Mass Layoffs and Their Impact on Earnings During Recessions and Expansions

Connecticut
Department of Labor
Office of Research
200 Folly Brook Blvd.
Wethersfield, CT 06109

OCCASIONAL PAPER SERIES

2009-1

PREPARED BY

Kenneth A. Couch, Ph.D.
University of
Connecticut

Nicholas A. Jolly, Ph.D.
Connecticut
Department of Labor

Dana W. Placzek
Connecticut
Department of Labor

April 2009

Connecticut Department of Labor - Office of Research
www.ctdol.state.ct.us/lmi
Labor Market Information

Mass Layoffs and Their Impact on Earnings During Recessions and Expansions

Connecticut Department of Labor ~ Office of Research
Occasional Paper Series
2009 - 1

April 2009

Prepared by:

Kenneth A. Couch, Ph.D.
Director, Center for Population Research and
Associate Professor, University of Connecticut

Nicholas A. Jolly, Ph.D.
Economist, Office of Research,
Connecticut Department of Labor

Dana W. Placzek
Research Analyst, Office of Research
Connecticut Department of Labor

Connecticut Department of Labor
Office of Research
200 Folly Brook Blvd.
Wethersfield, CT 06109

Director,
Roger Therrien

Commissioner,
Patricia H. Mayfield

Table of Contents

Executive Summary

This paper examines the earnings losses of workers displaced due to mass layoff at different points in the business cycle using administrative records from the state of Connecticut. Long-term earnings losses for those workers experiencing a mass layoff during a recessionary period are 1.7 to 3.9 times larger than for those observed in a period of sustained economic growth. Individuals who change industries following job loss, multiple job losers, and UI recipients also experience relatively large earnings reductions. The magnitudes of these earnings losses systematically increase during recessionary periods.

Detailed Findings

- During good economic times, workers who separate from their employers for reasons other than mass layoff experience no loss of earnings six years after separation. If this separation occurs during recessionary periods, workers suffer a six-year loss in earnings equaling 6.7 percent.

- If a worker suffers a mass layoff in an economic expansion, earnings losses in the sixth year amount to 7.2 percent. However, if the job loss occurs during a recession, the loss equals 18.2 percent.

- Regardless of gender, age, and firm size, workers experience substantially larger long-term earnings losses when a mass layoff occurs during poor economic conditions.

- Workers from all industries except financial services experience significantly larger earnings losses when job loss occurs in a recession. (However, the current downturn may prove to have a different impact on finance sector workers.)

- For displaced non-manufacturing workers, earnings losses are significantly larger if re-employment is found by switching industries. This pattern occurs regardless of economic conditions.

- During good economic times, manufacturing workers who are displaced and leave manufacturing to find re-employment experience long-term earnings losses similar to displaced manufacturing workers who remain in the same manufacturing industry after job loss. However, if the layoff occurs during recessionary periods, earnings losses are significantly larger for manufacturing workers switching industries to find a new job.

- Earnings losses are larger for workers experiencing multiple job losses and receiving unemployment insurance after layoff occurs. These losses are substantially higher if job loss occurs during poor economic conditions.

Policy Implications

- To counteract the long-term impacts on the economy, assistance directed to workers who experience a mass layoff during an economic recession is important.

- Re-employment efforts should be focused on getting displaced workers re-employed in jobs that offer the prospect of being held for a longer period as opposed to re-employment that may more likely be relatively short.

- Re-employment efforts should be focused on trying to help workers who experience a mass layoff find a job within their pre-layoff industry of employment.

I. Introduction

Researchers have devoted a great deal of attention to estimating the long-term earnings losses of displaced workers. A topic that has received less attention is how long-run earnings adjustments vary over the business cycle. This paper uses earnings data from unemployment insurance (UI) records for the state of Connecticut and shows that economic conditions at the time of displacement influence not only the size of the initial drop in pay the year following job loss, but also the pattern of recovery. This study also shows how the consequences of displacement vary for different groups of workers as the business cycle moves from expansion to recession. Finally, the analysis examines patterns of worker transitions across industries, multiple job separations, and UI receipt as potential reasons for the larger observed earnings losses for displaced workers during recessionary periods.

Theory suggests earnings losses should vary over the business cycle. During a downturn, real wages tend to fall (Bils 1985; Solon, Barsky, and Parker 1994) and unemployment spells increase in length. These factors reduce offered wages and increase the probability of workers receiving lower earnings after re-employment. Beaudry and DiNardo (1991) and Grant (2003) provide empirical evidence indicating that implicit contracts with risk sharing and labor mobility determine wages. In these models, wages are downwardly rigid and reflect the tightest labor market conditions since the date of hire.[1] The procyclicality of real wages and the loosening of labor market conditions during a downturn imply that workers displaced during poor economic times should have larger earnings losses than those who lose their jobs during an expansion.

[1] Grant (2003) notes that while the implicit contract model explains the majority of the variation in current wages, he is still unable to reject the negative relationship that exists between wages and contemporaneous unemployment. This provides further evidence that post-displacement wages should be lower during recessionary periods.

Using the Displaced Workers Supplements (DWS) to the Current Population Survey, Gibbons and Katz (1991) develop and test an asymmetric information model indicating that workers displaced in mass layoff events should experience larger earnings losses than those who separate from employment due to a plant closing. The reason for this is employers choose to lay off less productive workers, whereas plant closings affect everyone regardless of productivity. Gibbons and Katz (1991) define a lay-off as a displacement because of slack work or position/shift abolished. Farber (1997, 2005) shows overall displacement rates are counter-cyclical. However, he notes displacements caused by slack work drives this cyclical behavior (Farber 1997). Since lay-off rates increase during a recession and since workers who experience this type of displacement tend to have below average productivity, earnings losses should be larger during poor business cycle conditions.

While the above theories indicate the directional impact different business cycle conditions should have on displaced workers' earnings, they provide no insight into the size of the effect. Conducting an empirical investigation is the only way to obtain and estimate of the magnitude of the effect. Some studies have examined previously how different economic conditions affect displaced workers' earnings.[2] These articles find displaced workers experience larger earnings losses when the economy or pre-displacement industry of employment performs poorly.[3] While the quality of these studies is high, most use data or methodologies that have inherent shortcomings with respect to examining the impact of cyclical conditions on displaced workers' earnings. In part, this is because their focus is often on earnings losses in general rather than the role of the business cycle in determining the size of the loss.

[2] See Shapiro and Sandell (1985), Howland and Peterson (1988), Carrington (1993), Jacobson, LaLonde, and Sullivan (1993a, 1993b), Farber (1993, 1997, 2005), and Kaplan, Gonzalez, and Robertson (2005).
[3] One exception to this is Farber's (1993, 1997, and 2005) studies. He finds no cyclical relationship in displaced workers' earnings losses. However, in his 2005 paper, Farber does note earnings losses were substantially larger during the 2001 recession.

For example, studies using the DWS contain detailed retrospective information on displaced workers. However, the absence of histories for similar, continuously employed workers makes it difficult to measure accurately the impact of displacement on workers' earnings. Moreover, since the state of the business cycle may affect the earnings paths of both displaced and continuously employed workers, it is unclear how the estimates of earnings losses would be influenced by the absence of a natural comparison group using the DWS.

For this reason, researchers have made use of information from panel surveys. These data make it possible to screen workers and identify a group who is at risk of displacement, some of whom subsequently experience the event. In principle, the time coverage of data originating from the Panel Study of Income Dynamics (PSID) and the National Longitudinal Surveys (NLS) should allow researchers to contrast directly the impact of the business cycle on post-displacement earnings. However, the small number of displacements observed in each year of the data makes this contrast impractical. Because of this, researchers have typically controlled for cyclical effects by including regressors in the statistical model such as the unemployment rate. This approach makes it difficult to examine the impact of the business cycle on post-displacement earnings.

Other researchers have used administrative data that contain large samples of displaced workers and span a number of years. For example, Jacobson, LaLonde, and Sullivan (1993a, 1993b) use quarterly administrative earnings records from 1974 to 1986 for Pennsylvania; however, rather than drawing contrasts across periods of recession and growth, they instead compare workers across parts of the state differentially impacted by the general recession that occurred at the time of their study.

Perhaps the best study to date on this topic is Kaplan, Gonzalez, and Robertson (2005), which uses administrative records from Mexico and finds the state of the business cycle is important in explaining both the initial depth of earnings losses for displaced workers as well as the subsequent path of earnings recovery. They conduct their study by drawing similar samples of workers at risk of displacement from the administrative data at different points in the business cycle. Then, they contrast the experiences of those displaced with a continuously employed comparison group. The most important advantage of administrative data in this context is the very large samples of displaced workers. These large samples make it feasible for researchers to make direct contrasts of the patterns of earnings losses of workers displaced at different points in the business cycle.

The research presented here uses data and a conceptual approach similar to that of Kaplan et al. (2005). The data are from administrative wage records of the UI system in the state of Connecticut. These records span 12 years, 1993 to 2004. During this time, Connecticut experienced a full employment cycle and the United States experienced a complete recession. Using these data, two samples are drawn; the first consists of workers who change jobs during an uninterrupted growth period, and the second contains workers who change their jobs while the economy is in a downturn. Both datasets identify more than 25,000 displaced workers. Using these large samples, the analysis compares directly the experiences of workers displaced due to mass layoffs during recession and growth periods.

Workers who experience a mass layoff during a recessionary period have earnings losses that are 1.7 to 3.9 times larger than the losses of workers laid off during a period of sustained growth. The analysis also examines the role of industry switching in contributing to the earnings losses at different points in the business cycle. Workers who leave their prior industrial sector

during recessions experience the largest earnings losses. The study also shows that rates of re-employment, multiple job loss, and UI receipt are similar in the two analytical samples used in the study; however, conditional on any of these factors, earnings losses are still significantly larger when workers experience a displacement during a recession.

The paper proceeds with a discussion of the previous literature followed by a description of the data and empirical techniques used in the analysis. Section IV presents the empirical results, and Section V concludes.

II. Previous Literature

The long-run average earnings losses of displaced workers relative to the continuously employed appears to range from 10 to 15 percent (Couch and Placzek 2009). The majority of studies attempting to quantify the effect the business cycle has on displaced workers' earnings have used repeated cross-sectional survey-based data. Howland and Peterson (1988) use the DWS with no comparison group and show poor local labor market conditions negatively influence post-displacement earnings. Carrington (1993) also uses the DWS and finds that workers displaced from low and high growth industries experience earnings losses of 21.6 and 3.9 percent respectively. Alternatively, Farber (1993, 1997, 2005) also uses the DWS and finds that earnings losses vary little over the business cycle. Thus, studies that make use of the DWS provide conflicting evidence of the impact of the business cycle on earnings losses of displaced workers.

The only paper using survey-based panel data that has provided a direct contrast of the experiences of workers displaced at different points in the business cycle is Shapiro and Sandell (1985). Using the NLS of Mature Men, Shapiro and Sandell (1985) show workers displaced between 1967 and 1969 (a period of low national unemployment) experienced no earnings

losses. However, those displaced between 1969 and 1978 (a period of high unemployment) suffered average hourly losses of six percent of pre-displacement earnings.

Administrative records appear to be the most promising source of information on job loss and the experiences of displaced workers over the business cycle. Using administrative data, Jacobson et al. (1993b) compare directly the earnings losses of workers who separate from employment in western and eastern Pennsylvania. During the time of the study, the western region had a relatively higher unemployment rate compared to eastern Pennsylvania. They find that job separators from the western half of the state experience long-term quarterly earnings losses of $1,500. The same figure for workers in eastern Pennsylvania is $800. Thus, within their studies, losses were 87 percent larger in the most depressed areas.

In the main results, Jacobson et al. (1993a, 1993b) provide the largest estimates of lost earnings in the literature, 45 percent the year of displacement. The Pennsylvania data span the years 1974 to 1986. During this period, Pennsylvania, along with the United States, experienced a relatively high unemployment rate. The Bureau of Labor Statistics shows Pennsylvania's seasonally adjusted monthly average unemployment rate was 8.4 percent from 1974 to 1986. The poor economic conditions during the time of their study likely influenced the results.[4]

To see how cyclical conditions may have affected the average Jacobson et al. (1993a, 1993b) findings, Couch and Placzek (2009) estimate earnings losses for workers displaced in the state of Connecticut. The Connecticut data span the years 1993 to 2004. During this period, Connecticut's seasonally adjusted monthly unemployment rate averaged 4.5 percent, and the

[4] Other factors may influence the variance of estimates found in the literature. Studies may use different data sources and types, such as panel (Jacobson et al. 1993a, 1993b; Stevens 1997; Couch and Placzek 2008), pooled (Farber 1993, 1997, 2005), or cross sectional data (Ruhm 1991; Farber 1993, 1997, 2005). Researchers may use different empirical techniques; Jacobson et al. (1993a, 1993b), Farber (1993, 1997, 2005), Stevens (1997), and Couch and Placzek (2009) use a difference-in-difference methodology whereas Ruhm (1991) uses a standard OLS regression with a dummy variable indicating displacement status.

state experienced an entire employment cycle. The economy in Connecticut was more robust during the period examined than in Pennsylvania for the Jacobson et al. (1993a, 1993b) studies. Using the Connecticut data, Couch and Placzek (2009) find long-term earnings losses of 12 to 15 percent, which are significantly smaller than those reported by Jacobson et al. (1993a, 1993b) and similar to estimates of long-term losses based on survey data such as the DWS and PSID. A major finding from the Couch and Placzek study that reconciles results from the Pennsylvania and Connecticut data is that earnings losses are concentrated among UI recipients and that a higher incidence of UI receipt in Pennsylvania drove the relatively large estimates.

Similar to those studies, Kaplan et al. (2005) make use of administrative wage records from Mexico spanning the period from 1995 to 2000 to study earnings losses of workers who experience mass layoff. They select samples to vary the timing of job losses captured in their estimation samples and find that the earnings of workers displaced during the trough of a recession appear to be permanently reduced. Workers displaced after the trough but preceding a growth period see their earnings recover.

This study also makes use of administrative records to conduct the analysis. Much like Kaplan et al. (2005), the analysis makes use of two different samples that provide the basis for direct contrasts of the experiences of workers displaced during periods of recession and growth. Consistent with the previous literature, this study shows that the wages of workers displaced in Connecticut during recessionary periods appear to be permanently below those of their non-displaced counterparts. Workers displaced during growth periods see their wages recover.

In attempting to explain these differences across periods, the analysis examines the roles of industry switching, multiple job losses, and the receipt of unemployment insurance. During recessions, workers switching from the industry in which they were previously employed

experience the largest wage losses. While earnings reductions for both multiple job losers and UI recipients are larger in a recession, the proportions of workers in those groups do not change markedly across samples.

III. Data and Empirical Methodology

Data

The data used in this study come from UI wage records available at the Connecticut Department of Labor (DOL). Legislation requires nearly every employer to enroll in the UI system.[5] The same legislation requires each enrolled employer to provide the DOL with reports necessary to administer the UI program. These reports include quarterly wages paid to each employee. These records are a virtual census of the working population within the state, covering more than 95 percent of all employed individuals.

The available data are quarterly and span the period from 1993:1 to 2004:4. Figure 1 shows Connecticut's unemployment rate over the period. The graph shows that the unemployment rate in 1993 was relatively high following the recession. The unemployment rate steadily declined through the growth cycle of the 1990s until it turned upwards again after the 2001 recession.

The analytical strategy employed here is to divide the total sample into two periods that capture separately the growth cycle of the 1990s and the ensuing recession. The first sample extends from 1993:1 to 2001:4. Throughout the paper, this sample is referred to as the 1993 (expansion) group. Workers must remain continuously employed from 1993 to 1995, and first separations from employment begin in 1996. This sample provides the ability to track workers'

[5] See Connecticut General Statutes Section 31-223 for a description of the requirements and exemptions. One worker group not included in the data used here is the self-employed.

earnings adjustments as they experience employment changes during a period of sustained economic growth.

The second sample spans from 1996:1 to 2004:4 and is referred to as the 1996 (recessionary) sample. For this sample, workers remain continuously employed from 1996 through 1998. Changes in employment occur from 1999:1 to 2004:4, an interval characterized by growing unemployment. The United States experienced a recession from March to November in 2001; figure 1 shows this was associated with an increase in unemployment in Connecticut. Even though Connecticut's unemployment rate started declining in April 2003, it remained high compared to earlier levels. Thus, the second sample provides the opportunity to track displaced workers during a statewide downturn and a national recession.

While administrative UI records are free from recall bias and contain less measurement error than typically found in survey-based data, there is no available information on worker demographics, industry of employment, or firm size. Matches must be made between the UI records and other sources to obtain these data. Each wage record contains a worker's social security number (SSN) and an employer identification number (EIN). Using the EIN, matches are made to employer records from the Quarterly Census of Employment and Wages (QCEW). The QCEW provides data on firm size and industry of employment as defined by the North American Industrial Classification System (NAICS).

To obtain demographic information on age and gender, the SSNs found on the wage records are matched to license information provided by the Connecticut Department of Motor Vehicles (DMV). Legislation that became effective in 2002 requires each individual applying for or renewing a license to provide a SSN. At the time the sample was constructed, the DMV file contained information on age, gender, and SSNs for 70.1 percent of license holders.

A natural concern is whether the group of matched workers is reflective of all employees in Connecticut. If all workers are required to report positive earnings in the first quarter of the sample and at least once per year thereafter, 1,389,300 individuals meet these criteria in the 1993 group and 1,450,113 for the 1996 group. Of these, 807,861 were successfully matched to the DMV file for the expansion group and 904,667 were matched for the recession group. These are 58 and 62 percent coverage rates, respectively. If workers in Connecticut were proportionately represented among license holders, then one would expect that when these records are matched to the UI administrative data, about 70 percent coverage would occur. Relative to the expected coverage of 70 percent, the match rates of the two samples are 83 and 88 percent, respectively. These match rates for the available samples are similar to those reported by researchers who have combined UI wage records with the Social Security Master Beneficiary Record (Lengermann and Vilhuber 2002) for other states.

Mean and median wages as well as the distribution of employment by industrial sector for the matched workers are very similar to those obtained from the entire UI file. The group of all workers in the UI wage records have somewhat larger earnings than those in the matched file for both samples. The differences between median and average quarterly earnings for the matched sample relative to the entire UI file are $346 and $424 for the 1993 group. For the 1996 group, the respective numbers are and $537 and $539. Comparing the percentage of individuals employed across 21 two-digit NAICS sectors for the expansion (1993) sample and the UI file, the differences for 13 of the industries are within 0.2 percentage points of each other. The recession (1996) group has 14 industries within this range. For both samples, the largest difference in the industrial distribution of employment occurs with the manufacturing industry. The difference is 1.4 percentage points for the 1993 sample and 1.5 points for the 1996 sample.

A detailed appendix explaining data construction for the paper that provides a detailed comparison of the analytical files and the UI records is available upon request. This appendix is provided at the end of this draft for reviewers but is not intended for publication.

The available wage records are summed to construct total quarterly labor earnings in real 2000 dollars using the CPI-U.[6] The paper employs sample selection criteria similar to those found in Jacobson et al. (1993a, 1993b), Couch and Placzek (2009), and Couch, Jolly, and Placzek (2009). To be included in the sample, a worker must (1) report positive earnings in the first quarter of the study period, (2) be continuously employed with the same employer during the first three years, called the screening period, (3) report positive earnings at least once per year thereafter, and (4) have known demographic information.[7] Finally, the worker must be between the ages of 20 and 49 during the final year of the screening period and work for a firm with at least 50 employees.

This paper identifies job separations as in Jacobson et al. (1993a, 1993b), Couch and Placzek (2009), Couch et al. (2009). Changes in the EINs for a worker over time are used to determine changes in employment. There are times when EINs change for administrative reasons. The EINs are corrected for spurious changes and a consistent coding is available over time. Changes over time in the consistently coded EINs for an individual are associated with an employment separation from a firm.

Once the identification of all separators occurs, the firm's employment during the screening period is examined. If the separation occurs during a quarter within a year (either

[6] Wages are capped at $155,000 because of a few high wage earners affecting the parameter estimates. This is similar to Jacobson et al. (1993a, 1993b). The authors top-coded their wage data at $100,000 1987 dollars (Jacobson et al. 1993b). After adjusting for inflation and rounding to the nearest $5,000, their top-code is equivalent to the one used here.

[7] Jacobson et al. (1993a, 1993b) and Couch and Placzek (2009) use a six-year screening window. A three-year window is used here because of the need to break the data into two different samples and still have a sufficiently long follow-up period.

before or after) in which a firm's employment is 30 percent below its maximum during the screening period, then that worker is considered to have separated employment due to a mass layoff. Those workers are included in the mass layoff sample. Once all screening criteria are applied, the 1993 growth sample contains 162,402 workers. 70,961 people separate from employment of which 29,864 experience a mass layoff. The 1996 recessionary sample contains 167,542 workers, a total of 69,437 separations, and 25,449 mass layoffs.

The 1993 sample contains 4,415 more displaced workers than the 1996 group. Figure 1 provides an explanation for this finding. The unemployment rate is high and increasing slightly in 1996, the first year mass layoffs can occur in the 1993 sample. Figure 1 also shows the unemployment rate is low and decreasing in 1999 and 2000, the first two follow-up years in the 1996 data.[8] Given this, it is unsurprising that more displacements are identified in the 1993 group. However, even though the majority of workers displaced in the 1993 sample lose their jobs during a time of high unemployment, they are being observed subsequently during a sustained decrease in the unemployment rate. Similarly, those workers who lose their jobs in 1999 and 2000 are being followed during a large rise in the unemployment rate.

Empirical Methodology

The methodologies employed in this study come from Jacobson et al. (1993a, 1993b). The first equation estimated is a fixed-effects model.

$$y_{it} = \alpha_i + \gamma_t + \sum_{k \geq -12} D_{it}^k \delta_k + \varepsilon_{it} \qquad (1).$$

In equation (1), y_{it} is quarterly earnings of worker i in period t, and γ_t are year-quarter dummy variables. The displacement dummy variables, D_{it}^k, equal one if individual i suffers displacement

[8] In fact, Connecticut's unemployment rate fell to an historic low of 2.1 percent in August 1999, and October and November 2000.

in quarter t, and k indexes the variables beginning 12 quarters before job loss. Finally, α_i controls for any time-invariant, unobserved heterogeneity that may affect earnings.

The second model is a time trend (or random growth) estimator. It is similar to equation (1); however, it contains a term, $\omega_i t$, that controls for individual-specific time trends. The equation is:

$$y_{it} = \alpha_i + \gamma_t + \omega_i t + \sum_{k \geq -12} D_{it}^k \delta_k + \varepsilon_{it} \qquad (2).$$

Equation (2) is used to account for any individual earnings trends not captured by equation (1).

To explore differences in earnings losses across groups, a spline function is added to equation (2). The spline consists of a time trend variable three years before job loss, a dummy variable for six quarters afterwards, and a time trend term beginning six quarters after separation. The parameters from this function provide a convenient summary of the trend in earnings before job loss, the drop in earnings during the first year and a half afterwards, and the trend beyond that point. Following the literature, these are referred to as the dip, drop, and recovery estimates and are used to estimate earnings reductions across groups five years after job loss. This formulation provides a method of compactly summarizing differences in earnings losses by age, gender, pre-displacement industry of employment, and pre-displacement firm size.

IV. Empirical Results

Earnings Losses and the Business Cycle

Table 1 presents sample characteristics during the final quarter of the screening window for the 1993 and 1996 groups. In both samples, the difference between the mass layoff sample, separators not in the mass layoff sample, and the comparison group of continuously employed

workers is small. In the 1993 sample, the average age of workers experiencing a mass layoff is 36.5, 36.3 for other separators, and 38.7 for the comparison group. Average labor earnings are $11,145.61, $10,876, and $12,553.90 for the respective groups. For the recession (1996) sample, the average ages in 1998 are 36.6, 37.1, and 39.1 for the separators not part of the mass layoff sample, the mass layoff sample, and continuously employed workers, respectively. Average quarterly labor earnings for the respective groups are $12,158, $11,753, and $14,091.

Figure 2 shows the parameter estimates from equations (1) and (2) for the group of separators who did not experience a mass layoff from the 1993 and 1996 samples. Lines with the label FE are the parameter estimates associated with the displacement variables from equation (1). Lines with the label TT are the comparable estimates from equation (2). Figure 2 shows separators' earnings fall significantly the quarter after changing employers regardless of cyclical conditions. The drop in earnings for separators in the 1993 group is similar to the drop in the 1996 group. The range of earnings estimates across the four estimators is 26 to 29 percent.

After separation, earnings do show some recovery regardless of the stage of the business cycle. However, the pattern of earnings recovery depends somewhat on cyclical conditions. No meaningful earnings losses are present six years after separation using the 1993 growth sample regardless of the estimator employed. On average, in the sixth year after separation, equation (1) estimates earnings losses of 2.2 percent for the 1993 growth sample and 9.4 percent for the 1996 recessionary sample, a 7.2 percentage point gap. Estimates from equation (2) show that the workers who separate from employment in the 1993 growth sample have a six-year average gain in their earnings of 3.7 percent and those in the 1996 recessionary sample have an average sixth year loss of 4.0 percent. This is a gap of 7.7 percentage points. Thus, across the two estimation

methods (fixed effects and time trend), the difference in long-term earnings losses is 7 to 8 percentage points larger in the recessionary sample.

Figure 3 presents estimates from equations (1) and (2) for the group of workers displaced by mass layoff. As is the case with separators, displaced workers' earnings drop significantly after job loss and show some recovery thereafter. Unlike separators, the initial drop in earnings the quarter immediately following displacement is different depending upon the sample to which one belongs. Using the fixed-effects estimator, workers displaced during a recessionary period experience a loss of 33 percent. For those displaced during a growth period, the drop is 26 percent. The respective numbers from the time trend estimator are 31 and 27 percent, respectively. Therefore, the difference in losses using the two estimators at the time of displacement ranges from four to seven percentage points, which is roughly 10 to 20 percent of the size of the drop in earnings in the expansion sample.

The recovery pattern of earnings is also different. In the sixth year following job loss, the fixed-effects estimates indicate that workers displaced during a recession have average sustained losses of 20.4 percent. Those who experience a job loss in a growth period have a comparable average sustained loss of 5.2 percent. This is a gap of 15.2 percentage points. Using the time trend estimator, the average sixth year loss for workers displaced in a recession is 15.9 percent. For workers displaced in an expansion, the average estimated loss in the sixth year is 9.1 percentage points. This is a 6.8 percentage point gap. Thus, earnings losses for those who experience mass layoff during a recession are 1.7 to 3.9 times larger than the losses observed in a period of sustained growth. It is worth noting that in the 1993 growth sample and the 1996 recessionary sample, regardless of the estimator used, the estimated long-term earnings losses for the mass layoff sample consistently lie below those of other separators.

Losses by Worker Characteristic

Table 2 contains estimates of equation (2) for the 1993 and 1996 samples separately adding the spline terms described in the methods section. The columns labeled dip, drop, and recovery contain the estimated coefficients associated with the spline variables. The column labeled "fifth year loss diff" shows the overall fifth-year loss for the average displaced worker from that particular group relative to the loss for the average displaced worker in the entire sample. The column labeled "fifth year loss" shows the overall loss during the entire fifth year after displacement for that particular worker group.[9]

Table 2 shows the overall earnings loss in the fifth year after displacement is $4,728 for those workers who experience a displacement during an expansion. For those displaced during a contraction, the fifth-year loss is more than double, equaling $11,662. This evidence is consistent with prior research (Shapiro and Sandell 1985; Howland and Peterson 1988; Carrington 1993; Jacobson et al. 1993a, 1993b; and Kaplan et al. 2005) that has concluded that those workers who lose their job during a recession experience significantly larger sustained earnings losses than those workers displaced during an expansion.

Even though overall losses vary with different economic conditions, there are clear, consistent patterns between samples. First, males and females have comparable earnings losses during the fifth year after job loss in both expansions and contractions. For the growth sample, the male's fifth year loss is $4,100 and the female's is $5,322. For the recession sample, the comparable figures are $12,338 and $10,996. The losses are deeper for both men and women in the recession sample.

[9] The estimates in the "fifth year loss diff" column equal 4*drop plus 50*recovery. The estimates in the "fifth year loss" column are equal to the estimates in the "fifth year loss diff" column plus the estimates of $\delta_{17} + \delta_{18} + \delta_{19} + \delta_{20}$.

The second consistent pattern occurs with earnings losses by age. Confirming previous research (Couch 1998; Chan and Stevens 2004; Couch et al. 2009), older workers suffer larger sustained earnings losses when compared to their younger counterparts, and this occurs regardless of economic conditions. During an expansion, those displaced workers born in the 1950s experience a fifth-year loss of $6,434 while those born in the 1970s see a reduction of $1,696. The respective numbers in the recession sample are -$14,036 and -$7,963.[10]

Considering industry of employment before job loss, table 2 shows that, with the exception of the FIRE industries, earnings losses are strikingly larger in the recessionary period. However, an examination of underlying employment data revealed that roughly one in five workers in the insurance industry lost their job from 1996 to 2001. Employment in this industry subsequently stabilized. This decline in the insurance industry during a period of overall growth in the Connecticut economy helps explain the larger losses observed in the FIRE industries in the 1993 sample.

Focusing on firm size, the relative impacts across the growth and recession samples are inconsistent. In the growth sample, those from the medium-sized firms (501-2000 employees) have the largest losses after five years (-$5,442) but in the recession sample, workers who lose jobs at very large firms (>5000) have the largest losses (-$18,008). Similar inconsistent patterns of earnings losses by firm size can be found in other studies that have made use of administrative UI wage records (Jacobson et al. 1993a and Couch and Placzek 2009); however, for firms of all sizes, the earnings losses are larger in the recessionary period.

[10] In the 1993 and 1996 samples, there are some workers born in the late 1940s contained in the 1950s decade of birth sample. The reason for this is the age restriction placed on the samples of being between 20 and 49 years old during the final year of the screening window.

Industry Switching

One way that sectoral patterns of employment would be expected to influence earnings losses is through the need for workers to change industries. To investigate this issue, earnings losses are estimated for those displaced manufacturing and non-manufacturing workers who become re-employed in a firm in the same 6-digit NAICS industry, those in a different 6-digit NAICS industry but still in the same broader sector, and those who changed sectors entirely.

Table 3 shows earnings losses from the time trend estimator by pre-displacement industry of employment and industry switching status. Generally, the results confirm findings in the previous literature (Carrington 1993; Neal 1995). Specifically, long-term earnings losses are larger for workers who need to switch industries in order to find re-employment, and these earnings losses are generally larger during recessionary periods. This pattern occurs for displaced manufacturing workers who experience a mass layoff in a recession and for displaced non-manufacturing workers in both stages of the business cycle. This pattern does not hold for displaced manufacturing workers who experience a job loss in an expansion. Here, long-term earnings losses tend to be relatively similar regardless of industry switching status. This finding indicates that for manufacturing workers, changing industries after displacement during a growth period does not significantly alter the long-term trajectory of a worker's earnings.

Multiple Job Loss and UI Status

The preceding analysis demonstrates that as labor demand declines during periods of economic slowdowns, earnings losses intensify as workers are forced to seek work in other sectors. One would also expect that when workers lose their jobs during a downturn they would experience slower rates of re-employment and have a greater chance of experiencing multiple

job losses. In addition, workers displaced during a recession would be more likely to take-up UI benefits when compared to workers displaced during an expansion and that this surplus of labor might serve to depress wages upon re-employment. The remainder of this section investigates these additional issues.

While it is reasonable to think that displaced workers who lose their jobs during a downturn would have a relatively more difficult time finding re-employment after the event when compared to workers who lose their jobs during an expansion, the rates of re-employment of displaced workers during the follow-up period for both samples are nearly identical.[11] This result is likely due to the restriction that workers report positive earnings at least once per year and the relatively mild recession covered by the 1996 sample. Nevertheless, it does imply that differing rates of re-employment among the workers examined do not drive the larger earnings losses observed during a recession.

Even though re-employment probabilities are similar between the two samples, it may be the case that those workers who lose their jobs during a recession have less stable post-displacement employment patterns when compared to workers displaced during an expansion. If this is true, then workers experiencing a mass lay-off during poor economic times would have greater difficulty acquiring specific human capital, and their earnings losses would be larger and sustained longer (Stevens 1997). The data, however, also show employment stability is roughly the same for the two samples. Of those displaced workers who lose their jobs during an expansion, 49 percent separate from their post-displacement employer. During poor conditions, the percentage is 46.

[11] The average re-employment rate over the six-year follow-up period in both samples equals approximately 95 percent.

Although the stability of post-displacement employment is similar for both samples, it would still be expected that those workers who have a single displacement should experience more earnings recovery when compared to workers with multiple job separations. Figure 4 plots parameter estimates from equation (1) by multiple job loss status for the 1993 and 1996 groups. Regardless of cyclical conditions, workers who have less stable post-displacement employment patterns experience larger long-term earnings losses than those who only have a single job loss. During an expansion, those who have only one separation recover their losses by the tenth quarter after job loss. Those who experience one job separation during a contraction suffer losses similar to those who have multiple separations during an expansion. Finally, workers who have multiple job separations after experiencing job displacement due to mass layoff during a recession incur the largest earnings losses. Since single separators displaced during a recession have similar earnings losses as multiple separators in an expansion, it is likely that the larger losses observed during a downturn are not caused by a lack of post-displacement human capital acquisition.

In a similar analysis conditional on UI receipt, earnings losses are larger for recipients who experience mass layoff than for non-recipients. Figures 5 and 6 show the parameter estimates from equation (1) by UI status; Figure 5 shows those estimates for workers from the mass layoff sample who receives UI benefits during the follow-up period. Figure 6 presents similar estimates for those who do not receive benefits. As Figure 5 indicates, workers who received UI experience large, sustained earnings losses regardless of which phase of the business cycle they lose their job. However, recipients who lost jobs during a contraction have significantly larger losses. The average quarterly loss the year after separation for the mass layoff sample during a downturn is $1,032 larger than that experienced by workers displaced during an

expansion. Six years after the event, the average quarterly difference in lost earnings is about $1,800, or 15 percent of prior earnings. Primarily, lower reported earnings rather than the absence of wages drive this differential earnings loss. The proportion of observations of zero earnings for UI recipients increased by only 1.5 percent in the recession relative to the growth sample.

Figure 6 shows that workers in the mass layoff sample who did not receive UI benefits recover their earnings quickly regardless of economic conditions. For the 1993 sample, full recovery occurs during the fourth quarter after separation. Recovery occurs for the 1996 group around the tenth quarter. Even with this quick recovery, those who lose their job during a contraction sustain larger earnings losses and take twice the amount of time to recoup their earnings when compared to those who experience a mass layoff during an expansion.

The earnings losses shown in Figures 5 and 6 differ over the business cycle despite a number of similarities across samples. The proportion of displaced workers receiving UI in the follow-up period is roughly equal (41 and 38 percent in the 1993 and 1996 groups, respectively) and the duration of benefit receipt is similar. Furthermore, the proportion of UI recipients reporting multiple job separations is similar across groups, 63 percent for the growth and 59 percent for the recession samples. The proportion of non-UI displaced workers reporting multiple job separations is also similar, about 38 percent in both samples. Thus, the difference in earnings reductions across the growth and contraction samples for UI recipients is not related closely to the incidence of multiple job losses.

The analyses in this subsection highlight a number of similarities between the 1993 and 1996 groups. Rates of re-employment, multiple job losses, and take-up of UI benefits are similar across the two samples. Furthermore, of workers in the mass layoff sample receiving UI, the

duration of receipt is similar between the two groups. Despite these similarities, earnings losses of displaced workers who lose their jobs during a recession are significantly larger than those experienced by workers displaced during an expansion. These results suggest that the larger earnings losses observed during a recession are caused by large reductions in aggregate employment demand that result in fewer hours of work and lower reported wages.

V. Conclusions

This paper uses administrative wage records drawn from Connecticut's UI system and shows that regardless of economic conditions, workers displaced due to mass layoff experience large reductions in earnings immediately following job loss and shows some recovery thereafter. The analysis is extended to show that the state of the business cycle is a significant factor affecting the recovery of workers' earnings following mass layoff. Earnings recover more if job loss occurs during a period of economic expansion. Workers who experience mass layoff in a growth period have sustained earnings losses between five and nine percent. Those displaced in a recession incur long-term earnings losses of 16 to 20 percent.

Workers from almost all groups appear to have larger earnings losses during recessions. Possible causes of the larger earnings losses during recession were also examined, focusing on rates of re-employment, multiple job losses, and UI recipiency. All of these events occurred at similar rates across the growth and recession samples. This is likely because the sample selection rule for the study required that positive earnings be reported at least once each calendar year, peak rates of unemployment were similar across the samples, and the recession that occurred in Connecticut was relatively mild. Nonetheless, earnings losses are concentrated among UI recipients and multiple job losers and are more pronounced in the recessionary sample.

The findings here are consistent with the literature examining how labor market conditions influence the earnings of displaced workers. Previous research using surveys such as the NLS found that workers displaced during downturns had larger earnings losses than those who lost jobs during growth periods. Similarly, the Jacobson et al. (1993a, 1993b) studies based on administrative data in Pennsylvania found that those who separate from employment in areas with higher unemployment experienced the largest earnings losses. In an indirect contrast to the studies of Jacobson, LaLonde, and Sullivan, Couch and Placzek (2009) also find that in an economic setting with lower unemployment, earnings losses are much smaller. Finally, the study of Kaplan, Gonzalez, and Robertson (2005) using Mexican administrative data reports that those displaced during growth periods do not experience sustained earnings losses. Overall, these findings, along with the conclusions of prior studies, point to the importance of the business cycle in determining post-displacement earnings.

References

Beaudry, Paul, and John DiNardo. 1991. "The Effect of Implicit Contracts on the Movement of Wages Over the Business Cycle: Evidence from Micro Data." *The Journal of Political Economy* 99(4): 665-688.

Bils, Mark J. 1985. "Real Wages over the Business Cycle: Evidence from Panel Data." *The Journal of Political Economy* 93(4): 666-689.

Carrington, William J. 1993. "Wage Losses for Displaced Workers: Is it Really the Firm that Matters?" *The Journal of Human Resources* 28(3): 435-462.

Chan, Sewin, and Ann Huff Stevens. 2004. "How Does Job Loss Affect the Timing of Retirement?" *Contributions to Economic Analysis & Policy* 3(1), Article 5.

Couch, Kenneth A. 1998. "Late Life Job Displacement." *The Gerontologist* 38(1): 7-17.

Couch, Kenneth A., and Dana W. Placzek. 2009 (forthcoming). "Earnings Losses of Displaced Workers Revisited." *The American Economic Review*.

Couch, Kenneth A., Nicholas A. Jolly, and Dana W. Placzek. 2009. "Earnings Losses of Older Displaced Workers: a Detailed Analysis with Administrative Data." *Research on Aging* 31(1): 17-40.

Farber, Henry S. 1993. "The Incidence and Costs of Job Loss: 1982-91." *Brookings Papers on Economic Activity. Microeconomics* 1993(1): 73-132.

------. 1997. "The Changing Face of Job Loss in the United States, 1981-1995." *Brookings Papers on Economic Activity. Microeconomics* 1997(1997): 55-142.

------. 1999. "Alternative and Part-time Employment Arrangements as a Response to Job Loss." *Journal of Labor Economics* 17(4): S142-S169.

------. 2005. "What Do We Know about Job Loss in the United States? Evidence from the Displaced Workers Survey, 1984-2004." *Economic Perspectives* 2Q: 13-28.

Gibbons, Robert and Lawrence F. Katz. 1991. "Layoffs and Lemons." *Journal of Labor Economics* 9(4): 351-380.

Grant, Darren. 2003. "The Effect of Implicit Contracts on the Movement of Wages over the Business Cycle: Evidence from the National Longitudinal Surveys." *Industrial and Labor Relations Review* 53(3): 393-408.

Howland, Marie and George E. Peterson. 1988. "Labor Market Conditions and the Reemployment of Displaced Workers." *Industrial and Labor Relations Review* 42(1): 109-122.

Jacobson, Louis S., Robert J. LaLonde, and Daniel G. Sullivan. 1993a. "Earnings Losses of Displaced Workers." *The American Economic Review* 83(4): 685-709.

------. 1993b. *The Costs of Worker Dislocation*. W.E. Upjohn Institute for Employment Research, Kalamazoo, Michigan.

Kaplan, David S., Gabriel Martinez Gonzalez, and Raymond Robertson. 2005. "What Happens to Wages after Displacement?" *Economia* Spring: 197-242.

Lengermann, Paul A., and Lars Vilhuber. 2002. "Abandoning the Sinking Ship: the Composition of Worker Flows Prior to Displacement." Longitudinal Employer-Household Dynamics Technical Paper No. TP-2002-11.

Madden, Janice Fanning. 1988. "The Distribution of Economic Losses among Displaced Workers: Measurement Methods Matter." *The Journal of Human Resources* 23(1): 93-107.

Neal, Derek. 1995. "Industry-Specific Human Capital: Evidence from Displaced Workers." *Journal of Labor Economics* 13(4): 653-677.

Ruhm, Christopher. 1991. "Are Workers Permanently Scarred by Job Displacement?" *The American Economic Review* 81(1): 319-324.

Shapiro, David, and Steven H. Sandell. 1985. "Age Discrimination in Wages and Displaced Older Men." *Southern Economic Journal* 52(1): 90-102.

Solon, Gary, Robert Barsky, and Jonathan A. Parker. 1994. "Measuring the Cyclicality of Real Wages: How Important is Composition Bias?" *The Quarterly Journal of Economics* 109(1): 1-25.

Stevens, Ann Huff. 1997. "Persistent Effects of Job Displacement: the Importance of Multiple Job Losses." *The Journal of Labor Economics* 15(1): 165-188.

Figures and Tables

Figure 1: Connecticut Monthly Unemployment Rate (Seasonally Adjusted)

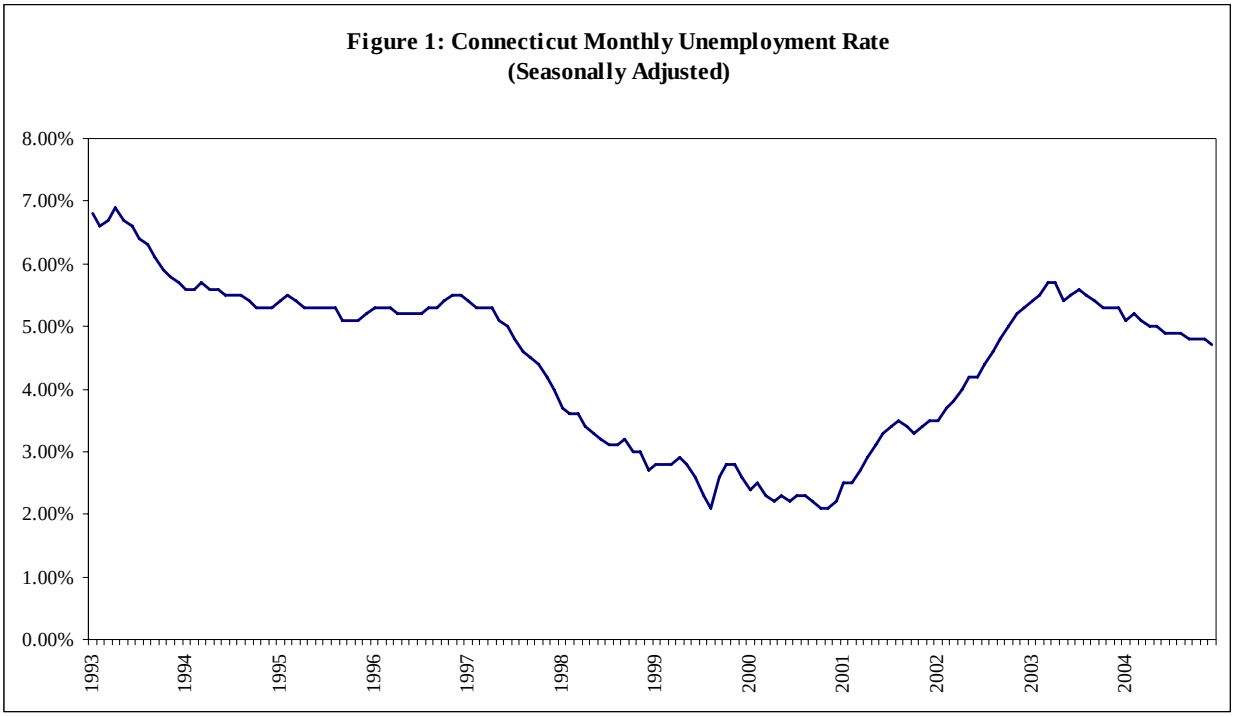

Figure 2: Earnings Losses: Non-Mass Layoff Separators

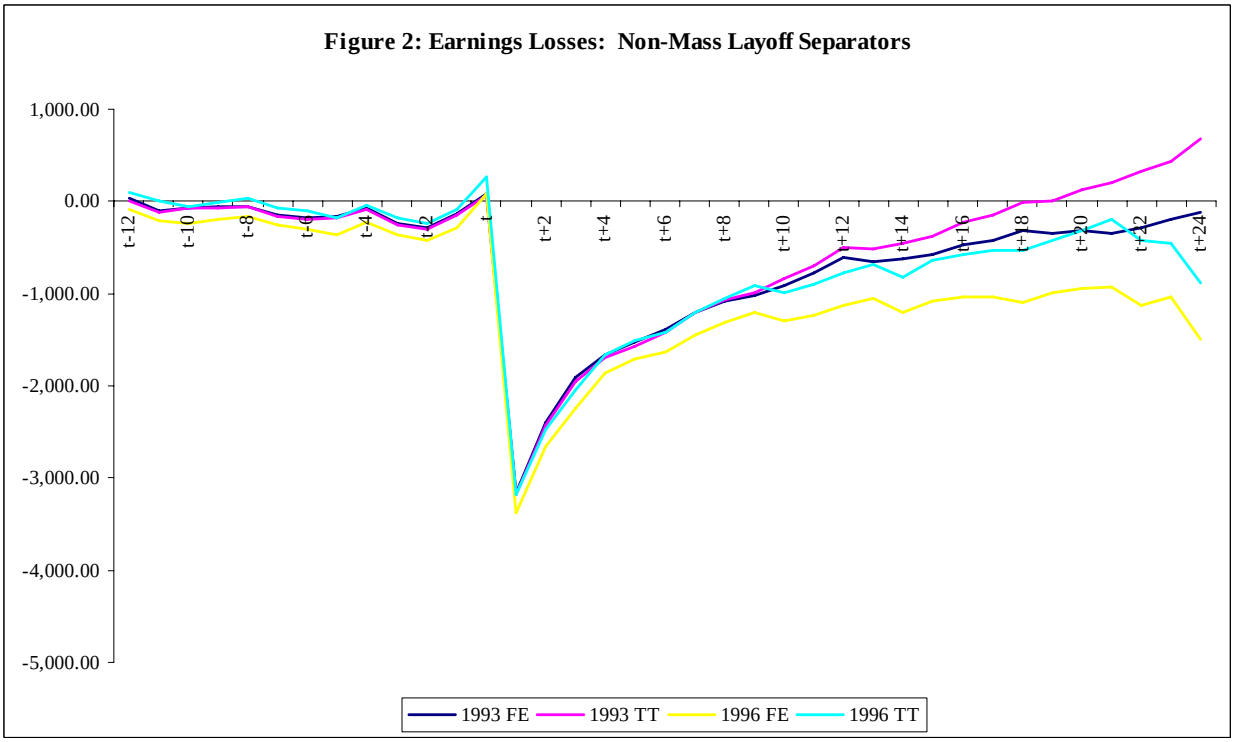

Figure 3: Earnings Losses: Mass Layoff Sample

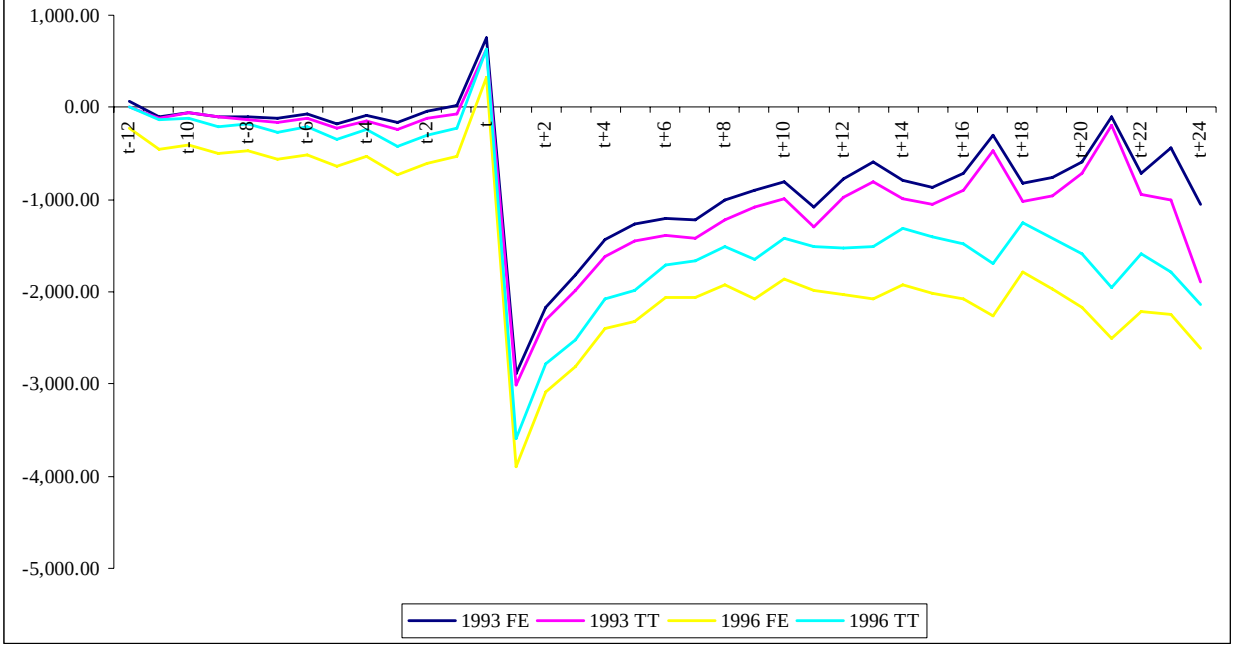

Figure 4: Earnings Losses by Multiple Job Loss Status: Mass Layoff Sample

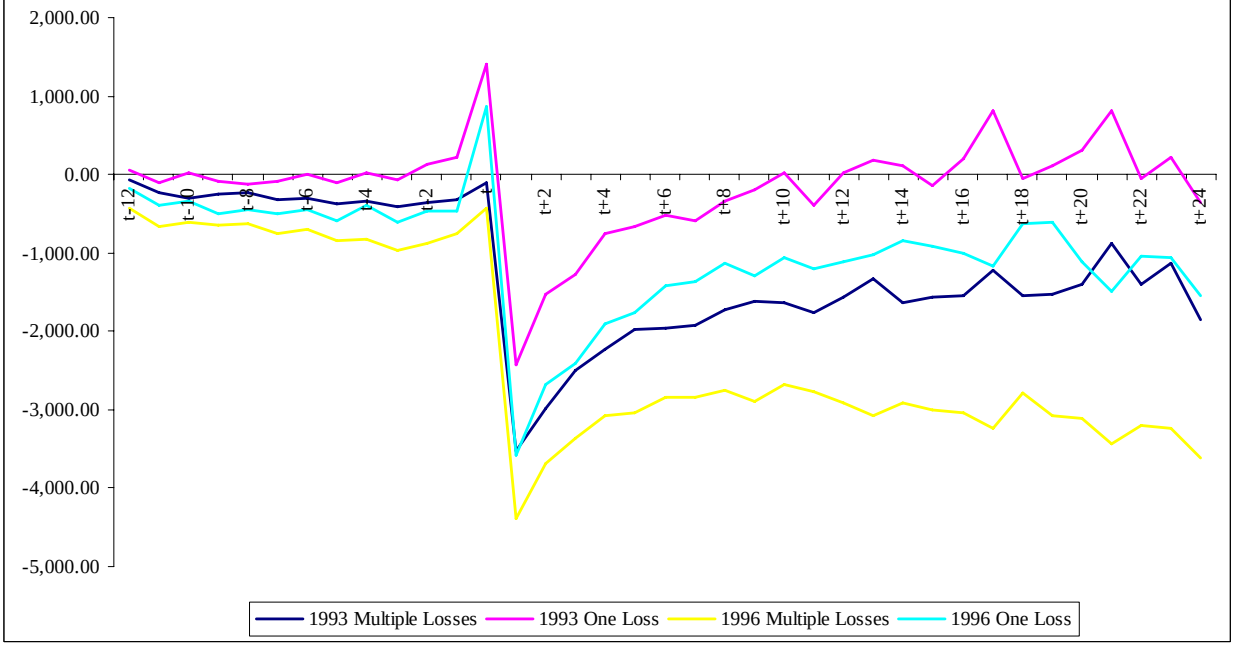

Figure 5: Earnings Losses of UI Recipients: Mass Layoff Sample

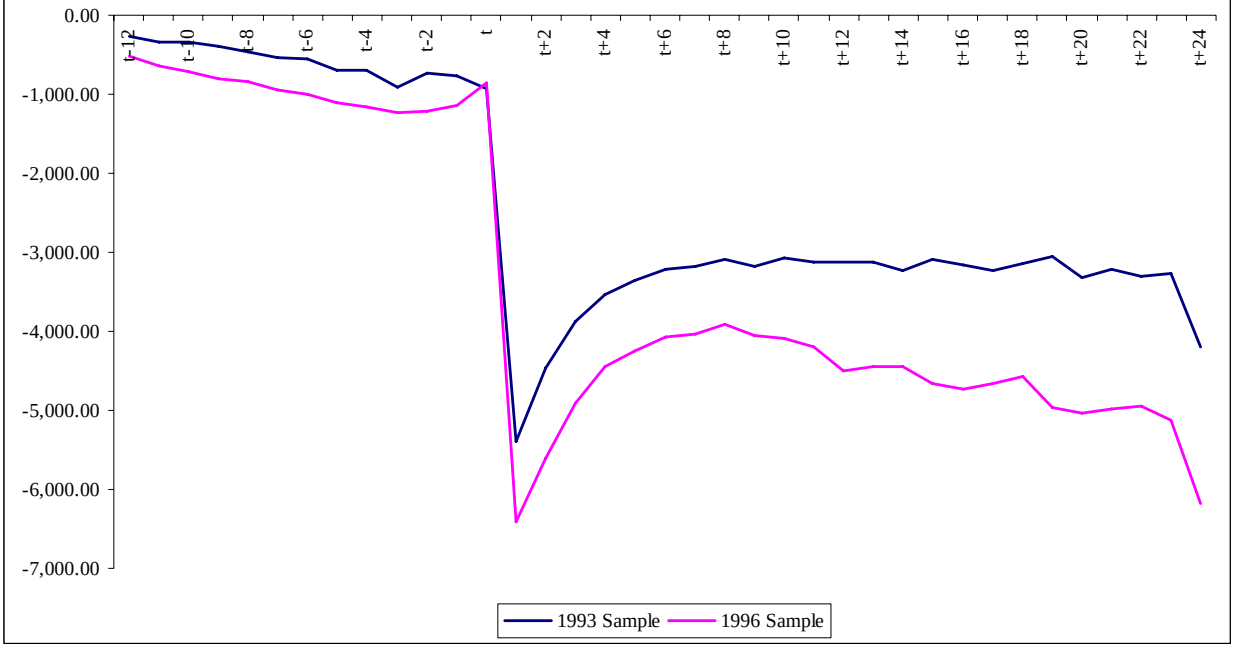

Figure 6: Earnings Losses of Non-Recipients of UI: Mass Layoff Sample

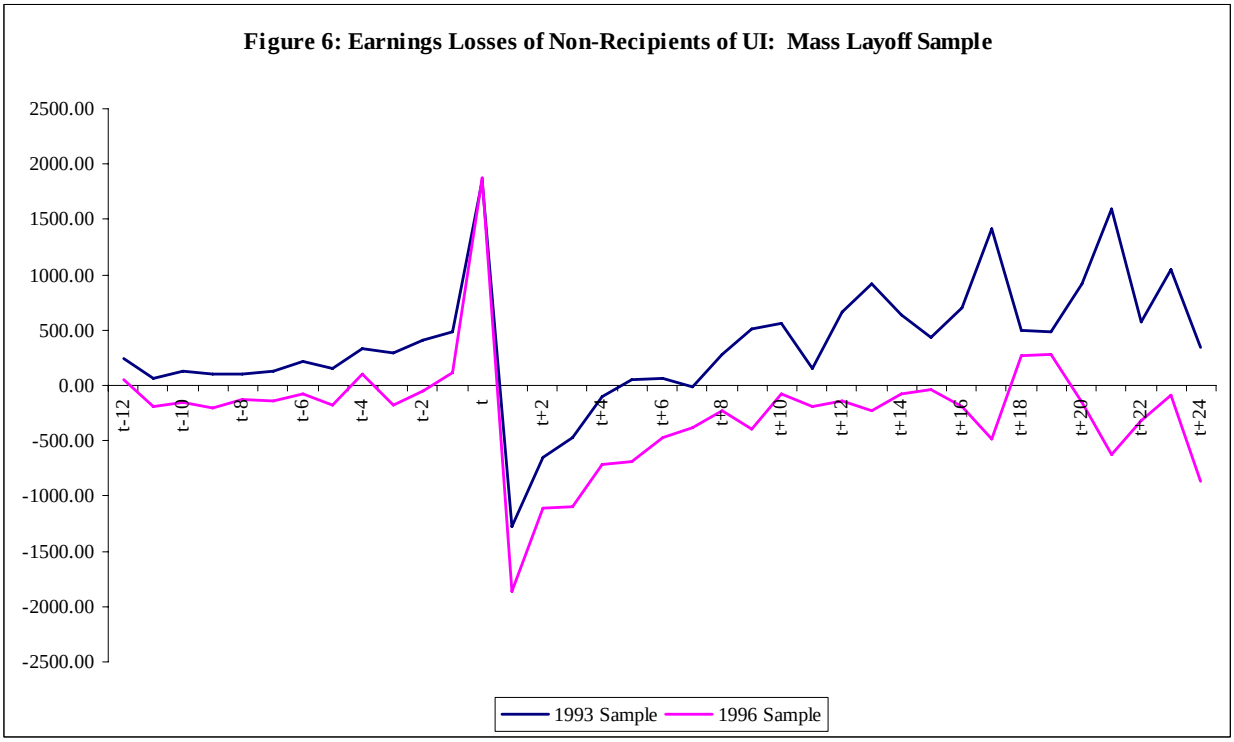

Table 1: Sample Characteristics

Panel A: 1993 Sample							
A.1 Age in 1995		**Observations**	**Mean**	**Median**	**Std. Dev.**	**10th %tile**	**90th %tile**
Entire Sample:		162,402	37.68	38	7.18	28	47
Separators:							
	All	70,961	36.37	36	7.52	26	47
	Males	33,651	36.40	37	7.44	26	47
	Females	37,310	36.34	36	7.59	26	47
	Non-manufacturing	56,584	36.17	36	7.64	26	47
	Manufacturing	14,377	37.14	37	6.98	28	47
	Non-mass layoffs	41,097	36.26	36	7.62	26	47
	Mass layoffs	29,864	36.51	37	7.38	26	47
Continuously employed:		91,441	38.69	39	6.72	29	48
A.2 1995 Earnings							
Entire Sample:		162,402	$11,870.35	$10,516.50	$8,604.98	$5,086.00	$18,687.00
Separators:							
	All	70,961	$10,989.51	$9,541.00	$8,354.68	$4,195.00	$18,006.80
	Males	33,651	12,949.13	11,203.00	9,946.03	5,485.20	20,304.60
	Females	37,310	9,222.08	8,168.50	6,078.53	3,543.00	15,685.00
	Non-manufacturing	56,584	10,846.10	9,375.00	8,557.62	3,874.00	17,997.50
	Manufacturing	14,377	11,553.96	10,096.00	7,476.48	5,591.80	18,035.40
	Non-mass layoffs	41,097	10,876.08	9,462.00	8,216.55	4,079.00	17,916.20
	Mass layoffs	29,864	11,145.61	9,647.00	8,538.80	4,345.00	18,115.50
Continuously employed:		91,441	12,553.90	11,238.00	8,733.35	5,898.40	19,132.00
Panel B: 1996 Sample							
B.1 Age in 1998		**Observations**	**Mean**	**Median**	**Std. Dev.**	**10th %tile**	**90th %tile**
Entire Sample:		167,542	38.16	39	6.99	28	47
Separators:							
	All	69,437	36.81	37	7.41	27	47
	Males	32,972	36.86	37	7.36	27	47
	Females	36,465	36.77	37	7.46	27	47
	Non-manufacturing	55,210	36.52	37	7.52	26	47
	Manufacturing	14,227	37.96	38	6.84	28	47
	Non-mass layoffs	43,988	36.64	37	7.50	26	47
	Mass layoffs	25,449	37.10	38	7.25	27	47
Continuously employed:		98,105	39.12	40	6.52	30	47
B.2 1998 Earnings							
Entire Sample:		167,542	$13,223.51	$11,549.50	$9,830.91	$5,548.00	$20,843.00
Separators:							
	All	69,437	$11,997.63	$10,239.00	$9,444.27	$4,624.80	$19,747.40
	Males	32,972	14,164.28	11,974.50	11,113.54	6,069.00	22,549.10
	Females	36,465	10,038.52	8,819.00	7,077.02	3,861.00	16,811.40
	Non-manufacturing	55,210	11,759.79	9,947.00	9,437.59	4,304.00	19,699.00
	Manufacturing	14,227	12,920.61	11,224.00	9,413.70	6,115.00	19,906.20
	Non-mass layoffs	43,988	12,138.80	10,364.50	9,524.20	4,659.00	19,942.30
	Mass layoffs	25,449	11,753.63	10,036.00	9,299.61	4,562.00	19,172.00
Continuously employed:		98,105	14,091.16	12,451.00	10,005.31	6,430.00	21,429.40

Table 2: Losses by Worker Characteristic: Mass Layoff Sample

		1993 Growth Sample						1996 Recessionary Sample				
Group	Number of Observations	Dip	Drop	Recovery	Fifth Year Loss Diff	Fifth Year Loss	Number of Observations	Dip	Drop	Recovery	Fifth Year Loss Diff	Fifth Year Loss
Overall	29864	25.75	-1949.93	229.62		-4728.31	25449	-1.08	-1,065.01	11.41		-11,661.75
		(0.80)	(13.82)	(4.42)		(4.41)		(0.03)	(6.47)	(0.21)		(7.21)
Sex:												
Male	14500	5.21	-148.09	24.40	627.79	-4,100.52	12612	-15.37	-487.31	25.46	-676.14	-12,337.90
		(1.51)	(2.76)	(2.94)	(1.47)	(3.32)		(4.02)	(8.06)	(2.74)	(1.35)	(7.07)
Female	15364	-4.93	140.03	-23.08	-593.59	-5,321.91	12837	15.13	479.58	-25.06	665.41	-10,996.34
		(1.51)	(2.76)	(2.94)	(1.47)	-(5.01)		(4.02)	(8.06)	(2.74)	(1.35)	(6.71)
Decade of Birth:												
1950's	15166	10.88	-378.71	-3.81	-1,705.48	-6,433.80	10368	16.47	-441.50	-12.16	-2,373.19	-14,035.94
		(3.54)	(7.57)	(0.53)	(4.63)	(5.35)		(3.54)	(6.15)	(1.10)	(3.97)	(7.92)
1960's	11526	-8.62	290.25	5.02	1,411.84	-3,316.47	10593	-3.78	124.86	5.17	757.88	-10,903.87
		(2.31)	(5.10)	(0.58)	(3.16)	(3.00)		(0.90)	(1.89)	(0.51)	(1.39)	(6.33)
1970's	3172	-20.57	758.01	0.01	3,032.21	-1,696.10	4488	-29.14	725.87	15.91	3,698.95	-7,962.80
		-(4.00)	(8.36)	(0.00)	(4.58)	(1.49)		(5.29)	(7.27)	(1.18)	(5.23)	(4.93)
Industry:												
Manufacturing	6963	27.75	436.22	52.87	4,658.55	-69.76	7520	-30.20	-682.09	-18.87	-3,671.57	-15,333.41
		(4.23)	(4.50)	(3.85)	(6.19)	(0.06)		(5.00)	(7.57)	(1.17)	(4.32)	(8.31)
Trade	4926	-43.35	-241.35	-6.14	-1,272.56	-6,000.88	4625	-20.97	71.43	49.64	2,767.61	-8,894.14
		(6.62)	(2.22)	(0.42)	(1.70)	(4.63)		(3.49)	(0.66)	(3.25)	(3.42)	(5.06)
Finance, Insurance, and Real Estate	5858	88.50	25.35	-84.41	-4,119.04	-8,847.35	2169	147.06	734.56	35.18	4,696.99	-6,964.75
		(6.67)	(0.85)	(4.32)	(3.96)	(5.40)		(8.16)	(2.96)	(1.01)	(2.54)	(2.95)
Business Services	2727	29.99	-12.17	50.36	2,469.16	-2,259.15	3052	20.06	-983.44	-46.95	-6,281.15	-17,932.90
		(2.28)	(0.06)	(1.85)	(1.94)	(1.31)		(1.56)	(4.87)	(1.82)	(4.47)	(7.84)
Education and Health Services	4238	-34.99	821.95	5.03	3,539.31	-1,189.01	4169	-6.86	1,509.93	16.01	6,840.01	-4,821.74
		(5.28)	(7.98)	(0.34)	(4.39)	(0.93)		(1.09)	(14.43)	(1.01)	(7.93)	(2.77)
Other	5152	-83.36	-1,054.30	-7.61	-4,597.75	-9,326.06	3914	-6.86	-24.91	-22.40	-1,219.70	-12,881.46
		(13.37)	(10.06)	(0.58)	(6.88)	(7.71)		(0.91)	(0.19)	(1.20)	(1.21)	(6.60)
Firm Size:												
50-500	11867	-4.05	-80.98	5.67	-40.19	-4,768.50	12660	-13.41	-172.20	6.08	-384.90	-12,046.66
		(0.96)	(1.25)	(0.65)	(0.09)	(1322.00)		(3.62)	(3.00)	(0.71)	(0.83)	(7.04)
501-2000	8499	16.14	-87.44	-7.29	-714.13	-5,442.44	7964	36.71	320.79	-4.67	1,049.68	-10,612.07
		(3.23)	(1.11)	(0.53)	(1.00)	(4.10)		(6.99)	(3.93)	(0.38)	(1.57)	(6.28)
2001-5000	2053	76.93	217.32	15.67	1,652.84	-3,075.47	3561	-10.88	82.73	19.68	1,314.80	-10,346.95
		(5.51)	(1.36)	(0.66)	(1.37)	(1.79)		(1.22)	(0.59)	(0.88)	(1.07)	(5.06)
> 5000	7445	-33.33	168.98	-5.05	423.43	-4,304.88	1264	-66.05	-528.18	-86.28	-6,426.49	-18,008.25
		(5.52)	(1.67)	(0.32)	(0.51)	(3.37)		(4.05)	(2.02)	(2.07)	(2.91)	(6.52)
Local labor market:												
Employment trend		-9.57	-749.00	-18.71	-3,934.32			-11.10	-1,231.02	46.80	-2,583.93	
		(0.86)	(5.51)	(0.95)	(4.60)			(0.89)	(10.07)	(1.87)	(2.47)	
Employment deviation		-12.15	139.91	-55.15	-2,197.86			4.07	-539.76	1.72	-2,073.00	
		(2.32)	(2.43)	(5.49)	(5.35)			(0.65)	(7.04)	(0.08)	(2.37)	
Unemployment rate		-0.02	1.52	0.08	9.95			0.02	-1.65	0.34	10.52	
		(1.02)	(5.95)	(1.15)	(2.93)			(0.74)	(4.29)	(5.58)	(3.74)	

T-Statistics based on Bootstrapped standard errors with 50 draws are in parentheses

Table 3: Time Trend Estimates of Earnings Loss by Industry Switching Status

Displaced from	Manufacturing					
Re-employed in	Same NAICS		Different NAICS, Same Sector		Different Sector	
Sample	1993	1996	1993	1996	1993	1996
t-4	-1,098.75	-1,022.15	125.68	-592.70	248.59	-535.85
	(197.97)	(185.39)	(96.95)	(118.52)	(104.39)	(86.41)
t+1	-1,638.09	-1,938.25	-2,710.08	-4,618.54	-3,976.56	-6,150.37
	(271.15)	(269.57)	(147.26)	(163.86)	(141.73)	(133.50)
t+4	-1,741.79	-1,364.07	-1,245.51	-2,842.62	-1,813.42	-3,784.14
	(283.45)	(304.30)	(128.10)	(175.19)	(143.25)	(135.72)
t+8	-1,941.92	-938.24	-672.40	-2,213.14	-1,000.22	-2,662.20
	(288.77)	(283.36)	(164.30)	(204.29)	(167.12)	(152.83)
t+12	-659.99	-1430.08	-321.71	-2858.87	-863.70	-2872.67
	(721.07)	(395.38)	(176.59)	(227.95)	(188.03)	(192.14)
Displaced from	Non-Manufacturing					
Re-employed in	Same NAICS		Different NAICS, Same Sector		Different Sector	
Sample	1993	1996	1993	1996	1993	1996
t-4	372.60	408.55	-279.59	-229.43	-190.06	-95.40
	(124.85)	(138.20)	(46.21)	(52.08)	(54.26)	(65.60)
t+1	-1,551.80	-1,836.69	-2,940.15	-3,414.80	-3,961.43	-4,052.58
	(208.86)	(159.96)	(72.11)	(87.64)	(89.91)	(104.45)
t+4	-559.37	-266.86	-1,594.72	-2,069.93	-2,334.69	-2,438.54
	(174.05)	(167.01)	(68.70)	(86.32)	(81.21)	(104.21)
t+8	-167.67	409.73	-1,207.92	-1,535.97	-1,736.41	-1,845.51
	(198.49)	(236.19)	(75.84)	(95.78)	(88.62)	(117.79)
t+12	295.45	521.46	-879.20	-1436.69	-1300.29	-1772.78
	(262.58)	(255.90)	(87.22)	(115.15)	(98.70)	(135.75)

Robust standard errors are in parentheses.

A. Data Appendix

A.1 Data Construction of Matched Wage and Firm Information

The combined individual and firm level data used in this study are constructed by merging Connecticut Unemployment Insurance (UI) reports to records from Connecticut's Quarterly Census of Employment and Wages (QCEW). For each employee, the UI reports include quarterly earnings and identify the worker's employers with an Employer Identification Number (EIN). The available earnings data are quarterly, converted to real 2000 dollars using the Consumer Price Index for All Urban Consumers, and top-coded at $155,000. The age and gender information used in the analysis is obtained from matching the worker-firm dataset to Connecticut Department of Motor Vehicles (DMV) records. These matches are described in section A.5.

Components of the QCEW provide information on firm employment. The QCEW data also contain the EIN, which is used to attach firm information to the individual level UI file. After this merge, two analysis files are created that contain information on quarterly earnings, the principal employer's EIN each quarter, the employer's six-digit industry defined by the North American Industrial Classification System (NAICS) code, and the employment level of the principal firm. The first file spans the periods of 1993:1 to 2001:4 (henceforth, the 1993 file), and the second file covers the period 1996:1 to 2004:4 (the 1996 file).

A.2 Dating Worker Separations

In the UI file, an EIN is attached to each earnings source. Changes in this EIN are used to track employment changes for individuals in the analysis files. These EINs may change for administrative reasons, and making certain that the changes observed are genuine is important to

the analysis. The Connecticut Department of Labor (DOL) maintains files that detail the nature of the change of EINs when they occur. These files are referred to as predecessor-successor files. The EINs are coded using these sources of information so that they are consistent over time.

Between-quarter changes in the EIN and earnings information from different employers are used to date worker-firm separations. There are two basic rules followed. First, if an employee had a principal employer this quarter but not the next and their recorded earnings from the original employer stop this quarter, then the separation is dated as occurring this quarter. Second, in cases where earnings from multiple employers overlap, the date of the separation is the quarter when the person last receives earnings from the previous employer.

This dating procedure may miss the timing of some separations. For example, a person may receive severance payments several quarters after employment ends. In addition, a worker might have had a continuous job with a third employer. The dating procedure used here does not account for such circumstances. To the extent that the dating procedure is incorrect, it will contribute to earnings declines before separation. Figures 2 and 3 in the text indicate that the earnings before separation are not meaningfully different from those of the comparison group of continuously employed workers. Furthermore, these figures show there is no clear upward or downward trend in earnings before separation.

A.3 Sample Restrictions

Both analysis files are treated symmetrically. This allows more confidence in stating that differing business cycle conditions drive the differences found in the parameter estimates. Workers in both files are required to have three years of continuous employment with the same employer. These initial three years are referred to throughout as the screening period. Each worker is required to be between the ages of 20 and 49 in the final year of the screening period

and report some positive earnings in each year thereafter. Workers are only included in the analysis files if information regarding age and gender is available for them. For small firms, minor changes in employment might result in a firm appearing to have a large percentage lay-off. For this reason, individuals working for firms with less than 50 employees are omitted from the analysis.

A.4 Local Labor Market Conditions

The DOL maintains files on Local Area Unemployment Statistics (LAUS). These LAUS data have geographic identifiers that are used to match to firm locations in the employer records. The LAUS data on area resident employment and unemployment rates are attached to the analysis files using these geographic identifiers. Wherever a match is not possible, the state average is attached to that location. The unemployment rate is attached as an analysis variable. The trend of the employment rate by location is calculated along with the deviation from that trend. These variables are included to control for local labor market conditions.

A.5 Matching to DMV Records to Obtain Demographic Information

One of the drawbacks to using administrative data drawn from state Departments of Labor is that demographic information is typically not available unless an individual has made use of a state's employment services or filed an UI claim. One would naturally be concerned that using a sample built on that basis would result in a highly selected analysis sample.

Another method of obtaining demographic data is to match to DMV records. In Connecticut, procedures for obtaining motor vehicle operators licenses were altered effective July of 2002. These procedures require that social security numbers (SSNs) be obtained and verified as part of the licensing process. The normal life cycle for a Connecticut license is six

years, and one can expect that expiration will occur on a roughly random basis. One exception to this is those workers who move into the state. For this study, a file that cumulatively covers 70.1 percent of license numbers in Connecticut is used to match to the UI wage records.

If the data from the UI wage file are screened such that individuals report positive earnings in the first quarter of each sample and some positive earnings every year, 1,389,300 individuals are identified in the 1993 file and 1,450,113 are identified in the 1996 file. Of these, 807,861 successful matches are made to the DMV file for 1993 sample. There are 904,667 matches for the 1996 file. These matches provide 58.15 and 62.39 percent coverage of the relevant records in the 1993 and 1996 files, respectively. If the matches are proportional to the 70.1 percent DMV file, then the effective match rates for the respective samples are 83 and 89 percent. These rates compare well with match rates for individual states using the social security master file. For example, Lengermann and Vilhuber (2002, pp. 5-6) report an 89 percent match rate between the UI records and the social security file for Maryland.

In this study, all individuals are required to have positive earnings information in each year. Thus, whether demographic information is matched at the beginning or end of the study period does not matter for any of the core calculations in the analysis. The question that remains is: how well do the samples in the matched files represent the UI file?

To answer this question, Tables A-1 and A-2 are created using the selection criteria mentioned in the preceding paragraph. The tables present the quarterly distribution of employment at the 2-digit NAICS level for the 1993 and 1996 files during the first quarter of the samples. Both tables show the distributions of employment are similar between the matched files and the entire set of wage records. For the 1993 file, 13 of the 21 2-digit industries are within 0.2 percentage points of one another. The 1996 sample has 14 industries within this band. The

largest exception in both matched files is in the manufacturing industry. Here, the matched 1993 file under-represents manufacturing employment by 1.4 percentage points. The 1996 file under-represents manufacturing employment by 1.5 points.

UI records contain information on payroll for everyone who works in a state. However, once matches are made to DMV records, citizens who have always worked in another state and out-of-state residents who work in Connecticut are excluded. The resulting sample is consistent with the definition of the resident worker population of Connecticut, those who both live and work in the state.

Census data allow one to obtain information on the resident worker population by using cross border migrant data to construct the population of individuals who both live and work in Connecticut. Further, they can be compared to those who commute from another state to work in Connecticut. Generally, data from the 2000 Decennial Census show that approximately 3.5 percent of the workforce in Connecticut at any point in time is represented by commuters from surrounding states. Commuting workers tend to have higher incomes than non-commuters. This shows up when considering the distribution of earnings for the matched files and UI files used in Tables A-1 and A-2.

Tables A-3 and A-4 show the mean, median, and various percentiles of the wage distributions from the UI files and matched files for the 1993 and 1996 data. Table A-3 shows the differences between the mean and median wages in the UI and matched 1993 files are $424 and $346, respectively. The differences in the 1996 files are $539 and $537. Therefore, the wages found in the matched files tend to be somewhat lower than those in the entire UI files.

A.6 Attrition

Since workers are required to report positive earnings at least once per year, attrition from the samples is worth considering. In Jacobson et al. (1993a, 1993b), they report that they lose 25 percent of the mass lay-off group because of workers not reporting positive earnings beyond the point where they lose their jobs. Similar calculations are performed on the analysis files here. A total of 5,800 people drop out of the 1993 mass lay-off sample beyond the point where a job is lost because of failure to report some positive earnings in at least one of the years examined. The same number for the 1996 mass lay-off sample is 5,194.

If the 5,800 people who do not meet this criterion but otherwise would be in the study were added to the total 1993 sample of mass lay-offs, the total available number of displacements would be 35,664. Thus, attrition because of unreported earnings in the 1993 mass lay-off sample is 16.3 percent. Similarly, if the attritions from the 1996 sample were added into the lay-off sample, the total displacements would equal 30,643, yielding an attrition rate of 17%. It is likely these numbers understate the true degree of attrition since matches are obtained based on information available at the end of the sample period. Nevertheless, including individuals with intermittent earnings reports following displacement would increase the estimated earnings losses presented in the body of the paper.

Table A-1: Percent Distribution of Connecticut Employment - 1993:1

NAICS Sector	NAICS Title	UI File	DMV Matches
11	Agriculture, Forestry, Fishing, Hunting	0.20%	0.23%
21	Mining	0.04%	0.05%
22	Utilities	0.41%	0.43%
23	Construction	3.11%	3.36%
31	Manufacturing	17.77%	16.40%
42	Wholesale Trade	3.96%	3.83%
44	Retail Trade	10.90%	11.61%
48	Transportation and Warehousing	2.45%	2.94%
51	Information	2.71%	2.60%
52	Finance and Insurance	7.64%	7.23%
53	Real Estate and Rental and Leasing	1.25%	1.28%
54	Professional, Scientific, and Technical	5.07%	4.85%
55	Management of Companies & Ent.	2.44%	2.37%
56	Admin., Support, Waste Mgmt., Remed.	4.63%	4.91%
61	Education Services	9.07%	8.77%
62	Health Care and Social Assistance	12.46%	12.31%
71	Arts, Entertainment, and Recreation	1.43%	1.49%
72	Accommodation and Food Services	5.71%	6.38%
81	Other Services (except Public Admin)	4.06%	3.92%
92	Public Administration	3.89%	4.20%
99	Unclassified Establishments	0.80%	0.84%

Table A-2: Percent Distribution of Connecticut Employment - 1996:1

NAICS Sector	NAICS Title	UI File	DMV Matches
11	Agriculture, Forestry, Fishing, Hunting	0.22%	0.24%
21	Mining	0.03%	0.04%
22	Utilities	0.65%	0.69%
23	Construction	3.19%	3.35%
31	Manufacturing	15.82%	14.36%
42	Wholesale Trade	3.87%	3.81%
44	Retail Trade	11.31%	12.17%
48	Transportation and Warehousing	2.90%	3.42%
51	Information	2.79%	2.69%
52	Finance and Insurance	6.58%	6.16%
53	Real Estate and Rental and Leasing	1.21%	1.23%
54	Professional, Scientific, and Technical	4.75%	4.51%
55	Management of Companies & Ent.	2.33%	2.26%
56	Admin., Support, Waste Mgmt., Remed.	5.35%	5.72%
61	Education Services	8.61%	8.07%
62	Health Care and Social Assistance	13.13%	12.99%
71	Arts, Entertainment, and Recreation	1.92%	2.03%
72	Accommodation and Food Services	5.81%	6.61%
81	Other Services (except Public Admin)	4.18%	4.10%
92	Public Administration	3.62%	3.80%
99	Unclassified Establishments	1.74%	1.75%

Table A-3 Connecticut's Reported Quarterly Wage Distribution - 1993:1

	P-25	Median	P-75	Mean
UI File	$ 2,101.00	$ 5,404.00	$ 9,085.00	$ 6,874.67
Matched File	$ 1,820.00	$ 5,058.00	$ 8,649.00	$ 6,450.24

Table A-4 Connecticut's Reported Quarterly Wage Distribution - 1996:1

	P-25	Median	P-75	Mean
UI File	$ 2,134.00	$ 5,902.00	$ 10,270.00	$ 7,790.67
Matched File	$ 1,775.00	$ 5,365.00	$ 9,692.00	$ 7,251.90