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Henry S. Farber

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Henry S. Farber
Princeton University
and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Job Loss in the Great Recession and its Aftermath: U.S. Evidence from the Displaced Workers Survey*

The Great Recession from December 2007 to June 2009 is associated with a dramatic weakening of the labor market from which, by some measures, it has not completely recovered. I use data from the Displaced Workers Survey (DWS) from 1984-2014 to investigate the incidence and consequences of job loss from 1981-2013. In particular, the 2010, 2012, and 2014 DWSs provide a window through which to examine the experience of job losers in the Great Recession and its aftermath and to compare their experience to that of earlier job losers. These data show a record high rate of job loss in the Great Recession, with almost one in six workers reporting having lost a job in the 2007-2009 period, that has not yet returned to pre-recession levels. The employment consequences of job loss are also very serious during this period with very low rates of reemployment and difficulty finding full-time employment. The reduction in weekly earnings for those job losers during the 2007-2013 period who were able to find new employment are not unusually large by historical standards.

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Corresponding author:

Henry S. Farber
Industrial Relations Section
Firestone Library
Princeton University
Princeton, NJ 08544
USA
E-mail: farber@princeton.edu

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1 Introduction

The Great Recession from December 2007 to June 2009 is associated with a dramatic weakening of the labor market from which it only recovered very slowly. Indeed, by some measures the recovery is not yet complete. The unemployment rate remained stubbornly high for several years, and durations of unemployment continue to be unprecedentedly long. The weakening of the labor market in the Great Recession was associated with tremendous job destruction and costly adjustment for those whose jobs were lost. In this study I use the Displaced Workers Surveys (DWS), administered every two years from 1984-2014 as a supplement to the Current Population Survey (CPS), to examine the experience of job losers during and after the Great Recession and to compare their experience to that of earlier job losers. The January 2010 DWS is of particular interest since it covers job loss during the period of the Great Recession (2007-2009), and the succeeding two DWSs (2012 and 2014) shed important light on the experience of post-recession job losers in a labor market that was still recovering from the Great Recession (2009-2013).[1]

The study of worker displacement, both through plant closings, large layoffs, and smaller events is an important focus of work in recent years. While much earlier work uses data from the DWS, a body of recent work builds on the seminal study of Jacobsen, LaLonde, and Sullivan (1993) and uses adminstrative data (e.g., Couch and Placzek, 2010; Davis and von Wachter, 2011); Song and Von Wachter, 2014). The work using the DWS and the work using administrative data are complementary in the sense that they address related but somewhat different dimensions of the cost of job loss. The DWS is well suited for the study of short run employment outcomes of job losers and declines in weekly earnings for reemployed job losers. The administrative data, usually quarterly data from state unemployment insurance records or Social Security Administration data, is well suited for studying earnings losses over longer periods of time and calculating the total dollar value of lost income.

I begin in the next section with a brief presentation of movements over time in key labor market indicators derived from the CPS. These include the unemployment rate, the average duration of unemployment spells, the employment-population ratio, and key monthly transition rates between labor force states (exit rates from employment and unemployment). These highlight the severity of the Great Recession and the slow recovery. In section 3 I

[1] Examples of earlier work using the DWS includes Farber (1997, 2013), Podgursky and Swaim (1987), Kletzer (1989), Topel (1990), Gardner (1995), Neal (1995), Hipple (1999), and Schmeider and von Wachter (2010). See Fallick (1996) and Farber (2004) for reviews of the earlier literature.

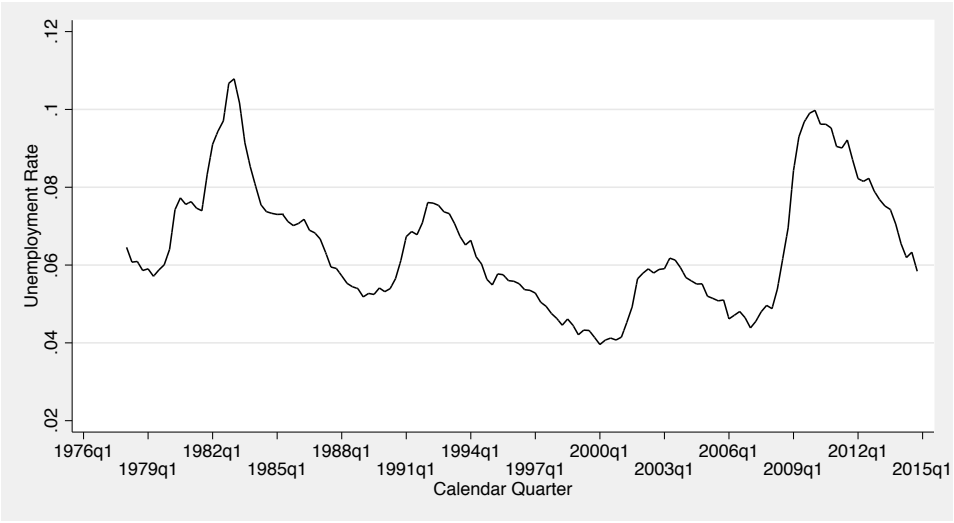

Figure 1: Civilian Unemployment Rate, by quarter, seasonally adjusted

describe the data I use from the DWS and discuss measurement and data issues relevant to the analysis of job loss. Section 4 contains my analysis of the incidence of job loss. Next, I analyze the consequences of job loss in several dimensions. I begin in section 5 with an investigation of post-displacement labor force status and employment probabilities. Next in section 6, I consider the quality of job-displacement jobs including the full-time/part-time status of reemployed job losers and the decline in weekly earnings due to displacement. Section 7 contains a discussion of the findings and concluding remarks.

2 Overview of Labor Market Conditions

The high unemployment rate experienced in the Great Recession has been very slow to return to pre-recession levels. The seasonally-adjusted unemployment rate peaked at 10.0 percent in the first quarter of 2010, was still at 9.5 percent in the fourth quarter of 2010, more than one full year after the "official" end of the recession in June 2009.[2]

Figure 1 contains a plot of the quarterly seasonally adjusted civilian unemployment rate

[2] This is the NBER dating of the recession. See *http://www.nber.org/cycles.html* and NBER (2010) for more information of the NBER business cycle dating procedure. The labor market historically lags the NBER dates, which are based largely on GDP growth. For example, the NBER dated the end of the Great Recession in June 2009 while the unemployment rate reported by the U.S. Bureau of Labor Statistics peaked in October 2009.

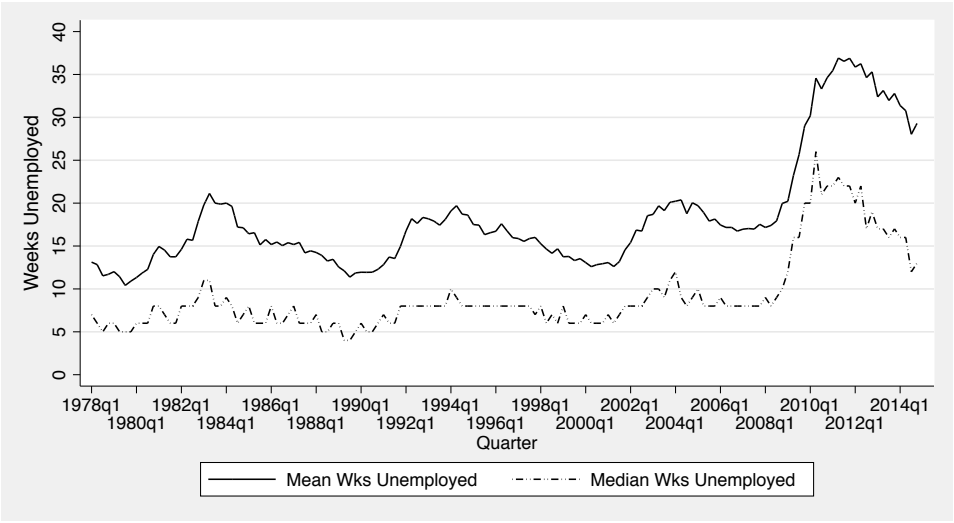

Figure 2: Duration of Unemployment Spells, by quarter, seasonally adjusted

from 1978 through 2014.[3] There has been substantial variation in labor market conditions over the period covered by the DWS (1981-2013). The early 1980s saw a sharp increase in the unemployment rate to more than 10 percent during the July 1981 - November 1982 recession. This increase was followed by a long decline in during the remainder of the 1980s. The unemployment rate then increased to almost 8 percent in 1992 before beginning a long decline to about 4 percent in 2000. After the comparatively mild recession in 2001, with a 6 percent unemployment rate, the unemployment rate again declined to about 4.5 percent in 2007 before increasing sharply to about 10 percent by early 2010. Since that time the unemployment rate has fallen slowly but steadily to about 6 percent in 2014q4. Note that more than 5 years after the end of the Great Recession, the unemployment rate remains above its level at the onset of the recession (unemployment rate of 5.8 percent in 2014q4 vs. 5.0 percent in 2007q4).

A related concern is the unprecedentedly long average duration of unemployment spells. This is illustrated in figure 2, which shows both the mean and median seasonally adjusted duration of unemployment for spells in progress, quarterly from 1978-2014. This figure clearly shows the counter-cyclical nature of unemployment duration. The mean unemployment rate reached about 20 weeks in the three earlier recessions show but rose to 37 weeks in the

[3] The unemployment rates that I refer to in the text and in the figures are based on my own calculations using the basic CPS public use files available for this period. I weight by the CPS final sampling weights. In order to seasonally adjust a series Y_t with overall mean $\bar{Y}$, I regress Y_t on a complete set of seasonal dummy variables and calculate the residuals, e_t. I then compute the seasonally adjusted series as $Y_t^{sa} = \bar{Y} + e_t$.

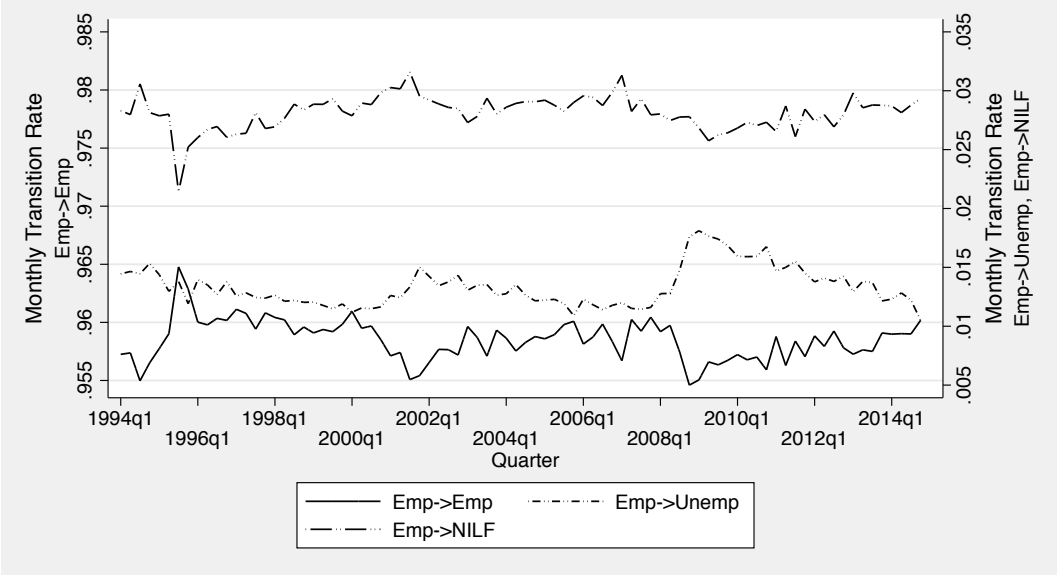

Figure 3: Monthly Flows from Employment, Matched CPS

Great Recession. The figure further indicates a continuing increase in mean unemployment duration into 2011 (mean duration 36.9 weeks in 2011Q4) before falls somewhat to just under 30 weeks in 2014q4. The median showed a similar pattern, reaching about 10 weeks in earlier recession but increasing to 25 weeks in the most recent recession. Again more than 5 years after end of the Great Recession, both mean and median duration of unemployment spells in progress remain above anything seen prior to the Great Recession.

These high unemployment rates reflect in large measure changes in flows between labor force states. Figure 3, uses month-to-month matched CPS data from 1994 onward to show flow rates from "employed" (E) to "employed" (E), unemployed" (U), and "not in the labor force" (NILF). The E-E flow (left scale), which represents the probability that an employed person remains employed, drops from 0.96 to 0.955 in 2008 and slowly recovers by late 2014. While this sounds small, consider the complement. The probability of leaving employment increased from 0.04 to 0.45, an increase of 12.5 percent. Virtually all of this was movement from employment to unemployment (rather than exit from the labor force). The E-U flow rate (right scale) increased from about .011 in late 2007 to .018 by early 2009 (an increase of 63 percent) and slowly decreased by late 2014.

Figure 4, shows flow rates from "unemployed" to each of the three labor force states. The U-E flow, which represents the probability that an unemployed person finds employment, dropped from 0.27 in late 2007 to about 0.16 to 0.17 in 2009 and 2010 (a drop of 37 percent)

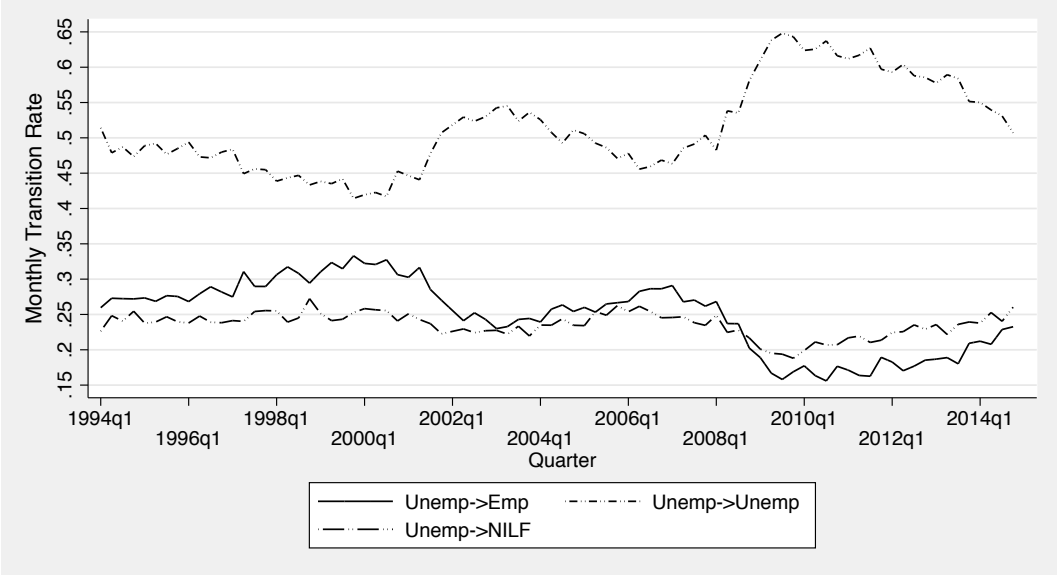

Figure 4: Monthly Flows from Unemployment, Matched CPS

before partially recovering to 0.23 in late 2014. The probability of remaining unemployed (U-U flow) increased from 0.5 in late 2007 to 0.65 in late 2009 (an increase of 30 percent) before recovering by late 2014.

The labor force flows shown in figures 3 and 4 are consistent with the sharp elevation and slow declines in the unemployment rate and unemployment durations shown in figures 1 and 2. The Great Recession was a period of serious disruption of employment relationships, and it is clear that unemployed workers had a difficult time finding new jobs. The dynamics of unemployment in the Great Recession and its aftermath were fundamentally different from unemployment dynamics in earlier recessions, where the changes in the unemployment rate, unemployment durations, and flows out of employment and unemployment were less pronounced and recovered to pre-recession levels relatively quickly.

I turn now to analyses of the experience of displaced workers in order to understand more about the incidence and consequences of job loss in the Great Recession and the slow recovery and how labor market outcomes for job losers differ from the experience in earlier time periods.

3 The Displaced Workers Survey

I analyze data on 1,203,109 individuals between the ages of twenty and sixty-four from the DWS conducted as part of the January or February CPS in even years from 1984 through

2014. The survey is meant to capture worker terminations as the result of business decisions of the employer (e.g., a plant closing, a layoff, the abolition of a job) unrelated to the performance or choices of the particular employee. As such, it is not meant to capture voluntary job changes (quits) or termination "for cause." While the precise question asked varied somewhat over time, in January 2010 respondents were asked:

> "During the last 3 calendar years, that is, January 2007 through December 2009, did (name/you) lose a job or leave one because: (your/his/her) plant or company closed or moved, (your/his/her) position or shift was abolished, insufficient work or another similar reason?"

The recall window was five years in the 1984-1992 DWS, and it changed to three years in 1994.[4]

In order to investigate the consequences of job loss, I use a set of followup questions in the DWS asked of workers who report having lost a job. Unfortunately, since 1994, the follow-up questions were asked only of job losers whose reported reason for the job loss was one of three reasons: slack work, plant closing, or position/shift abolished. I term these the "big three" reasons. Workers who lost jobs due to the ending of a temporary job, the ending of a self-employment situation, or "other" reasons were not asked the follow-up questions. In order to maintain comparability across years my analysis of post-job-loss experience, regardless of year, uses only workers who lost jobs for one of the "big three" reasons. Additionally, in order to have a consistent sample over time, I do not use information on the post job-loss experience of job losers in the 1984-1992 DWS whose reported job loss was more than three years prior to the interview date.

There are some important issues of definition implicit in the design of this question that are not always recognized in analyses using the DWS. Job loss as measured in these data almost certainly does not represent all job loss about which we ought to be concerned. Specifically, the distinction between quits and layoffs is not always clear. Firms may wish to reduce employment without laying off workers, and they might accomplish this by reducing or failing to raise wages.[5] This can encourage workers (perhaps those having better alternatives)

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[4] There are important issues of measurement and interpretation that arise when comparing job loss rates calculated using the DWS over time, including changes in wording of the key questions as well as the change in 1994 in the recall period from five years to three years. See Farber (1997) and Farber (2004) for detailed discussions of these issues and the procedures I use to reweight the data to yield adjusted job loss rates that are comparable over time.

[5] This is consistent with work by Jacobsen, LaLonde, and Sullivan (1993) who find that displaced workers suffer earnings declines even before they are displaced.

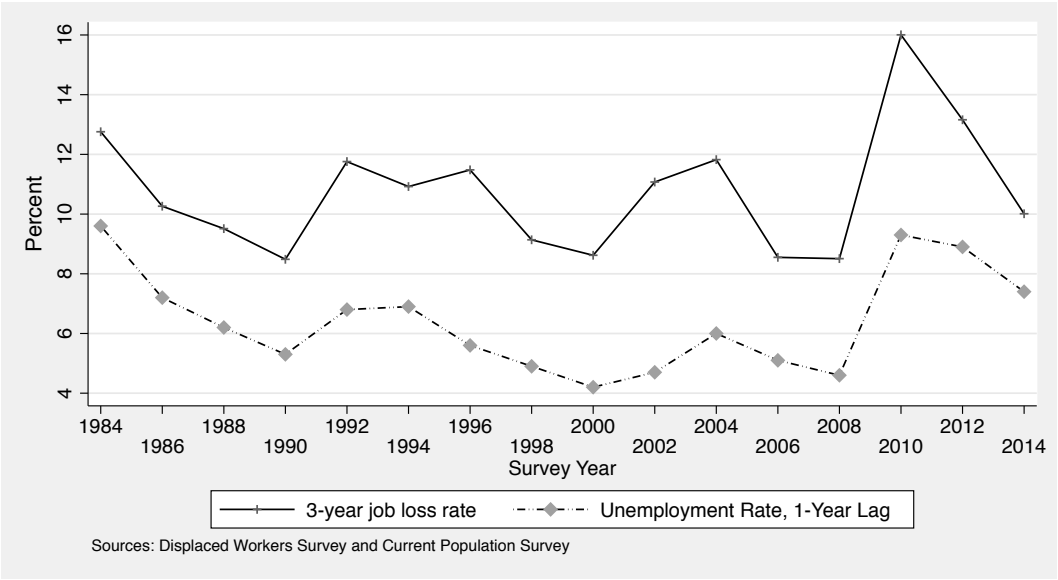

Figure 5: Unemployment and Job Loss Rates, by Survey Year

to quit. Other workers (perhaps those having worse alternatives) might be willing to continue to work at reduced wages. To the extent that these are important phenomena, the sample of individuals observed to be displaced by the definition used in the DWS is a potentially non-random sub-sample of "truly displaced" workers. The consequences of this are difficult to measure, but it is worth noting that the ability of employers to offer at least nominal wage decreases to their workers can be quite limited (Bewley, 1999), a factor that may be particularly important in the relatively low inflation environment of the last 20 years.

4 The Rate of Job Loss

Figure 5 contains plots of adjusted three-year job loss rates computed from each of the 16 DWSs from 1984-2014 along with the civilian unemployment rate for the year preceding each survey.[6] The cyclical behavior of job loss is apparent, with job-loss rates clearly positively correlated with the unemployment rate ($\rho = 0.79$).[7] Both unemployment and job-loss rates

[6] All counts in the figures I present are weighted using the CPS sampling weights.

[7] Another possibility would be to use the average unemployment rate for the three years preceding each survey. However, reported rates of job loss are always higher in the year immediately preceding the survey relative to the rates of job loss two and three years preceding the survey. This may be the result of recall bias noted by Topel (1990). Empirically, the correlation of the rate of job loss with the unemployment rate in the year preceding the survey (ρ =0.79) is much higher than the correlation of the rate of job loss with

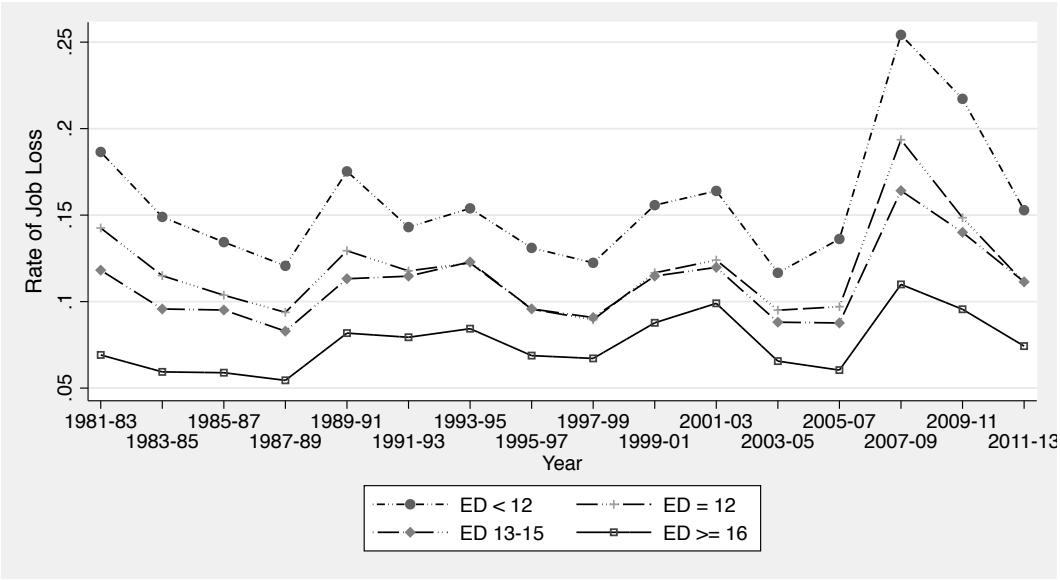

Figure 6: Three-Year Job Loss Rate by Education, 1981-2013.

were very high in the two most serious recessionary periods (1981-83 and 2007-09, the 1984 and 2010 survey years respectively). While the unemployment rates were comparable in 1983 and 2009 (9.6 percent vs. 9.3 percent), the job loss rate was much higher in the 2007-2009 period than in the 1981-83 period (16.0 percent vs. 12.8 percent). Additionally, the job loss rate fell much more sharply after the 2010 DWS than did the unemployment rate. These patterns suggest that the Great Recession was associated with a much higher job loss rate than the norm, which makes it of particular interest to study the consequences of job loss in the Great Recession and its aftermath.

4.1 Education and Job Loss

Figure 6 contains three-year rates of job loss by year for each of four education categories. Not surprisingly, job loss rates are dramatically higher for less educated workers than for more educated workers. For example, the job loss rate for workers with twelve years of education was 9.4 percent in 1997-99 (the lowest in the sample period) compared with 14.3 percent in 1981-83 and 19.4 percent in 2007-09. In contrast, the job loss rate for workers with at least sixteen years of education was 5.4 percent in 1987-89 compared with 6.9 percent in 1981-83 and 11.0 percent in 2007-2009. In the aftermath of the Great Recession, the job

the average unemployment rate in the three years preceding the survey ($\rho = 0.45$).

loss rate fell for workers in all education groups and converged somewhat. Clearly, there is a cyclical pattern in job loss rates for all educational groups, but the cyclical fluctuations are much larger for less educated workers.

Cyclical fluctuations in job loss rates have grown over time for more educated workers. Early on, there was little cyclical movement of job loss rates for workers with at least 16 years of education. Job loss rates for these workers fell only slightly in the recovery from the early 1980s recession. However, the rate of job loss increased substantially in the 1989-91 period, did not fall much during the subsequent recovery, increased again from 1997-2003, before falling through 2007. In the 2007-09 period, the job loss rate of college graduates increased sharply (from 6 percent in 2005-07 to 11 percent in 2007-09) before declining. While the 2007-09 rate of job loss for college graduates was substantially below the rate for workers with less education, it was at a historically high level. One conclusion is that more educated workers are less vulnerable to job loss, but even their vulnerability has increased over time. A final point is that job loss rates have declined since 2009 for workers in all educational groups. However, they remain above rates of job loss for educationally comparable workers in the pre-recession period. For example, the rate of job loss for college educated workers was 7.4 percent in 2011-13 versus 6.0 percent in 2005-07.

4.2 Age and Job Loss

Figure 7 contains three-year job loss rates by year for four age groups covering the range from 20-64. Job loss rates are highest for the youngest workers (20-29) and generally show the standard cyclical pattern. The job loss rates of the oldest two groups, ages 40-49 and 50-64, are very similar. There has been some convergence over time in rates of job loss by age, with the rates for older workers increasing relative to those for younger workers. As expected, the job loss rates for each age group spiked sharply in the Great Recession period and declined sharply in the aftermath but remain above the levels of the pre-recession period. For example, the rate of job loss workers aged 30-39 was 10.1 percent in 2011-13 versus 8.2 percent in 2005-07.

4.3 Tenure and Job Loss

Job tenure is an important job characteristic that is related to job security and job quality (e.g., earnings). Abraham and Medoff (1984) documented that many employers (even non-union) have policies that take tenure into account when selecting workers for layoff. Given

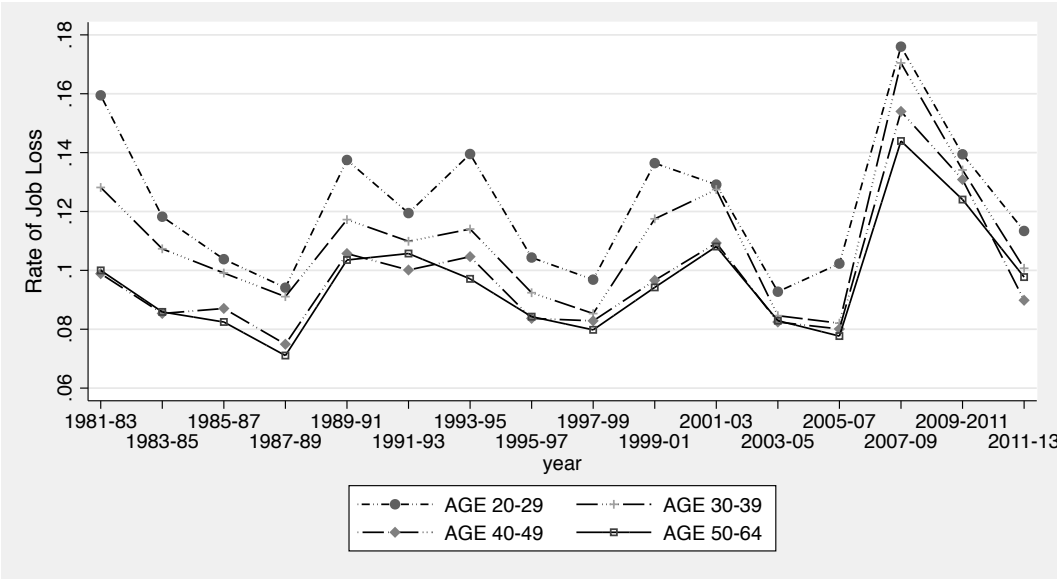

Figure 7: Three-Year Job Loss Rate by Age, 1981-2013.

the well-documented decline in long-term employment in the United States (e.g., Farber (2007)) it is worth investigating the relationship between tenure and job loss. This analysis is facilitated by the fact that, since 1996, the Current Population Surveys that contain a Displaced Workers Survey also contain a mobility supplement with information on how long an individual has worked for his current employer. I assign tenure for the job losers from their response on the DWS to question asking how long they had worked for the employer on the lost job. I assign tenure for those workers who did not lose a job based on their response to a question in the mobility supplement asking how long they had worked for their current employer.

This combined measure is not perfect. The timing is not quite right. Respondents to the DWS and mobility supplements were at risk to lose a job during a three-year window preceding the date of the survey, and a job loser's tenure referred to some time in that three-year window. The tenure for those who did not lose jobs is measured as of the date of the DWS/mobility survey (January or February of the survey year). Some of these workers (those with low tenure) would likely have been on different jobs during the earlier three-year window. And some of those who did not lose jobs but are not employed at the survey date will not be included in the analysis. Still, as long as the tenure distribution is changing slowly, the survey-date distribution of tenure for those employed who did not report a job loss is likely a good approximation to the tenure distribution among those employed during

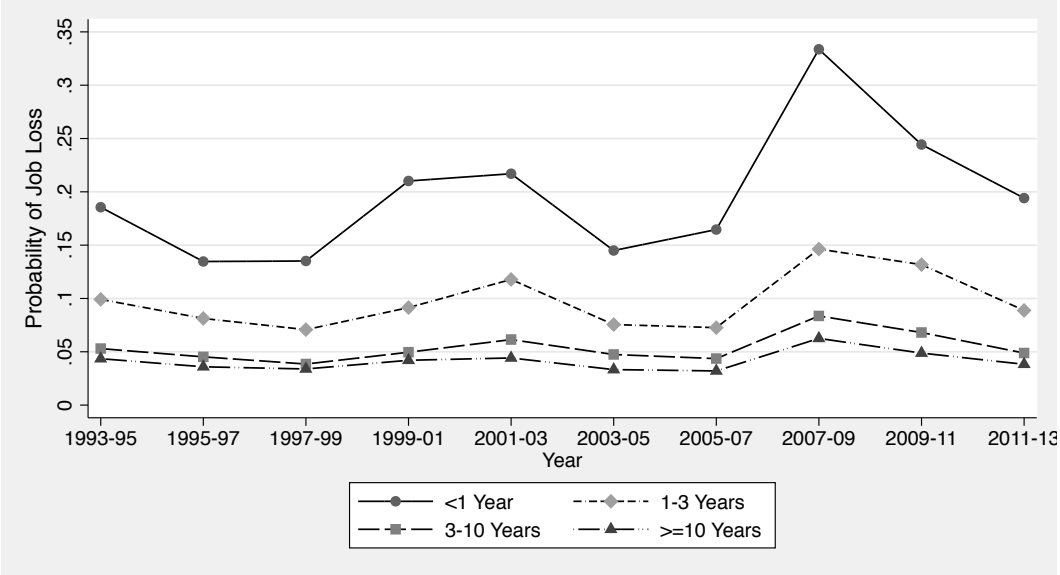

Figure 8: Three-Year Job Loss Rate by Tenure, 1993-2013

the three-year window for job loss. I proceed using this mixed measure.

Figure 8 contains a plot of the job loss rate over the 20-year period from 1993-2013 broken down by tenure category. In every year, the job loss rate is monotonically decreasing with tenure. This is not a surprise. The job loss rate is far higher for workers on the first year of their job than for workers in any other tenure category. This is due to at least three factors. First, these are the workers most vulnerable to layoff in a demand downturn. Second, the first year of the job is a period of learning about match quality, and low quality matches are likely to end early (Jovanovic, 1979). Third, there is surely heterogeneity across workers in their underlying turnover rates resulting is very high turnover rates early in jobs among high mobility workers (Farber, 1999). And some of this will come in the form of job loss rather than quits.

Workers with 1-3 years of tenure have somewhat lower job loss rates, but still high compared with workers with more than 3 years of tenure. Workers in the two lowest tenure categories (less than 1 year and 1-3 years) have seen substantial cyclical variation in their job loss rates, with the increase in the Great Recession being particularly sharp. Workers in the highest two tenure categories (3-10 years and more than 10 years) had relatively low rates of job loss that, until the great recession, did not vary very much with the cycle. However, in the Great Recession, even these workers saw a sharp increase (relative to their low base rate) in their job loss rate. For example, workers with more than 10 years tenure had a job

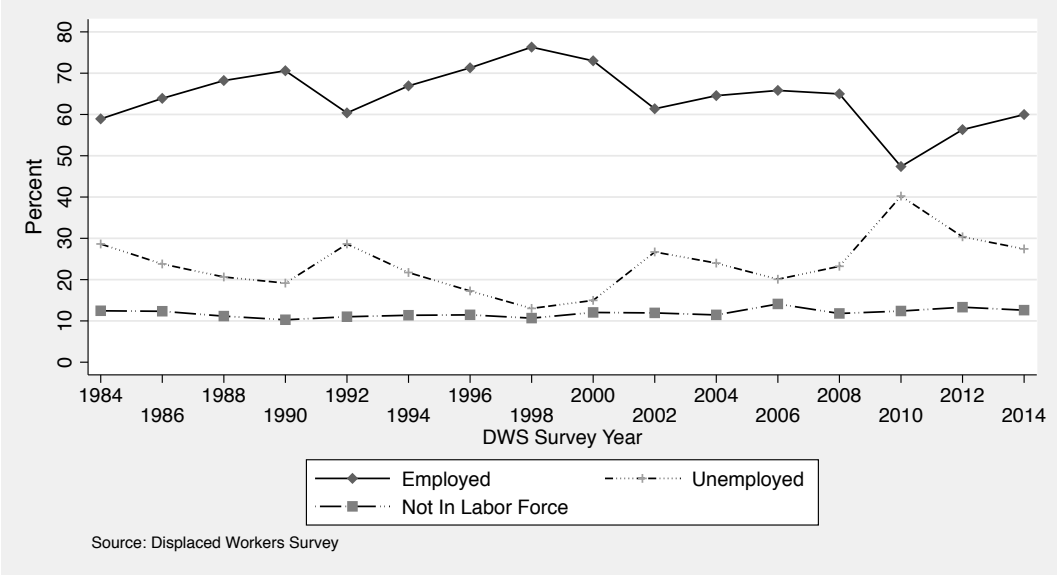

Figure 9: Survey Date Labor Force Status of Job Losers

loss rate of about 3.2 percent in 2005-07 that almost doubled to about 6.3 percent.

5 Consequences of Job Loss: Employment and Unemployment

I start with an examination of how the distribution o f survey-date labor force status of job losers has varied over time. Figure 9 contains plots of the fraction employed, unemployed, and not in the labor force at the DWS survey dates for job losers in each of the DWSs. It is clear from this figure that the post-displacement employment rate is pro-cyclical, with relatively low employment rates in surveys covering the slack labor markets 1984, 1992, 2002, and 2010. The most striking feature of this plot is that the post-displacement employment rate is substantially lower, at less than 50 percent, in the 2010 survey (covering job loss in the 2007-2009 period of the Great Recession) than in any earlier period. And, while the post-displacement employment rate of job losers increased in the 2012 and 2014 surveys (covering the 2009-2013 periods), the employment rate remains lower than in any earlier period, including those with very strong labor markets.

Not surprisingly, the fraction of job losers who report being unemployed at the survey-date moves counter-cyclically, with peak unemployment shares at the 1984, 1992, 2002, and 2010 survey dates.[8] The most striking feature of the unemployment plot is that the post-

[8] Note that the fraction of job losers who report being unemployed is not the unemployment rate of job

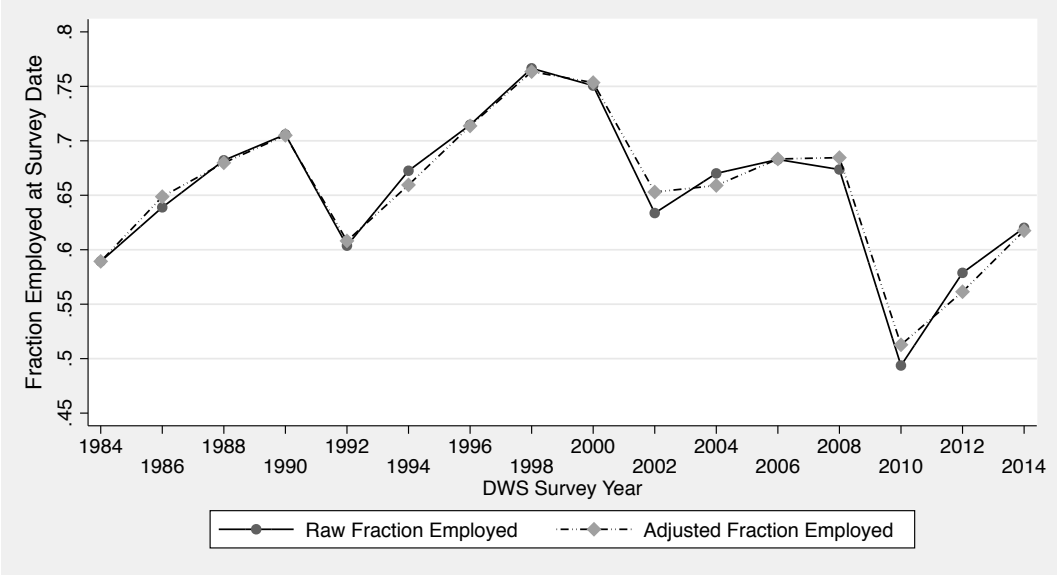

Figure 10: Fraction of Job Losers Employed at Survey Date, by Year

displacement unemployment share is substantially higher, about 40 percent, in the 2010 survey than in any earlier period. And, while the post-displacement unemployment share of job losers decreased in the 2012 and 2014 surveys (covering the 2009-2013 periods), the unemployment share remains high by historical standards.

The survey-date fraction of job losers not in the labor force is remarkably constant across all years, at about 10 percent. There is no evidence that job losers are disproportionately discouraged in recessions, including the most recent recession, leading to withdrawal from the labor force.

There are important differences in post-displacement labor force status across workers with different demographic characteristics, and changes in these characteristics could account for some of the time series patterns shown in figure 9. In order to address this I estimate a linear probability model of the post-job-loss employment status that accounts for differences in sex, race, age (5 categories), education (4 categories), tenure on the lost job (5 categories), the number of years between the job loss and the survey date (3 categories), and survey year (16 categories).

Figure 10 contains plots of the raw and regression-adjusted fraction employed at the DWS

losers. The fraction of job losers who report being unemployed uses as a base the number of job losers while the unemployment rate of job losers is uses as a base the number of job losers in the labor force (employed plus unemployed).

survey date for job losers in each of the DWSs. The raw fractions are simple tabulations of the data (identical to the appropriate series in figure 9) while the adjusted fractions are derived from the linear probability model of survey-date employment status I described.[9] The key result is that the raw and adjusted probabilities are almost identical throughout (simple correlation = 0.989), which implies that any changes in the characteristics of job losers over time are unrelated to the time-series movements in post-displacement employment probabilities.

The linear probability model shows substantial differences in post-displacement employment probabilities for workers of different characteristics, and I examine these directly. The first column of table 1 contains estimates of the linear probability model of post-job-loss employment at the DWS survey date that underlie the adjusted estimates of the year effects in figure 10. These estimates show that more educated workers are substantially more likely to be employed subsequent to job loss, with a college - high school gap in the employment probability of 12.5 percentage points. Older workers are less likely to be employed, with workers aged 55-64 about 16 percentage points less likely than workers aged 35-44 to be employed. Females are about 6 percentage points less likely than men to be employed, while nonwhites are about 10 percentage points less likely than whites to be employed. Workers who lost jobs with 1-20 years tenure are 3 to 4 percentage points more likely than workers who lost short-term (less than one year) job to be employed, while workers who lost jobs with more than 20 years tenure are about 8 percentage points less likely than workers who lost jobs with 1-20 years tenure to be employed. Finally, elapsed time since job loss has an important effect on the likelihood of employment at the survey date. Workers who lost jobs more than one year prior to the DWS survey date are about 20 percentage points more likely to be employed then are workers who lost a job in the year immediately prior to the survey date.

While the plot of the fraction not in the labor force (NILF) at the DWS survey date subsequent to a job loss does not show much movement over time, I calculated adjusted post-job-loss NILF rates using the same specification (controlling for education, age, sex, race, tenure on the lost job, and years since job loss) underlying figure 10 for post-job-loss employment rates. A plot of the adjusted and unadjusted post-job-loss NILF fractions are presented in figure 11. I have expanded the vertical scale to provide more definition, and

[9] The actual numbers presented for the adjusted probabilities are the coefficients on the survey year dummy variables in the linear probability model plus the measured average employment probability for the omitted survey year (1984).

Table 1: Analysis of Post-Job-Loss Employment Outcomes

Variable	(1) Employed At Survey	(2) NILF At Survey	(3) Employed Ever	(4) Weeks to Find Job	(5) Part-Time All Losers	(6) Part-Time FT Losers
Constant	0.4829	0.0892	0.6524	5.5591	0.1806	0.1881
	(0.0097)	(0.0066)	(0.0095)	(0.4763)	(0.0105)	(0.0108)
ED<12	-0.0951	0.0382	-0.0709	0.3381	0.0325	0.0370
	(0.0069)	(0.0049)	(0.0069)	(0.3789)	(0.0076)	(0.0077)
ED 13-15	0.0551	-0.0087	0.0458	-0.5488	0.0031	0.0014
	(0.0051)	(0.0036)	(0.0049)	(0.2553)	(0.0051)	(0.0051)
ED $\geq$ 16	0.1252	-0.0448	0.0977	-0.6694	-0.0336	-0.0266
	(0.0054)	(0.0036)	(0.0052)	(0.2784)	(0.0051)	(0.0051)
Age 25-34	0.0139	-0.0175	-0.0111	0.7085	-0.0518	-0.0521
	(0.0072)	(0.0049)	(0.0069)	(0.3205)	(0.0079)	(0.0084)
Age 35-44	-0.0014	-0.0224	-0.0285	1.9127	-0.0576	-0.0636
	(0.0075)	(0.0051)	(0.0071)	(0.3445)	(0.0082)	(0.0086)
Age 45-54	-0.0332	-0.0125	-0.0580	3.1313	-0.0500	-0.0557
	(0.0080)	(0.0056)	(0.0076)	(0.3800)	(0.0087)	(0.0091)
Age 55-64	-0.1612	0.1033	-0.1730	4.1555	0.0203	0.0113
	(0.0093)	(0.0071)	(0.0091)	(0.4878)	(0.0105)	(0.0110)
Female	-0.0595	0.0975	-0.0493	1.4866	0.1061	0.0987
	(0.0041)	(0.0030)	(0.0040)	(0.2149)	(0.0044)	(0.0044)
Nonwhite	-0.1062	0.0148	-0.0938	1.8781	-0.0032	0.0008
	(0.0059)	(0.0041)	(0.0059)	(0.3323)	(0.0063)	(0.0063)
Tenure 1-3	0.0314	-0.0133	0.0198	0.5842	-0.0185	-0.0262
	(0.0050)	(0.0034)	(0.0048)	(0.2384)	(0.0051)	(0.0052)
Tenure 3-10	0.0393	-0.0199	0.0183	1.9181	-0.0266	-0.0322
	(0.0060)	(0.0041)	(0.0058)	(0.3166)	(0.0059)	(0.0059)
Tenure 11-20	0.0270	-0.0031	0.0030	2.5931	-0.0302	-0.0335
	(0.0079)	(0.0057)	(0.0077)	(0.4482)	(0.0075)	(0.0075)
Tenure > 20	-0.0456	0.0711	-0.0872	3.9068	-0.0118	-0.0131
	(0.0117)	(0.0097)	(0.0117)	(0.7499)	(0.0120)	(0.0120)
2 Yrs Since Loss	0.1929	0.0064	0.2292	6.2596	-0.0323	-0.0270
	(0.0048)	(0.0033)	(0.0047)	(0.2098)	(0.0049)	(0.0049)
3 Yrs Since Loss	0.2381	0.0123	0.2850	8.9930	-0.0305	-0.0217
	(0.0049)	(0.0035)	(0.0046)	(0.2610)	(0.0050)	(0.0050)
PT Lost Job	—-	—-	—-	—-	0.3005	—-
					(0.0089)	
N	64595	64595	58986	34992	41818	37191
R-Squared	0.118	0.048	0.148	0.094	0.113	0.037

Note: Based on data from the 1984-2014 DWS. Weighted by CPS sampling weights. The base category consists of white males in 1984 aged 20-24 with 12 years of education and less than one year of tenure and who lost a job in the calendar year immediately prior to the survey date. All models include a complete set of survey year fixed effects. Robust standard errors are in parentheses.

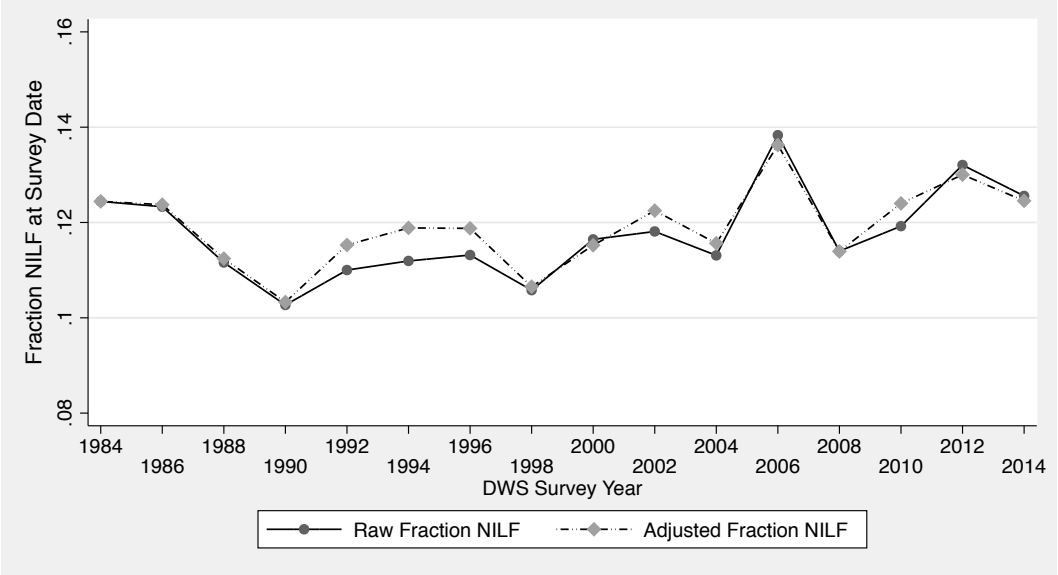

Figure 11: Fraction of Job Losers Not in the Labor Force at Survey Date, by Year

it appears that movement out of the labor force after job loss has become slightly more common since the early 1990s. Again, there is not much difference between the raw NILF fractions and the adjusted NILF fractions.

Column 2 of table 1 contains estimates of the linear probability model for being out of the labor force subsequent to job loss. I do not go through all of the results, but a few bear mentioning. First, females are about 10 percentage points more likely to exit the labor force subsequent to job loss. Second, job losers aged 55-64 are at least 10 percentage points more likely to exit the labor force than are younger job losers, perhaps moving to early retirement. Third, those who lose jobs with more than 20 years tenure are at least 7 percentage points more likely than workers with less tenure to exit the labor force. Again, this may reflect a move toward retirement, as workers who have been in their jobs more than 20 years are likely to have access to more generous pension benefits.

Workers who lose jobs may have unstable subsequent employment histories. A job loser may move in and out of jobs, at least for some period. Beginning with the 1986 DWS, job losers were asked if they ever were employed subsequent to the job loss. All job losers who were employed at the DWS survey data would answer this question affirmatively, but others, who found and then left a job after the job loss, would also answer affirmatively. Figure 12 contains plots of the fraction ever employed subsequent to the job loss overall and broken down by time since job loss. First note that there is a substantial gap between this fraction

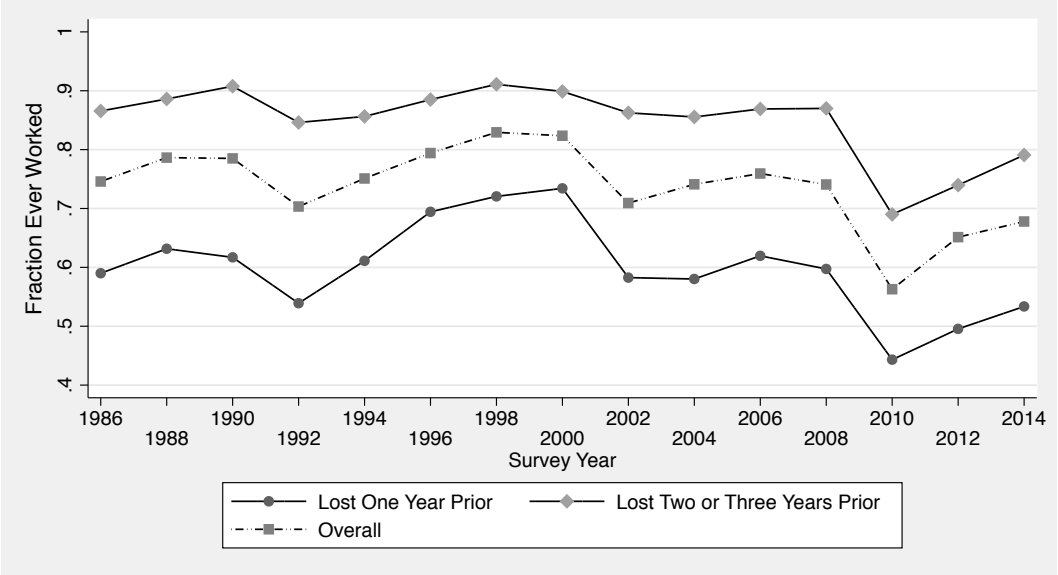

Figure 12: Fraction Ever Employed Subsequent to Job Loss, by Year

and the fraction employed at the survey date (figure 10). For example, in the great recession period (2010 DWS), about 50 percent of job losers 2007-09 where employed in January 2010 while about 56 percent of job losers 2007-2009 had held at least one subsequent job. Second, the probability of having held a job increases with the time since job loss. Again looking at job losses in the 2007-09 period, 69 percent of workers who lost jobs in 2007 or 2008 had held at least one job by January 2010. In contrast, only 44 percent of workers who lost jobs in 2009 had held at least one job by January 2010. Third, there is a clear counter-cyclical pattern to job finding that is particularly apparent in the Great Recession, and there has only been a small recovery in its aftermath. The fraction of workers who lost jobs in the 2011-13 period who subsequently found another job remains lower (at 68 percent) than in any period prior to the Great Recession.

Column 3 of table 1 contains estimates of the linear probability model for ever being employed subsequent to the job loss. Not surprisingly, the patterns here are very similar to those for survey-date employment (column 1 of the table).

Next, I examine the length of time it takes job losers to find another job. However, the DWS is not well designed to study this question. The core question in the DWS, included in the survey from 1988 on, is "After that job [referring to the lost job] ended, how many weeks went by before you started working again at another job?" However, this question is asked of all job losers only from 1988-1992. From 1996 on the question is asked only of job

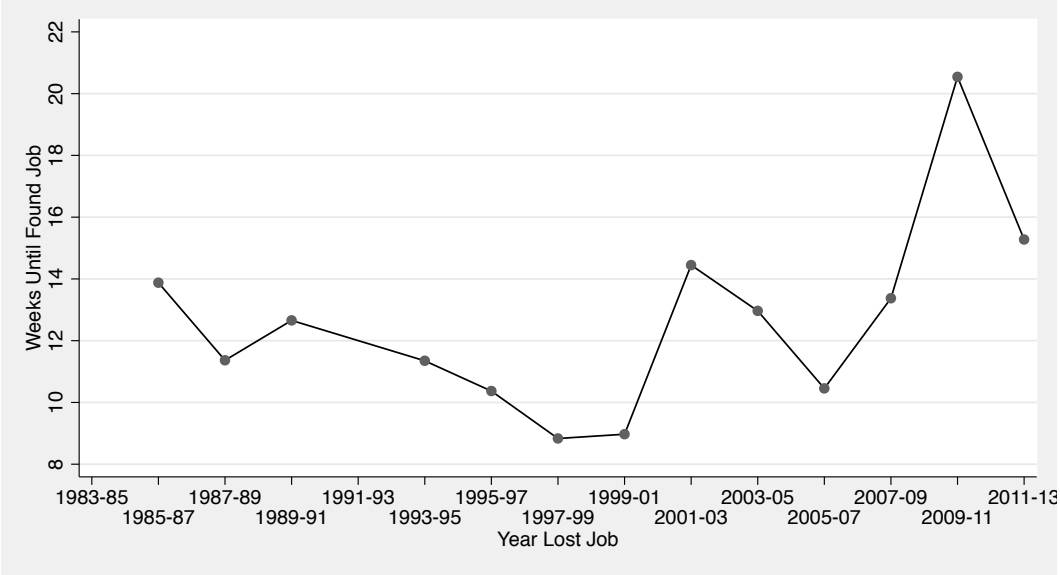

Figure 13: Average Weeks to Find a Job Conditional on Ever Employed, by Year

losers who found another job.[10] Therefore, consistent data are available from the 1988-92 and 1996-2014 DWSs, and there is no consistent information for job losers who did not find another job.

I proceed with an analysis of average weeks to find a job conditional on finding a job. This is plotted in figure 13. The time to find a job increased dramatically from 2005-07 to 2009-11 after declining from the mid 1980s through 2000. The job-finding time fell in most recent period (2011-13), but it is still higher than any pre-Great-Recession period. The multivariate analysis of job-finding time, contained in column 4 of table 1 shows small differences by education (a college high-school gap of less than one week) but large gaps by age. Reemployed job losers who are 45-64 take 3-4 weeks longer to find jobs than the youngest job losers. Similarly, reemployed high-tenure job losers take longer to find a new job. The relationship is monotone. Relative to workers who lost very short jobs, those who lost a job with 3-10 years tenure take 2 weeks longer to find a job while those with more than 20 year tenure on the lost job take 4 weeks longer. Reemployed females and nonwhites take one to two weeks longer to find jobs.

Interestingly, those who lost their job more than one year ago take substantially more time to find their new job (6 to 8 weeks more). It may be that those who report losing a

[10] The data are miscoded (largely missing) in 1994.

job in the year immediately prior to the survey have not had much time to search (and so mechanically cannot report long durations). This is also consistent with the pattern of lower employment probabilities for those who lost jobs in the year prior to the survey (columns 1 and 3 of table 1).[11] Another explanation may be related to recall bias (Topel, 1990). If, with the passage of time, job losses with more serious consequences are more likely to be recalled, then the job losses reported having happened more than one year before the survey date would be more likely those with longer post-job-loss spells of non-employment.

The overall pattern that I have described in this section and summarized in figures 9-13 highlight just how serious the effect of the Great Recession was on the ability of job losers to find employment. The perhaps surprising general finding is that even by 2013 (the last year covered by the DWS and 4 years after the end of the Great Recession) is that the ability of workers to find jobs remains compromised. None of the measures I have presented and discussed has returned to what would have been considered normal levels prior to the Great Recession.

6 Consequences of Job Loss: Job Quality

6.1 Post-Displacement Full-Time/Part-Time Status

Many reemployed job losers are employed part time subsequent to job loss. Some of these workers lost part-time jobs but many had lost full-time jobs. In addition to having lower weekly earnings, it is well known that part-time workers have substantially lower hourly wage rates and less access to fringe benefits like health insurance than do full-time workers (Farber and Levy (2000)). The DWS collects information on part-time status (less than 35 hours per week) on the lost job, and it is straightforward to compute part-time status on post-displacement jobs from the standard CPS hours information. The analysis in this section focuses only on individuals employed at the survey date, and all part-time rates are computed based on this group of workers.

Figure 14 contains plots of part-time status on the lost job and the new job. The fact that a substantially higher fraction of post-job-loss jobs than lost jobs are part time, implies that a potentially important cost of job loss is movement from full-time to part-time employment. The rate of part-time employment after jobs loss has been increasing since 2000 and jumped sharply in the Great Recession, from 17.7 percent in 2008 to 23.6 percent in 2010. Once

[11] It is unfortunate, that the DWS does not collect information on the precise date of job loss.

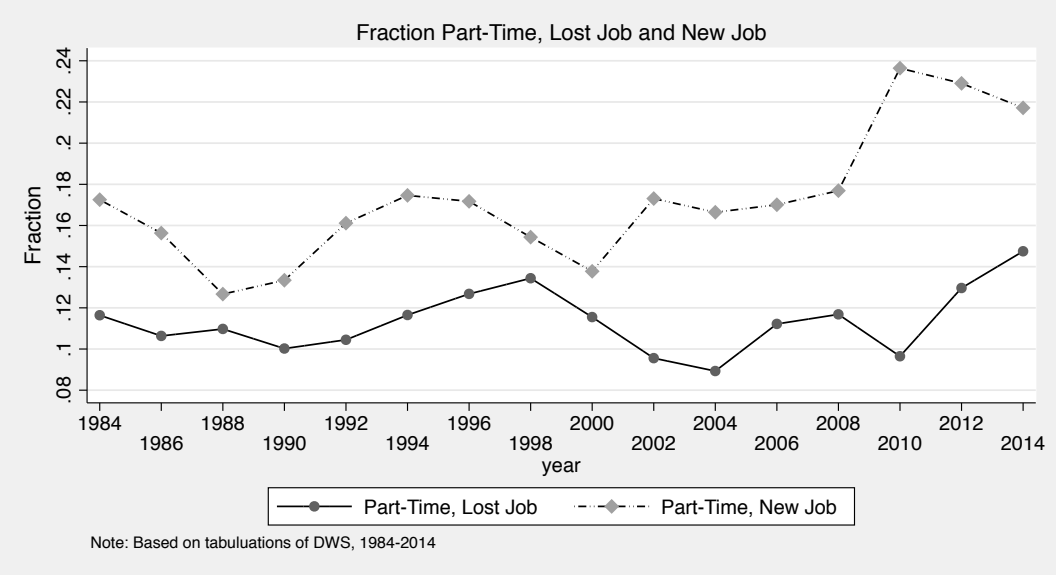

Figure 14: Fraction Part-Time, Lost Job and New Job

again, there has been only an incomplete recovery in since 2010, but the post-job-loss part-time rate remains higher than in any previous period (at 21.7 percent in 2014).

Another perpsective on these data is provided by figure 15, which contains a plot of the fraction of employed job losers who are employed part-time at each survey date conditional on part-time status on the lost job.[12] Not surprisingly, workers who lose part-time jobs are substantially more likely to be working on part-time jobs at the survey date. Many of these workers are part-time due to labor supply choices, and it is reasonable to expect that these workers would continue to choose to work part time. It is noteworthy, then, that on the order of 50 percent of part-time job losers are working full-time at the survey date, although this fraction has decreased substantially since the late 1980s. Among reemployed part-time job losers in the 2007-09 period, about 46 percent were working full-time in January 2010.

In terms of the cost of job loss, the more interesting group to study consists of those workers who lost full-time jobs. Between 10 and 15 percent of these job losers were working part-time at the survey dates from 1984-2008. The part-time rate among full-time job losers increased substantially to 20 percent in 2010. Thus, even among the 50 percent of job losers

[12] Note that there is a problem of temporal comparability of the data on part-time employment at the survey date. The new survey instrument, first used in the 1994 CPS, asks a different battery of questions about hours of work on the current job, and this may have the effect of raising the fraction of workers reporting they are currently working part time (Polivka and Miller, 1998). The survey question regarding whether the lost job was part-time is unchanged in the 1994 and later DWSs.

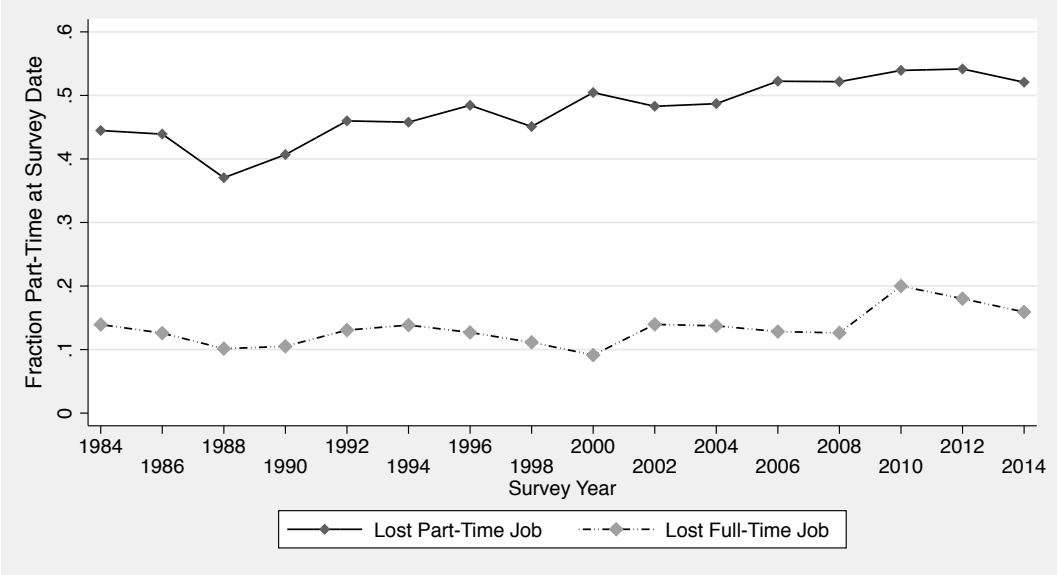

Figure 15: Fraction Part-Time at Survey Date, by Part-time Status on Lost Job

who were reemployed in January 2010, a substantial fraction of full-time job losers did not find full time employment. Again, there has been only a partial recovery from the Great Recession. The part-time rate among full-time job losers fell from 20 percent in January 2010 to 15.9 percent in January 2014, higher than at any point prior to the Great Recession.

Columns 5 and 6 of table 1 contain a pair of multivariate analyses of the probability of part-time employment. The first analysis, in column 5, is an analysis of the probability of part-time employment among all job losers, both full-time and part-time, and includes a control for part-time status on the lost job. Not surprisingly given that part-time status is strongly influenced by labor supply, losers of part-time jobs are 30 percentage points more likely than full-time job losers to be working on a part-time job at the DWS survey date. There are some other regularities. Females are about 10 percentage points more likely to be working part-time after job loss, even after accounting for part-time status on the lost job. The post-job-loss part-time rate is negatively related to education. With regard to age, the youngest (aged 20-24) and oldest (aged 55-64) job losers are, 5 and 7 percentage points repsectively, more likely to be in part-time jobs subsequent to job loss. This may reflect young job losers returning to school and old job losers moving toward retirement. Interestingly, the post-job-loss part-time rate is significantly higher for workers who lost a job in the year immediately preceding the DWS survey date. This suggests that some job losers may take part-time jobs while they continue to search for full-time employemnt. The

second analysis of part-time employment, in column 6 of table 1, focuses on full-time job losers only, and the results are very similar to those for all job losers.

The conclusion from the analysis of part-time vs. full-time employment after job loss is that an important component of the cost of job loss is the inability of a substantial fraction of job losers, especially full-time job losers, to find a full-time job. This problem was particularly severe in the Great Recession but remains a problem even for workers who lost jobs in the 2011-2013 period.

6.2 Decreased Weekly Earnings Due to Displacement

The analysis of the decrease in weekly earnings of reemployed displaced workers proceeds in two stages. First, I investigate the change in earnings between the lost job and the job held at the DWS survey date. However, had the displaced worker not lost his or her job, earnings may have grown over the interval between the date of job loss and the DWS survey date. While it is not possible to know what the counterfactual course of wages would have been absent displacement, one potential estimate is to use the earnings of observationally similar workers who were not displaced over the same period. Thus, second, I create estimates of the weekly earnings decrease suffered by displaced workers, including both the decline in earnings of the displaced workers and the increase in earnings over the same period experienced by non-displaced workers. In order to measure this earnings drop, a control group of non-displaced workers is required, and, later in this section, I provide such a control group using data from the CPS outgoing rotation groups.

6.2.1 Difference Estimates of the Change in Earnings as a Result of Job Loss

I begin the analysis of earnings changes by examining the difference in real weekly earnings for job losers between the post-displacement job and the job from which the worker was displaced.[13] The solid line in figure 16 shows the average proportional decline, by survey year, in real weekly earnings between the lost job and the survey-date job for all workers who lost a job, were reemployed at the survey date, and were not self-employed on either the lost job or the new job. It is clear that there is a cyclical component to the earnings decline, with larger declines in slack labor market periods. The average earnings decline in

[13] Earnings are deflated by the 1982-84=100 consumer price index (CPI). The CPI in the reported year of displacement is used to deflate earnings on the old job. The CPI for the DWS survey month is used to deflate current earnings.

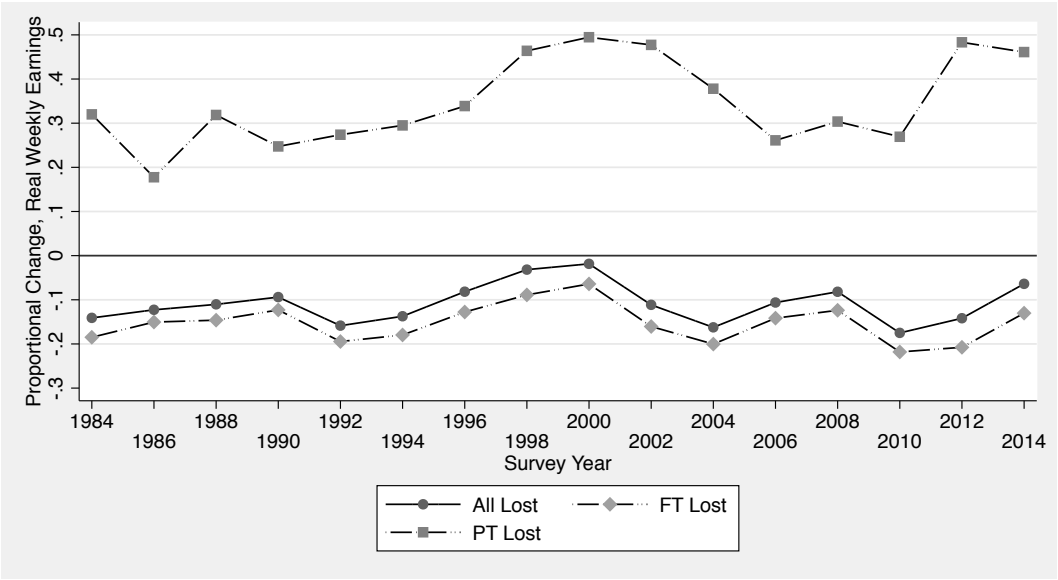

Figure 16: Proportional Change in Real Weekly Earnings for Job Losers

the Great Recession is the largest in my sample period at 17.5 percent. This compares with a decline of 14.1 percent in 1984 and 15.9 percent in 1992. In contrast to the incomplete recovery in the aftermath of the Great Recession of the employment measures I examined, the average earnings decline of job losers was much less severe, with a decline of only 6.4 percent for jobs lost 2011-13.

Because my measure of earnings is weekly, part of the measured earnings change reflects voluntary or involuntary hours change (movement to or from full-time work). The lower dashed line in figure 16 is the average earnings change of full-time job losers. Not surprisingly, this closely parallels the earnings change of all job losers (correlation 0.986) because most reported loss is of full-time jobs (almost 90 percent). The reason full-time job losers have larger average earnings declines is that some full-time workers are reemployed on part-time jobs (figure 15). The upper dashed line in figure 16 is the average earnings change of part-time job losers. This is positive in every period because many losers of part-time jobs are employed subsequently on full-time jobs (48 percent overall, figure 15). In summary, job losers suffer substantial earnings declines on average, and the average decline was largest for jobs lost in the Great Recession.

Given that a large majority of job losers lost full-time jobs, I focus on the experience of these workers. The solid line in figure 17, which reproduces the lower dashed line in the figure 16, is the average earnings change of full-time job losers. The upper dashed line

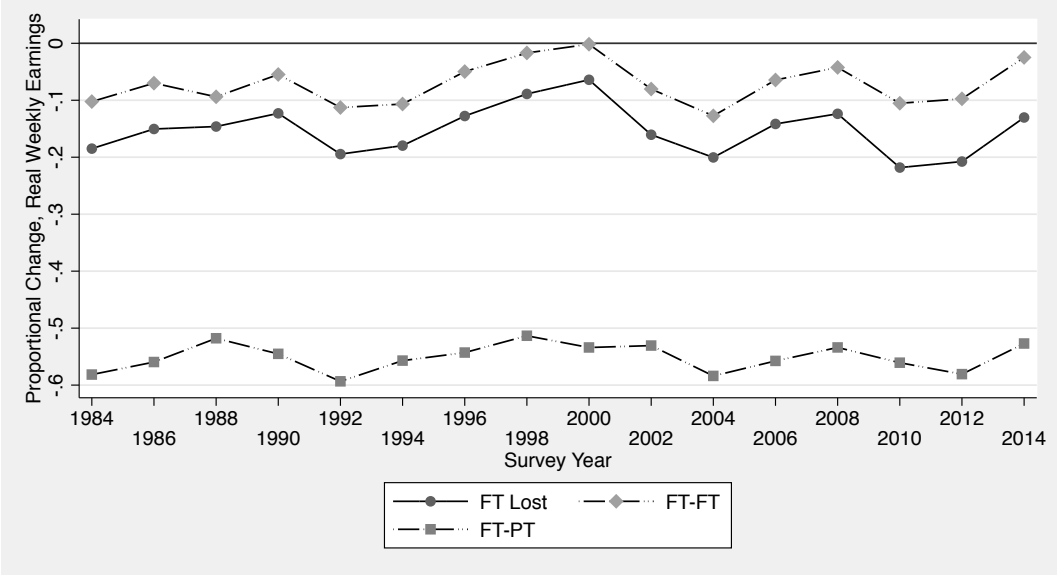

Figure 17: Proportional Change in Real Weekly Earnings for Full-Time Job Losers

in figure 17 is the average earnings change of job losers who make a full-time to full-time transition. This closely parallels the earnings change of all full-time job losers (correlation 0.927) because most reemployed full-time job losers are reemployed full time. (86.8 percent). The lower dashed line in figure 17 is the average earnings change of job losers who have made a FT-PT transition. This is substantial and negative, because of the decline in weekly hours in moving from full-time to part-time.

All of these series show a cyclical pattern, with larger earnings declines in weaker labor markets. That this decline is largest for job loss during the Great Recession (2010 DWS) is due largely to the higher incidence of part-time employment on the new job among both full-time and part-time job losers. The earnings decline holding FT-PT status fixed is not particularly large in this period relative to other slack labor market periods.[14]

In table 2, I present the results of multivariate regression analyses of the log earnings change of reemployed displaced workers, controlling for year, education, age, race, sex, tenure on the lost job, and years since job loss. The estimates in the first column of the table refer to all job losers, and there are important regularities. Job losers with at least a 4-year college education have a significantly smaller wage decline than do high school graduates. Older job losers suffer substantially larger earnings declines, with the oldest group (aged 55-64)

[14] The differences between the earnings decline holding FT-PT status fixed between 2010 and earlier slack labor market periods (1984, 1992, 1994, and 2004) are not statistically significant.

Table 2: Analysis of Earnings Change of Job Losers (Reemployed Job Losers)

	(1)	(2)	(3)	(4)	(5)	(6)
Variable	All Losers	All Losers	FT Losers	PT Losers	FT-FT	FT-PT
Constant	-0.0240	-0.0065	-0.1242	0.4013	-0.0218	-0.6460
	(0.0208)	(0.0190)	(0.0209)	(0.0743)	(0.0195)	(0.0722)
ED<12	-0.0455	-0.0192	-0.0321	-0.1774	-0.0209	0.0783
	(0.0135)	(0.0125)	(0.0138)	(0.0502)	(0.0130)	(0.0430)
ED 13-15	-0.0128	-0.0276	-0.0191	-0.0598	-0.0072	-0.1065
	(0.0110)	(0.0100)	(0.0110)	(0.0396)	(0.0101)	(0.0385)
ED $\geq$ 16	0.0428	0.0016	0.0244	0.1567	0.0191	-0.2092
	(0.0116)	(0.0104)	(0.0111)	(0.0506)	(0.0100)	(0.0485)
Age 25-34	-0.0583	-0.0368	-0.0293	0.1233	-0.0467	-0.1512
	(0.0153)	(0.0142)	(0.0156)	(0.0444)	(0.0158)	(0.0446)
Age 35-44	-0.1064	-0.0871	-0.0710	0.0242	-0.0972	-0.1901
	(0.0164)	(0.0153)	(0.0165)	(0.0583)	(0.0165)	(0.0501)
Age 45-54	-0.1157	-0.0930	-0.0894	0.0683	-0.1178	-0.1415
	(0.0177)	(0.0163)	(0.0178)	(0.0600)	(0.0176)	(0.0549)
Age 55-64	-0.2037	-0.1366	-0.1941	0.0308	-0.1502	-0.2621
	(0.0233)	(0.0211)	(0.0232)	(0.0849)	(0.0224)	(0.0628)
Female	-0.0227	0.0071	-0.0622	-0.1590	0.0114	0.0201
	(0.0091)	(0.0081)	(0.0090)	(0.0377)	(0.0080)	(0.0319)
Nonwhite	-0.0176	-0.0161	-0.0156	0.0213	-0.0132	-0.0386
	(0.0132)	(0.0118)	(0.0130)	(0.0493)	(0.0121)	(0.0424)
Tenure 1-3	-0.0481	-0.0389	-0.0061	-0.1478	-0.0084	-0.1166
	(0.0107)	(0.0097)	(0.0103)	(0.0404)	(0.0093)	(0.0394)
Tenure 3-10	-0.1230	-0.1112	-0.0726	-0.2193	-0.0797	-0.2105
	(0.0124)	(0.0112)	(0.0122)	(0.0520)	(0.0111)	(0.0452)
Tenure 11-20	-0.1979	-0.1811	-0.1483	-0.1451	-0.1409	-0.4195
	(0.0195)	(0.0179)	(0.0192)	(0.1074)	(0.0178)	(0.0728)
Tenure >20	-0.3445	-0.3067	-0.2606	-1.0885	-0.2020	-0.7411
	(0.0335)	(0.0308)	(0.0282)	(0.8165)	(0.0244)	(0.0929)
2 Yrs Since Loss	0.0329	0.0177	0.0446	0.0061	0.0197	0.0631
	(0.0105)	(0.0095)	(0.0102)	(0.0426)	(0.0090)	(0.0383)
3 Yrs Since Loss	0.0295	0.0214	0.0412	0.0834	0.0171	0.0864
	(0.0109)	(0.0099)	(0.0109)	(0.0408)	(0.0100)	(0.0385)
PT Lost Job	—-	0.6861	—-	—-	—-	—-
		(0.0177)				
PT New Job	—-	-0.7262	—-	—-	—-	—-
		(0.0148)				
N	31921	31921	28357	3564	24733	3624
R-Squared	0.031	0.209	0.031	0.043	0.028	0.073

Note: Based on data from the 1984-2014 DWS. Weighted by CPS sampling weights. The base category consists of white males in 1984 aged 20-24 with 12 years of education and less than one year of tenure and who lost a job in the calendar year immediately prior to the survey date. All models include a complete set of survey year fixed effects. Robust standard errors are in parentheses.

suffering a 20 log point larger decline than do workers aged 20-24. Middle aged job losers (aged 35-54) suffer a 10 log point larger decline. There is a very strong relationship between the change in earnings and tenure on the lost job. The average earnings decline is much larger when the worker had accumulated substantial tenure on the lost job (34 log points for workers who lose a job with more than 20 years tenure). This is consistent with the destruction of job or industry specific human capital when a long-term job ends.[15] There are only small differences by sex and race, and workers who lost a job more than one year prior to the survey date have slightly smaller earnings losses.

Given that an important component of earnings changes are due to movement from full-time to part-time or the reverse, I reestimated the model including indicators for part-time status on the lost and new jobs. These estimates are contained in column 2 of table 2, and they indicate, not surprisingly, that hours on the lost and new jobs strongly affect the change in weekly earnings.[16] The effects are approximately equal in magnitude and of opposite sign, with the change in earnings 69 log points higher if the lost job was part time and 73 log points lower if the new job is part time. This implies that workers making a part-time to part-time transition have about a 4 percentage point larger earnings decline than do workers who make a full-time to full-time transition. The general pattern of results with respect to the other variables included in the model are similar to that seen in column 1 of the table.[17]

The next two columns of table 2 consider full-time and part-time job losers separately. The estimates for full-time job losers in column 3 show a similar pattern to those for the overall sample in column 1. This is not surprising given that most job loss is of full-time jobs. The estimates for part-time job losers are somewhat noisy given the small size of the sample, though it appears that females who report losing a part-time job suffer substantially larger earnings declines (about 16 log points) than do males.

The final two columns of table 2 examine the experience of full-time job losers separately by whether they made a FT-FT transition or a FT-PT transition. The estimates for the FT-FT group are in column 5, and they show very little relationship with education. Age and tenure continue to have strong negative effects on earnings decline though not as large as for all losers (column 1) or all full-time losers (column 3). The estimates in the last column of

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[15] Kletzer (1989), Neal (1995), and Parent (2000) address the issue of job loss and specific capital, both at the firm and industry level. See also Podgursky and Swaim (1987), Topel (1990), and de la Rica (1992).

[16] This drives the increase in the R-squared from 0.03 when hours are not accounted for (column 1) to 0.21 when hours are accounted for (column 2).

[17] One exception is that, once part-time status on the lost and new jobs are accounted for, there is no difference in the earnings change between job losers with high school and 4-year college educations.

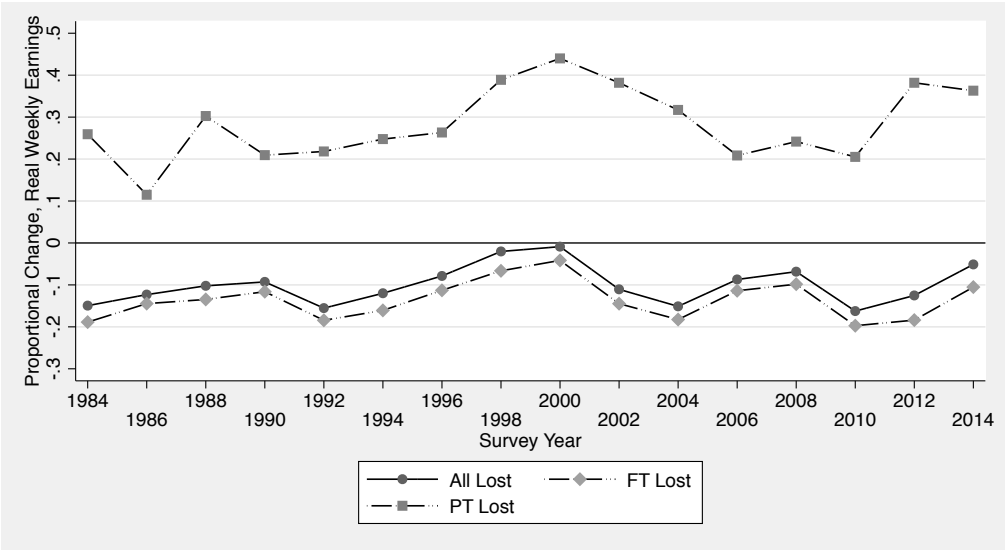

Figure 18: Proportional Change in Real Weekly Earnings for Job Losers, Regression Adjusted

table 2, for job losers who make a FT-PT transition show stark differences. College graduates who make a FT-PT transition suffer much large earnings losses (about 21 log points) than do high school graduates who make the same transition. In addition, age and tenure have much larger effects on the earnings loss for workers making at FT-PT transition. Taken together, the results in columns 5 and 6 of table 2 are consistent with the idea that when high wage workers (more educated, older, higher tenure) lose a full-time job and do not find another full-time job, their earnings declines are substantial, perhaps reflecting a sharp drop in the skill requirements from the lost full-time job to the new part-time job. The was a particularly serious problem in the Great Recession and its aftermath given the relatively high rate of post-displacement part-time employment.

The estimated differences in earnings decline by year are not shown for the various models estimated in table 2 but are presented graphically. Figure 18 contains plots of the year effects associated with the estimates in columns 1, 3, and 4 of the table for all job losers, full-time job losers, and part-time job losers respectively. They are normalized to the 1984 mean earnings loss for the appropriate group to facilitate comparison with the unadjusted earnings losses by year shown in figure 16. These regression adjusted average earnings losses by year are slightly attenuated relative to the unadjusted earnings losses but otherwise show very similar time-series movement.

Figure 19 contains the analogous plots of the year effects associated with the estimates in columns 3, 5, and 6 of table 2, focusing on full-time job losers overall and by type of

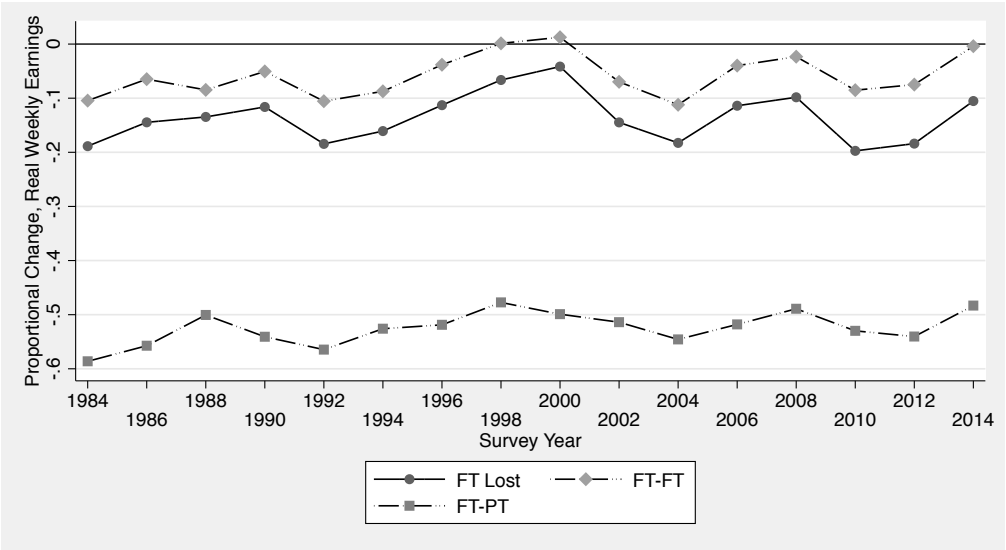

Figure 19: Proportional Change in Real Weekly Earnings for Full-Time Job Losers, Regression Adjusted

transition (full-time job losers, job losers with a FT-FT transition, and job losers with a FT-PT transition respectively. These are somewhat attenuated relative to the unadjusted earnings losses shown in figure 17 but otherwise show very similar time-series movement.

6.2.2 Difference-in-Difference Estimates of the Effect of Job Loss on Earnings

In order to provide an estimate of the extent to which earnings might have grown had workers not been displaced, I generate a comparison group of workers using a random sample from the merged outgoing rotation group (MOGRG) files of the CPS for the three calendar years prior to each DWS (period 0) together with all workers from the outgoing rotation groups of the CPSs containing the DWSs (period t). The data from MOGRG files of the CPS provide the period 0 earnings, and the data from the outgoing rotation rotation groups in the CPSs containing the DWSs provide the period t earnings.

This analysis is restricted to full-time workers. In particular, the job losers considered are only those who are reemployed and make full-time to full-time transitions. As such, it will understate the true earnings loss of displacement for two reasons. First, it considers only those who are reemployed (50 percent of job losers in the Great Recession and about 60 percent in the most recent period). Second, it ignores the fact that many full-time job losers are reemployed in part-time jobs (about 20 percent in the Great Recession and 16 percent in the most recent period), offset to some extent by those part-time job losers who

are reemployed in full-time jobs.

Define the change in log real earnings for displaced workers as

$$\Delta_d = (lnW_{dt} - lnW_{d0}), \tag{1}$$

and define the difference in log real earnings for workers in the comparison group as

$$\Delta_c = (lnW_{ct} - lnW_{c0}), \tag{2}$$

where d refers to displaced workers (the "treatment" group), c refers to non-displaced workers (the "control" group), t refers to "current" (post-displacement) period, and 0 refers to the "initial" (pre-displacement) period. The difference-in-difference estimate of the change in log real weekly earnings due to job loss in is computed as

$$\Delta\Delta = \Delta_d - \Delta_c. \tag{3}$$

To the extent that average earnings would have grown rather than declined in the absence of displacement, Δ_c will be positive so that the difference-in-difference estimate of the average earnings decline ($\Delta\Delta$) will be larger in absolute value than the simple difference estimate (Δ_d).

I generate initial earnings for the comparison group (lnW_{g0}) from a random sub-sample of the merged outgoing rotation group CPS file (MOGRG) each year from 1981-2013.[18] The resulting comparison sample of initial earnings for full-time workers contains 174,736 observations.The CPSs containing the DWSs have two outgoing rotation groups (OGRGs) with earnings data for all workers. These provide the observations on current earnings for the comparison group of non-displaced workers (lnW_{gt}). This sample contains observations on full-time earnings for 181,799 workers at the DWS survey date.

The data for the treatment group (job losers) come from the DWSs, where lnW_{dt} is survey-date earnings for displaced workers and lnW_{d0} is earnings on the lost job. The pre-displacement sample consists of all displaced workers who were not self-employed but were

[18] The size of the random sample was set so that 1) the size of the sample with initial earnings on the control group was expected to be the same size as that with current earnings on the control group (two rotation groups) and 2) the distribution of years since the associated DWS survey date roughly mimicked the distribution of years since displacement in the sample of displaced workers. In other words, a separate control sample was drawn for each DWS from the three MOGRGs for the years immediately prior to the DWS that reflected the distribution of time since job loss. Each MOGRG file has 24 rotation groups (2 per month for 12 months). Denote the share of reported job loss one, two, and three years prior to the survey date t as p_{1t}, p_{2t}, and p_{3t} respectively. In order to get the appropriate sample size in survey year t, I took a random sample with probability $(p_{1t})(2)/24$. Similarly, for the second and third years prior to to the DWS I took random samples with probability $(p_{2t})(2)/24$ and $(p_{3t})(2)/24$, respectively.

employed full-time on the lost job and who were employed with earnings available at the survey date (n=30,106). The postdisplacement sample consists of all displaced workers who were not self-employed but were employed full-time at the survey date and who had earnings data available on the lost job (n=26,850).

The difference-in-difference estimates are derived using these data from separate ordinary least squares (OLS) regressions for each DWS survey year of log real earnings (deflated by the CPI) on a set of worker characteristics and an indicator for time period (before or after displacement), an indicator for whether the observation is part of the "contaminated" control sample or part of the displacement sample, and the interaction of the time period and sample indicators.[19] This is of the form year of the form

$$lnW_{is} = X_{is}\beta + \gamma_1 T_s + \gamma_2 D_i + \gamma_3 T_s D_i + \epsilon_{is}, \tag{4}$$

where lnW_{is} measures log real full-time earnings for individual i in period s (either 0 or t), X is a vector of individual characteristics, β is a vector of coefficients, T_s is a dummy variable indicating the post-displacement period, D_i is a dummy variable indicating the displacement sample, and ϵ is an error term.[20] The estimates of the parameters γ_j are used along with information from the DWS on period-specific job loss rates to adjust for the fact that the control group from the MOGRG data in period 0 is "contaminated" with job losers to compute estimates of the earnings effects[21] My adjustment procedure is described in Appendix I.

Figure 20 contains the overall regression-adjusted difference-in-difference estimates of the proportional earnings change from job loss for each year.[22] In order for the figure to be clearly readable, the earnings decline for displaced workers in presented as a positive

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[19] Note that I do not calculate first-differenced estimates for the displaced workers, as I did in section 6.2.1, despite the fact that the observations are paired. This is because observations for the control group are from a set of cross-sections and are not paired. I do not account for the correlation over time in the two observations for each displaced worker.

[20] The X vector includes a constant, dummy variables for sex, race, nine age categories, and four educational categories.

[21] Ideally, the comparison groups based on the MOGRG samples would contain only workers who had not lost a job during the relevant period. While I can identify the non-displaced workers in period t (since the data come from the CPSs with DWSs), I cannot identify the non-displaced workers in the period 0 MOGRG samples.

[22] Note that the differences (or DIDs) in log earnings are approximations to the appropriate proportional differences (or DIDs) in earnings. I transform the differences in log earnings to proportional differences using the usual relationship that, with a log difference of δ, the proportional difference is $e^{\delta} - 1$. The difference-in-difference estimate plotted in the figure is then calculated as the difference of the transformed differences ($\Delta\Delta = e^{\Delta_d} - e^{\Delta_c}$).

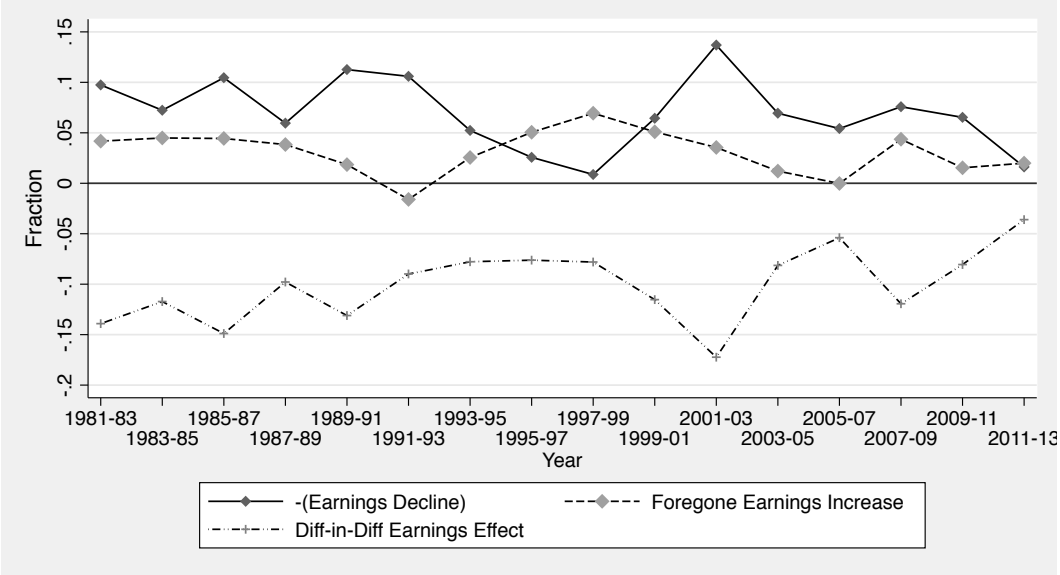

Figure 20: Proportional Earnings Loss, Difference-in Difference Analysis, FT-FT transitions.

number (the negative of the earnings change for displaced workers: $-\Delta_d$). The foregone earnings increase is Δ_c, and the difference-in-difference earnings effect is $\Delta\Delta$. Note that these estimates incorporate the effect of normal growth along the age-earnings profile. This is because the age variables in the regression are measured at the DWS survey date (period t) for both the period 0 and period t observations.[23]

The results show that in the 1980s displaced workers earned about 9 percent less on average after displacement than before while earnings for the control group rose by about 4.5 percent over the same period. The difference-in-difference estimate of the earnings loss is the difference between these numbers, which is a loss of about 13 percent during the 1980s.[24] The 1990s show a different pattern. The earnings decline of displaced workers in the 1990s dropped sharply during the decade, from 11.3 percent in the 1989-91 period to a statistically insignificant 0.9 percent in 1997-99. During the same period, the earnings growth of the control group increased from 1.8 percent in 1989-91 to 6.9 percent in 1997-99, reflecting a general increase in real wages in the late 1990s. The difference-in-difference estimate of the

[23] This is one reason why it is important that the sample fractions in the initial-earnings control group mimic the fractions in the treatment group with respect to the time until the DWS survey date. See footnote 18.

[24] Since in the figure I present the earnings decline rather than the earnings change for displaced workers, the difference-in-difference estimate is the negative of the sum of the earnings decline for displaced workers and the foregone earnings increase.

earnings loss associated with job loss decreased during the 1990s (from a high of 13.1 percent in 1989-91 to a low of 7.8 percent later in the decade), reflecting the fact that the earnings decline suffered by displaced workers fell by more than the increase in earnings growth among the comparison group.

The picture changed in the 2000s. The foregone earnings increase fell from 5.9 percent in 1997-1999 to zero in 2005-2007 while the earnings decline suffered by displaced workers increased substantially from 0.9 percent in the 1997-99 period to 13.7 percent in 2001-03 before declining to 5.4 percent in 2005-2007. In the period covering the Great Recession (2007-09), the earnings decline of job losers making a FT-FT transition is 7.6 percent with a foregone earnings increase of 4.4 percent. This implies a total earnings loss from job displacement for these workers of 12 percent, which is not unusually large by historical standards. In the aftermath of the Great Recession earnings losses from both sources have fallen. By 2011-2013, the earnings decline of job losers was 1.6 percent with a foregone earnings increase of 2 percent for a total earnings loss of 3.6 percent, the lowest in the sample period.

7 Concluding Remarks

My estimates of the costs of job loss based on the DWS show that displacement imposes a significant economic burden on job losers. The first part of these costs are in the form of difficulty in finding new employment and, importantly, difficulty in finding full-time employment. This component of costs was particularly severe for workers losing jobs in the Great Recession, when only 50 percent of job losers reported being employed at the next DWS survey date (January 2010). And almost 25 percent of those job losers who did find jobs were employed full time. Even among losers of full-time jobs between 2007 and 2009, only about 52 percent were employed in January 2010 and only 80 percent of those were reemployed in a full-time job. Thus, only about 35-40 percent of those in the DWS who reported losing a job from 2007-2009 period were employed full-time in January 2010. This was by far the worst post-displacement employment experience in the sample period (1981-2014).

Importantly, the adverse employment experience of job losers continued beyond the Great Recession. While employment rates and full-time employment rates improved, those who lost jobs even two to four years after the Great Recession (2011-2013) had very low employment rates and very low full-time employment rates by historical standards. This is consistent with the rather slow decline in the unemployment rate and the continuing high level of long-term unemployment in the aftermath of the Great Recession. The long run consequences

of the decreased ability to find employment subsequent to job loss and resulting long spells of unemployment may be self-reinforcing in that some of these job losers, perhaps by being scarred by a long spell of unemployment or simply perceived by employers as less able workers, may have serious long-run difficulty in finding work.[25] The second part of the cost of job loss concerns post-displacement earnings on new jobs relative to earnings on the lost job. While my analysis of the DWS shows substantial weekly earnings declines for reemployed job losers (even those reemployed full-time), the earnings losses were not especially large by historical standards in the Great Recession or its aftermath.

The earnings declines I estimate generally are smaller than those that are derived using administrative data.[26] This is true for several reasons. Importantly, the concept of earning change that I estimate using the DWS, weekly earnings for full-time workers, is more like a wage rate. In contrast, the administrative data, typically from UI or Social Security records, records quarterly earnings. Quarterly hours are likely be quite variable across weeks within a quarter relative to the weekly hours of a full-time worker, particularly after a job loss. Immediately after job loss, there will be whole or part quarters during which workers are without jobs. Additionally, The earnings loss measure from administrative data includes the loss in quarterly earnings that comes from a move from full-time to part-time employment that is a consequence of job loss I document using the DWS. And, to the extent that the employment experience of workers subsequent to job loss is less secure, there are likely to be partial quarters of non-employment even later. The result will be continued lower earnings that are due to lower hours worked as well as potentially lower weekly earnings when employed full time.

The earnings decline measure from the DWS is appropriate for understanding how job loss affects the earnings that a full-time employed former job-loser is able to command (essentially a wage rate). This is important for understanding a range of important issues. One example is the relationship between earnings loss and tenure focusing on the potential importance of specific capital (Kletzer, 1989; Topel, 1990; Neal, 1995; Parent, 2000). However, the DWS measure of weekly earnings change alone does not capture the full earnings cost of job loss

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[25] Kroft, Lange, and Notowidigdo (2013) find in an audit study that the callback rate for job applications "submitted by" younger workers (less than 35 years of age) is negatively related to the duration of unemployment.

[26] The large earnings losses found in administrative data were highlighted by Jacobsen, LaLonde, and Sullivan (1993). von Wachter, Handwerker, and Hildreth (2009) explicitly investigate reasons why the DWS and administrative data from California in the 1990s seem to yield different measures of earnings loss. Couch and Placzek (2010) and Davis and von Wachter (2011) are other examples of relatively large estimates of earning loss after displacement.

because it does not account for time spent without a job or time spent working part-time after loss of a full-time job. I did examine post-job-loss employment rates and part-time employment rates based on the DWS and found strong adverse effects. However, the DWS lacks detailed information on the timing of job loss and any subsequent reemployment that would make it very difficult to calculate a dollar value of total lost earnings due to the loss of a particular job.

The administrative data are perhaps better suited than the DWS to measure the overall dollar cost of job loss. First, the administrative data measure total earnings directly. Second, the administrative data offer the possibility of following individuals for many quarters after the job loss in order to measure the intermediate and long-run earnings loss. In contrast, the DWS measures earnings in a single week (at the time of the DWS) and cannot get at long-run costs. However, the DWS may dominate the administrative data in the demographic detail available that allows investigation of how the cost of job loss varies by worker characteristics. Additionally, the DWS provides the the ability to examine more detailed measures of outcomes, such as hours of employment.

The measures I focused on likely substantially understate the true economic cost of job loss. First, time spent unemployed by those workers who are reemployed is not considered. Second, more hinges on employment, particularly full-time employment, in the U.S. than in other developed countries. Health insurance and pensions are closely linked to employment, and many workers do not have alternative access to these important benefits. This makes job loss an expensive and damaging event on average.

To conclude, while job loss is a fact of life in the U.S., the employment consequences of job loss in the Great Recession have been unusually severe and remain substantial years later. Most importantly, job losers in the Great Recession and its aftermath have been much less successful at finding new jobs (particularly full-time jobs) than in earlier periods. The decreased ability of job losers in recent years to find new employment reinforces the findings from studies of job loss using administrative data that job loss has very long run adverse consequences for employment and earnings.

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APPENDIX I – Details of the Difference-In-Difference Procedure

The observed log wage change of workers in the outgoing rotation groups (which include both displaced and non-displaced workers) is a probability-of-job-loss weighted average of the change in log earnings for displaced and non-displaced workers. Define the change in log earnings for the outgoing rotation groups as

$$\Delta_g = (1-\theta)\Delta_c + \theta\Delta_d, \tag{5}$$

where Δ_g is the log earnings change in the outgoing rotation group sample ($lnW_{gt} - lnW_{g0}$) and θ is the fraction of workers in the outgoing rotation group sample who lost a job (the displacement rate).

The observable quantities are Δ_g and Δ_d, but calculation of the difference-in-difference estimate of the log earnings change due to job loss requires both Δ_d and Δ_c (equations 1 and 2).[27] I can compute Δ_c with the available data on Δ_g, Δ_d, and θ. Using equation 5, the change in log earnings for the comparison group is

$$\Delta_c = \frac{\Delta_g - \theta\Delta_d}{(1-\theta)}, \tag{6}$$

and the difference-in-difference estimate of the effect of job loss on earnings is

$$\Delta\Delta = \frac{\Delta_d - \Delta_g}{(1-\theta)}. \tag{7}$$

Intuitively, the samples from the outgoing rotation groups are "contaminated" with displaced workers so that the difference-in-difference estimate computed using this contaminated control group need to be scaled up by the factor $\frac{1}{(1-\theta)}$ to compensate.

The parameters γ_j, estimated by separate OLS regressions for each DWS survey year from equation 4, are used along with information from the DWS on period-specific job loss rates (θ) to compute estimates of the log earnings effects as follows:

$$\Delta_d = \gamma_1 + \gamma_3, \tag{8}$$

$$\Delta_c = \gamma_1 - \frac{\theta\gamma_3}{(1-\theta)}, \quad \text{and} \tag{9}$$

$$\Delta\Delta = \frac{\gamma_3}{(1-\theta)}. \tag{10}$$

[27] Note that I do not use the information on who is displaced that is available in the DWS outgoing rotation groups. My estimate of Δ_g includes both displaced and non-displaced workers at both time 0 and time t.