

The Effect of Local Employment Changes on the Incidence, Timing, and Duration of Applications to Social Security Disability Insurance

Till von Wachter*

Columbia University, NBER, CEPR, and IZA

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Abstract:

While a growing literature confirms that applications to Social Security Disability Insurance (DI) increase when conditions in the labor market worsen, less is known about how such conditions interact with characteristics of the screening process. Similarly, little is known about the effect of labor market conditions on the screening process itself. This project analyzes the effect of predicted changes in county employment rates on the application pattern and adjudication process of DI. The findings suggest that while employment declines raise DI application rates and lower labor force participation rates, the effect is smaller in the early 2000s than in the early 1990s. It also appears that the fraction of applications allowed at the level of Disability Determination Service (DDS) office allowance rates experience a substantial decline when applications rise due to a decline in employment. At the same time, the duration of screening of DI applications at the DDS-level rises somewhat. This implies that part of the applicants induced to apply by economic shocks are screened out during the initial stages of the adjudication process, and ensuing congestion appears weak. There is also some evidence that DDS offices with higher average screening duration receive fewer applications when local employment drops. Yet, potential applicants so dissuaded from applying after an employment decline do not appear to return to the labor force.

* Email: vw2112@columbia.edu. I thank Mike Mueller for excellent research assistance. This research was supported by the U.S. Social Security Administration through grant #10-M-98363-1-02 to the National Bureau of Economic Research as part of the SSA Retirement Research Consortium. The findings and conclusions expressed are solely those of the author(s) and do not represent the views of SSA, any agency of the Federal Government, or the NBER.

1. Introduction

The existing literature has shown that U.S. states experiencing declines in employment and increase in unemployment rates in the 1980s and 1990s have seen increases in application rates to Social Security Disability Insurance (DI) (e.g., Rupp and Stapleton 1995). At the same time, these states also experienced declines in the rate of labor force participation, especially among lower educated men. Both effects have increased in the mid-1980s, in parallel to reforms of the DI system that are generally believed to have made it easier to receive DI benefits (e.g., Duggan and Imberman 2006). This concurrence of events has led to the concern that DI increasingly draws workers out of the labor force (Autor and Duggan 2003). This debate has fuelled the long-standing question whether the presence of DI lowers labor force participation of individuals who might otherwise be employed (e.g., Bound and Burkhauser 1999). A related concern is that the same reforms in the DI system have encouraged applications of individuals who are potentially disabled, but whose eligibility is harder to assess, potentially putting strain on the disability screening process (e.g., Autor and Duggan 2006). An increasing rate of applications from ineligible workers due to different economic conditions would likely also burden the adjudication system.

In this paper, we use county-level data from 1994 to 2008 to confirm that declines in employment still lead to concurrent increases in application rates to DI and declines in labor force participation. However, we find that the size of the effect has declined from its high level in the late 1980s to the mid-1990s, and is now again what it was in the early

1980s. Moreover, we find that the effect on application rates is more robust to changes in specifications than the effect on labor force participation.

We also use DDS-level information to show that localities subject to declines in employment and increases in applications also experience substantial declines in the allowance rate at the DDS level. We also find modest increases in the average duration until adjudication at the DDS level. This finding suggests that employment declines indeed are likely to partly trigger applicants from ineligible individuals, and that these applications get screened out in the initial adjudication process. The rise in processing time also suggests that some of these applications may be more difficult to adjudicate, making it likely that some of the increase in rejections is later reversed at higher stages of the adjudication process. Yet, since the increase in process time we find is relatively modest, only unusually large economic downturns would lead to potentially costly “congestion” of the screening process.

In a third step, we show that if there are marginal applicants (whether ineligible or not) with outside options in terms of employment or income, they do not seem to exhibit strong strategic behavior; for example, the effect of employment declines on DI applications is only lowered somewhat if the mean processing time at the respective DDS office is above average. We also do not find any difference in the effect of employment declines on labor force participation by basic DDS characteristics. As a result, we do not find any evidence that those workers prevented from applying to DI because of high average screening times do end up returning to the labor force.

Overall, it appears that while there may be an increase in applicants that are truly ineligible or have high employment potential in periods of employment declines, we show that the effect has been smaller in the 2002 recession than in the 1991 recession. Moreover, if there are ineligible workers among these induced applicants, these are partly screened out in the adjudication process. They also do not appear to lead to excessive congestion in the screening system. Similarly, they do not respond strongly to the duration of the screening process at the local DDS office.

The increase in applications in difficult economic times is partly to be expected. First, disabled employees are typically hit strongest by adverse economic shocks. Second, since the definition of disability contains an assessment of whether an individual can do similar work as before or can be retrained with a reasonable burden, the pool of eligible workers expands in recessions. Third, potential applicants who are already unemployed, or may have been so for some time, face a lower cost from applying since they are likely to satisfy the criterion of not having engaged in substantial gainful activity (SGA) prior to application. Finally, potential applicants who are already unemployed suffer large earnings penalties after reentry into the labor market; hence, receiving DI benefits is relatively more attractive to them.

These considerations suggest that the fact that employment declines raise DI applications is not surprising nor does it necessarily a mal-functioning of the DI system. Similarly, the fact that at the same time employment declines lowers labor force participation does not

necessarily imply that this is due to the rise in DI applications. An important fraction of workers drop out of the labor force upon job loss or after unemployment independently of DI (e.g., von Wachter, Song, and Manchester 2009). Moreover, there is no evidence that spending more time out of the labor force hurts reemployment prospects (e.g., Schmieder, von Wachter, and Bender 2010). Thus, there is no strong reason to expect that once a worker is unemployed his future employment prospects are hurt by applying for DI. The fact that workers dissuaded from applying because of higher process times at the DDS level do not show higher labor force participation further suggests that it may not be the DI application that lowers labor force participation. Analyses exploiting the effect of other features of the DI system on DI application to study its effect on labor force participation are a promising avenue for future research.

The next section describes the data, sample, and methodology we use. The third section contains our main results on the effect of employment declines on DI applications and changes in the labor force participation rate. The fourth section discusses the effect of employment shocks on application rates and process times. The fifth section examines differences in the effect of economic shocks by DDS-level characteristics. The last section concludes.

2. Data and Methodology

2.1 Data, Variables, and Sample

The empirical analysis examines the effect of fluctuations in employment at the regional level on DI applications, labor force participation, and DDS-level outcomes of the

screening process. Data for this exercise was drawn from a variety of public and private sources described in the following chart.

Dataset	Information	Level of Observation
Social Security Administration Administrative Data (SSA-AD)	- Total Disability Insurance Applications - Characteristics of DDS Offices	County/DDS Office
Quarterly Census of Employment and Wages (QCEW)	- Disaggregated Employment Counts by Industrial Classification	County
Local Area Unemployment Statistics (LAUS)	- Labor Force Size - Unemployment Rate	County/State
Census Population Estimates (CPE)	- Size of Total Working Age Population (TWAP) - Age by Gender breakdown of TWAP - Local Racial Composition	County/State
Mass Layoff Statistics (MLS)	- Total Layoffs	State
Business Dynamics Survey (BDS)	- Total Job Destruction	State
Small Area Income and Poverty Estimates	Poverty Rate	County

Three analysis datasets with varying levels of geographic aggregation were created using these raw data sources. From lowest to highest form of aggregation, observations were created at the county, DDS office and state levels. Information available in each was generally consistent across datasets; however, some variables were not available at the county level, and thus would only show up in either the DDS or State level data. DDS offices serve only one state, and on average there were 3.6 offices per State.¹

¹ Different data sources were merged using FIPS codes. In some cases crosswalks were required to attach a FIPS code to the data. SSA-AD and LAUS data both required use of county name to FIPS code crosswalks. These matches required some “fuzzy matching” as well as additional processing in the spelling of county names in order to ensure appropriate matching.

Multiple variables were constructed through the use of raw data from individual sources and combinations of sources. Determining the number of people considered “Not in the Labor Force” required combined LAUS data on labor force size as well as CPE data on the size of the working age population. Employment shocks were constructed using QCEW data according to the methodology proposed by Autor and Duggan (2003) (see more discussion in the next section). A variety of other measures of economic shocks were weighted according to the local total working age population (TWAP).

Records were included in the final analysis dataset if valid information was available on both the disability application per TWAP and not in the labor force per TWAP measures. SSA application count data was suppressed in cases where total applications in the county were less than 50 in a given year. When aggregating different measures up to the DDS-level and state-level analysis dataset, only records which were included in the county-level analysis dataset were included in order to ensure that the per capita measures were consistent. Some measures, like application approval rate or total job destruction, were only available at the DDS or State-level, in which case county level data could not be aggregated.

The final datasets covered a period of 15 years ranging between 1994 and 2008. Information preceding the analysis period was available for employment data (back to 1990), which allows the analysis to include lagged economic shock variables without dropping observations. Total observations for county, DDS and state level datasets were respectively 35,819, 2,480, and 765.

2.2 Methodology

The method used in this paper is closely related to the empirical approach of Autor and Duggan (2003). Predicted changes in aggregate local employment are used to explain the growth in DI applications and changes in the proportion of the working age population exiting the labor force. The economic shock variables were constructed using the following formula,

$$\text{Predicted Change}_{it} = \sum_j [(\text{Emp}_{ijb} / \sum_j \text{Emp}_{ijb}) * (\log(\text{Emp}_{ijt}) - \log(\text{Emp}_{jtb}))]$$

where i = Locale, j = Industry, b = Base Year, t = Year, and \mathbb{I} = National total excluding locale i . In words, the predicted employment change (percent, not level) uses observed national percentage growth (excluding local counts) in employment across disaggregated industries between a base year and the year of estimation, and projects these changes onto the local industrial composition in the base year in order to create a predicted local percentage growth (or decline) in aggregate employment (not industry specific).

A variety of base years could be used in the calculation. The empirical work explores use of various base years. This includes one, two or three years preceding the predicted year, or an average of the three years preceding the prediction year. Each of these measures is explored in more detail later on in the analysis.

Following Autor and Duggan (2003), our main findings are based on two basic regressions:

$$(DI\ Apps / TWAP)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

$$\Delta (NILF / TWAP)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

where D = Predicted Percentage Employment Growth, X = Vector of Control Variables (Male population age 40 to 54, Male population age 55 to 64, Female population age 25 to 39, Female population age 40 to 54, Female population age 55 to 64), and FE = Fixed Effect on Year, State, and/or State*Year. The key coefficient of interest is the effect of predicted employment growth on the application rate or the change in the NILF rate.

A key part of the analysis is exploration of additional outcomes at the DDS-level. The basic regression framework was applied to examining the impact of predicted employment changes DDS performance measures: approval rate, mean processing days, log mean processing days, median processing days, and log median processing days. The regression model becomes

$$\Delta (DDS\ Outcome)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

Again, it is the effect of the employment changes on DDS level outcomes which is the variable of interest.

The analysis also included a series of interaction regressions, both examining local socio-economics characteristics as well as DDS performance measures. In this class of regressions, a baseline period preceding the analysis sample was examined to determine “high” and “low” states, counties and DDS offices. For instance, four years of unemployment data between 1990 and 1993 was pooled. Locales that had on average a greater than the 75th percentile unemployment rate were deemed “high” unemployment

rate areas, while locales that had on average a less than 25th percentile unemployment rate were deemed “low” unemployment rate areas. These dummy variables were then interacted with the employment shock created a modified version of the original regressions:

$$\begin{aligned}
 (\text{DI Apps} / \text{TWAP})_{it} = & \alpha + \beta_1 D_{it} + \beta_2 D_{it} * \text{High}_i + \beta_3 D_{it} * \text{Low}_i + \beta_4 \text{High}_i + \beta_5 \text{Low}_i \\
 & + \gamma \Delta X_{it} + \delta \text{FE}_{it} + \varepsilon_{it}
 \end{aligned}$$

$$\begin{aligned}
 \Delta (\text{NILF} / \text{TWAP})_{it} = & \alpha + \beta_1 D_{it} + \beta_2 D_{it} * \text{High}_i + \beta_3 D_{it} * \text{Low}_i + \beta_4 \text{High}_i + \beta_5 \text{Low}_i \\
 & + \gamma \Delta X_{it} + \delta \text{FE}_{it} + \varepsilon_{it}
 \end{aligned}$$

The interpretation of these coefficients will be further discussed below.

Finally, the analysis assesses the persistence of the effect of labor market shocks on DI applications and changes in the labor force participation rate. To do so, among others we examined a series of distributed lag models. Binary “shocks” to employment were generated using the following logic: a shock-dummy would equal one if the predicted employment change was below -2.5% to -4% depending on the base year being utilized and 0 otherwise. This resulted in just above 5% of the sample experiencing a shock during the analysis period. Not surprisingly, most of these shocks were concentrated between 2001 and 2003. The model estimated in this exercise is as follows:

$$(\text{DI Apps} / \text{TWAP})_{it} = \alpha + \sum_{k=-4}^7 \beta_k \text{Shock}_{i,(t-k)} + \gamma \Delta X_{it} + \delta \text{FE}_{it} + \varepsilon_{it}$$

$$\Delta (\text{NILF} / \text{TWAP})_{it} = \alpha + \sum_{k=-4}^7 \beta_k \text{Shock}_{i,(t-k)} + \gamma \Delta X_{it} + \delta \text{FE}_{it} + \varepsilon_{it}$$

The shock-indicator variables turn on in the years before and after a shock has occurred. Since the model contains both region and year fixed effects, the coefficients on the

shock-indicator variables can be interpreted as the change in, say, DI applications relative to a base year, relative to the regular evolution of the outcome over time as captured by year effects.² The year effects are identified by the presence of regions that do not experience a shock. The coefficients of the shock-indicators aim at capturing the evolution of, say, DI applications that are just due to the presence of the shock, not due to trends that would have occurred otherwise.

3. Effects of Employment Shocks on DI Applications and Labor Force Participation

3.1 Effects from 1994 to 2008 on Application Rates

Tables 2 to 4 show various estimates of the effect of a change in predicted employment (our measure of an economic shock) on the application rate to DI and on changes in the fraction of workers not in the labor force (NILF). Overall, these estimates confirm that adverse economic shocks lead to precisely estimated and sizeable increases in the application rate to DI. This finding is robust to many specification changes we tried. It is smaller than previous estimates in the literature (e.g., Autor and Duggan 2003), suggesting that the effect of economic shocks on DI application has declined somewhat in the late 1990s and early 2000s. We also find an effect of economic shocks on increases in NILF. Although these estimates are non-negligible, they are less robust to specification changes and over time.

Table 2 shows estimates of the effect of our measure of economic shocks on the DI application rate and changes in the NILF rate. Our preferred estimates use variation at the

² This base year corresponds to shock-indicator variables that were left out of the regression to avoid multicollinearity (even though not necessary typically one leaves out several indicators starting with the earliest pre-shock years).

county level and include state and year fixed effects.³ The main effect of changes in predicted employment on the DI application rate in the first column is -0.104; the overall range of estimates in Table 2 and 3 is approximately from -0.03 to -0.1. To interpret the magnitude, consider that in our sample period a change of two standard deviations (SD) of the employment shock is 0.034 (see Table 1). This implies that at a coefficient estimate of -0.104 a two SD decline in predicted employment leads to an increase of about one SD in the DI application rate (0.003), or about 40 percent of the mean application rate (0.008). These rough magnitudes are indicative even for the smaller point estimates, since the standard deviation of the shock measure varies across specifications (as further discussed below).

Autor and Duggan (2003) estimate similar specifications based on data ranging from 1978 to 1998. Their estimates range from -0.11 to -0.47, depending on the time period they consider (Table V). The magnitudes are difficult to compare, since the overall size of the effect will depend on the typical magnitude of employment shocks and changes in DI applications over the period they consider. But if we take the baselines statistics shown in Table 1 to be similar, our range of estimates is lower than that of Autor and Duggan. Most likely, given the large changes in employment during the 1982 and 1991 recession and the large fluctuations in the application rate during the early 1980s and early 1990s, it is likely that the standard deviations are larger during that period. This would imply larger implied effects of a ‘typical’ shock, but not necessarily a larger overall contribution to the variation in application rates.

³ We have replicated our main specifications without state effects, and with state-year effects in Table 2b. The results are robust to alternative specifications. They are somewhat larger when state effects are excluded.

The differences in the range of point estimates imply that a similar reduction in employment has less of an effect on the application rate in the 1994-2008 period than in the period from 1978-1998. The difference is especially large when we consider Autor and Duggan's estimate for the period of 1984-1998, which once year and state effects are included is -0.37. To gain further insight into this difference we break up our sample into three year-groups. For our baseline estimates (using the previous year's share as weight of our employment measure) we find that the period from 1994-1998 has the largest effect (a point estimate of -0.165 with year and state effects, -0.237 when we include state-specific flexible trends). For later years, the effect is smaller, and more on the order of -0.8. As for the main effect in the first row, these numbers are the upper bound of the overall range of estimates in Table 2 and 3, which go from 0.037 to -0.327 for 1994-1998, and from -0.033 to -0.087 for the period of 1999-2008. From these findings it appears that there are relatively large effects in the mid-1990s. Estimates for this period may have been partly influenced by the rapid increase in DI application and enrollment in the early to mid-1990s. The sources of this surge are not well understood, but may relate to the SSI outreach conducted by SSA during that period, since the medical criteria for DI and SSI are the same.

Note that again differences in the standard deviations appear to partly offset the difference in point estimates; thus, even if the coefficient estimate for 1994-1998 is larger, the lower incidence of economic shocks than, say, in 1999-2003 shown in Table 1 implies that economically induced shocks have a smaller overall effect on disability

applications. For example, for a decline in predicted employment of two standard deviations, the predicted increase in the DI application rate is 0.0014 in 1994-1998, whereas it is 0.034 in 1999-2003 and 0.028 in 2004-2008. Since the variability of employment changes across regions typically increases in recessions, these patterns partly reflect the fact that the U.S. economy went into a recession in 2002, and that the labor market did experience a slow recovery afterwards. Nevertheless, the substantially lower point estimates imply that we had severely over-estimated the impact of the employment declines in the 2002 recession on DI applications based on point estimates from the mid-1990s or the late-1980s. Instead, the effect of economic shocks in the 2002 recession seems to have been more similar to what Autor and Duggan estimate for the period from 1978 to 1984.

Overall, our findings appear to imply smaller effects of employment declines on the DI application rate than Autor and Duggan's (2003) results, possibly because they focused on the late-1980s and early- and mid-1990s, a period of particularly rapid growth in DI applications. Instead, the effect in the early 2000s appears more similar to what it was before the DI retrenchment in the early 1980s. It should be kept in mind, however, that our findings still imply sizeable increases in DI application rates as a function of adverse employment shocks.

The estimates in Tables 2 and 3 are based on year-to-year changes in employment. Autor and Duggan (2003) obtain their estimates using differences over longer periods of time. To make sure our estimates do not differ from Autor and Duggan's because of the

different horizon over which economic shocks occur, we replicated their specification in Table V which uses three-year changes in our employment measure. The results are shown in Table 4, and use the share in the base period as the weight in the employment variable. These estimates are thus directly comparable to those in Autor and Duggan for the earlier time period. These estimates lie on the lower range of estimates we obtain with our annual specifications in Table 2. In fact, the point estimates drop to about half of the values in the baseline estimates in Table 1. For the period 1994-1998 the drop is even larger. Thus, it is unlikely that it is our methodology that is producing smaller results.

3.2 Effects from 1994 to 2008 on Changes in Labor Force Participation

As shown in Tables 2 to 4, we also find significant effects of economic shocks on labor force participation. The effects are not significant and can get very small when we use state-level data, but imply non-negligible effects and are precisely estimated at the county-level. For our baseline specification in Table 2 the point estimate is about -0.3; overall, focusing on the county-level regressions, estimates range from 0 to -0.3. Yet, contrary to our findings for application rates, the effect on changes in the NILF rate is less robust to alternative specifications of the base year of the shock variable. It may be that this arises from endogeneity of the employment shock measure to local trends in economic conditions also affecting the NILF rate. In this case, as further discussed in the next section, the shares in the previous years are likely endogenous, and a better share in the employment measure is based on years further in the past. Table 3 shows that once that is done, the point estimates of the effect of employment shocks on changes in the NILF rate get significantly smaller.

Our estimates of the effect of employment shocks on changes in labor force participation are substantially smaller than those reported in Autor and Duggan (2003), which range from -0.5 to -1. Our range of estimates is from 0 to -0.3, and our preferred estimates using lagged or averaged shares lie around -0.1. Thus, a decline in employment of similar size would lead to substantially smaller implied declines in the labor force participation rate in our sample.

Again, it is difficult to compare the overall contribution of the variance of employment shocks to differences in changes in labor force participation across regions, since we do not have the appropriate sample statistics for Autor and Duggan's sample. In our time period ranging from 1994 to 2008, an effect of a decline in the employment shock by two standard deviations (-0.034) implies an increase in the *change* in the NILF rate by 0.01 (0.034×0.3). The average change in the NILF rate over 1994-2008 was 0.002, and its standard deviation across counties was 0.018. Thus, differences in employment changes play a non-negligible role in explaining the variability in changes in the NILF rate across counties. The effect for our preferred measure using past shares, is similar, since again smaller point estimates are offset by larger variability in the measure of employment shocks.

Considering changes over time in the effect of employment shocks on changes in the NILF rate, we see a substantial decline in the effect in 1999-2003 relative to the period before or after. This suggests two interpretations. On the one hand, this finding would imply that employment shocks occurring in recessions lead to smaller declines in labor

force participation. On the other hand, this is a period with a high variation in employment shocks across counties; thus, the overall contribution of employment shocks in explaining the variation of changes in the NILF rate *increases* during the recession. The fact that the point estimate declines may also be due to an underlying non-linearity in the effect of employment shocks on the NILF rate (and, as we saw above, on the application rate). In that case, a period with larger standard deviation in employment changes will average over a different range of effects, potentially leading to a smaller overall estimate.

3.3 Alternative Measures of Employment Shocks

To further probe the robustness of our findings, we re-estimated our main models using alternative measures of distress in local labor markets. The results are shown in Table 5, and the mean and standard deviations of our different measures are summarized in Appendix Table 1. Overall, we obtain different findings for different measures. Yet the main impression of our findings is that the effects of local economic shocks on changes in labor force participation are less robust than the effect on DI application; as seen before, the strongest and most precise effects of economic shocks on changes in labor force participation tend to occur at the beginning of our sample period, in the mid-1990s. As with our main measure, the positive effects of economic shocks on DI applications occur throughout the time period we study.

A commonly used measure to assess the impact of local labor market conditions on DI applications is the unemployment rate. To avoid problems related to measurement error,

we follow the existing literature and use unemployment rates at the state level. Since the model we estimate contains state fixed effects, the resulting coefficient estimates capture the effect of the change in unemployment rates on the change in the DI application rate. Columns 1 and 2 show that the effects are statistically significant and positive, confirming that year-to-year increases in unemployment rates raise DI applications. As found in the previous literature, the correlation between changes in unemployment rates and increases in DI applications is reasonably stable over time. In terms of overall magnitudes, the effect is smaller – for an increase in unemployment rates of four points (roughly a gap from peak to trough in regular recessions) the predicted effect is an increase of 0.001 to 0.002 in application rates – about a third to half of the effect implied by changes in predicted employment changes. We find a sizeable and precisely estimated positive correlation between increases in unemployment rates and increases in the fraction NILF only for the mid-1990s.

For the other two measures we tried, the evidence is more inconclusive; the fraction of total layoffs per working age population neither has an effect on DI applications or fraction NILF. Total job destruction per working age population raises DI applications only in the mid-1990s, not later; it raises fraction NILF throughout the period we study, but the effect is particularly large in the mid-1990s. Overall, still, the findings in Table 5 confirm that if there was an effect of economic shocks on increases in fraction NILF because of a rise in DI applications, these were likely to have been strongest in the mid-1990s, a period of particularly strong growth in both DI and SSI programs.

3.4 Effects of Employment Shocks by Pre-Existing Labor Market Conditions

To better predict the effect of employment shocks on changes in DI application rates and in labor force participation rates, we also explored whether the effect differs by pre-existing conditions in local labor markets. If those workers applying to DI after employment shocks are motivated by economic considerations, their chances of finding new employment will be affected by, say, the overall level of unemployment in the region. The results from this exercise are summarized in Table 6. The Table displays the effect of our main measure of the employment shock, as well as interactions for whether the mean level of alternative variables characterizing local labor markets was high (above 75th percentile) or low (below the 25th percentile). The main effect thus measures the effect for observations with pre-existing averages between the 25th and 75th percentiles, while the interactions show the differences in the effect for high or low values. To avoid issues related to measurement error, this table again uses observations at the state level.

Overall, Table 6 suggests that the effect of employment shocks on DI applications does not vary appreciably with our measures of pre-existing conditions in local labor markets. Instead, the effect is smaller in states who have a low fraction of the population in working age (i.e., the total effect of employment effect is the sum of the main effect plus the interaction; thus, if the coefficient on the interaction is positive, the total effect is less negative and thus smaller in magnitude). Presumably, this is due to the fact that fewer workers are covered by DI in these states. Oddly, the effect is also smaller in states that have a particularly high fraction of their population in working age. No immediate

plausible explanation is apparent, other than for example general equilibrium effects, by which states with a higher fraction of their population at working age are areas with an economic environment that is more active. The effect of employment shocks on changes in fraction NILF is also smaller in areas with a higher fraction in working age.

The main effect of employment shocks on changes in fraction NIFL is not statistically significant, as we had seen in our state-level models in Table 2. Yet, the effect of employment shocks on changes in the fraction NILF is significantly larger (more negative) in areas with high pre-existing unemployment rates. This is plausible, since it means that if pre-existing labor market conditions are weak, employment shocks lead to higher rates of drop out from the labor force. Note, however, that there is no corresponding larger effect of employment shocks on DI applications (in fact, the interaction effect is very small but positive). Thus, it is not true that shocks occurring in already depressed labor markets lead to larger increases in DI applications, and thereby to stronger declines in labor force participation rates. The greater decline in labor force participation in these areas must be driven by reasons other than the availability of the DI program.

3.5 Persistence in Effects of Employment Shocks on DI Applications

The majority of findings regarding the effect of labor market conditions on disability applications in this paper and the existing literature are based on contemporaneous effects of employment shocks. However, it is likely that labor market conditions have persistent effects on DI applications and labor force participation – partly this may arise because

these conditions themselves are persistent over time. Partly it is because workers may take time to respond, either because other support programs such as unemployment insurance run out, or because the economic losses to the individual reveal themselves to be persistent.

Knowing about such persistent effect is not only important from the point of view of understanding individual decision processes and mechanisms operating in the labor market. It is also important if ones concern lies with predicting the time path of DI applications following the onset of negative economic conditions. Different economic shocks may induce different increases in DI applications at different arrival rates, requiring different amounts of resources for the screening process.

There are two potential ways to assess the degree of persistence in the effect of economic shocks. One is to estimate dynamic models that include lagged dependent variables. The alternative is to trace the effect of particularly severe negative ‘events’ before and after their onset. The analysis here is meant to be mainly illustrative of the potential of persistent effects of economic shocks on DI application, and on the alternative methods available to study this persistence. A full analysis of the actual degree of persistence is left to future work with data that allow more concise definition of economic ‘shocks’, leading to more precise and well-identified estimates of dynamic patterns.

Table 7a shows estimates of our baseline regression model at the state-level where we have included lagged independent variables as additional regressors. Given the presence

of state fixed effects, this estimates the effect of lagged deviations of our measures of employment shocks – the predicted change in employment and the unemployment rate – from the state-level mean. The results for predicted employment changes are mixed; for DI applications as outcome, most of the effect seems to come from the lagged change; for changes in fraction NILF, most of the effect seems to come from the concurrent change. For unemployment rates the opposite pattern results; the current deviation in unemployment rates from state means is what matters for the DI application rate, whereas lagged unemployment rate deviations appear to matter for changes in fraction NILF. One reason might be that the two measures pick up different phenomena in the labor market. They are also of different nature, with the change in non-employment rate representing a flow, while the unemployment rate per se is measures of a stock. While the presence of state effects will help to alleviate this, if this approach is followed, one has to be careful in specifying models that match the types of dependent and independent variables. Another, more fundamental issue is that with potentially high persistence in labor market conditions at least in the short run, there might not be enough variation in the data to successfully identify of different adjacent lagged independent variables. This may result in unstable parameter estimates and in difficulties in identifying the appropriate lag structure.

The second approach allows a more straightforward assessment of the underlying dynamics. The idea is to specify the timing of an ‘event’ – a large and sudden decline in local employment – and consider the dynamic path of, say, the DI application rate before and after the year of the event. Of course, a potential difficulty with this approach is that

there is some degree of arbitrariness in the definition of an ‘event’, leaving to the researcher what constitutes a sensible definition of a ‘shock’. Here, we considered several definitions of such negative events in the labor market. As explained in the methods section (Section 2) each definition define as an event a large decline in predicted employment over a limited range of time (either over one or over two years). Since we only consider large shocks, almost all of the events we identify occur during the 2002 recession (i.e., during the years 2001 to 2003).

As an example, the resulting dynamic patterns around shocks occurring during one year – from 2000 to 2001 – are shown in Figure 1. The figure displays the mean DI application rate, the mean change in the fraction NILF, and the average predicted change in employment in the four years before and after 2001. The dashed line shows that our shock appears defined correctly – i.e., that there is indeed a large decline in predicted employment in that year.⁴ The second line shows the evolution of DI application rates before and after the shock. The application rate appears stable four and three years before the shock, and then starts to quickly rise in the years leading up the event. In the years following the shock the DI application rate stays permanently above its pre-shock level. This illustrates the potential for a high degree of persistence in the response of DI application rates to local economic shocks. Given the continued variability of employment changes after the first negative shock shown in the figure, it also illustrates the need to understand the effect of the continued evolution of employment conditions

⁴ However, it also shows that one might want to consider putting further restrictions on the development of employment afterwards, as is typically done in the literature on layoffs at the firm level; in the particular case shown, one sees a large rebound with an ensuing decline in employment four years later, raising the question whether one is not also measuring the effect on an increase in economic instability.

after the onset of a ‘shock’. Finally, the figure displays the evolution of changes in the fraction NILF. There is no clear pattern in the rate of change, despite perhaps an increase in variability. Overall, there does not appear to be an increase in the mean rate of change in the fraction NILF after the shock, implying no persistent rise in the fraction of workers out of the labor force. This is consistent with our observation made above that the somewhat stronger effects of labor market shocks on participation rates occurred in the mid-1990s.

This illustrative analysis is taken further in Table 7b, which shows the main coefficients from the distributed lag regressions explained in the method section. The displayed coefficients represent changes in the outcome variables before and after the year of the shock relative to an initial baseline period, relative to the evolution of the outcome variable over time as defined by the annual trend of a control group of counties not experiencing employment shocks. The table shows results for shocks defined over one and over two years; it also shows results where the shocks used for estimation are restricted to the first shock that occurs in a county, as opposed to any shock (such that counties can experience multiple shocks). The table also shows results for persistent shocks – i.e., shocks leading to a persistent decline in employment. This is done to try to focus on cases where the county-level reduction in employment is permanent. The regression results largely confirm our observations made for the patterns in Figure 1. DI application rates appear stable in three to four years before the shock, rise in the years leading up to the shock, and then stay permanently elevated. In terms of results differing by the definition of a shock, the persistent rise is generally larger for shocks occurring

over two years, with the exception when we consider persistent shocks. This suggests that large employment declines occurring over two years already select areas in which the decline is persistent. Again consistent with results in Figure 1, it does not appear that there is a corresponding persistent increase in the change of the labor force participation rate for any of our events. While there is a response in the year of the shock, no systematic long-term effects are apparent from the table.

We conclude from this preliminary analysis that the study of the persistent effects of employment shocks – be they temporary or lasting – is a promising area for further inquiry. In particular, if the goal is to predict the evolution of DI application rates in the wake of recessions, it will be important that modeling potentially persistent effects may improve predictions of the path of DI application rates after economic shocks.

4. Effects of Employment Shocks on Outcomes at the DDS Level

The results in Section 3 have confirmed previous research that employment shocks increase the DI application rate and lower labor force participation, although the effects are smaller than for the late 1980s and early 1990s. This increase in applications has several potentially important implications. On the one hand, it can put a burden on the disability determination system, in particular if the applications triggered by economic conditions are those that are more difficult to adjudicate. On the other hand, it can imply that the presence and features of the DI system itself help trigger applications, and thereby reduce labor force participation. To contribute to answer the first question, we have obtained average characteristics at the level of the local DDS offices spanning our

sample period. The information conveyed by this additional data will also yield helpful insights into the second question.

To analyze the effect of employment shocks on the disability determination process, we have replicated our main regression with two additional outcomes at the DDS level – the allowance rate and the mean number of total days an application is processed. Note that these outcomes refer to adjudication at the DDS level. The ultimate allowance rate and the ultimate number of days an application will be processed are higher because of some applications are decided during higher stages in the DI adjudication process. Table 8 displays the outcome from these regressions. The first column shows that the effect of our measure of predicted employment changes are positive – suggesting that declines in employment lower the probability that an application is judged favorably. The effect is sizeable – a decline in employment by two SD leads to a decline in the allowance rate by roughly 8.5%. From a mean allowance rate of 35.6%, that is a decline of over 20 percent. This finding suggests that a high fraction of applications triggered by economic shocks are deemed ineligible at the DDS level. Of course, part of these denials will be reversed at higher levels of the adjudication process. It is therefore hard to say whether these applications were from individuals who were truly disabled according to the definition of the DI system or not. However, to the least these results indicate that an important fraction of the applications induced by employment declines are harder to adjudicate and thus will lead to higher rate of initial denials.

The effect of employment shocks on our measure of ‘congestion’ in the screening process at the DDS level is less precise and of a smaller order of magnitude. The effect of a two SD employment decline on the mean duration until adjudication at the DDS level is approximately an increase of five days, though the point estimate is far from being statistically significant. At a mean of 100 days (see Table 1), this would be a rather small effect. To assess whether this effect is driven by potential outliers across DDS level offices or over time, we re-estimated our model taking the natural logarithm of mean processing days. At a two SD deviation change, this would imply a 7% increase in mean duration – about a similar magnitude as the model in levels. Moreover, the estimate is not significant. The effects are even smaller, not significant, and of the wrong sign, when to probe for DDS level outliers we use the median processing days at the DDS office at our measure. Thus, we conclude that there is no strong or precise relationship between typical economic shocks and the duration until adjudication at the DDS level. There might be a more sizeable effect for less frequent large employment shocks, but we cannot pick it up with the data used here.

5. Variation of Effects of Employment Shocks at the DDS Level

The DI application and adjudication process is complex and affected by a variety of factors. The requirements that workers have to meet to be eligible, and the time until they receive benefits mean that it can be costly for workers to apply for DI. In particular, taken together with the waiting period before application the mean time to adjudication shown in Table 1 implies that the typical worker will be out of work and without benefits for at least three quarters of a year before entering the DI program. Thus, for workers who deem it unlikely that their application will be accepted or who are uncertain about their

prospect of receiving DI, applying for DI would seem a costly proposal. Similarly, if workers are constraint in their savings or alternative sources of income, a longer period until benefit receipt should discourage them from applying. Per se, this should hold independently of their true health limitation, but such consideration of an economic nature will be more likely to occur among workers who have the option to work in the labor market or receive other sources of income. Workers that have no ability to work or have no other income sources are likely to be less affected.

To assess the potential effect of such economic considerations on the incidence of application to DI, we have re-estimated our main models of Section 3 and included interactions between mean DDS level characteristics described in Section 4 and our employment shock variable as explanatory factors. The idea is to exploit differences in the average allowance rate and in the average duration of adjudication among DDS levels. These differences are likely to be partly driven by permanent differences in the characteristics of applicants across regions (by taking the mean of these characteristics at the DDS-level over time, we abstract from year-to-year fluctuations due to changes in applicant types). Yet, they are likely to also be driven by differences in the underlying typical allowance rate or processing duration across DDS level offices.

The idea of this exercise is to see whether workers laid-off during difficult economic times are more likely to apply to DI (and are more likely to exit the labor force) when the conditions for doing at the relevant local DDS office is favorable. By favorable, we intend typically high allowance rates or typically fast time to adjudication. Table 9 shows

these interacted regressions. There are two main findings. First, the interaction term between a dummy if the mean DDS allowance is above (below) the average allowance rate and our employment shock has a precisely estimated positive (negative) coefficient. This is the *opposite* sign of what we would have expected to see if DDS offices with a high average allowance rate draw more applications in tough economic times. It also does not indicate that areas with high average allowance rates are populated by more disabled workers, who are also more vulnerable to economic shocks. Instead, it seems that if a DDS level office already has a high allowance rate it indicates that most of the likely eligible applicants in a region have already applied. Thus, for these DDS regions the effect of an economic shock is lower, since in some sense the group ‘at risk’ of entering DI is smaller.

The second finding is that the interaction of our employment shock with a dummy for whether the mean DDS-level processing days is above average is also positive. This implies that in areas where waiting times until adjudication at the DDS-level are high, an economic shock has less of an impact on applications. In this case, the sign is as expected if one believes workers take into account the average length of time until adjudication in their decision whether to apply. However, this could also be due to a similar phenomenon as in the case of the allowance rate; that is, in areas in which most eligible workers are already applying, the average processing time is low, and fewer workers decide to apply in times of economic shocks. Note that this presumes that the time until adjudication of the marginal applicant in areas with a large fraction of eligible workers is low; the opposite might be the case.

The evidence in favor of strategic behavior in the application decision is mixed. When we turn to the effect on the change in the NILF rate in the remaining column of the table, the evidence is more clear-cut – there is little significant difference in the effect of employment shocks in DDS areas with high or low allowance rates or high or low mean processing days. This results also in specifications where we have interacted our employment shock linearly with the mean allowance rate or average of mean processing days. The problem is partly one of precision. However, the point estimates themselves also do not reveal any systematic pattern. Thus, while DDS-level characteristics may influence application rates, they do not seem to influence the effect of employment shocks on labor force participation.

6. Conclusion

A growing literature confirms that applications to Social Security Disability Insurance (DI) increase as conditions in the labor market worsen (e.g., Bound and Burkhauser 1999). Yet, less is known how employment conditions interact with characteristics of the screening process. Are workers dissuaded from applying to DI if aspects of the screening process – such as the waiting time or the mean allowance rate at the local DDS office – appear unfavorable? If this is the case, do these workers return to the labor force? These are important questions that speak to the determinants of DI applications and to the effect of DI application on labor force participation.

Similarly, little is known about the effect of labor market conditions on the screening process itself. Yet, this is of substantial concern to the Social Security Administration,

which has to try to ensure efficient screening for eligibility to DI even when applications suddenly rise in economic downturns. This project has analyzed the effect of predicted changes in county employment on the application pattern and adjudication process of DI using a variety of county, state, and DDS-level data sources heretofore not use for research on the economic effects of DI.

Our findings suggest that while employment declines raise DI applications and lower labor force participation as the previous literature has found, the effect is smaller in the early 2000s than in the early 1990s. Thus, we revise downwards somewhat the large effects of economic conditions on DI applications and labor force participation found in the early 1990s. It also appears that DDS-level allowance rates decline when applications rise because of an employment decline. At the same time, the average duration of screening at the DDS-level rises somewhat. Thus, part of the applicants induced to apply by economic shocks are screened out during the initial stages of the adjudication process, suggesting that some of them may have been induced to apply because of adverse economic conditions. On the upside, we find that ensuing congestion in the screening process – as measured by an increase in the average days to adjudication – appears weak.

We also exploited average differences between DDS offices to further assess underlying determinants of DI applications. There is some evidence that DDS offices with higher average screening duration receive fewer applications when local employment drops. Yet, potential applicants so dissuaded from applying after an employment decline to not appear to return to the labor force. Thus, it does not appear that workers who would

otherwise be working strategically choose to apply to DI based on their chances of success. Instead, it appears that if cost-benefit considerations on the side of potential applicants do play a role, this is for applicants who are already out of the labor force.

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Table 1: Sample Statistics of County-Level and DDS-Level Sample

Variable	County-Level Sample			DDS-Level Sample		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
DI Applications per Pop 25 to 64	35819	0.008	0.003	2661	0.008	0.002
Not In Labor Force per Pop 25 to 64	35819	0.002	0.018	2480	0.002	0.010
DI Allow Rate	--	--	--	2661	0.356	0.065
Mean Processing Days	--	--	--	2661	98.8	18.4
Median Processing Days	--	--	--	2661	89.3	20.2
Employment Shock Base Year: Initial Year 1990	35819	0.062	0.056	2661	0.071	0.038
Base Year: Initial Year 1990 (1994-1998)	11534	0.034	0.034	874	0.040	0.030
Base Year: Initial Year 1990 (1999-2003)	11987	0.083	0.049	893	0.093	0.028
Base Year: Initial Year 1990 (2004-2008)	12298	0.068	0.068	894	0.080	0.035
Employment Shock Base Year: Previous Year	35819	0.008	0.017	2661	0.006	0.016
Base Year: Previous Year (1994-1998)	11534	0.021	0.004	874	0.017	0.009
Base Year: Previous Year (1999-2003)	11987	-0.003	0.020	893	-0.003	0.019
Base Year: Previous Year (2004-2008)	12298	0.005	0.011	894	0.005	0.011
Employment Shock Base Year: 2 Years Previous	35819	0.017	0.030	2661	0.012	0.028
Base Year: 2 Years Previous (1994-1998)	11534	0.040	0.008	874	0.025	0.021
Base Year: 2 Years Previous (1999-2003)	11987	0.000	0.039	893	0.001	0.037
Base Year: 2 Years Previous (2004-2008)	12298	0.009	0.019	894	0.010	0.017
Employment Shock Base Year: 3 Years Previous	35819	0.025	0.040	2661	0.016	0.037
Base Year: 3 Years Previous (1994-1998)	11534	0.053	0.016	874	0.025	0.031
Base Year: 3 Years Previous (1999-2003)	11987	0.014	0.050	893	0.015	0.048
Base Year: 3 Years Previous (2004-2008)	12298	0.007	0.030	894	0.008	0.028
Employment Shock Base Year: Previous 3 Year Average	35819	0.016	0.028	2661	0.010	0.026
Base Year: Previous 3 Year Average (1994-1998)	11534	0.038	0.008	874	0.017	0.021
Base Year: Previous 3 Year Average (1999-2003)	11987	0.004	0.035	893	0.004	0.034
Base Year: Previous 3 Year Average (2004-2008)	12298	0.007	0.018	894	0.008	0.016

Notes: Various data sources, see text for description.

Table 2a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	-0.104*** (0.0103)		-0.0935*** (0.0228)		-0.0467** (0.0201)		-0.309*** (0.0318)		-0.188** (0.0923)		-0.201 (0.221)	
Emp Shock (1994-1998)		-0.165*** (0.0183)		-0.0811* (0.0483)		0.115*** (0.0424)		-0.490*** (0.0803)		-0.578** (0.241)		-0.249 (0.829)
Emp Shock (1999-2003)		-0.0846*** (0.00920)		-0.0768*** (0.0205)		-0.0418** (0.0178)		-0.174*** (0.0426)		-0.0716 (0.103)		-0.121 (0.247)
Emp Shock (2004-2008)		-0.122*** (0.0162)		-0.161*** (0.0376)		-0.0760 (0.0477)		-0.578*** (0.0524)		-0.501*** (0.171)		-0.670** (0.325)
Constant	0.0134*** (0.000467)	0.0149*** (0.000561)	0.0144*** (0.000412)	0.0141*** (0.000849)	0.00733*** (0.000942)	0.00342*** (0.00114)	0.00774*** (0.00211)	0.0124*** (0.00256)	0.0114*** (0.00209)	0.0174*** (0.00418)	0.00780 (0.00534)	0.00874 (0.0196)
Observations	35,819	35,819	2,480	2,480	765	765	35,819	35,819	2,480	2,480	765	765
R-squared	0.527	0.529	0.807	0.809	0.934	0.937	0.059	0.062	0.165	0.169	0.208	0.212
Base Year for Employmen			Previous Year						Previous Year			
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 2b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64						
Employment Shock	-0.158***	-0.104***	-0.108***				-0.352***	-0.309***	-0.316***				
	(0.0120)	(0.0103)	(0.0107)				(0.0313)	(0.0318)	(0.0309)				
Emp Shock (1994-1998)				-0.263***	-0.165***	-0.237***				-0.555***	-0.490***	-0.493***	
				(0.0207)	(0.0183)	(0.0159)				(0.0788)	(0.0803)	(0.0658)	
Emp Shock (1999-2003)				-0.131***	-0.0846***	-0.0877***				-0.210***	-0.174***	-0.155***	
				(0.0114)	(0.00920)	(0.0103)				(0.0413)	(0.0426)	(0.0480)	
Emp Shock (2004-2008)				-0.165***	-0.122***	-0.0774***				-0.598***	-0.578***	-0.597***	
				(0.0181)	(0.0162)	(0.0168)				(0.0593)	(0.0524)	(0.0471)	
Constant	0.0147***	0.0134***	0.0106***	0.0171***	0.0149***	0.0135***	0.00952***	0.00774***	0.0179	0.0140***	0.0124***	0.0239	
	(0.000316)	(0.000467)	(0.00101)	(0.000462)	(0.000561)	(0.000986)	(0.00120)	(0.00211)	(0.0337)	(0.00200)	(0.00256)	(0.0336)	
Observations	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	
R-squared	0.296	0.527	0.571	0.300	0.529	0.576	0.052	0.059	0.192	0.054	0.062	0.195	
Base Year for Employment				Previous Year						Previous Year			
Fixed Effect	Year	Year; State	Year *	Year	Year; State	Year *	Year	Year; State	Year *	Year	Year; State	Year *	
			State			State			State			State	
SE Cluster				County						County			
Level of Observation				County x Year						County x Year			

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 3a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models, Alternative Base Year for Employment Shock

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
	County		DDS		State		County		DDS		State	
Employment Shock	-0.0666***		-0.0666***		-0.0505***		-0.135***		-0.0757		-0.0565	
	(0.00582)		(0.0129)		(0.0142)		(0.0171)		(0.0480)		(0.151)	
Emp Shock (1994-1998)	-0.0964***		-0.0463*		0.0369		-0.222***		-0.352**		0.370	
	(0.0112)		(0.0269)		(0.0320)		(0.0389)		(0.140)		(0.449)	
Emp Shock (1999-2003)	-0.0563***		-0.0585***		-0.0425***		-0.0654***		-0.0192		-0.0129	
	(0.00518)		(0.0115)		(0.0132)		(0.0241)		(0.0564)		(0.157)	
Emp Shock (2004-2008)	-0.0788***		-0.0974***		-0.0690**		-0.267***		-0.209***		-0.173	
	(0.00859)		(0.0207)		(0.0274)		(0.0247)		(0.0771)		(0.176)	
Constant	0.0129***	0.0138***	0.0128***	0.0128***	0.00783***	0.00510***	0.00403**	0.00692***	0.00844***	0.00809***	0.00459	-0.00875
	(0.000413)	(0.000471)	(0.000281)	(0.000291)	(0.000924)	(0.00113)	(0.00203)	(0.00205)	(0.00144)	(0.00146)	(0.00464)	(0.0138)
Observations	35,819	35,819	2,480	2,480	765	765	35,819	35,819	2,480	2,480	765	765
R-squared	0.534	0.536	0.812	0.814	0.936	0.939	0.057	0.060	0.164	0.168	0.206	0.214
Base Year for Employment	Moving Average of Previous Three Years						Moving Average of Previous Three Years					
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 3b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends, Alternative Base Year for Employment Shock

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64						
Employment Shock	-0.0953***	-0.0666***	-0.0659***				-0.164***	-0.135***	-0.136***				
	(0.00682)	(0.00582)	(0.00618)				(0.0162)	(0.0171)	(0.0173)				
Emp Shock (1994-1998)				-0.155***	-0.0964***	-0.134***					-0.271***	-0.222***	-0.277***
				(0.0134)	(0.0112)	(0.00986)					(0.0383)	(0.0389)	(0.0374)
Emp Shock (1999-2003)				-0.0809***	-0.0563***	-0.0559***					-0.0889***	-0.0654***	-0.0399
				(0.00625)	(0.00518)	(0.00567)					(0.0235)	(0.0241)	(0.0269)
Emp Shock (2004-2008)				-0.0993***	-0.0788***	-0.0518***					-0.285***	-0.267***	-0.275***
				(0.00971)	(0.00859)	(0.00895)					(0.0273)	(0.0247)	(0.0237)
Constant	0.0136***	0.0129***	0.0108***	0.0153***	0.0138***	0.0137***	0.00601***	0.00403**	0.0148	0.00879***	0.00692***	0.0226	
	(0.000247)	(0.000413)	(0.000976)	(0.000361)	(0.000471)	(0.000970)	(0.00108)	(0.00203)	(0.0336)	(0.00136)	(0.00205)	(0.0337)	
Observations	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	
R-squared	0.310	0.534	0.575	0.315	0.536	0.580	0.049	0.057	0.190	0.052	0.060	0.193	
Base Year for Employment Fixed Effect		Moving Average of Previous Three Years						Moving Average of Previous Three Years					
	Year	Year; State	Year *	Year	Year; State	Year *	Year	Year; State	Year *	Year	Year; State	Year *	
			State			State			State			State	
SE Cluster			County				County						
Level of Observation			County x Year				County x Year						

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 4a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models, 3-Year Changes Instead of 1-Year Changes

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
	County		DDS		State		County		DDS		State	
Employment Shock	-0.0432***		-0.0514***		-0.0355**		-0.345***		-0.0719		-0.307	
	(0.00408)		(0.00927)		(0.0144)		(0.0359)		(0.153)		(0.255)	
Emp Shock (1994-1998)	-0.0534***		0		0.0455		-0.171		0		1.413	
	(0.0105)		(0)		(0.0377)		(0.116)		(0)		(1.046)	
Emp Shock (1999-2003)	-0.0410***		-0.0459***		-0.0269*		-0.260***		-0.0310		-0.110	
	(0.00380)		(0.00828)		(0.0140)		(0.0478)		(0.170)		(0.276)	
Emp Shock (2004-2008)	-0.0461***		-0.0673***		-0.0403		-0.562***		-0.225		-0.503*	
	(0.00596)		(0.0154)		(0.0269)		(0.0466)		(0.144)		(0.274)	
Constant	0.0131***	0.0130***	0.0153***	0.0149***	0.00598***	0.00605***	0.0111*	0.00700	-0.00409	-0.00374	-0.0324***	-0.0299***
	(0.000482)	(0.000466)	(0.000595)	(0.000547)	(0.000455)	(0.000421)	(0.00590)	(0.00590)	(0.0103)	(0.0104)	(0.00941)	(0.00876)
Observations	11,946	11,946	885	885	255	255	11,938	11,938	708	708	255	255
R-squared	0.536	0.536	0.796	0.797	0.929	0.931	0.100	0.103	0.352	0.353	0.343	0.368
Base Year for Employment			3 Years Previous						3 Years Previous			
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 4b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends, 3-Year Changes Instead of 1-Year Changes

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	-0.0619***	-0.0432***	-0.0428***				-0.383***	-0.345***	-0.348***			
	(0.00466)	(0.00408)	(0.00419)				(0.0337)	(0.0359)	(0.0356)			
Emp Shock (1994-1998)				-0.0877***	-0.0534***	-0.0780***				-0.257**	-0.171	
				(0.0104)	(0.0105)	(0.0101)				(0.103)	(0.116)	
Emp Shock (1999-2003)				-0.0598***	-0.0410***	-0.0448***				-0.301***	-0.260***	
				(0.00450)	(0.00380)	(0.00401)				(0.0472)	(0.0478)	
Emp Shock (2004-2008)				-0.0612***	-0.0461***	-0.0312***				-0.572***	-0.562***	
				(0.00662)	(0.00596)	(0.00623)				(0.0482)	(0.0466)	
Constant	0.0145***	0.0131***	0.0144***	0.0144***	0.0130***	0.0146***	0.0173***	0.0111*	0.0134	0.0114***	0.00700	
	(0.000284)	(0.000482)	(0.00139)	(0.000283)	(0.000466)	(0.00138)	(0.00265)	(0.00590)	(0.0115)	(0.00333)	(0.00590)	
Observations	11,946	11,946	11,946	11,946	11,946	11,946	11,938	11,938	11,938	11,938	11,938	
R-squared	0.309	0.536	0.579	0.310	0.536	0.580	0.078	0.100	0.217	0.081	0.103	
Base Year for Employment												
Fixed Effect	Year	Year; State	Previous Year Year * State	Year	Year; State	Year * State	Year	Year; State	Previous Year Year * State	Year	Year; State	Year * State
SE Cluster			County						County			
Level of Observation			County x Year						County x Year			

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 5: Estimates of Effect of Alternative Measures of Economic Conditions at the State Level on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	0.000337*** (9.14e-05)		1.765 (1.431)		0.00811 (0.00762)		0.00108 (0.000642)		-11.65 (10.86)		0.219*** (0.0568)	
Emp Shock (1994-1998)	0.000273*** (8.81e-05)		2.025 (2.033)		0.0209*** (0.00731)		0.00130* (0.000754)		-14.22 (10.20)		0.289*** (0.0790)	
Emp Shock (1999-2003)	0.000224*** (7.98e-05)		1.626 (1.584)		0.00411 (0.00887)		0.000602 (0.00115)		-10.43 (11.47)		0.187*** (0.0608)	
Emp Shock (2004-2008)	0.000466*** (0.000113)		4.141 (2.610)		-0.00452 (0.0158)		0.00102 (0.000750)		-9.250 (14.66)		0.198** (0.0909)	
Constant	0.00605*** (0.000863)	0.00505*** (0.000933)	0.00443*** (0.000703)	0.00447*** (0.000691)	0.00646*** (0.000688)	0.00501*** (0.00106)	-0.00730 (0.00616)	-0.0184*** (0.00657)	-0.00745** (0.00323)	-0.00714** (0.00334)	-0.0102* (0.00518)	-0.0181** (0.00804)
Observations	765	765	658	658	612	612	765	765	658	658	612	612
R-squared	0.940	0.942	0.940	0.941	0.952	0.954	0.212	0.214	0.290	0.290	0.220	0.224
Alternative Measure	Unemployment Rate		Total Layoffs per Total Working Age Population		Job Destruction per Total Working Age Population		Unemployment Rate		Total Layoffs per Total Working Age Population		Job Destruction per Total Working Age Population	
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	State		State		State		State		State		State	
Level of Observation	State x Year		State x Year		State x Year		State x Year		State x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Base year of employment is previous year.

Table 6: Estimated Effects of Predicted Employment Changes Interacted with Pre-Existing Average State-Level Characteristics, 1994 to 2008, State-Level Models

Variable	Disability Insurance Applications per Population 25 to 64				Change in Not In Labor Force per Population 25 to 64			
Employment Shock	-0.0467** (0.0191)	-0.0474** (0.0199)	-0.0447** (0.0189)	-0.0354** (0.0175)	-0.244 (0.230)	-0.204 (0.227)	-0.148 (0.216)	-0.128 (0.188)
Employment Shock X High	0.00317 (0.00533)	-0.00580 (0.00398)	-0.00207 (0.00697)	0.0201*** (0.00409)	-0.132* (0.0740)	0.0758 (0.0761)	-0.00570 (0.0504)	0.129* (0.0661)
Employment Shock X Low	0.00559 (0.00688)	0.00145 (0.00551)	0.00214 (0.00419)	0.0122** (0.00490)	-0.0995 (0.0678)	0.0517 (0.0646)	0.0645 (0.0778)	0.0923 (0.0673)
Baseline High	0.000318 (0.000409)	0.00193*** (0.000268)	-0.00280*** (0.000200)	-0.00408*** (0.000258)	-0.00193 (0.00370)	-0.00289 (0.00274)	-0.00642*** (0.00150)	-0.00639*** (0.00182)
Baseline Low	-0.00284*** (0.000235)	-0.00241*** (0.000302)	-0.00106*** (0.000273)	-0.00269*** (0.000236)	-0.00368 (0.00226)	-0.00116 (0.00269)	-0.00945*** (0.00294)	-0.00303** (0.00135)
Constant	0.00773*** (0.000532)	0.00869*** (0.000905)	0.0114*** (0.000866)	0.00976*** (0.000762)	-0.00901* (0.00535)	0.00949 (0.00649)	0.0143** (0.00634)	0.0111** (0.00464)
Observations	765	765	765	765	765	765	765	765
R-squared	0.934	0.934	0.934	0.938	0.224	0.213	0.212	0.222
Local Characteristic	Unemployment Rate	Poverty Rate	Percent of Population that is White	Percent of Population that is of Working Age	Unemployment Rate	Poverty Rate	Percent of Population that is White	Percent of Population that is of Working Age
Base Year for Employment Sho		Previous Year				Previous Year		
Fixed Effect		Year; State				Year; State		
SE Cluster		State				State		
Level of Observation		State x Year				State x Year		

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

States were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.

Table 7a: Estimates of Lagged Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models

Variable	Disability Insurance Applications per Population 25 to 64				Change in Not In Labor Force per Population 25 to 64			
Employment Shock	-0.00617 (0.0152)	-0.00969 (0.0169)			-0.254 (0.223)	-0.235 (0.213)		
Employment Shock (t-1)	-0.0481*** (0.0171)	-0.0568*** (0.0180)			0.000739 (0.245)	-0.0433 (0.230)		
Employment Shock (t-2)	-0.0563*** (0.0182)	-0.0365** (0.0147)			0.199 (0.176)	0.167 (0.211)		
Employment Shock (t-3)		-0.00174 (0.0152)				0.179 (0.200)		
Employment Shock (t-4)		-0.0464* (0.0238)				-0.223 (0.177)		
Unemployment Rate			0.000383*** (0.000118)	0.000380*** (0.000116)			-0.00407*** (0.000843)	-0.00438*** (0.000798)
Unemployment Rate (t-1)			-8.63e-05 (9.72e-05)	-8.61e-05 (9.51e-05)			0.00846*** (0.00124)	0.00829*** (0.00118)
Unemployment Rate (t-2)			3.45e-05 (5.82e-05)	1.61e-05 (4.70e-05)			-0.00221** (0.00102)	-0.000926 (0.00106)
Unemployment Rate (t-3)				7.52e-05 (4.70e-05)				0.000199 (0.00110)
Unemployment Rate (t-4)				-7.69e-05 (6.71e-05)				-0.00223*** (0.000791)
Constant	0.00678*** (0.000858)	0.00707*** (0.000848)	0.00568*** (0.000902)	0.00586*** (0.000864)	0.00973 (0.00605)	0.0150** (0.00739)	-0.0185*** (0.00539)	-0.00846 (0.00621)
Observations	765	765	765	765	765	765	765	765
R-squared	0.937	0.939	0.940	0.940	0.209	0.212	0.297	0.312
Base Year for Employment Shock		Previous Year				Previous Year		
Fixed Effect		Year; State				Year; State		
SE Cluster		State				State		
Level of Observation		State x Year				State x Year		

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64 Weighted according to local share of national population aged 25 to 64 in a given year.

Table 7b: Distributed Lag Models of Disability Insurance Applications and Change in Fraction Not in Labor Force Before and After Large County-Level Employment Declines Based on Net Job Losses in 2001 and 2002

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock (t-4)	-0.000259 (0.000170)	0.000301* (0.000179)	-6.52e-05 (0.000153)	0.000301* (0.000179)	0.000369** (0.000156)	0.000219 (0.000169)	0.00109 (0.000937)	0.00131 (0.00120)	0.00222** (0.000951)	0.00132 (0.00120)	0.00697*** (0.00116)	0.00116 (0.00131)
Employment Shock (t-3)	-0.000324 (0.000201)	0.000328* (0.000192)	-5.71e-05 (0.000151)	0.000328* (0.000192)	0.000479*** (0.000155)	0.000236 (0.000180)	0.00166 (0.00106)	0.00120 (0.00124)	0.00121 (0.00117)	0.00119 (0.00124)	0.00666*** (0.00112)	0.000690 (0.00112)
Employment Shock (t-2)	-0.000331 (0.000213)	0.000507** (0.000233)	-5.07e-05 (0.000165)	0.000507** (0.000233)	0.000650*** (0.000156)	0.000437** (0.000211)	0.00129 (0.00244)	-0.00269 (0.00277)	0.00104 (0.00257)	-0.00266 (0.00277)	0.000138 (0.00124)	-0.00306 (0.00278)
Employment Shock (t-1)	4.03e-05 (0.000184)	0.000799*** (0.000215)	0.000354*** (0.000126)	0.000801*** (0.000215)	0.00105*** (0.000160)	0.000724*** (0.000193)	-2.82e-05 (0.00111)	-0.000413 (0.000957)	-0.000149 (0.00109)	-0.000402 (0.000957)	0.000766 (0.00330)	-0.000616 (0.00103)
Employment Shock (t)	0.000296 (0.000200)	0.000968*** (0.000243)	0.000520*** (0.000144)	0.000968*** (0.000242)	0.00138*** (0.000168)	0.000880*** (0.000218)	0.00287** (0.00124)	0.00311** (0.00150)	0.00372*** (0.00108)	0.00312** (0.00150)	0.00442*** (0.000978)	0.00302* (0.00155)
Employment Shock (t+1)	0.000396** (0.000201)	0.00105*** (0.000247)	0.000591*** (0.000145)	0.00104*** (0.000247)	0.00152*** (0.000179)	0.000949*** (0.000220)	0.00240** (0.000975)	0.000447 (0.00121)	0.00170** (0.000805)	0.000459 (0.00121)	-0.000471 (0.000975)	0.000256 (0.00118)
Employment Shock (t+2)	0.000600*** (0.000199)	0.00105*** (0.000249)	0.000555*** (0.000157)	0.00105*** (0.000248)	0.00147*** (0.000184)	0.000985*** (0.000220)	0.000531 (0.000842)	0.00131 (0.000882)	0.000156 (0.000724)	0.00131 (0.000881)	0.00323*** (0.000875)	0.000819 (0.000808)
Employment Shock (t+3)	0.00182*** (0.000248)	0.00215*** (0.000319)	0.00130*** (0.000181)	0.00110*** (0.000293)	0.00105*** (0.000176)	0.000913*** (0.000222)	0.00414*** (0.00114)	-0.00465* (0.00242)	0.00395*** (0.000953)	-0.00596** (0.00234)	0.000358 (0.000863)	0.000582 (0.000901)
Observations	18,304	18,304	18,304	18,304	35,815	35,815	18,304	18,304	18,304	18,304	35,815	35,815
R-squared	0.552	0.558	0.553	0.558	0.513	0.517	0.051	0.051	0.052	0.051	0.057	0.056
First versus all Shocks	First		All		Persistent		First		All		Persistent	
Period of Employment Decline	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years
Base Year for Employment Shock	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		County		County		County		County		County	
Level of Observation	County		County		County		County		County		County	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 8: Estimates Effect of Predicted Employment Changes on Annual DDS Level Outcomes from 1994 to 2008

Variable	DI Application Allowance Rate		New Enrollments		Mean Processing Days		Log Mean Processing Days		Median Processing Days		Log Median Processing Days	
Employment Shock	2.484*** (0.832)		-54,184 (121,047)		-156.9 (176.1)		-2.210 (1.717)		58.09 (233.1)		0.377 (2.587)	
Emp. Shock (1994-1998)	-1.104 (2.016)		205,629 (212,350)		121.8 (383.5)		1.986 (4.101)		502.2 (541.3)		7.288 (6.524)	
Emp. Shock (1999-2003)	1.843** (0.847)		-32,798 (85,107)		-143.6 (201.7)		-2.162 (1.912)		103.0 (270.5)		0.562 (2.915)	
Emp. Shock (2004-2008)	6.095*** (1.244)		-220,686 (242,164)		-298.6 (325.9)		-3.768 (3.233)		-258.3 (415.5)		-2.595 (4.577)	
Constant	0.336*** (0.0171)	0.383*** (0.0191)	9,262*** (1,813)	7,152** (3,064)	108.8*** (3.864)	107.0*** (5.031)	4.662*** (0.0384)	4.643*** (0.0500)	101.5*** (4.757)	97.48*** (6.435)	4.591*** (0.0522)	4.555*** (0.0706)
Observations	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
R-squared	0.650	0.659	0.642	0.645	0.651	0.652	0.674	0.674	0.555	0.556	0.582	0.583
Base Year for Employment Shock							Previous Year					
Fixed Effect							Year; State					
SE Cluster							DDS					
Level of Observation							DDS x Year					

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 9: Estimates of Effect of Predicted Employment Changes Interacted with Average DDS-Level Characteristics, 1994-2008, DDS-Level Models

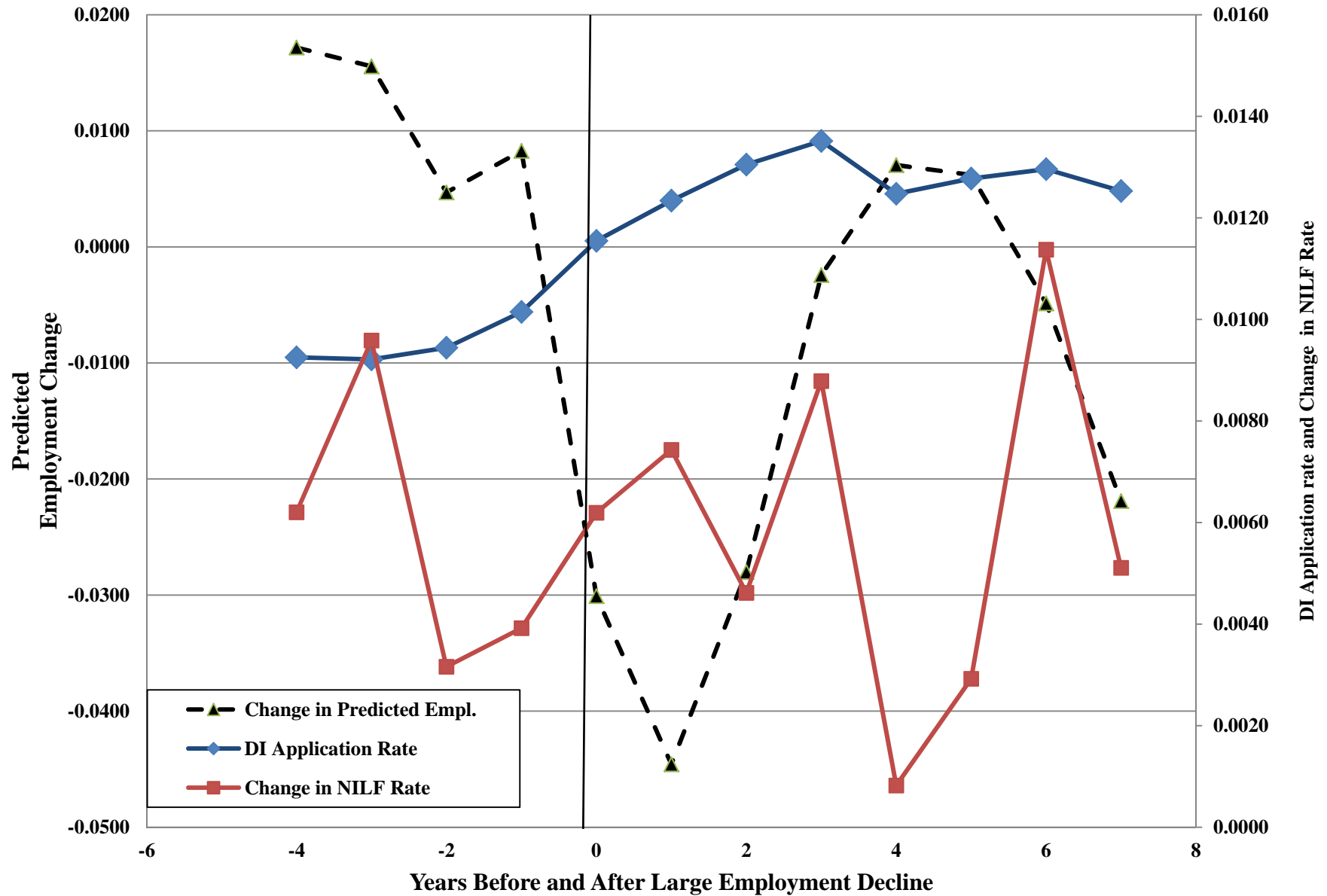
Variable	Disability Insurance Applications per Population 25 to 64			Change in Not In Labor Force per Population 25 to 64		
Employment Shock	-0.0727*** (0.0244)	-0.0739*** (0.0247)	-0.269*** (0.0559)	-0.100 (0.107)	-0.116 (0.110)	-0.224 (0.747)
Emp. Shock x Allow Rate High	0.00357 (0.00237)	0.00512** (0.00259)		0.0830 (0.0830)	0.0909 (0.0846)	
Emp. Shock x Allow Rate Low	-0.0139*** (0.00342)	-0.0120*** (0.00374)		0.0761 (0.0973)	0.0861 (0.0982)	
Allow Rate High	-0.000890*** (0.000299)	-0.000471*** (0.000159)		-0.00420*** (0.00150)	-0.00842*** (0.00194)	
Allow Rate Low	0.00529*** (0.000148)	0.00493*** (0.000302)		0.00109 (0.00108)	0.00677*** (0.00136)	
Emp. Shock x Processing Days Mean High		0.00651** (0.00306)			0.0252 (0.0571)	
Emp. Shock x Processing Days Mean Low		-0.000388 (0.00479)			0.0456 (0.0469)	
Mean Processing Days, High		-0.000846*** (0.000194)			0.00972*** (0.00216)	
Mean Processing Days, Low		-0.000355 (0.000249)			0.00555*** (0.00109)	
Emp. Shock x Allow Rate			0.171*** (0.0338)			0.459 (0.858)
Emp. Shock x Log Processing Days Mean			0.0323*** (0.0119)			-0.00134 (0.169)
Log Mean Processing Days			-2.46e-05 (0.000375)			0.00225 (0.00309)
Constant	0.00849*** (0.000573)	0.00731*** (0.000376)	0.0139*** (0.00170)	0.00851*** (0.00264)	-0.00976*** (0.00253)	-0.000385 (0.0142)
Observations	2,132	2,132	2,132	2,132	2,132	2,132
R-squared	0.827	0.827	0.828	0.193	0.193	0.191
Base Year for Employment Shock		Previous Year			Previous Year	
Fixed Effect		Year; State			Year; State	
SE Cluster		DDS			DDS	
Level of Observation		DDS x Year			DDS x Year	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Population Level of Men 40-54, Men 55-64, Women 25-39, Women, 40-54, and Women 55-64 Weighted according to local share of national population aged 25 to 64 in a given year.

DDS were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.

Figure 1: Persistent Effect of Large Local Change in Predicted Employment Occuring in 2001 on Disability Applications and Changes in Fraction Not in Labor Force Participation



Appendix Table 1: Sample Statistics State-Level Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
DI Applications per Pop 25 to 64	765	0.008	0.002	0.003	0.017
Not In Labor Force per Pop 25 to 64	765	0.001	0.007	-0.047	0.036
DI Allow Rate	765	0.353	0.062	0.205	0.529
Mean Processing Days	765	98.2	17.8	51.4	182.8
Median Processing Days	765	88.7	18.9	43.6	153.0
Employment Shock Base Year: Initial Year 1990	765	0.068	0.039	-0.019	0.203
Base Year: Initial Year 1990 (1994-1998)	255	0.038	0.031	-0.019	0.112
Base Year: Initial Year 1990 (1999-2003)	255	0.089	0.031	0.005	0.167
Base Year: Initial Year 1990 (2004-2008)	255	0.076	0.034	0.004	0.203
Employment Shock Base Year: Previous Year	765	0.008	0.016	-0.035	0.034
Base Year: Previous Year (1994-1998)	255	0.021	0.003	0.014	0.029
Base Year: Previous Year (1999-2003)	255	-0.003	0.019	-0.035	0.034
Base Year: Previous Year (2004-2008)	255	0.006	0.010	-0.017	0.028
Employment Shock Base Year: 2 Years Previous	765	0.018	0.029	-0.055	0.062
Base Year: 2 Years Previous (1994-1998)	255	0.040	0.005	0.028	0.055
Base Year: 2 Years Previous (1999-2003)	255	0.002	0.037	-0.055	0.062
Base Year: 2 Years Previous (2004-2008)	255	0.011	0.017	-0.019	0.052
Employment Shock Base Year: 3 Years Previous	765	0.026	0.038	-0.075	0.088
Base Year: 3 Years Previous (1994-1998)	255	0.053	0.014	0.012	0.075
Base Year: 3 Years Previous (1999-2003)	255	0.016	0.047	-0.075	0.088
Base Year: 3 Years Previous (2004-2008)	255	0.009	0.027	-0.054	0.067
Employment Shock Base Year: Previous 3 Year Avg	765	0.017	0.026	-0.050	0.061
Base Year: Previous 3 Year Average (1994-1998)	255	0.038	0.006	0.021	0.052
Base Year: Previous 3 Year Average (1999-2003)	255	0.005	0.033	-0.050	0.061
Base Year: Previous 3 Year Average (2004-2008)	255	0.008	0.016	-0.024	0.048
Unemployment Rate	765	5.147	1.139	2.3	8.7
Unemployment Rate (1994-1998)	255	5.343	1.237	2.4	8.7
Unemployment Rate (1999-2003)	255	4.958	1.139	2.3	8.1
Unemployment Rate (2004-2008)	255	5.140	0.999	2.5	8.3
Total Layoffs	658	0.000112	0.000082	0.000008	0.000414
Total Layoffs (1994-1998)	150	0.000106	0.000086	0.000008	0.000342
Total Layoffs (1999-2003)	253	0.000122	0.000090	0.000008	0.000354
Total Layoffs (2004-2008)	255	0.000105	0.000071	0.000013	0.000414
Job Destruction	612	0.107	0.015	0.067	0.238
Job Destruction (1994-1998)	255	0.101	0.012	0.067	0.238
Job Destruction (1999-2003)	255	0.116	0.016	0.069	0.220
Job Destruction (2004-2008)	102	0.102	0.010	0.069	0.151

Notes: Various data sources, see text for description.

Appendix Table 2: Estimates of Effect of Predicted Employment Changes Interacted with Average DDS-Level Characteristics, 1994-2008, DDS-Level Models, Alternative Base-Year for Predicted Employment Changes

Variable	Disability Insurance Applications per Population 25 to 64			Change in Not In Labor Force per Population 25 to 64		
Employment Shock	-0.0692*** (0.0126)	-0.0697*** (0.0129)	-0.146*** (0.0321)	-0.0857* (0.0480)	-0.0953* (0.0500)	0.431 (0.386)
Emp. Shock x Allow Rate High	0.00270** (0.00126)	0.00307** (0.00143)		0.0111 (0.0491)	0.0153 (0.0505)	
Emp. Shock x Allow Rate Low	-0.00957*** (0.00167)	-0.00912*** (0.00185)		0.0751* (0.0421)	0.0802* (0.0439)	
Allow Rate High	-0.000768*** (0.000278)	0.00125*** (0.000210)		-0.00333** (0.00147)	0.00536*** (0.00114)	
Allow Rate Low	0.00481*** (0.000116)	0.00420*** (0.000260)		-0.000497 (0.000794)	0.00329*** (0.00101)	
Emp. Shock x Processing Days Mean High		0.00132 (0.00195)			0.0105 (0.0307)	
Emp. Shock x Processing Days Mean Low		0.00118 (0.00269)			0.0381 (0.0245)	
Mean Processing Days, High		-0.00191*** (7.80e-05)			0.000908 (0.00148)	
Mean Processing Days, Low		-0.000614*** (0.000213)			0.00351*** (0.000894)	
Emp. Shock x Allow Rate			0.102*** (0.0217)			0.0943 (0.413)
Emp. Shock x Log Processing Days Mean			0.0100 (0.00719)			-0.123 (0.0867)
Log Mean Processing Days			-5.01e-05 (0.000368)			0.00295 (0.00285)
Constant	0.00779*** (0.000238)	0.00869*** (0.000216)	0.0128*** (0.00175)	-0.00313 (0.00194)	0.00486*** (0.00126)	-0.0173 (0.0138)
Observations	2,480	2,480	2,480	2,480	2,480	2,480
R-squared	0.815	0.815	0.815	0.176	0.177	0.172
Base Year for Employment Shock	Average of Previous 3 Years			Average of Previous 3 Years		
Fixed Effect	Year; State			Year; State		
SE Cluster	DDS			DDS		
Level of Observation	DDS x Year			DDS x Year		

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Population Level of Men 40-54, Men 55-64, Women 25-39, Women, 40-54, and Women 55-64 Weighted according to local share of national population aged 25 to 64 in a given year.

DDS were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.

The Effect of Local Employment Changes on the Incidence, Timing, and Duration of Applications to Social Security Disability Insurance

Till von Wachter*

Columbia University, NBER, CEPR, and IZA

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Abstract:

While a growing literature confirms that applications to Social Security Disability Insurance (DI) increase when conditions in the labor market worsen, less is known about how such conditions interact with characteristics of the screening process. Similarly, little is known about the effect of labor market conditions on the screening process itself. This project analyzes the effect of predicted changes in county employment rates on the application pattern and adjudication process of DI. The findings suggest that while employment declines raise DI application rates and lower labor force participation rates, the effect is smaller in the early 2000s than in the early 1990s. It also appears that the fraction of applications allowed at the level of Disability Determination Service (DDS) office allowance rates experience a substantial decline when applications rise due to a decline in employment. At the same time, the duration of screening of DI applications at the DDS-level rises somewhat. This implies that part of the applicants induced to apply by economic shocks are screened out during the initial stages of the adjudication process, and ensuing congestion appears weak. There is also some evidence that DDS offices with higher average screening duration receive fewer applications when local employment drops. Yet, potential applicants so dissuaded from applying after an employment decline do not appear to return to the labor force.

* Email: vw2112@columbia.edu. I thank Mike Mueller for excellent research assistance. This research was supported by the U.S. Social Security Administration through grant #10-M-98363-1-02 to the National Bureau of Economic Research as part of the SSA Retirement Research Consortium. The findings and conclusions expressed are solely those of the author(s) and do not represent the views of SSA, any agency of the Federal Government, or the NBER.

1. Introduction

The existing literature has shown that U.S. states experiencing declines in employment and increase in unemployment rates in the 1980s and 1990s have seen increases in application rates to Social Security Disability Insurance (DI) (e.g., Rupp and Stapleton 1995). At the same time, these states also experienced declines in the rate of labor force participation, especially among lower educated men. Both effects have increased in the mid-1980s, in parallel to reforms of the DI system that are generally believed to have made it easier to receive DI benefits (e.g., Duggan and Imberman 2006). This concurrence of events has led to the concern that DI increasingly draws workers out of the labor force (Autor and Duggan 2003). This debate has fuelled the long-standing question whether the presence of DI lowers labor force participation of individuals who might otherwise be employed (e.g., Bound and Burkhauser 1999). A related concern is that the same reforms in the DI system have encouraged applications of individuals who are potentially disabled, but whose eligibility is harder to assess, potentially putting strain on the disability screening process (e.g., Autor and Duggan 2006). An increasing rate of applications from ineligible workers due to different economic conditions would likely also burden the adjudication system.

In this paper, we use county-level data from 1994 to 2008 to confirm that declines in employment still lead to concurrent increases in application rates to DI and declines in labor force participation. However, we find that the size of the effect has declined from its high level in the late 1980s to the mid-1990s, and is now again what it was in the early

1980s. Moreover, we find that the effect on application rates is more robust to changes in specifications than the effect on labor force participation.

We also use DDS-level information to show that localities subject to declines in employment and increases in applications also experience substantial declines in the allowance rate at the DDS level. We also find modest increases in the average duration until adjudication at the DDS level. This finding suggests that employment declines indeed are likely to partly trigger applicants from ineligible individuals, and that these applications get screened out in the initial adjudication process. The rise in processing time also suggests that some of these applications may be more difficult to adjudicate, making it likely that some of the increase in rejections is later reversed at higher stages of the adjudication process. Yet, since the increase in process time we find is relatively modest, only unusually large economic downturns would lead to potentially costly “congestion” of the screening process.

In a third step, we show that if there are marginal applicants (whether ineligible or not) with outside options in terms of employment or income, they do not seem to exhibit strong strategic behavior; for example, the effect of employment declines on DI applications is only lowered somewhat if the mean processing time at the respective DDS office is above average. We also do not find any difference in the effect of employment declines on labor force participation by basic DDS characteristics. As a result, we do not find any evidence that those workers prevented from applying to DI because of high average screening times do end up returning to the labor force.

Overall, it appears that while there may be an increase in applicants that are truly ineligible or have high employment potential in periods of employment declines, we show that the effect has been smaller in the 2002 recession than in the 1991 recession. Moreover, if there are ineligible workers among these induced applicants, these are partly screened out in the adjudication process. They also do not appear to lead to excessive congestion in the screening system. Similarly, they do not respond strongly to the duration of the screening process at the local DDS office.

The increase in applications in difficult economic times is partly to be expected. First, disabled employees are typically hit strongest by adverse economic shocks. Second, since the definition of disability contains an assessment of whether an individual can do similar work as before or can be retrained with a reasonable burden, the pool of eligible workers expands in recessions. Third, potential applicants who are already unemployed, or may have been so for some time, face a lower cost from applying since they are likely to satisfy the criterion of not having engaged in substantial gainful activity (SGA) prior to application. Finally, potential applicants who are already unemployed suffer large earnings penalties after reentry into the labor market; hence, receiving DI benefits is relatively more attractive to them.

These considerations suggest that the fact that employment declines raise DI applications is not surprising nor does it necessarily a mal-functioning of the DI system. Similarly, the fact that at the same time employment declines lowers labor force participation does not

necessarily imply that this is due to the rise in DI applications. An important fraction of workers drop out of the labor force upon job loss or after unemployment independently of DI (e.g., von Wachter, Song, and Manchester 2009). Moreover, there is no evidence that spending more time out of the labor force hurts reemployment prospects (e.g., Schmieder, von Wachter, and Bender 2010). Thus, there is no strong reason to expect that once a worker is unemployed his future employment prospects are hurt by applying for DI. The fact that workers dissuaded from applying because of higher process times at the DDS level do not show higher labor force participation further suggests that it may not be the DI application that lowers labor force participation. Analyses exploiting the effect of other features of the DI system on DI application to study its effect on labor force participation are a promising avenue for future research.

The next section describes the data, sample, and methodology we use. The third section contains our main results on the effect of employment declines on DI applications and changes in the labor force participation rate. The fourth section discusses the effect of employment shocks on application rates and process times. The fifth section examines differences in the effect of economic shocks by DDS-level characteristics. The last section concludes.

2. Data and Methodology

2.1 Data, Variables, and Sample

The empirical analysis examines the effect of fluctuations in employment at the regional level on DI applications, labor force participation, and DDS-level outcomes of the

screening process. Data for this exercise was drawn from a variety of public and private sources described in the following chart.

Dataset	Information	Level of Observation
Social Security Administration Administrative Data (SSA-AD)	- Total Disability Insurance Applications - Characteristics of DDS Offices	County/DDS Office
Quarterly Census of Employment and Wages (QCEW)	- Disaggregated Employment Counts by Industrial Classification	County
Local Area Unemployment Statistics (LAUS)	- Labor Force Size - Unemployment Rate	County/State
Census Population Estimates (CPE)	- Size of Total Working Age Population (TWAP) - Age by Gender breakdown of TWAP - Local Racial Composition	County/State
Mass Layoff Statistics (MLS)	- Total Layoffs	State
Business Dynamics Survey (BDS)	- Total Job Destruction	State
Small Area Income and Poverty Estimates	Poverty Rate	County

Three analysis datasets with varying levels of geographic aggregation were created using these raw data sources. From lowest to highest form of aggregation, observations were created at the county, DDS office and state levels. Information available in each was generally consistent across datasets; however, some variables were not available at the county level, and thus would only show up in either the DDS or State level data. DDS offices serve only one state, and on average there were 3.6 offices per State.¹

¹ Different data sources were merged using FIPS codes. In some cases crosswalks were required to attach a FIPS code to the data. SSA-AD and LAUS data both required use of county name to FIPS code crosswalks. These matches required some “fuzzy matching” as well as additional processing in the spelling of county names in order to ensure appropriate matching.

Multiple variables were constructed through the use of raw data from individual sources and combinations of sources. Determining the number of people considered “Not in the Labor Force” required combined LAUS data on labor force size as well as CPE data on the size of the working age population. Employment shocks were constructed using QCEW data according to the methodology proposed by Autor and Duggan (2003) (see more discussion in the next section). A variety of other measures of economic shocks were weighted according to the local total working age population (TWAP).

Records were included in the final analysis dataset if valid information was available on both the disability application per TWAP and not in the labor force per TWAP measures. SSA application count data was suppressed in cases where total applications in the county were less than 50 in a given year. When aggregating different measures up to the DDS-level and state-level analysis dataset, only records which were included in the county-level analysis dataset were included in order to ensure that the per capita measures were consistent. Some measures, like application approval rate or total job destruction, were only available at the DDS or State-level, in which case county level data could not be aggregated.

The final datasets covered a period of 15 years ranging between 1994 and 2008. Information preceding the analysis period was available for employment data (back to 1990), which allows the analysis to include lagged economic shock variables without dropping observations. Total observations for county, DDS and state level datasets were respectively 35,819, 2,480, and 765.

2.2 Methodology

The method used in this paper is closely related to the empirical approach of Autor and Duggan (2003). Predicted changes in aggregate local employment are used to explain the growth in DI applications and changes in the proportion of the working age population exiting the labor force. The economic shock variables were constructed using the following formula,

$$\text{Predicted Change}_{it} = \sum_j [(\text{Emp}_{ijb} / \sum_j \text{Emp}_{ijb}) * (\log(\text{Emp}_{ijt}) - \log(\text{Emp}_{jtb}))]$$

where i = Locale, j = Industry, b = Base Year, t = Year, and \mathbb{I} = National total excluding locale i . In words, the predicted employment change (percent, not level) uses observed national percentage growth (excluding local counts) in employment across disaggregated industries between a base year and the year of estimation, and projects these changes onto the local industrial composition in the base year in order to create a predicted local percentage growth (or decline) in aggregate employment (not industry specific).

A variety of base years could be used in the calculation. The empirical work explores use of various base years. This includes one, two or three years preceding the predicted year, or an average of the three years preceding the prediction year. Each of these measures is explored in more detail later on in the analysis.

Following Autor and Duggan (2003), our main findings are based on two basic regressions:

$$(DI\ Apps / TWAP)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

$$\Delta (NILF / TWAP)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

where D = Predicted Percentage Employment Growth, X = Vector of Control Variables (Male population age 40 to 54, Male population age 55 to 64, Female population age 25 to 39, Female population age 40 to 54, Female population age 55 to 64), and FE = Fixed Effect on Year, State, and/or State*Year. The key coefficient of interest is the effect of predicted employment growth on the application rate or the change in the NILF rate.

A key part of the analysis is exploration of additional outcomes at the DDS-level. The basic regression framework was applied to examining the impact of predicted employment changes DDS performance measures: approval rate, mean processing days, log mean processing days, median processing days, and log median processing days. The regression model becomes

$$\Delta (DDS\ Outcome)_{it} = \alpha + \beta D_{it} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

Again, it is the effect of the employment changes on DDS level outcomes which is the variable of interest.

The analysis also included a series of interaction regressions, both examining local socio-economics characteristics as well as DDS performance measures. In this class of regressions, a baseline period preceding the analysis sample was examined to determine “high” and “low” states, counties and DDS offices. For instance, four years of unemployment data between 1990 and 1993 was pooled. Locales that had on average a greater than the 75th percentile unemployment rate were deemed “high” unemployment

rate areas, while locales that had on average a less than 25th percentile unemployment rate were deemed “low” unemployment rate areas. These dummy variables were then interacted with the employment shock created a modified version of the original regressions:

$$(DI\ Apps / TWAP)_{it} = \alpha + \beta_1 D_{it} + \beta_2 D_{it} * High_i + \beta_3 D_{it} * Low_i + \beta_4 High_i + \beta_5 Low_i \\ + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

$$\Delta (NILF / TWAP)_{it} = \alpha + \beta_1 D_{it} + \beta_2 D_{it} * High_i + \beta_3 D_{it} * Low_i + \beta_4 High_i + \beta_5 Low_i \\ + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

The interpretation of these coefficients will be further discussed below.

Finally, the analysis assesses the persistence of the effect of labor market shocks on DI applications and changes in the labor force participation rate. To do so, among others we examined a series of distributed lag models. Binary “shocks” to employment were generated using the following logic: a shock-dummy would equal one if the predicted employment change was below -2.5% to -4% depending on the base year being utilized and 0 otherwise. This resulted in just above 5% of the sample experiencing a shock during the analysis period. Not surprisingly, most of these shocks were concentrated between 2001 and 2003. The model estimated in this exercise is as follows:

$$(DI\ Apps / TWAP)_{it} = \alpha + \sum_{k=-4}^7 \beta_k Shock_{i, (t-k)} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

$$\Delta (NILF / TWAP)_{it} = \alpha + \sum_{k=-4}^7 \beta_k Shock_{i, (t-k)} + \gamma \Delta X_{it} + \delta FE_{it} + \varepsilon_{it}$$

The shock-indicator variables turn on in the years before and after a shock has occurred. Since the model contains both region and year fixed effects, the coefficients on the

shock-indicator variables can be interpreted as the change in, say, DI applications relative to a base year, relative to the regular evolution of the outcome over time as captured by year effects.² The year effects are identified by the presence of regions that do not experience a shock. The coefficients of the shock-indicators aim at capturing the evolution of, say, DI applications that are just due to the presence of the shock, not due to trends that would have occurred otherwise.

3. Effects of Employment Shocks on DI Applications and Labor Force Participation

3.1 Effects from 1994 to 2008 on Application Rates

Tables 2 to 4 show various estimates of the effect of a change in predicted employment (our measure of an economic shock) on the application rate to DI and on changes in the fraction of workers not in the labor force (NILF). Overall, these estimates confirm that adverse economic shocks lead to precisely estimated and sizeable increases in the application rate to DI. This finding is robust to many specification changes we tried. It is smaller than previous estimates in the literature (e.g., Autor and Duggan 2003), suggesting that the effect of economic shocks on DI application has declined somewhat in the late 1990s and early 2000s. We also find an effect of economic shocks on increases in NILF. Although these estimates are non-negligible, they are less robust to specification changes and over time.

Table 2 shows estimates of the effect of our measure of economic shocks on the DI application rate and changes in the NILF rate. Our preferred estimates use variation at the

² This base year corresponds to shock-indicator variables that were left out of the regression to avoid multicollinearity (even though not necessary typically one leaves out several indicators starting with the earliest pre-shock years).

county level and include state and year fixed effects.³ The main effect of changes in predicted employment on the DI application rate in the first column is -0.104; the overall range of estimates in Table 2 and 3 is approximately from -0.03 to -0.1. To interpret the magnitude, consider that in our sample period a change of two standard deviations (SD) of the employment shock is 0.034 (see Table 1). This implies that at a coefficient estimate of -0.104 a two SD decline in predicted employment leads to an increase of about one SD in the DI application rate (0.003), or about 40 percent of the mean application rate (0.008). These rough magnitudes are indicative even for the smaller point estimates, since the standard deviation of the shock measure varies across specifications (as further discussed below).

Autor and Duggan (2003) estimate similar specifications based on data ranging from 1978 to 1998. Their estimates range from -0.11 to -0.47, depending on the time period they consider (Table V). The magnitudes are difficult to compare, since the overall size of the effect will depend on the typical magnitude of employment shocks and changes in DI applications over the period they consider. But if we take the baselines statistics shown in Table 1 to be similar, our range of estimates is lower than that of Autor and Duggan. Most likely, given the large changes in employment during the 1982 and 1991 recession and the large fluctuations in the application rate during the early 1980s and early 1990s, it is likely that the standard deviations are larger during that period. This would imply larger implied effects of a ‘typical’ shock, but not necessarily a larger overall contribution to the variation in application rates.

³ We have replicated our main specifications without state effects, and with state-year effects in Table 2b. The results are robust to alternative specifications. They are somewhat larger when state effects are excluded.

The differences in the range of point estimates imply that a similar reduction in employment has less of an effect on the application rate in the 1994-2008 period than in the period from 1978-1998. The difference is especially large when we consider Autor and Duggan's estimate for the period of 1984-1998, which once year and state effects are included is -0.37. To gain further insight into this difference we break up our sample into three year-groups. For our baseline estimates (using the previous year's share as weight of our employment measure) we find that the period from 1994-1998 has the largest effect (a point estimate of -0.165 with year and state effects, -0.237 when we include state-specific flexible trends). For later years, the effect is smaller, and more on the order of -0.8. As for the main effect in the first row, these numbers are the upper bound of the overall range of estimates in Table 2 and 3, which go from 0.037 to -0.327 for 1994-1998, and from -0.033 to -0.087 for the period of 1999-2008. From these findings it appears that there are relatively large effects in the mid-1990s. Estimates for this period may have been partly influenced by the rapid increase in DI application and enrollment in the early to mid-1990s. The sources of this surge are not well understood, but may relate to the SSI outreach conducted by SSA during that period, since the medical criteria for DI and SSI are the same.

Note that again differences in the standard deviations appear to partly offset the difference in point estimates; thus, even if the coefficient estimate for 1994-1998 is larger, the lower incidence of economic shocks than, say, in 1999-2003 shown in Table 1 implies that economically induced shocks have a smaller overall effect on disability

applications. For example, for a decline in predicted employment of two standard deviations, the predicted increase in the DI application rate is 0.0014 in 1994-1998, whereas it is 0.034 in 1999-2003 and 0.028 in 2004-2008. Since the variability of employment changes across regions typically increases in recessions, these patterns partly reflect the fact that the U.S. economy went into a recession in 2002, and that the labor market did experience a slow recovery afterwards. Nevertheless, the substantially lower point estimates imply that we had severely over-estimated the impact of the employment declines in the 2002 recession on DI applications based on point estimates from the mid-1990s or the late-1980s. Instead, the effect of economic shocks in the 2002 recession seems to have been more similar to what Autor and Duggan estimate for the period from 1978 to 1984.

Overall, our findings appear to imply smaller effects of employment declines on the DI application rate than Autor and Duggan's (2003) results, possibly because they focused on the late-1980s and early- and mid-1990s, a period of particularly rapid growth in DI applications. Instead, the effect in the early 2000s appears more similar to what it was before the DI retrenchment in the early 1980s. It should be kept in mind, however, that our findings still imply sizeable increases in DI application rates as a function of adverse employment shocks.

The estimates in Tables 2 and 3 are based on year-to-year changes in employment. Autor and Duggan (2003) obtain their estimates using differences over longer periods of time. To make sure our estimates do not differ from Autor and Duggan's because of the

different horizon over which economic shocks occur, we replicated their specification in Table V which uses three-year changes in our employment measure. The results are shown in Table 4, and use the share in the base period as the weight in the employment variable. These estimates are thus directly comparable to those in Autor and Duggan for the earlier time period. These estimates lie on the lower range of estimates we obtain with our annual specifications in Table 2. In fact, the point estimates drop to about half of the values in the baseline estimates in Table 1. For the period 1994-1998 the drop is even larger. Thus, it is unlikely that it is our methodology that is producing smaller results.

3.2 Effects from 1994 to 2008 on Changes in Labor Force Participation

As shown in Tables 2 to 4, we also find significant effects of economic shocks on labor force participation. The effects are not significant and can get very small when we use state-level data, but imply non-negligible effects and are precisely estimated at the county-level. For our baseline specification in Table 2 the point estimate is about -0.3; overall, focusing on the county-level regressions, estimates range from 0 to -0.3. Yet, contrary to our findings for application rates, the effect on changes in the NILF rate is less robust to alternative specifications of the base year of the shock variable. It may be that this arises from endogeneity of the employment shock measure to local trends in economic conditions also affecting the NILF rate. In this case, as further discussed in the next section, the shares in the previous years are likely endogenous, and a better share in the employment measure is based on years further in the past. Table 3 shows that once that is done, the point estimates of the effect of employment shocks on changes in the NILF rate get significantly smaller.

Our estimates of the effect of employment shocks on changes in labor force participation are substantially smaller than those reported in Autor and Duggan (2003), which range from -0.5 to -1. Our range of estimates is from 0 to -0.3, and our preferred estimates using lagged or averaged shares lie around -0.1. Thus, a decline in employment of similar size would lead to substantially smaller implied declines in the labor force participation rate in our sample.

Again, it is difficult to compare the overall contribution of the variance of employment shocks to differences in changes in labor force participation across regions, since we do not have the appropriate sample statistics for Autor and Duggan's sample. In our time period ranging from 1994 to 2008, an effect of a decline in the employment shock by two standard deviations (-0.034) implies an increase in the *change* in the NILF rate by 0.01 (0.034×0.3). The average change in the NILF rate over 1994-2008 was 0.002, and its standard deviation across counties was 0.018. Thus, differences in employment changes play a non-negligible role in explaining the variability in changes in the NILF rate across counties. The effect for our preferred measure using past shares, is similar, since again smaller point estimates are offset by larger variability in the measure of employment shocks.

Considering changes over time in the effect of employment shocks on changes in the NILF rate, we see a substantial decline in the effect in 1999-2003 relative to the period before or after. This suggests two interpretations. On the one hand, this finding would imply that employment shocks occurring in recessions lead to smaller declines in labor

force participation. On the other hand, this is a period with a high variation in employment shocks across counties; thus, the overall contribution of employment shocks in explaining the variation of changes in the NILF rate *increases* during the recession. The fact that the point estimate declines may also be due to an underlying non-linearity in the effect of employment shocks on the NILF rate (and, as we saw above, on the application rate). In that case, a period with larger standard deviation in employment changes will average over a different range of effects, potentially leading to a smaller overall estimate.

3.3 Alternative Measures of Employment Shocks

To further probe the robustness of our findings, we re-estimated our main models using alternative measures of distress in local labor markets. The results are shown in Table 5, and the mean and standard deviations of our different measures are summarized in Appendix Table 1. Overall, we obtain different findings for different measures. Yet the main impression of our findings is that the effects of local economic shocks on changes in labor force participation are less robust than the effect on DI application; as seen before, the strongest and most precise effects of economic shocks on changes in labor force participation occur in the mid-1990s. As with our main measure, the positive effects of economic shocks on DI applications occur throughout the time period we study.

A commonly used measure to assess the impact of local labor market conditions on DI applications is the unemployment rate. To avoid problems related to measurement error, we follow the existing literature and use unemployment rates at the state level. Since the

model we estimate contains state fixed effects, the resulting coefficient estimates capture the effect of the change in unemployment rates on the change in the DI application rate. Columns 1 and 2 show that the effects are statistically significant and positive, confirming that year-to-year increases in unemployment rates raise DI applications. As found in the previous literature, the correlation between changes in unemployment rates and increases in DI applications is reasonably stable over time. In terms of overall magnitudes, the effect is smaller – for an increase in unemployment rates of four points (roughly a gap from peak to trough in regular recessions) the predicted effect is an increase of 0.001 to 0.002 in application rates – about a third to half of the effect implied by changes in predicted employment differences. Interesting, we find a sizeable and precisely estimated positive correlation between increases in unemployment rates and increases in the fraction NILF only for the mid-1990s.

For the other two measures we tried, the evidence is more inconclusive; the fraction of total layoffs per working age population neither has an effect on DI applications or fraction NILF. Total job destruction per working age population raises DI applications only in the mid-1990s, not later; it raises fraction NILF throughout the period we study, but the effect is particularly large in the mid-1990s, too. Overall, still, the findings in Table 5 confirm that if there was an effect of economic shocks on increases in fraction NILF because of a rise in DI applications, these were likely to have been strongest in the mid-1990s, a period of particularly strong growth in both DI and SSI programs.

3.4 Effects of Employment Shocks by Pre-Existing Labor Market Conditions

To better predict the effect of employment shocks on changes in DI application rates and in labor force participation rates, we also explored whether the effect differs by pre-existing conditions in local labor markets. If those workers applying to DI after employment shocks are motivated by economic considerations, their chances to find new employment will be affected by the, say, the overall level of unemployment in the region. The results from this exercise are summarized in Table 6. The Table displays the effect of our main measure of the employment shock, as well as interactions for whether the mean level of alternative variables characterizing local labor markets was high (above 75th percentile) or low (below the 25th percentile). The main effect thus measures the effect for observations with pre-existing averages between the 25th and 75th percentiles, while the interactions show the differences in the effect for high or low values. To avoid issues related to measurement error, this table again uses observations at the state level.

Overall, Table 6 suggests that the effect of employment shocks on DI applications does not vary appreciably with our measures of pre-existing conditions in local labor markets. Instead, the effect is smaller in states who have a low fraction of the population in working age (i.e., the total effect of employment effect is the sum of the main effect plus the interaction; thus, if the coefficient on the interaction is positive, the total effect is less negative and thus smaller in magnitude). Presumably, this is due to the fact that fewer workers are covered by DI in these states. Oddly, the effect is also smaller in states that have a particularly high fraction of their population in working age. No immediately plausible explanation is apparent, other than general equilibrium effects, by which states with a higher fraction of their population at working age are areas with an economic

environment that is more active. The effect of employment shocks on changes in fraction NILF is also smaller in areas with a higher fraction in working age.

The main effect of employment shocks on changes in fraction NIFL is not statistically significant, as we had seen in our state-level models in Table 2. Yet, the effect of employment shocks on changes in the fraction NILF is significantly larger (more negative) in areas with high pre-existing unemployment rates. This is plausible, since it means that if pre-existing labor market conditions are weak, employment shocks lead to higher rates of drop out from the labor force. Note, however, that there is no correspondingly larger effect of employment shocks on DI applications (in fact, the interaction effect is very small but positive). Thus, it is not true that shocks occurring in already depressed labor markets lead to larger increases in DI applications, and thereby to stronger declines in labor force participation rates. The greater increase in labor force drop out in these areas must be driven by reasons other than the availability of the DI program.

3.5 Persistence in Effects of Employment Shocks on DI Applications

The majority of findings regarding the effect of labor market conditions on disability applications in this paper and the existing literature are based on contemporaneous effects of employment shocks. However, it is likely that labor market conditions have persistent effects on DI applications and labor force participation – partly this is because these conditions themselves are persistent over time. Partly it is because workers may take time to respond, either because other support programs such as unemployment insurance run

out, or because the economic losses to the individual reveal themselves to be very persistent.

Knowing about such persistent effect is not only important from the point of view of understanding individual decision processes and mechanisms operating in the labor market. It is also important if ones concern lies with predicting the time path of DI applications following the onset of negative economic conditions. Different economic shocks may induce different increases in DI applicants at different arrival rates, requiring different amounts of resources within the screening process.

There are two potential ways to assess the degree of persistence in the effect of economic shocks. One is to estimate dynamic models that include lagged dependent variables. The alternative is to trace the effect of particularly severe negative ‘events’ before and after their onset. The analysis here is meant to be illustrative of the potential of persistent effects of economic shocks on DI application, and on the alternative methods available to study this persistence. A full analysis of the actual degree of persistence is left to future work with data that allow more concise definitions of economic ‘shocks’, leading to more precise and well-identified estimates of dynamic pattern.

Table 7a shows estimates of our baseline regression model at the state-level where we have included lagged independent variables as additional regressors. Given the presence of state fixed effects, this estimates the effect of lagged deviations of our measures of employment shocks – the predicted change in employment and the unemployment rate –

from the state-level mean. The results for predicted employment changes are mixed; for DI applications as outcome, most of the effect seems to come from the lagged change; for changes in fraction NILF, most of the effect seems to come from the concurrent change. For unemployment rates the opposite pattern results; the current deviation in unemployment rates from state means is what matters for the DI application rate, whereas lagged unemployment rate deviations appear to matter for changes in fraction NILF. One reason might be that the two measures pick up different phenomena in the labor market. They are also of different nature, with the change in non-employment rate representing a flow, while the unemployment rate per se is measures of a stock. While the presence of state effects will help to alleviate this, if this approach is followed, one has to be careful in specifying models and matching the types of dependent and independent variables. Another, more fundamental issue is that with potentially high persistence in labor market conditions, at least in the short run there might not be enough variation in the data to successfully identify of different adjacent lagged independent variables. This may result in unstable parameter estimates and in difficult in identifying the appropriate lag structure.

The second approach is allows a more straightforward assessment of the underlying dynamics. The idea is to specify the timing of an ‘event’ – a large and sudden decline in local employment – and consider the dynamic path of, say, DI applications before and after the year of the event. Of course, a potential difficulty in this approach is that there is some degree of arbitrariness in the definition of an ‘event’, leaving to the researcher the choice of a sensible definition of what constitutes a ‘shock’. Here, we considered several

definitions of such negative events in the labor market. As explained in the methods section (Section 2) each defines as an event a large decline in predicted employment over a limited range of time (either over one or over two years). Since we only consider large shocks, almost all of the events we identify occur during the 2002 recession (i.e., during the years 2001 to 2003).

As an example, the resulting dynamic patterns around shocks occurring during one year from 2000 to 2001 are shown in Figure 1. The figure displays the mean DI application rate, the mean change in the fraction NILF, and the average change in predicted employment in the four years before and after 2001. The dashed line shows that our shock is correctly defined – i.e., that there is indeed a large decline in predicted employment in that year.⁴ The second line shows the evolution of DI application rates before and after the shock. The application rate appears stable four and three years before, and then starts to quickly rise in the years leading up the event. In the years following the shock the DI application rate stays permanently above its pre-shock level. This illustrates the potential for a high degree of persistence in the response of DI application rates to local economic shocks. Given the continued variability of employment changes after the first negative shock shown in the figure, it also illustrates the need to understand the effect of the continued evolution of employment conditions after the onset of a ‘shock’. Finally, the figure displays the evolution of changes in the fraction NILF. There is no clear pattern in the rate of change, despite perhaps an increase

⁴ However, it also shows that one might want to consider putting further restrictions on the development of employment afterwards, as is typically done in the literature on layoffs at the firm level; in the particular case shown, one sees a large rebound with an ensuing decline in employment four years later, raising the question whether one is not also measuring the effect on an increase in economic instability.

in variability. Overall, there does not appear to be an increase in the mean rate of change in the fraction NILF after the shock, implying no persistent rise in the fraction of workers out of the labor force. This is consistent with our observations made above that the stronger effects of labor market shocks on participation rates occurred in the mid-1990s.

This illustrative analysis is taken further in Table 7b, which shows the distributed lag regressions explained in the method section. The displayed coefficients represent changes in the outcome variables before and after the year of the shock relative to an initial baseline period, relative to the evolution of the outcome variable over time as defined by the annual trend of a control group of counties not experiencing employment shocks. The table shows results for shocks defined over one and over two years; it also shows results where the shocks used for estimation are restricted to the first shock that occurs in a county, as opposed to any shock (such that counties can experience multiple shocks). The table also shows results for persistent shocks – i.e., shocks leading to a persistent decline in employment. This is done to try and focus on cases where the county-level reduction in employment is permanent. The regression results largely confirm our observations made for the patterns in Figure 1. DI application rates appear stable in three to four years before the shock, rise in the years leading up to the shock, and then stay permanently elevated. In terms of results differing by the definition of a shock, the persistent rise is generally larger for shocks occurring over two years, with the exception when we consider persistent shocks. This suggests that large employment declines occurring over two years already select areas in which the decline is persistent. Again consistent with results in Figure 1, it does not appear that there is a corresponding persistent increase in the change

of the labor force participation rate for any of our events. While there is a response in the year of the shock, no systematic long-term effects are apparent from the figure.

We conclude from this preliminary analysis that employ there are further study

4. Effects of Employment Shocks on Outcomes at the DDS Level

The results in Section 3 have confirmed previous research that employment shocks increase the DI application rate and lower labor force participation, although the effects are smaller than for the late 1980s and early 1990s. This increase in applications has several potentially important implications. On the one hand, it can put a burden on the disability determination system, in particular if the applications triggered by economic conditions are those that are more difficult to adjudicate. On the other hand, it can imply that the presence and features of the DI system itself help trigger applications, and thereby reduce labor force participation. To contribute to answer the first question, we have obtained average characteristics at the level of the local DDS offices spanning our sample period. The information conveyed by this additional data will also yield helpful insights into the second question.

To analyze the effect of employment shocks on the disability determination process, we have replicated our main regression with two additional outcomes at the DDS level – the allowance rate and the mean number of total days an application is processed. Note that these outcomes refer to adjudication at the DDS level. The ultimate allowance rate and the ultimate number of days an application will be processed are higher because of some

applications are decided during higher stages in the DI adjudication process. Table 8 displays the outcome from these regressions. The first column shows that the effect of our measure of predicted employment changes are positive – suggesting that declines in employment lower the probability that an application is judged favorably. The effect is sizeable – a decline in employment by two SD leads to a decline in the allowance rate by roughly 8.5%. From a mean allowance rate of 35.6%, that is a decline of over 20 percent. This finding suggests that a high fraction of applications triggered by economic shocks are deemed ineligible at the DDS level. Of course, part of these denials will be reversed at higher levels of the adjudication process. It is therefore hard to say whether these applications were from individuals who were truly disabled according to the definition of the DI system or not. However, to the least these results indicate that an important fraction of the applications induced by employment declines are harder to adjudicate and thus will lead to higher rate of initial denials.

The effect of employment shocks on our measure of ‘congestion’ in the screening process at the DDS level is less precise and of a smaller order of magnitude. The effect of a two SD employment decline on the mean duration until adjudication at the DDS level is approximately an increase of five days, though the point estimate is far from being statistically significant. At a mean of 100 days (see Table 1), this would be a rather small effect. To assess whether this effect is driven by potential outliers across DDS level offices or over time, we re-estimated our model taking the natural logarithm of mean processing days. At a two SD deviation change, this would imply a 7% increase in mean duration – about a similar magnitude as the model in levels. Moreover, the estimate is not

significant. The effects are even smaller, not significant, and of the wrong sign, when to probe for DDS level outliers we use the median processing days at the DDS office at our measure. Thus, we conclude that there is no strong or precise relationship between typical economic shocks and the duration until adjudication at the DDS level. There might be a more sizeable effect for less frequent large employment shocks, but we cannot pick it up with the data used here.

5. Variation of Effects of Employment Shocks at the DDS Level

The DI application and adjudication process is complex and affected by a variety of factors. The requirements that workers have to meet to be eligible, and the time until they receive benefits mean that it can be costly for workers to apply for DI. In particular, taken together with the waiting period before application the mean time to adjudication shown in Table 1 implies that the typical worker will be out of work and without benefits for at least three quarters of a year before entering the DI program. Thus, for workers who deem it unlikely that their application will be accepted or who are uncertain about their prospect of receiving DI, applying for DI would seem a costly proposal. Similarly, if workers are constraint in their savings or alternative sources of income, a longer period until benefit receipt should discourage them from applying. Per se, this should hold independently of their true health limitation, but such consideration of an economic nature will be more likely to occur among workers who have the option to work in the labor market or receive other sources of income. Workers that have no ability to work or have no other income sources are likely to be less affected.

To assess the potential effect of such economic considerations on the incidence of application to DI, we have re-estimated our main models of Section 3 and included interactions between mean DDS level characteristics described in Section 4 and our employment shock variable as explanatory factors. The idea is to exploit differences in the average allowance rate and in the average duration of adjudication among DDS levels. These differences are likely to be partly driven by permanent differences in the characteristics of applicants across regions (by taking the mean of these characteristics at the DDS-level over time, we abstract from year-to-year fluctuations due to changes in applicant types). Yet, they are likely to also be driven by differences in the underlying typical allowance rate or processing duration across DDS level offices.

The idea of this exercise is to see whether workers laid-off during difficult economic times are more likely to apply to DI (and are more likely to exit the labor force) when the conditions for doing at the relevant local DDS office is favorable. By favorable, we intend typically high allowance rates or typically fast time to adjudication. Table 9 shows these interacted regressions. There are two main findings. First, the interaction term between a dummy if the mean DDS allowance is above (below) the average allowance rate and our employment shock has a precisely estimated positive (negative) coefficient. This is the *opposite* sign of what we would have expected to see if DDS offices with a high average allowance rate draw more applications in tough economic times. It also does not indicate that areas with high average allowance rates are populated by more disabled workers, who are also more vulnerable to economic shocks. Instead, it seems that if a DDS level office already has a high allowance rate it indicates that most of the likely

eligible applicants in a region have already applied. Thus, for these DDS regions the effect of an economic shock is lower, since in some sense the group ‘at risk’ of entering DI is smaller.

The second finding is that the interaction of our employment shock with a dummy for whether the mean DDS-level processing days is above average is also positive. This implies that in areas where waiting times until adjudication at the DDS-level are high, an economic shock has less of an impact on applications. In this case, the sign is as expected if one believes workers take into account the average length of time until adjudication in their decision whether to apply. However, this could also be due to a similar phenomenon as in the case of the allowance rate; that is, in areas in which most eligible workers are already applying, the average processing time is low, and fewer workers decide to apply in times of economic shocks. Note that this presumes that the time until adjudication of the marginal applicant in areas with a large fraction of eligible workers is low; the opposite might be the case.

The evidence in favor of strategic behavior in the application decision is mixed. When we turn to the effect on the change in the NILF rate in the remaining column of the table, the evidence is more clear-cut – there is little significant difference in the effect of employment shocks in DDS areas with high or low allowance rates or high or low mean processing days. This results also in specifications where we have interacted our employment shock linearly with the mean allowance rate or average of mean processing days. The problem is partly one of precision. However, the point estimates themselves

also do not reveal any systematic pattern. Thus, while DDS-level characteristics may influence application rates, they do not seem to influence the effect of employment shocks on labor force participation.

6. Conclusion

A growing literature confirms that applications to Social Security Disability Insurance (DI) increase as conditions in the labor market worsen (e.g., Bound and Burkhauser 1999). Yet, less is known how employment conditions interact with characteristics of the screening process. Are workers dissuaded from applying to DI if aspects of the screening process – such as the waiting time or the mean allowance rate at the local DDS office – appear unfavorable? If this is the case, do these workers return to the labor force? These are important questions that speak to the determinants of DI applications and to the effect of DI application on labor force participation.

Similarly, little is known about the effect of labor market conditions on the screening process itself. Yet, this is of substantial concern to the Social Security Administration, which has to try to ensure efficient screening for eligibility to DI even when applications suddenly rise in economic downturns. This project has analyzed the effect of predicted changes in county employment on the application pattern and adjudication process of DI using a variety of county, state, and DDS-level data sources heretofore not use for research on the economic effects of DI.

Our findings suggest that while employment declines raise DI applications and lower labor force participation as the previous literature has found, the effect is smaller in the

early 2000s than in the early 1990s. Thus, we revise downwards somewhat the large effects of economic conditions on DI applications and labor force participation found in the early 1990s. It also appears that DDS-level allowance rates decline when applications rise because of an employment decline. At the same time, the average duration of screening at the DDS-level rises somewhat. Thus, part of the applicants induced to apply by economic shocks are screened out during the initial stages of the adjudication process, suggesting that some of them may have been induced to apply because of adverse economic conditions. On the upside, we find that ensuing congestion in the screening process – as measured by an increase in the average days to adjudication – appears weak.

We also exploited average differences between DDS offices to further assess underlying determinants of DI applications. There is some evidence that DDS offices with higher average screening duration receive fewer applications when local employment drops. Yet, potential applicants so dissuaded from applying after an employment decline do not appear to return to the labor force. Thus, it does not appear that workers who would otherwise be working strategically choose to apply to DI based on their chances of success. Instead, it appears that if cost-benefit considerations on the side of potential applicants do play a role, this is for applicants who are already out of the labor force.

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Table 1: Sample Statistics of County-Level and DDS-Level Sample

Variable	County-Level Sample			DDS-Level Sample		
	Obs.	Mean	Std. Dev.	Obs.	Mean	Std. Dev.
DI Applications per Pop 25 to 64	35819	0.008	0.003	2661	0.008	0.002
Not In Labor Force per Pop 25 to 64	35819	0.002	0.018	2480	0.002	0.010
DI Allow Rate	--	--	--	2661	0.356	0.065
Mean Processing Days	--	--	--	2661	98.8	18.4
Median Processing Days	--	--	--	2661	89.3	20.2
Employment Shock Base Year: Initial Year 1990	35819	0.062	0.056	2661	0.071	0.038
Base Year: Initial Year 1990 (1994-1998)	11534	0.034	0.034	874	0.040	0.030
Base Year: Initial Year 1990 (1999-2003)	11987	0.083	0.049	893	0.093	0.028
Base Year: Initial Year 1990 (2004-2008)	12298	0.068	0.068	894	0.080	0.035
Employment Shock Base Year: Previous Year	35819	0.008	0.017	2661	0.006	0.016
Base Year: Previous Year (1994-1998)	11534	0.021	0.004	874	0.017	0.009
Base Year: Previous Year (1999-2003)	11987	-0.003	0.020	893	-0.003	0.019
Base Year: Previous Year (2004-2008)	12298	0.005	0.011	894	0.005	0.011
Employment Shock Base Year: 2 Years Previous	35819	0.017	0.030	2661	0.012	0.028
Base Year: 2 Years Previous (1994-1998)	11534	0.040	0.008	874	0.025	0.021
Base Year: 2 Years Previous (1999-2003)	11987	0.000	0.039	893	0.001	0.037
Base Year: 2 Years Previous (2004-2008)	12298	0.009	0.019	894	0.010	0.017
Employment Shock Base Year: 3 Years Previous	35819	0.025	0.040	2661	0.016	0.037
Base Year: 3 Years Previous (1994-1998)	11534	0.053	0.016	874	0.025	0.031
Base Year: 3 Years Previous (1999-2003)	11987	0.014	0.050	893	0.015	0.048
Base Year: 3 Years Previous (2004-2008)	12298	0.007	0.030	894	0.008	0.028
Employment Shock Base Year: Previous 3 Year Average	35819	0.016	0.028	2661	0.010	0.026
Base Year: Previous 3 Year Average (1994-1998)	11534	0.038	0.008	874	0.017	0.021
Base Year: Previous 3 Year Average (1999-2003)	11987	0.004	0.035	893	0.004	0.034
Base Year: Previous 3 Year Average (2004-2008)	12298	0.007	0.018	894	0.008	0.016

Notes: Various data sources, see text for description.

Table 2a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	-0.104*** (0.0103)		-0.0935*** (0.0228)		-0.0467** (0.0201)		-0.309*** (0.0318)		-0.188** (0.0923)		-0.201 (0.221)	
Emp Shock (1994-1998)		-0.165*** (0.0183)		-0.0811* (0.0483)		0.115*** (0.0424)		-0.490*** (0.0803)		-0.578** (0.241)		-0.249 (0.829)
Emp Shock (1999-2003)		-0.0846*** (0.00920)		-0.0768*** (0.0205)		-0.0418** (0.0178)		-0.174*** (0.0426)		-0.0716 (0.103)		-0.121 (0.247)
Emp Shock (2004-2008)		-0.122*** (0.0162)		-0.161*** (0.0376)		-0.0760 (0.0477)		-0.578*** (0.0524)		-0.501*** (0.171)		-0.670** (0.325)
Constant	0.0134*** (0.000467)	0.0149*** (0.000561)	0.0144*** (0.000412)	0.0141*** (0.000849)	0.00733*** (0.000942)	0.00342*** (0.00114)	0.00774*** (0.00211)	0.0124*** (0.00256)	0.0114*** (0.00209)	0.0174*** (0.00418)	0.00780 (0.00534)	0.00874 (0.0196)
Observations	35,819	35,819	2,480	2,480	765	765	35,819	35,819	2,480	2,480	765	765
R-squared	0.527	0.529	0.807	0.809	0.934	0.937	0.059	0.062	0.165	0.169	0.208	0.212
Base Year for Employmen			Previous Year						Previous Year			
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 2b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64						
Employment Shock	-0.158***	-0.104***	-0.108***				-0.352***	-0.309***	-0.316***				
	(0.0120)	(0.0103)	(0.0107)				(0.0313)	(0.0318)	(0.0309)				
Emp Shock (1994-1998)				-0.263***	-0.165***	-0.237***				-0.555***	-0.490***	-0.493***	
				(0.0207)	(0.0183)	(0.0159)				(0.0788)	(0.0803)	(0.0658)	
Emp Shock (1999-2003)				-0.131***	-0.0846***	-0.0877***				-0.210***	-0.174***	-0.155***	
				(0.0114)	(0.00920)	(0.0103)				(0.0413)	(0.0426)	(0.0480)	
Emp Shock (2004-2008)				-0.165***	-0.122***	-0.0774***				-0.598***	-0.578***	-0.597***	
				(0.0181)	(0.0162)	(0.0168)				(0.0593)	(0.0524)	(0.0471)	
Constant	0.0147***	0.0134***	0.0106***	0.0171***	0.0149***	0.0135***	0.00952***	0.00774***	0.0179	0.0140***	0.0124***	0.0239	
	(0.000316)	(0.000467)	(0.00101)	(0.000462)	(0.000561)	(0.000986)	(0.00120)	(0.00211)	(0.0337)	(0.00200)	(0.00256)	(0.0336)	
Observations	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	
R-squared	0.296	0.527	0.571	0.300	0.529	0.576	0.052	0.059	0.192	0.054	0.062	0.195	
Base Year for Employment				Previous Year						Previous Year			
Fixed Effect	Year	Year; State	Year * State	Year	Year; State	Year * State	Year	Year; State	Year * State	Year	Year; State	Year * State	
SE Cluster				County						County			
Level of Observation				County x Year						County x Year			

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64 Weighted according to local share of national population aged 25 to 64 in a given year.

Table 3a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models, Alternative Base Year for Employment Shock

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
	County		DDS		State		County		DDS		State	
Employment Shock	-0.0666*** (0.00582)	-0.0666*** (0.0129)	-0.0505*** (0.0142)	-0.135*** (0.0171)	-0.0757 (0.0480)	-0.0565 (0.151)						
Emp Shock (1994-1998)	-0.0964*** (0.0112)	-0.0463* (0.0269)	0.0369 (0.0320)	-0.222*** (0.0389)	-0.352** (0.140)	0.370 (0.449)						
Emp Shock (1999-2003)	-0.0563*** (0.00518)	-0.0585*** (0.0115)	-0.0425*** (0.0132)	-0.0654*** (0.0241)	-0.0192 (0.0564)	-0.0129 (0.157)						
Emp Shock (2004-2008)	-0.0788*** (0.00859)	-0.0974*** (0.0207)	-0.0690** (0.0274)	-0.267*** (0.0247)	-0.209*** (0.0771)	-0.173 (0.176)						
Constant	0.0129*** (0.000413)	0.0138*** (0.000471)	0.0128*** (0.000281)	0.0128*** (0.000291)	0.00783*** (0.000924)	0.00510*** (0.00113)	0.00403** (0.00203)	0.00692*** (0.00205)	0.00844*** (0.00144)	0.00809*** (0.00146)	0.00459 (0.00464)	-0.00875 (0.0138)
Observations	35,819	35,819	2,480	2,480	765	765	35,819	35,819	2,480	2,480	765	765
R-squared	0.534	0.536	0.812	0.814	0.936	0.939	0.057	0.060	0.164	0.168	0.206	0.214
Base Year for Employment	Moving Average of Previous Three Years						Moving Average of Previous Three Years					
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 3b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends, Alternative Base Year for Employment Shock

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64							
Employment Shock	-0.0953***	-0.0666***	-0.0659***				-0.164***	-0.135***	-0.136***					
	(0.00682)	(0.00582)	(0.00618)				(0.0162)	(0.0171)	(0.0173)					
Emp Shock (1994-1998)				-0.155***	-0.0964***	-0.134***					-0.271***	-0.222***	-0.277***	
				(0.0134)	(0.0112)	(0.00986)					(0.0383)	(0.0389)	(0.0374)	
Emp Shock (1999-2003)				-0.0809***	-0.0563***	-0.0559***					-0.0889***	-0.0654***	-0.0399	
				(0.00625)	(0.00518)	(0.00567)					(0.0235)	(0.0241)	(0.0269)	
Emp Shock (2004-2008)				-0.0993***	-0.0788***	-0.0518***					-0.285***	-0.267***	-0.275***	
				(0.00971)	(0.00859)	(0.00895)					(0.0273)	(0.0247)	(0.0237)	
Constant	0.0136***	0.0129***	0.0108***	0.0153***	0.0138***	0.0137***	0.00601***	0.00403**	0.0148	0.00879***	0.00692***	0.0226		
	(0.000247)	(0.000413)	(0.000976)	(0.000361)	(0.000471)	(0.000970)	(0.00108)	(0.00203)	(0.0336)	(0.00136)	(0.00205)	(0.0337)		
Observations	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819	35,819		
R-squared	0.310	0.534	0.575	0.315	0.536	0.580	0.049	0.057	0.190	0.052	0.060	0.193		
Base Year for Employment Fixed Effect	Year	Moving Average of Previous Three Years Year; State					Year *	Year	Moving Average of Previous Three Years Year; State					Year *
			State	Year	Year; State	Year *			State	Year	Year; State	Year *	State	
SE Cluster			County						County					
Level of Observation			County x Year						County x Year					

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 4a: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-, DDS-, and State-Level Models, 3-Year Changes Instead of 1-Year Changes

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	-0.0432***		-0.0514***		-0.0355**		-0.345***		-0.0719		-0.307	
	(0.00408)		(0.00927)		(0.0144)		(0.0359)		(0.153)		(0.255)	
Emp Shock (1994-1998)	-0.0534***		0		0.0455		-0.171		0		1.413	
	(0.0105)		(0)		(0.0377)		(0.116)		(0)		(1.046)	
Emp Shock (1999-2003)	-0.0410***		-0.0459***		-0.0269*		-0.260***		-0.0310		-0.110	
	(0.00380)		(0.00828)		(0.0140)		(0.0478)		(0.170)		(0.276)	
Emp Shock (2004-2008)	-0.0461***		-0.0673***		-0.0403		-0.562***		-0.225		-0.503*	
	(0.00596)		(0.0154)		(0.0269)		(0.0466)		(0.144)		(0.274)	
Constant	0.0131***	0.0130***	0.0153***	0.0149***	0.00598***	0.00605***	0.0111*	0.00700	-0.00409	-0.00374	-0.0324***	-0.0299***
	(0.000482)	(0.000466)	(0.000595)	(0.000547)	(0.000455)	(0.000421)	(0.00590)	(0.00590)	(0.0103)	(0.0104)	(0.00941)	(0.00876)
Observations	11,946	11,946	885	885	255	255	11,938	11,938	708	708	255	255
R-squared	0.536	0.536	0.796	0.797	0.929	0.931	0.100	0.103	0.352	0.353	0.343	0.368
Base Year for Employment			3 Years Previous						3 Years Previous			
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		DDS		State		County		DDS		State	
Level of Observation	County x Year		DDS x Year		State x Year		County x Year		DDS x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 4b: Estimates of Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models with and without State Effects and State-Specific Flexible Trends, 3-Year Changes Instead of 1-Year Changes

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	-0.0619***	-0.0432***	-0.0428***				-0.383***	-0.345***	-0.348***			
	(0.00466)	(0.00408)	(0.00419)				(0.0337)	(0.0359)	(0.0356)			
Emp Shock (1994-1998)				-0.0877***	-0.0534***	-0.0780***				-0.257**	-0.171	
				(0.0104)	(0.0105)	(0.0101)				(0.103)	(0.116)	
Emp Shock (1999-2003)				-0.0598***	-0.0410***	-0.0448***				-0.301***	-0.260***	
				(0.00450)	(0.00380)	(0.00401)				(0.0472)	(0.0478)	
Emp Shock (2004-2008)				-0.0612***	-0.0461***	-0.0312***				-0.572***	-0.562***	
				(0.00662)	(0.00596)	(0.00623)				(0.0482)	(0.0466)	
Constant	0.0145***	0.0131***	0.0144***	0.0144***	0.0130***	0.0146***	0.0173***	0.0111*	0.0134	0.0114***	0.00700	
	(0.000284)	(0.000482)	(0.00139)	(0.000283)	(0.000466)	(0.00138)	(0.00265)	(0.00590)	(0.0115)	(0.00333)	(0.00590)	
Observations	11,946	11,946	11,946	11,946	11,946	11,946	11,938	11,938	11,938	11,938	11,938	
R-squared	0.309	0.536	0.579	0.310	0.536	0.580	0.078	0.100	0.217	0.081	0.103	
Base Year for Employment												
Fixed Effect	Year	Year; State	Previous Year Year * State	Year	Year; State	Year * State	Year	Year; State	Previous Year Year * State	Year	Year; State	Year * State
SE Cluster			County						County			
Level of Observation			County x Year						County x Year			

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 5: Estimates of Effect of Alternative Measures of Economic Conditions at the State Level on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock	0.000337*** (9.14e-05)		1.765 (1.431)		0.00811 (0.00762)		0.00108 (0.000642)		-11.65 (10.86)		0.219*** (0.0568)	
Emp Shock (1994-1998)	0.000273*** (8.81e-05)		2.025 (2.033)		0.0209*** (0.00731)		0.00130* (0.000754)		-14.22 (10.20)		0.289*** (0.0790)	
Emp Shock (1999-2003)	0.000224*** (7.98e-05)		1.626 (1.584)		0.00411 (0.00887)		0.000602 (0.00115)		-10.43 (11.47)		0.187*** (0.0608)	
Emp Shock (2004-2008)	0.000466*** (0.000113)		4.141 (2.610)		-0.00452 (0.0158)		0.00102 (0.000750)		-9.250 (14.66)		0.198** (0.0909)	
Constant	0.00605*** (0.000863)	0.00505*** (0.000933)	0.00443*** (0.000703)	0.00447*** (0.000691)	0.00646*** (0.000688)	0.00501*** (0.00106)	-0.00730 (0.00616)	-0.0184*** (0.00657)	-0.00745** (0.00323)	-0.00714** (0.00334)	-0.0102* (0.00518)	-0.0181** (0.00804)
Observations	765	765	658	658	612	612	765	765	658	658	612	612
R-squared	0.940	0.942	0.940	0.941	0.952	0.954	0.212	0.214	0.290	0.290	0.220	0.224
Alternative Measure	Unemployment Rate		Total Layoffs per Total Working Age Population		Job Destruction per Total Working Age Population		Unemployment Rate		Total Layoffs per Total Working Age Population		Job Destruction per Total Working Age Population	
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	State		State		State		State		State		State	
Level of Observation	State x Year		State x Year		State x Year		State x Year		State x Year		State x Year	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Base year of employment is previous year.

Table 6: Estimated Effects of Predicted Employment Changes Interacted with Pre-Existing Average State-Level Characteristics, 1994 to 2008, State-Level Models

Variable	Disability Insurance Applications per Population 25 to 64				Change in Not In Labor Force per Population 25 to 64			
Employment Shock	-0.0467** (0.0191)	-0.0474** (0.0199)	-0.0447** (0.0189)	-0.0354** (0.0175)	-0.244 (0.230)	-0.204 (0.227)	-0.148 (0.216)	-0.128 (0.188)
Employment Shock X High	0.00317 (0.00533)	-0.00580 (0.00398)	-0.00207 (0.00697)	0.0201*** (0.00409)	-0.132* (0.0740)	0.0758 (0.0761)	-0.00570 (0.0504)	0.129* (0.0661)
Employment Shock X Low	0.00559 (0.00688)	0.00145 (0.00551)	0.00214 (0.00419)	0.0122** (0.00490)	-0.0995 (0.0678)	0.0517 (0.0646)	0.0645 (0.0778)	0.0923 (0.0673)
Baseline High	0.000318 (0.000409)	0.00193*** (0.000268)	-0.00280*** (0.000200)	-0.00408*** (0.000258)	-0.00193 (0.00370)	-0.00289 (0.00274)	-0.00642*** (0.00150)	-0.00639*** (0.00182)
Baseline Low	-0.00284*** (0.000235)	-0.00241*** (0.000302)	-0.00106*** (0.000273)	-0.00269*** (0.000236)	-0.00368 (0.00226)	-0.00116 (0.00269)	-0.00945*** (0.00294)	-0.00303** (0.00135)
Constant	0.00773*** (0.000532)	0.00869*** (0.000905)	0.0114*** (0.000866)	0.00976*** (0.000762)	-0.00901* (0.00535)	0.00949 (0.00649)	0.0143** (0.00634)	0.0111** (0.00464)
Observations	765	765	765	765	765	765	765	765
R-squared	0.934	0.934	0.934	0.938	0.224	0.213	0.212	0.222
Local Characteristic	Unemployment Rate	Poverty Rate	Percent of Population that is White	Percent of Population that is of Working Age	Unemployment Rate	Poverty Rate	Percent of Population that is White	Percent of Population that is of Working Age
Base Year for Employment Sho		Previous Year				Previous Year		
Fixed Effect		Year; State				Year; State		
SE Cluster		State				State		
Level of Observation		State x Year				State x Year		

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

States were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.

Table 7a: Estimates of Lagged Effect of Predicted Employment Changes on Disability Insurance Application and Change in Fraction Not In Labor Force from 1994 to 2008, County-Level Models

Variable	Disability Insurance Applications per				Change in Not In Labor Force per Population 25			
	Population 25 to 64				to 64			
Employment Shock	-0.00617	-0.00969			-0.254	-0.235		
	(0.0152)	(0.0169)			(0.223)	(0.213)		
Employment Shock (t-1)	-0.0481***	-0.0568***			0.000739	-0.0433		
	(0.0171)	(0.0180)			(0.245)	(0.230)		
Employment Shock (t-2)	-0.0563***	-0.0365**			0.199	0.167		
	(0.0182)	(0.0147)			(0.176)	(0.211)		
Employment Shock (t-3)		-0.00174				0.179		
		(0.0152)				(0.200)		
Employment Shock (t-4)		-0.0464*				-0.223		
		(0.0238)				(0.177)		
Unemployment Rate			0.000383***	0.000380***			-0.00407***	-0.00438***
			(0.000118)	(0.000116)			(0.000843)	(0.000798)
Unemployment Rate (t-1)			-8.63e-05	-8.61e-05			0.00846***	0.00829***
			(9.72e-05)	(9.51e-05)			(0.00124)	(0.00118)
Unemployment Rate (t-2)			3.45e-05	1.61e-05			-0.00221**	-0.000926
			(5.82e-05)	(4.70e-05)			(0.00102)	(0.00106)
Unemployment Rate (t-3)				7.52e-05				0.000199
				(4.70e-05)				(0.00110)
Unemployment Rate (t-4)				-7.69e-05				-0.00223***
				(6.71e-05)				(0.000791)
Constant	0.00678***	0.00707***	0.00568***	0.00586***	0.00973	0.0150**	-0.0185***	-0.00846
	(0.000858)	(0.000848)	(0.000902)	(0.000864)	(0.00605)	(0.00739)	(0.00539)	(0.00621)
Observations	765	765	765	765	765	765	765	765
R-squared	0.937	0.939	0.940	0.940	0.209	0.212	0.297	0.312
Base Year for Employment Shock		Previous Year				Previous Year		
Fixed Effect		Year; State				Year; State		
SE Cluster		State				State		
Level of Observation		State x Year				State x Year		

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1;

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64 Weighted according to local share of national population aged 25 to 64 in a given year.

Table 7b: Distributed Lag Models of Disability Insurance Applications and Change in Fraction Not in Labor Force Before and After Large County-Level Employment Declines Based on Net Job Losses in 2001 and 2002

Variable	Disability Insurance Applications per Population 25 to 64						Change in Not In Labor Force per Population 25 to 64					
Employment Shock (t-4)	-0.000259 (0.000170)	0.000301* (0.000179)	-6.52e-05 (0.000153)	0.000301* (0.000179)	0.000369** (0.000156)	0.000219 (0.000169)	0.00109 (0.000937)	0.00131 (0.00120)	0.00222** (0.000951)	0.00132 (0.00120)	0.00697*** (0.00116)	0.00116 (0.00131)
Employment Shock (t-3)	-0.000324 (0.000201)	0.000328* (0.000192)	-5.71e-05 (0.000151)	0.000328* (0.000192)	0.000479*** (0.000155)	0.000236 (0.000180)	0.00166 (0.00106)	0.00120 (0.00124)	0.00121 (0.00117)	0.00119 (0.00124)	0.00666*** (0.00112)	0.000690 (0.00112)
Employment Shock (t-2)	-0.000331 (0.000213)	0.000507** (0.000233)	-5.07e-05 (0.000165)	0.000507** (0.000233)	0.000650*** (0.000156)	0.000437** (0.000211)	0.00129 (0.00244)	-0.00269 (0.00277)	0.00104 (0.00257)	-0.00266 (0.00277)	0.000138 (0.00124)	-0.00306 (0.00278)
Employment Shock (t-1)	4.03e-05 (0.000184)	0.000799*** (0.000215)	0.000354*** (0.000126)	0.000801*** (0.000215)	0.00105*** (0.000160)	0.000724*** (0.000193)	-2.82e-05 (0.00111)	-0.000413 (0.000957)	-0.000149 (0.00109)	-0.000402 (0.000957)	0.000766 (0.00330)	-0.000616 (0.00103)
Employment Shock (t)	0.000296 (0.000200)	0.000968*** (0.000243)	0.000520*** (0.000144)	0.000968*** (0.000242)	0.00138*** (0.000168)	0.000880*** (0.000218)	0.00287** (0.00124)	0.00311** (0.00150)	0.00372*** (0.00108)	0.00312** (0.00150)	0.00442*** (0.000978)	0.00302* (0.00155)
Employment Shock (t+1)	0.000396** (0.000201)	0.00105*** (0.000247)	0.000591*** (0.000145)	0.00104*** (0.000247)	0.00152*** (0.000179)	0.000949*** (0.000220)	0.00240** (0.000975)	0.000447 (0.00121)	0.00170** (0.000805)	0.000459 (0.00121)	-0.000471 (0.000975)	0.000256 (0.00118)
Employment Shock (t+2)	0.000600*** (0.000199)	0.00105*** (0.000249)	0.000555*** (0.000157)	0.00105*** (0.000248)	0.00147*** (0.000184)	0.000985*** (0.000220)	0.000531 (0.000842)	0.00131 (0.000882)	0.000156 (0.000724)	0.00131 (0.000881)	0.00323*** (0.000875)	0.000819 (0.000808)
Employment Shock (t+3)	0.00182*** (0.000248)	0.00215*** (0.000319)	0.00130*** (0.000181)	0.00110*** (0.000293)	0.00105*** (0.000176)	0.000913*** (0.000222)	0.00414*** (0.00114)	-0.00465* (0.00242)	0.00395*** (0.000953)	-0.00596** (0.00234)	0.000358 (0.000863)	0.000582 (0.000901)
Observations	18,304	18,304	18,304	18,304	35,815	35,815	18,304	18,304	18,304	18,304	35,815	35,815
R-squared	0.552	0.558	0.553	0.558	0.513	0.517	0.051	0.051	0.052	0.051	0.057	0.056
First versus all Shocks	First		All		Persistent		First		All		Persistent	
Period of Employment Decline	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years	1 Year	2 Years
Base Year for Employment Shock	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.	Prev. Year	2 Years Prev.
Fixed Effect	Year; State		Year; State		Year; State		Year; State		Year; State		Year; State	
SE Cluster	County		County		County		County		County		County	
Level of Observation	County		County		County		County		County		County	

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 8: Estimates Effect of Predicted Employment Changes on Annual DDS Level Outcomes from 1994 to 2008

Variable	DI Application Allowance Rate		New Enrollments		Mean Processing Days		Log Mean Processing Days		Median Processing Days		Log Median Processing Days	
Employment Shock	2.484*** (0.832)		-54,184 (121,047)		-156.9 (176.1)		-2.210 (1.717)		58.09 (233.1)		0.377 (2.587)	
Emp. Shock (1994-1998)	-1.104 (2.016)		205,629 (212,350)		121.8 (383.5)		1.986 (4.101)		502.2 (541.3)		7.288 (6.524)	
Emp. Shock (1999-2003)	1.843** (0.847)		-32,798 (85,107)		-143.6 (201.7)		-2.162 (1.912)		103.0 (270.5)		0.562 (2.915)	
Emp. Shock (2004-2008)	6.095*** (1.244)		-220,686 (242,164)		-298.6 (325.9)		-3.768 (3.233)		-258.3 (415.5)		-2.595 (4.577)	
Constant	0.336*** (0.0171)	0.383*** (0.0191)	9,262*** (1,813)	7,152** (3,064)	108.8*** (3.864)	107.0*** (5.031)	4.662*** (0.0384)	4.643*** (0.0500)	101.5*** (4.757)	97.48*** (6.435)	4.591*** (0.0522)	4.555*** (0.0706)
Observations	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480	2,480
R-squared	0.650	0.659	0.642	0.645	0.651	0.652	0.674	0.674	0.555	0.556	0.582	0.583
Base Year for Employment Shock							Previous Year					
Fixed Effect							Year; State					
SE Cluster							DDS					
Level of Observation							DDS x Year					

Notes: Robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Change in Population Level of Men 40 to 54, Men 55 to 64, Women 25 to 39, Women, 40 to 54, and Women 55 to 64

Weighted according to local share of national population aged 25 to 64 in a given year.

Table 9: Estimates of Effect of Predicted Employment Changes Interacted with Average DDS-Level Characteristics, 1994-2008, DDS-Level Models

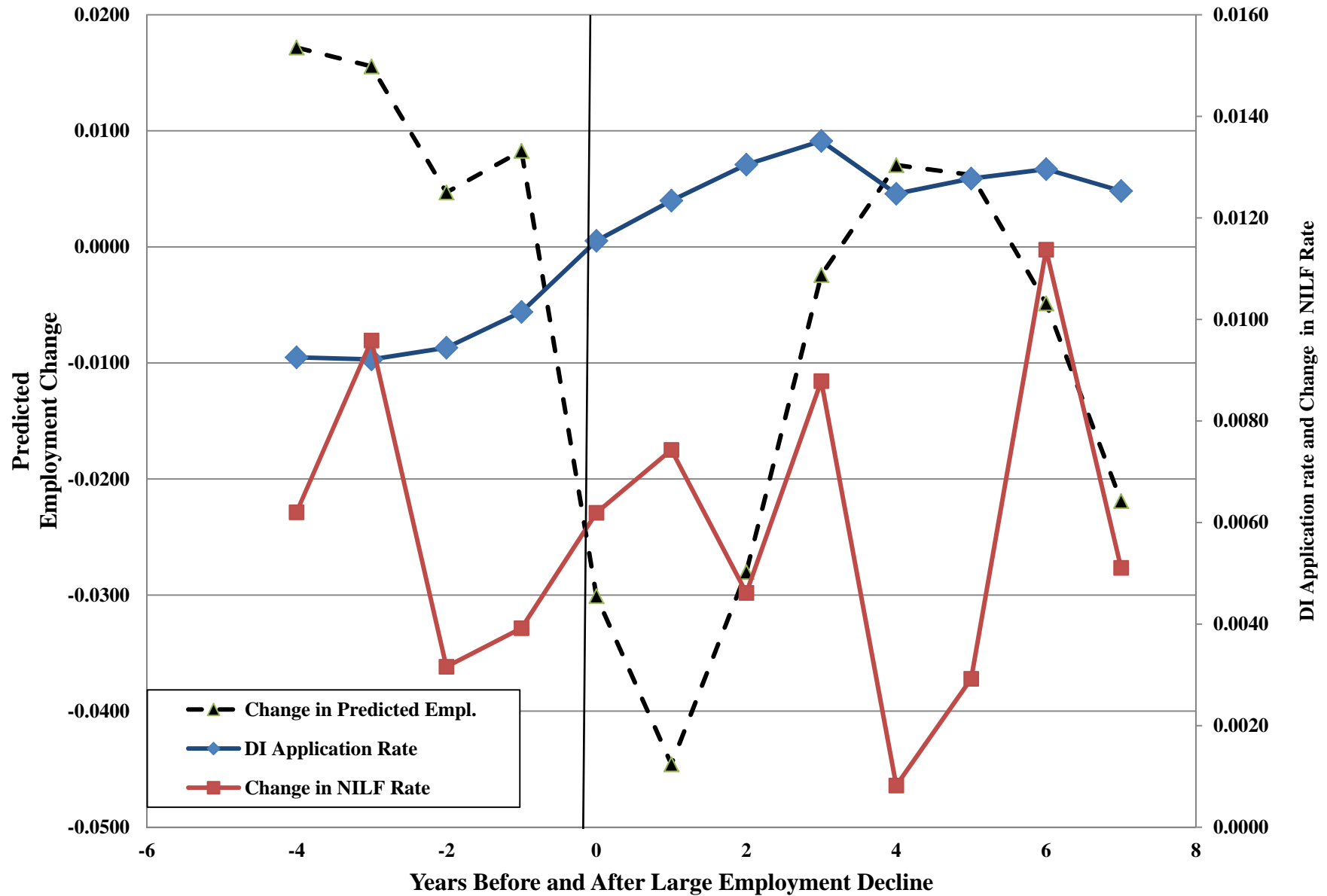
Variable	Disability Insurance Applications per Population 25 to 64			Change in Not In Labor Force per Population 25 to 64		
Employment Shock	-0.0727*** (0.0244)	-0.0739*** (0.0247)	-0.269*** (0.0559)	-0.100 (0.107)	-0.116 (0.110)	-0.224 (0.747)
Emp. Shock x Allow Rate High	0.00357 (0.00237)	0.00512** (0.00259)		0.0830 (0.0830)	0.0909 (0.0846)	
Emp. Shock x Allow Rate Low	-0.0139*** (0.00342)	-0.0120*** (0.00374)		0.0761 (0.0973)	0.0861 (0.0982)	
Allow Rate High	-0.000890*** (0.000299)	-0.000471*** (0.000159)		-0.00420*** (0.00150)	-0.00842*** (0.00194)	
Allow Rate Low	0.00529*** (0.000148)	0.00493*** (0.000302)		0.00109 (0.00108)	0.00677*** (0.00136)	
Emp. Shock x Processing Days Mean High		0.00651** (0.00306)			0.0252 (0.0571)	
Emp. Shock x Processing Days Mean Low		-0.000388 (0.00479)			0.0456 (0.0469)	
Mean Processing Days, High		-0.000846*** (0.000194)			0.00972*** (0.00216)	
Mean Processing Days, Low		-0.000355 (0.000249)			0.00555*** (0.00109)	
Emp. Shock x Allow Rate			0.171*** (0.0338)			0.459 (0.858)
Emp. Shock x Log Processing Days Mean			0.0323*** (0.0119)			-0.00134 (0.169)
Log Mean Processing Days			-2.46e-05 (0.000375)			0.00225 (0.00309)
Constant	0.00849*** (0.000573)	0.00731*** (0.000376)	0.0139*** (0.00170)	0.00851*** (0.00264)	-0.00976*** (0.00253)	-0.000385 (0.0142)
Observations	2,132	2,132	2,132	2,132	2,132	2,132
R-squared	0.827	0.827	0.828	0.193	0.193	0.191
Base Year for Employment Shock		Previous Year			Previous Year	
Fixed Effect		Year; State			Year; State	
SE Cluster		DDS			DDS	
Level of Observation		DDS x Year			DDS x Year	

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Population Level of Men 40-54, Men 55-64, Women 25-39, Women, 40-54, and Women 55-64 Weighted according to local share of national population aged 25 to 64 in a given year.

DDS were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.

Figure 1: Persistent Effect of Large Local Change in Predicted Employment Occuring in 2001 on Disability Applications and Changes in Fraction Not in Labor Force Participation



Appendix Table 1: Sample Statistics State-Level Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
DI Applications per Pop 25 to 64	765	0.008	0.002	0.003	0.017
Not In Labor Force per Pop 25 to 64	765	0.001	0.007	-0.047	0.036
DI Allow Rate	765	0.353	0.062	0.205	0.529
Mean Processing Days	765	98.2	17.8	51.4	182.8
Median Processing Days	765	88.7	18.9	43.6	153.0
Employment Shock Base Year: Initial Year 1990	765	0.068	0.039	-0.019	0.203
Base Year: Initial Year 1990 (1994-1998)	255	0.038	0.031	-0.019	0.112
Base Year: Initial Year 1990 (1999-2003)	255	0.089	0.031	0.005	0.167
Base Year: Initial Year 1990 (2004-2008)	255	0.076	0.034	0.004	0.203
Employment Shock Base Year: Previous Year	765	0.008	0.016	-0.035	0.034
Base Year: Previous Year (1994-1998)	255	0.021	0.003	0.014	0.029
Base Year: Previous Year (1999-2003)	255	-0.003	0.019	-0.035	0.034
Base Year: Previous Year (2004-2008)	255	0.006	0.010	-0.017	0.028
Employment Shock Base Year: 2 Years Previous	765	0.018	0.029	-0.055	0.062
Base Year: 2 Years Previous (1994-1998)	255	0.040	0.005	0.028	0.055
Base Year: 2 Years Previous (1999-2003)	255	0.002	0.037	-0.055	0.062
Base Year: 2 Years Previous (2004-2008)	255	0.011	0.017	-0.019	0.052
Employment Shock Base Year: 3 Years Previous	765	0.026	0.038	-0.075	0.088
Base Year: 3 Years Previous (1994-1998)	255	0.053	0.014	0.012	0.075
Base Year: 3 Years Previous (1999-2003)	255	0.016	0.047	-0.075	0.088
Base Year: 3 Years Previous (2004-2008)	255	0.009	0.027	-0.054	0.067
Employment Shock Base Year: Previous 3 Year Avg	765	0.017	0.026	-0.050	0.061
Base Year: Previous 3 Year Average (1994-1998)	255	0.038	0.006	0.021	0.052
Base Year: Previous 3 Year Average (1999-2003)	255	0.005	0.033	-0.050	0.061
Base Year: Previous 3 Year Average (2004-2008)	255	0.008	0.016	-0.024	0.048
Unemployment Rate	765	5.147	1.139	2.3	8.7
Unemployment Rate (1994-1998)	255	5.343	1.237	2.4	8.7
Unemployment Rate (1999-2003)	255	4.958	1.139	2.3	8.1
Unemployment Rate (2004-2008)	255	5.140	0.999	2.5	8.3
Total Layoffs	658	0.000112	0.000082	0.000008	0.000414
Total Layoffs (1994-1998)	150	0.000106	0.000086	0.000008	0.000342
Total Layoffs (1999-2003)	253	0.000122	0.000090	0.000008	0.000354
Total Layoffs (2004-2008)	255	0.000105	0.000071	0.000013	0.000414
Job Destruction	612	0.107	0.015	0.067	0.238
Job Destruction (1994-1998)	255	0.101	0.012	0.067	0.238
Job Destruction (1999-2003)	255	0.116	0.016	0.069	0.220
Job Destruction (2004-2008)	102	0.102	0.010	0.069	0.151

Notes: Various data sources, see text for description.

Appendix Table 2: Estimates of Effect of Predicted Employment Changes Interacted with Average DDS-Level Characteristics, 1994-2008, DDS-Level Models, Alternative Base-Year for Predicted Employment Changes

Variable	Disability Insurance Applications per Population 25 to 64			Change in Not In Labor Force per Population 25 to 64		
Employment Shock	-0.0692*** (0.0126)	-0.0697*** (0.0129)	-0.146*** (0.0321)	-0.0857* (0.0480)	-0.0953* (0.0500)	0.431 (0.386)
Emp. Shock x Allow Rate High	0.00270** (0.00126)	0.00307** (0.00143)		0.0111 (0.0491)	0.0153 (0.0505)	
Emp. Shock x Allow Rate Low	-0.00957*** (0.00167)	-0.00912*** (0.00185)		0.0751* (0.0421)	0.0802* (0.0439)	
Allow Rate High	-0.000768*** (0.000278)	0.00125*** (0.000210)		-0.00333** (0.00147)	0.00536*** (0.00114)	
Allow Rate Low	0.00481*** (0.000116)	0.00420*** (0.000260)		-0.000497 (0.000794)	0.00329*** (0.00101)	
Emp. Shock x Processing Days Mean High		0.00132 (0.00195)			0.0105 (0.0307)	
Emp. Shock x Processing Days Mean Low		0.00118 (0.00269)			0.0381 (0.0245)	
Mean Processing Days, High		-0.00191*** (7.80e-05)			0.000908 (0.00148)	
Mean Processing Days, Low		-0.000614*** (0.000213)			0.00351*** (0.000894)	
Emp. Shock x Allow Rate			0.102*** (0.0217)			0.0943 (0.413)
Emp. Shock x Log Processing Days Mean			0.0100 (0.00719)			-0.123 (0.0867)
Log Mean Processing Days			-5.01e-05 (0.000368)			0.00295 (0.00285)
Constant	0.00779*** (0.000238)	0.00869*** (0.000216)	0.0128*** (0.00175)	-0.00313 (0.00194)	0.00486*** (0.00126)	-0.0173 (0.0138)
Observations	2,480	2,480	2,480	2,480	2,480	2,480
R-squared	0.815	0.815	0.815	0.176	0.177	0.172
Base Year for Employment Shock	Average of Previous 3 Years			Average of Previous 3 Years		
Fixed Effect	Year; State			Year; State		
SE Cluster	DDS			DDS		
Level of Observation	DDS x Year			DDS x Year		

Notes: Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Additional Controls include Population Level of Men 40-54, Men 55-64, Women 25-39, Women, 40-54, and Women 55-64 Weighted according to local share of national population aged 25 to 64 in a given year.

DDS were classified as high and low with regard to local characteristics if the average of 3 years of baseline data preceding the analysis period was respectively higher or lower than the 75th and 25th percentiles.