

(a) Level of employment



(b) Log of employment



Notes: These figures display the relationship between the unemployment rate and past and future employment of denied applicants. Each point represents results from a separate regression with employment during year X relative to the application year as dependent variable, where X is the number on the x-axis, ranging from 10 years before to 5 years after the year of application. Regressions include the unemployment rate as well as state fixed-effects, year fixed effects, and state fixed effects interacted with linear time trends. Points show estimates for the unemployment rate. Figure 3a shows results for level or employment and figure 3b shows results for log of employment. Striped lines indicate 95 percent confidence intervals. All standard errors are clustered at the state level.

Table 1: Hypotheses for the association of applicant characteristics and the unemployment rate

Characteristic	Average / share of applicants	Number of applications
Age	-	
Applicants without HS degree	+/-	+/0
Application for DI/SSI	+/-	+/0
Stage 2 applicants	+	+
Stage 3 applicants	-	0
Stage 4 applicants	+	+
Stage 5 applicants	+	+
Musculoskeletal impairment	+	+
Mental disorder	+	+
Circulatory impairment	-	0
Neoplasms	-	0
Earnings/employment before application	+	
Earnings/employment during / after application	+/-	
Application duration	+/-	
Accepted at initial determination	+/-	
Accepted at final determination	+/-	

Notes: This table shows hypotheses for the relationship between characteristics of applicants and the unemployment rate. A positive sign stands for a positive relationship, a negative sign for a negative relationship, and a zero for no relationship between the unemployment rate and the variable. The second column shows signs for the average or share of applicants. The third column shows signs for the number of applications.

Table 2: Regression results for applicant characteristics and the unemployment rate

Variable	Mean	Level	Log
Applications (b.p.)	19.8	0.53 ***	3.10 ***
		(0.09)	(0.38)
Age (years, mean)	45.5	-0.04	-0.08
		(0.02)	(0.05)
Appl. without HS (%)	29.5	0.04	0.06
		(0.08)	(0.32)
Appl. without HS (b.p.)	5.9	0.13 ***	3.16 ***
		(0.04)	(0.54)
Appl. for DI/SSI (%)	51.3	0.81 ***	1.85 ***
		(0.13)	(0.34)
Appl. for DI/SSI (b.p.)	10.3	0.40 ***	4.95 ***
		(0.06)	(0.56)
Stage 2 applicants (%)	14.9	0.59 **	4.13 ***
		(0.19)	(1.04)
Stage 2 applicants (b.p.)	3.0	0.15 ***	7.23 ***
		(0.05)	(1.24)
Stage 3 applicants (%)	21.9	-0.47 **	-2.17 **
		(0.15)	(0.73)
Stage 3 applicants (b.p.)	4.2	0.05	0.93
		(0.03)	(0.64)
Stage 4 applicants (%)	17.5	0.35	2.68 *
		(0.20)	(1.20)
Stage 4 applicants (b.p.)	3.5	0.14 **	5.78 ***
		(0.04)	(1.33)
Stage 5 applicants (%)	37.1	-0.35	-1.21
		(0.26)	(0.68)
Stage 5 applicants (b.p.)	7.4	0.18 **	1.90 **
		(0.07)	(0.72)
Appl. with musculoskeletal imp. (%)	27.8	-0.05	-0.07
		(0.13)	(0.47)
Appl. with musculoskeletal imp. (b.p.)	5.5	0.15 ***	3.04 ***
		(0.03)	(0.54)
Appl. with mental disorders (%)	20.9	-0.04	-0.19
		(0.10)	(0.45)
Appl. with mental disorders (b.p.)	4.1	0.11 **	2.91 ***
		(0.04)	(0.67)
Appl. with circulatory imp. (%)	10.4	0.02	0.04
		(0.03)	(0.28)
Appl. with circulatory imp. (b.p.)	2.1	0.05 ***	3.14 ***
		(0.01)	(0.40)
Appl. with neoplasms (%)	7.0	-0.11 ***	-1.42 ***
		(0.02)	(0.30)
Appl. with neoplasms (b.p.)	1.4	0.02 ***	1.68 ***
		(0.00)	(0.30)

Notes: Each cell of the third and fourth column represents a separate regression and displays the coefficient for the unemployment rate in a regression with the dependent variable as given by the first column. All regressions use the number of applications of a state per period as weights and include state fixed effects, year fixed effects, and state fixed effects interacted with linear time trends. Age is expressed in years. All other variables are either expressed as percentage of all applicants or as basis points (number of applicants with that characteristic per ten thousand adults for a time period and state). Standard errors are clustered at the state level and displayed in parentheses below corresponding coefficients. Mean values refer to weighted averages over all states and the time period 1991 to 2008. The sample size for all regressions is 3744.
* p<0.05, ** p<0.01, *** p<0.001

Table 3: Regression results for application outcomes and the unemployment rate

Variable	Mean	State-specific FE	Applicants' characteristics
		Level	
Application duration (days)	162.3	-2.24	-3.06 **
		(1.61)	(1.15)
Accepted at initial determination (%)	40.6	-1.40 ***	-0.26 *
		(0.36)	(0.11)
Accepted at final determination (%)	57.3	-0.86 ***	-0.22 *
		(0.22)	(0.11)
		Log	
Application duration (days)	162.3	-1.08	-1.64 *
		(0.87)	(0.65)

Notes: Each cell of the third and fourth column represents a separate regression and displays the coefficient for the unemployment rate in a regression with the dependent variable as given by the first column. All regressions use the number of applications of a state per period as weights. Regressions with state-specific fixed effects (third column) include state fixed effects, year fixed effects, and state fixed effects interacted with linear time trends. Regressions with applicants characteristics (fourth column) include these fixed effects and also the following covariates: number of applicants in basis points; average age of applicants, fraction of male applicants, fraction of applicants classified as white, fraction of applicants with a high-school degree and with some college experience (base category: fraction of applicants with no high-school degree), fraction of applicants who apply for DI only, fraction of applicants whose initial application is determined at stage 3, 4, and 5 (base category: stage 2), and the fraction of applicants in one of the diagnosis code groups (base category:). Mean values refer to weighted averages for the time period 1991 to 2008. Standard errors are clustered at the state level and displayed in parentheses below corresponding coefficients. The sample size for all regressions is 3744.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 4: Regression results for characteristics of accepted and denied applicants and the unemployment rate

	Accepted		Denied	
Variable	Level	Log	Level	Log
Applications (b.p.)	0.18***	1.62***	0.33***	4.82***
	(0.05)	(0.45)	(0.06)	(0.75)
Age (years, mean)	-0.02	-0.05	0.05	0.13
	(0.02)	(0.04)	(0.05)	(0.11)
Appl. without HS (%)	-0.02	-0.29	0.04	0.15
	(0.08)	(0.32)	(0.10)	(0.38)
Appl. without HS (b.p.)	0.04	1.33	0.09***	4.96***
	(0.02)	(0.69)	(0.02)	(0.78)
Appl. for DI/SSI (%)	0.56***	1.60***	0.76***	1.39***
	(0.12)	(0.41)	(0.17)	(0.31)
Appl. for DI/SSI (b.p.)	0.13***	3.23***	0.25***	6.22***
	(0.03)	(0.67)	(0.04)	(0.84)
Stage 2 applicants (%)	0.30**	7.95***	0.56*	1.70**
	(0.10)	(2.06)	(0.28)	(0.66)
Stage 2 applicants (b.p.)	0.03**	9.56***	0.12**	6.52***
	(0.01)	(1.93)	(0.04)	(1.15)
Stage 4 applicants (%)	0.35*	5.09**	-0.08	0.07
	(0.18)	(1.66)	(0.28)	(1.22)
Stage 4 applicants (b.p.)	0.05*	6.72***	0.08**	4.89***
	(0.02)	(1.50)	(0.03)	(1.35)
Stage 5 applicants (%)	-0.39	-1.07	-0.04	-0.36
	(0.28)	(0.64)	(0.24)	(0.75)
Stage 5 applicants (b.p.)	0.06	0.55	0.12***	4.47***
	(0.05)	(0.96)	(0.03)	(0.90)
Appl. with musculoskeletal imp. (%)	-0.02	-0.09	-0.28	-0.69
	(0.11)	(0.45)	(0.22)	(0.71)
Appl. with musculoskeletal imp. (b.p.)	0.05**	1.52*	0.09***	4.13***
	(0.02)	(0.72)	(0.02)	(0.78)
Appl. with mental disorders (%)	-0.13	-0.87	0.16	1.18
	(0.14)	(0.56)	(0.14)	(0.74)
Appl. with mental disorders (b.p.)	0.03	0.75	0.08***	6.01***
	(0.03)	(0.87)	(0.02)	(1.27)
Appl. with circulatory imp. (%)	0.05	0.42	0.05	0.39
	(0.04)	(0.33)	(0.04)	(0.50)
Appl. with circulatory imp. (b.p.)	0.03***	2.04***	0.03***	5.21***
	(0.01)	(0.48)	(0.01)	(1.05)
Appl. with neoplasms (%)	-0.04	-0.31	-0.02	-0.96
	(0.04)	(0.43)	(0.02)	(0.81)
Appl. with neoplasms (b.p.)	0.02***	1.31***	0.01**	3.87**
	(0.00)	(0.21)	(0.00)	(1.27)

Notes: Each cell of the third and fourth column represents a separate regression and displays the coefficient for the unemployment rate in a regression with the dependent variable as given by the first column. All regressions use the number of applications of a state per period as weights and include state fixed effects, year fixed effects, and state fixed effects interacted with linear time trends. Age is expressed in years. All other variables are either expressed as percentage of all applicants or as basis points (number of applicants with that characteristic per ten thousand adults for a time period and state). Standard errors are clustered at the state level and displayed in parentheses below corresponding coefficients. Mean values refer to weighted averages over all states and the time period 1991 to 2008. The sample size for all regressions is 3744.
* $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 5: Decomposition results for earnings

Recession		Non-recession		Decomposition		
Year	Earnings	Year	Earnings	Δ	Δ_{bc}	Δ_{comp}
1991	8268	1996	9671	-1404	-1728	325
1992	8805	1996	9671	-866	-1058	191
2001	8314	1996	9671	-1357	-1338	-19
2002	8399	1996	9671	-1272	-1463	191
2003	8069	1996	9671	-1602	-2116	513
1991	8268	1997	8965	-697	-1176	479
1992	8805	1997	8965	-160	-483	323
2001	8314	1997	8965	-651	-662	11
2002	8399	1997	8965	-566	-778	211
2003	8069	1997	8965	-896	-1437	541
1991	8268	1998	8379	-111	-774	663
1992	8805	1998	8379	427	-70	496
2001	8314	1998	8379	-64	-113	48
2002	8399	1998	8379	20	-267	287
2003	8069	1998	8379	-309	-980	671
1991	8268	1999	8292	-24	-866	842
1992	8805	1999	8292	513	-324	837
2001	8314	1999	8292	22	-87	110
2002	8399	1999	8292	107	-235	342
2003	8069	1999	8292	-223	-954	732

Notes: The table shows average earnings of denied applicants for years pertaining to recession and non-recession years as well as decomposition results. Δ is the overall mean earnings difference between mean earnings during a recession years and mean earnings during a non-recession years. Δ_{bc} is the estimated business-cycle part of the overall difference and Δ_{comp} the compositional part of the overall difference. See text for details of the decomposition and these terms. All earnings are expressed in January, 2010 values.

Table 6: Decomposition results for employment

Recession		Non-recession		Decomposition		
Year	Employment	Year	Employment	Δ	Δ_{bc}	Δ_{comp}
1991	46.0	1996	50.7	-4.8	-6.8	2.0
1992	48.6	1996	50.7	-2.2	-3.3	1.1
2001	46.6	1996	50.7	-4.1	-3.0	-1.1
2002	47.3	1996	50.7	-3.4	-3.0	-0.4
2003	46.1	1996	50.7	-4.6	-5.3	0.7
1991	46.0	1997	47.6	-1.7	-3.6	2.0
1992	48.6	1997	47.6	1.0	-0.3	1.3
2001	46.6	1997	47.6	-1.0	-0.1	-0.9
2002	47.3	1997	47.6	-0.3	-0.2	-0.1
2003	46.1	1997	47.6	-1.5	-2.5	1.0
1991	46.0	1998	45.4	0.6	-1.3	1.9
1992	48.6	1998	45.4	3.2	1.9	1.3
2001	46.6	1998	45.4	1.2	2.1	-0.8
2002	47.3	1998	45.4	1.9	2.0	-0.1
2003	46.1	1998	45.4	0.8	-0.3	1.1
1991	46.0	1999	45.1	0.9	-1.4	2.2
1992	48.6	1999	45.1	3.5	1.9	1.6
2001	46.6	1999	45.1	1.6	1.9	-0.4
2002	47.3	1999	45.1	2.2	1.9	0.3
2003	46.1	1999	45.1	1.1	-0.4	1.4

Notes: The table shows average employment in percent of denied applicants for years pertaining to recession and non-recession years as well as decomposition results. Δ is the overall mean employment difference between mean employment during a recession years and mean employment during a non-recession years. Δ_{bc} is the estimated business-cycle part of the overall difference and Δ_{comp} the compositional part of the overall difference. See text for details of the decomposition and these terms.

A Robustness checks

Including years of the great recession: We repeat regressions for applicants' characteristics with the years 2009 and 2010 included in our panel. We exclude these years for our main analysis because post-application earnings are not observed and an increasing fraction of applications filed during these years are still pending. Still, including these years allows us to assess whether results for characteristics of applicants are robust to including years characterized by a much higher unemployment rate and application numbers. In general, most results from our main analysis change little. The coefficient for stage 4 applications is a bit smaller as compared to table 2 and the coefficient for stage 5 applications is still negative. The most prominent difference is that the coefficient for application duration is smaller (1.7 for levels when applicants' characteristics are included as covariates), which this might be the result of some pending applications.

Unweighted regressions: We also estimate our regressions using no weights and find very similar results. The coefficient for high-school drop-outs is slightly larger in this specification and so is the coefficient for joint DI/SSI applications. We also find a somewhat larger relationship between the unemployment rate and the share or applicants with applications determined at stage 4. However, we find no substantial differences for the large groups of marginal applicants, namely those with applications determined at stage 5 and those with a musculoskeletal impairment or mental disorder. Overall, these results suggest that the relationship between short-term fluctuations of the unemployment rate and characteristics of applicants are similar across states.

Applicants with stage 5 determination: We look at characteristics of applicants with applications determined at the fifth stage of initial determination to examine whether the composition of this group of applicants changes over the business cycle despite no apparent increase in the share of applicants from this group. Interestingly, we find a much stronger negative relationship between the unemployment rate and age for this group of applicants as compared to all applicants. We also speculate that because applications for this group is determined by vocational factors and the judgment of case workers, application decisions might vary more for them as for other groups of applicants. However, regression results reveal essentially no relationship between the application outcome (both initial and final) and the unemployment rate for these applicants.

Lagged unemployment rates: Because many applicants for DI do not immediately file an application after losing their job (Lindner 2013), it is plausible that lagged values of

the unemployment rate better reflect the economic conditions of marginal applicants when they leave the labor force. We estimate models with one period (quarter or year) and two periods of lagged unemployment rates. We find no evidence that using lagged values changes any of the results of our main specification. For instance, the fraction of stage 5 applications is also negatively related to lagged values of the unemployment rate. Similarly, the coefficient for the fraction of applications with musculoskeletal impairments is positive but minuscule (0.02) for the one-lagged model and negative for the two-lagged model.

Decomposing earnings and employment 2 years after application: We carry out decompositions for earnings and employment of denied applicants 2 years after application. As expected from figures 2 and 3, the overall earnings and employment difference is much larger two years after application. Most of this larger difference appears as the business cycle component, suggesting that denied applicants initially find it harder to find valuable employment during recessions, but that the business cycle effect attenuates over subsequent years. This results may also reflect that some applications are not fully determined 2 years after application begin.

B Appendix tables

Appendix table 1: Regression results for earnings and employment

	Earnings			Employment		
Year relative to appl. year	Mean	Level	Log	Mean	Level	Log
-10	15402	-53.18	-0.23	77.0	0.26	0.34
		(127.44)	(0.80)		(0.23)	(0.30)
-9	15822	42.33	0.26	79.2	0.34	0.40
		(114.09)	(0.65)		(0.18)	(0.24)
-8	16238	162.23	0.86	81.2	0.33*	0.37
		(96.62)	(0.53)		(0.17)	(0.21)
-7	16538	262.40**	1.42**	82.8	0.39*	0.46*
		(89.14)	(0.49)		(0.17)	(0.22)
-6	16627	293.23***	1.63***	83.7	0.38	0.46
		(73.62)	(0.41)		(0.20)	(0.24)
-5	16521	256.95**	1.53**	83.7	0.26	0.33
		(80.84)	(0.52)		(0.26)	(0.32)
-4	16198	149.74	1.03	83.0	-0.07	-0.07
		(121.23)	(0.75)		(0.31)	(0.38)
-3	15549	-1.81	0.24	81.3	-0.38	-0.46
		(139.62)	(0.85)		(0.35)	(0.43)
-2	14234	-213.13	-1.08	78.0	-0.85*	-1.09*
		(148.50)	(0.89)		(0.37)	(0.46)
-1	11198	-359.38**	-2.80***	71.6	-1.36***	-1.94***
		(124.44)	(0.77)		(0.34)	(0.45)
0	5642	-243.15***	-3.81***	60.5	-1.64***	-2.68***
		(55.11)	(0.55)		(0.29)	(0.42)
1	6276	-306.59***	-4.14***	53.5	-1.44***	-2.55***
		(57.96)	(0.56)		(0.29)	(0.47)
2	7483	-276.28***	-3.16***	53.1	-1.05***	-1.81***
		(57.70)	(0.50)		(0.26)	(0.41)
3	7582	-143.76**	-1.73**	49.2	-0.42	-1.20**
		(51.96)	(0.61)		(0.28)	(0.41)
4	8339	-77.69	-0.74	50.9	-0.52*	-0.72
		(74.68)	(0.71)		(0.26)	(0.47)
5	8532	-46.68	-0.56	49.5	-0.45	-0.64
		(79.53)	(0.78)		(0.26)	(0.49)

Notes: Each cell of the third, fourth, seventh and eighth column represents a separate regression and displays the coefficient for the unemployment rate with the dependent variable being earnings or employment during a year X relative to the application year as dependent variable, where X is the number shown by the first column. Earnings are expressed in 2010 dollars. All regressions use the number of applications of a state per period as weights and include state fixed effects, year fixed effects, and state fixed effects interacted with linear time trends. Age is expressed in years. Standard errors are clustered at the state level and displayed in parentheses below corresponding coefficients. Mean values refer to weighted averages over all states and the time period 1991 to 2008. The sample size for all regressions is 936.
* p<0.05, ** p<0.01, *** p<0.001

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