What Happens to the Employers Involved in Mass Layoffs?


Working Paper 470
March 2014

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We apply the empirical framework of the displaced worker literature to the study of outcomes for displacing employers. Long-term patterns of employment, wages, and closure probabilities before and after mass layoffs vary by the complexity, age, and industry of employers, reason for the layoff, and the period in which the layoff took place. Employers with mass layoffs during the Great Recession and the recovery that has followed have different patterns of employment, wages, and closure probabilities than employers with layoffs in previous periods. However, differences in employment and wage patterns are explained by changing observable characteristics of employers and layoffs.

We thank Till von Wachter, Anne Polivka, Patrick Carey, Sandi Mason, Mark Loewenstein, Jesse Rothstein, and Lori Kletzer for many helpful comments and suggestions, as well as seminar participants at the BLS-Census Researcher Workshop, the Mass Layoff Survey Annual staff meeting, and the George Washington University Microeconomics Seminar.
1. Introduction

A large and growing literature traces the causes and impacts of mass layoffs for both workers and their employers. Much evidence shows negative impacts of mass layoffs on workers, with wage losses and other negative outcomes that persist over time. However, the impact of mass layoffs on employers, whether on wages for remaining workers, or on other outcomes, such as productivity or profitability, is less clear. More fundamentally, there has been little study of the relationship between mass layoffs and the employment level of employers over time. To our knowledge, this paper represents the first study of the relationship between mass layoffs and employers’ overall employment and wage levels before and after the layoff, relative to comparison employers. It is the first to take the empirical framework used in studying outcomes for displaced workers over time, and apply this framework to the study of their displacing employers.

Beginning with the classic work of Jacobson, Lalonde, and Sullivan, 1993 [JLS], many studies have combined longitudinal data on displaced and non-displaced workers with an event-study empirical model to trace the impact of displacement over time. These studies, including Schoeni and Dardia, 2002; Couch and Placzek, 2007; Kodrzycki, 2007; and von Wachter, Song, and Manchester, 2009, clearly show that workers suffer long term reductions in wages when they are displaced from their jobs during employment contractions. Other studies have used this same longitudinal approach to show an impact of job loss on increased mortality (Sullivan and von Wachter, 2009) and decreased homeownership levels (Handwerker and von Wachter, 2010). Von Wachter, Handwerker, and Hildreth, 2009, show that the results of these studies depend on the comparison of displaced workers with a ‘control’ group of non-displaced workers.

The scholarship on employers involved in mass layoffs is not as well established. As summarized in Datta, Guthrie, Basuil, and Pandey, 2010, and Hallock, Strain, and Webber, 2011, few studies compare employers involved in mass layoffs with a true comparison group of other employers. For example, McKinney and Vilhuber, 2006, follow displacing employers over time, comparing employers with slow declines in employment with employers with fast employment declines, without a comparison group of non-displacing employers. Studies that do include comparison employers include Lengermann and Vilhuber, 2002 and Schwerdt, 2011, who show that employers affected by mass layoffs see a disproportionate loss of higher-wage workers in the quarters before the displacement or closure, as well as Abowd, McKinney, and Vilhuber, 2009, who show that employers of low-skilled workers are more likely to have mass layoffs, and conditional on a mass layoff, employers are more likely to close if they employ lower-skilled workers.

In recent years, there has been a great expansion of the literature on employer dynamics over the business cycle, following the construction of new datasets at annual and quarterly frequencies. For example, using the microdata of the Longitudinal Employer-Household Dymanics (LEHD), Hyatt and McEntarfer, 2012, show a great decline in job mobility among workers during the Great Recession, with particularly low rates of re-employment for displaced workers. Lazear and Spletzer, 2012, use the Job Openings and Labor Turnover Survey (JOLTS) microdata to show a great decline in employer hiring to replace departing workers during the Great Recession. Foster, Grim, and Haltiwanger, 2013, use the
annual data of the Business Dynamics Statistics (BDS) and the quarterly data of the Business Employment Dynamics (BED) to show that the Great Recession had a dramatic fall in job creation, especially among young firms (earlier recessions saw more increased job destruction), and less reallocation of labor in the Great Recession than other recessions. Fort, Haltiwanger, Jarmin, and Miranda (2013) use the BDS data to show that young and small firms have the strongest cyclical patterns of job creation and destruction, and were particularly affected by the Great Recession. However, none of these studies address the specific employment dynamics of employers with layoffs.

This paper examines the long term histories of employers that have extended mass layoffs—events when 50 or more employees are let go and file for unemployment insurance, and their former employer tells a state workforce agency that these layoffs will be for at least 31 days duration. Following the work of Handwerker, Hildreth, and von Wachter, 2009, who demonstrate the importance of a comparison group of unaffected workers when studying wage impacts for workers, we compare these employers with a comparison group of employers without concurrent mass layoffs, selecting each comparison employer to be similar in age (just before the layoff date), size, and industry to a firm with a mass layoff. In Section 2, we describe how we match the microdata of the Mass Layoff Statistics Program (MLS) with these employers’ records in the BLS Longitudinal Business Database. We also describe our methodology, analogous to JLS, to show patterns of outcomes over time for employers with mass layoffs, relative to the comparison group.

In Section 3, we examine several aspects of the relationship between mass layoffs and the long term employment patterns of employers.¹ We show how patterns of employment vary by the reason for the layoff, the industry of employers, the age of the employer, and whether there were changes to the set of establishments reported by the employer. We examine the patterns of employment for layoffs taking place during different portions of the business cycle, with and without controlling for employer and layoff characteristics. Section 4 repeats these analyses for patterns of average wages paid by these employers. Section 5 repeats these analyses for the probability of a closure of the employer. Section 6 concludes.

2. Data and Methodology

The MLS data

We match microdata from the Mass Layoff Statistics (MLS) with the employment, wage, and industry microdata of the Quarterly Census of Employed Workers (QCEW), linked across time in the Longitudinal Business Database (LDB). The MLS microdata contain detailed information on major employment cutbacks, collected directly from the employers. This survey was conducted by state workforce agencies from 1995 to 2013. These agencies contacted employers with at least 50 initial claims for unemployment insurance filed against them during a consecutive 5-week period and

¹ This work greatly extends a project begun by Hyson and Splezter at the Bureau of Labor Statistics. To their analyses, we add additional years of data and data for multi-establishment employers, and add the comparisons to comparable employers without contemporaneous mass layoffs. We also examine a broader range of outcomes.
determined whether these layoffs would last at least 31 days. If so, the MLS program collected information on the nature of the layoff, including the total number of people laid off and the reason for the layoff. More information about the MLS, the QCEW, and the LDB is given in the Data Appendix. The total number of mass layoffs is shown in Table 1, in total and by the reasons for the layoffs, the industries in which the layoffs occurred, and the ages of the employers in these layoffs.

Table 1: Characteristics of Layoffs in the MLS and the Employers involved:

<table>
<thead>
<tr>
<th>Reason for Layoff</th>
<th>1990s expansion</th>
<th>2001 Recession</th>
<th>2000s expansion</th>
<th>Great Recession</th>
<th>2010s expansion</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Layoffs</td>
<td>25,514</td>
<td>7,110</td>
<td>29,836</td>
<td>16,876</td>
<td>24,209</td>
<td>103,545</td>
</tr>
<tr>
<td>Layoffs per quarter</td>
<td>1,343</td>
<td>1,778</td>
<td>1,297</td>
<td>2,411</td>
<td>1,614</td>
<td>1,523</td>
</tr>
<tr>
<td>Business Demand</td>
<td>7,983</td>
<td>2,795</td>
<td>10,050</td>
<td>7,453</td>
<td>8,935</td>
<td>37,216</td>
</tr>
<tr>
<td>Disaster</td>
<td>553</td>
<td>61</td>
<td>654</td>
<td>73</td>
<td>107</td>
<td>1,448</td>
</tr>
<tr>
<td>Financial</td>
<td>1,708</td>
<td>894</td>
<td>2,084</td>
<td>1,505</td>
<td>1,612</td>
<td>7,803</td>
</tr>
<tr>
<td>Reorganization</td>
<td>3,571</td>
<td>1,070</td>
<td>3,985</td>
<td>941</td>
<td>1,151</td>
<td>10,718</td>
</tr>
<tr>
<td>Production</td>
<td>869</td>
<td>146</td>
<td>577</td>
<td>161</td>
<td>263</td>
<td>2,016</td>
</tr>
<tr>
<td>Seasonal</td>
<td>8,613</td>
<td>1,508</td>
<td>9,662</td>
<td>3,714</td>
<td>7,865</td>
<td>31,362</td>
</tr>
<tr>
<td>Other</td>
<td>1,129</td>
<td>379</td>
<td>696</td>
<td>169</td>
<td>299</td>
<td>2,672</td>
</tr>
<tr>
<td>Nonresponse</td>
<td>1,088</td>
<td>257</td>
<td>2,128</td>
<td>2,860</td>
<td>3,977</td>
<td>10,310</td>
</tr>
<tr>
<td>Industry</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Construction</td>
<td>4,313</td>
<td>760</td>
<td>5,270</td>
<td>3,273</td>
<td>5,304</td>
<td>18,920</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>10,138</td>
<td>3,135</td>
<td>9,142</td>
<td>5,459</td>
<td>4,681</td>
<td>32,555</td>
</tr>
<tr>
<td>Retail Trade</td>
<td>1,562</td>
<td>436</td>
<td>1,989</td>
<td>1,092</td>
<td>1,504</td>
<td>6,583</td>
</tr>
<tr>
<td>Administrative and Support</td>
<td>1,588</td>
<td>575</td>
<td>2,877</td>
<td>1,398</td>
<td>2,934</td>
<td>9,372</td>
</tr>
<tr>
<td>Accommodation and Food</td>
<td>1,151</td>
<td>351</td>
<td>1,629</td>
<td>901</td>
<td>1,743</td>
<td>5,775</td>
</tr>
<tr>
<td>Other</td>
<td>6,762</td>
<td>1,853</td>
<td>8,929</td>
<td>4,753</td>
<td>8,043</td>
<td>30,340</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 2 years</td>
<td>1,033</td>
<td>239</td>
<td>815</td>
<td>234</td>
<td>444</td>
<td>2,765</td>
</tr>
<tr>
<td>2 - 3 years</td>
<td>1,183</td>
<td>330</td>
<td>946</td>
<td>271</td>
<td>417</td>
<td>3,147</td>
</tr>
<tr>
<td>4 - 5 years</td>
<td>4,328</td>
<td>362</td>
<td>1,138</td>
<td>418</td>
<td>512</td>
<td>6,758</td>
</tr>
<tr>
<td>More than 5 years</td>
<td>18,200</td>
<td>5,959</td>
<td>26,062</td>
<td>15,451</td>
<td>22,781</td>
<td>88,453</td>
</tr>
</tbody>
</table>

Table 1 shows that the reasons for layoffs, the industry composition of layoffs, and the age composition of employers with layoffs varied over the business cycle during 1995-2013.

**Reasons for layoffs:** In the most recent subperiods, the Great Recession and the expansion that has followed, the fraction of layoffs due to Business Demand reasons has been unusually high. The fraction of layoffs due to Financial reasons was unusually high in both recessions covered by the MLS, while the fractions of layoffs due to Reorganization was highest from the 1990s expansion through the 2000s expansion.
Industry composition of layoffs: The fraction of layoffs in the manufacturing industry was particularly high during the 1990s expansion and the 2001 recession. The fraction of layoffs in the construction industry has been particularly high during the current expansion (more so than during the Great Recession). Overall, the Great Recession saw layoffs happen in a very similar pattern of industries to the period as a whole.

Age composition of employers with layoffs: Most of the employers appearing in the MLS have been reporting their employment to the Unemployment Insurance system and thus appear in the QCEW for some time before the layoff. The age distribution of these employers (multiple-establishment employers are listed in this table by their age of their oldest establishment) is listed in Table 1. The fraction of all layoffs happening in young employers has been steadily falling over time, regardless of the business cycle. This is consistent with other evidence that new businesses have been starting with decreasingly few employees and growing at decreasing rates (see for example Choi and Spletzer 2012)—without employing at least 50 employees, it is impossible for an employer to lay off 50 employees and appear in the MLS.

In a companion paper (Handwerker and Mason 2012), we show that the distribution of these characteristics not only differs from the overall distribution of industry and age among US employers, but also differs from the characteristics of all employers with large declines in employment. The employers in the MLS are larger, with more establishments and more workers, paying higher wages, and having larger layoffs, than employers with large declines in employment that do not appear in the MLS. They are also more likely (in earlier sub-periods) to be in manufacturing.

Additional information about the MLS, including coverage, response rates, item refusal rates, and characteristics of employers in the MLS, can be found in the data appendix.

Regression methodology for comparing employment dynamics

We use the JLS event-study methodology to examine the long-term impact of mass layoffs in a regression context. This allows us to model employment and wage dynamics by capturing the displacement effect given a mass layoff with a subset of the model’s parameters. The subset of model parameters is estimated using dummy variables that represent the number of quarters before or after the mass layoff, and is invariant to the specific date the mass layoff occurred.

This framework requires a set of comparison employers, and so we select one comparison employer for every mass layoff event in the MLS. These comparison employers are randomly selected from the QCEW in the quarter before the layoff date. These comparison employers do not have mass layoffs in the quarter after selection, although some of them may have mass layoffs in other quarters. We select each comparison employer to match the age group and size class of an employer in the MLS.

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2 The total number of employers in this tabulation does not match the total number of MLS Events in previous tables because some employers have multiple layoff events per quarter, and these are consolidated here.
in an industry that is as close a match as possible to the MLS employer. More information about the selection of comparison employers can be found in the data appendix.

For both employers with layoffs and comparison employers, we aggregate establishments to the UI account level, aggregating employment and total wages each quarter. Some employers are involved in consolidations (combining many previous establishments into one) and break-outs (turning one previous establishment into many) during the 5 years before and after the quarter of a layoff. We compile the full set of establishments that are ever part of each UI account over the five years (20 quarters) before and after the event quarter. Overall, 46% of the events in the MLS data are associated with an employer consisting of a single establishment that never consolidates or breaks apart, 32% are associated with employers consisting of multiple establishments without changes in structure, and 22% are associated with an employer involved in the breakup or consolidation of multiple establishments.³

The JLS event-study methodology can be expressed more formally where $D_{it}^k$ equals 1 if in period $t$ employer $i$ had a mass layoff $k$ quarters earlier and $D_{it}^k$ equals 0 otherwise. For outcomes such as employment and wages, with a non-zero value in most quarters, the model is specified as:

$$y_{it} = \alpha_i + \sum_{1995Q2}^{2011Q2} T^T \gamma_t + x_{it} \beta + \sum_{|k|\leq20} D_k \delta_k + \epsilon_{it},$$

where $y_{it}$ is the outcome of interest (employment, wages).

$\alpha_i$ is an employer fixed effect. This fixed effect normalizes the overall difference between employers with a mass layoff and those without to zero.

$\gamma_t$ is a time fixed effect.

$x_{it}$ are observed, time-varying characteristics of the employer, such as industry classification.

Of most interest to us are the dummy variables $D_{it}^k$ that jointly represent the mass layoff event and the parameters $\delta_k$, $k = -20, ..., 20$ which give the displacement effect of a mass layoff. Graphically, the parameters $\delta_k$ allow us to show the dynamics of employment and wages visually. We also model variations of (1) to show the time-varying patterns of displacement effects for different subgroups of employers. These variations take the form:

³ Over time, there has been a small decrease in the fraction of events associated with single establishments, and a large increase in the fraction of events associated with multiple establishments with changes in structure. Single-establishment employers have fewer workers than the multiple-establishment employers, and their layoffs are smaller. Examining the total number of people laid off in an MLS event, 38% are laid-off from single establishment employers, 35% are laid off from multi-establishment employers without changes in structure, and 26% are laid-off from employers with changing structure. Looking at the total number of pre-layoff employees at employers reporting events in the MLS, 17% of the employees are with single establishment employers, 35% of the employees are with multi-establishment employers with unchanging structure, and 48% of employees are with employers that have breakouts and/or consolidations.
\[ y_{it} = \alpha_t + \sum_{1995Q2 \leq t \leq 2011Q2} T_t + x_{it}\beta + \sum_{|k| \leq 20} D_k \delta_{1k} + \cdots + \sum_{|k| \leq 20} D_n \delta_{nk} + \epsilon_{it}, \]

where

D_1 through D_n are dummy variables for displacements among n separate subpopulations of employers, classified by industry, age, or the reason reported for the separation, and the estimation of parameters \( \delta_{nk} \) allow us to show visually how the dynamics of employment and wages differ for these groups.

For outcomes such as a closure, where the outcome variable is binary and will have a value of zero in most quarters, the model is specified instead as

\[ y_{it} = \sum_{1995Q2 \leq t \leq 2011Q2} T_t + x_{it}\beta + \sum_{|k| \leq 20} D_k \delta_{k} + \epsilon_{it}, \]

without the employer fixed effect. In this model, the overall difference between employers with and without mass layoffs is not necessarily zero.

### 3. Findings: employment

#### Overall patterns of employment over time

To illustrate this regression method, Figure 1 shows the employment levels over time of employers with mass layoffs in 2001Q4, as well as their comparison employers. Employers with mass layoffs in 2001Q4 are shown in three groups in this figure: all employers with mass layoffs, the subgroup of these employers which did not breakout or consolidate any of their unemployment insurance reports (at the establishment level) over the entire period, and the subgroup of these employers which had only one establishment for the entire period. For each group in the figure, including the comparison employers, there is some seasonality of employment, and a fall in employment in 2001Q4. However, the decline in employment in 2001Q4 is much smaller for the comparison employers than for the employers that had mass layoffs. The average employment of all employers with a mass layoff in 2001Q4 (1,491.5) is close to the employment of the comparison employers (1,391.6). We expect these to be close because comparison employers are chosen for their similarity in industry, age, and size to employers with mass layoffs, as of the quarter before the layoff date. The group of employers with a constant set of establishments has a mean employment of 964.7 in 2001Q4, while single establishment employers have an average employment of 473.1.

Over time, we see that employers were generally growing before 2001Q4. After the layoffs in 2001Q4, the comparison employers, single-establishment employers and multiple-establishment employers that have no change in structure have roughly constant employment, while employers with changes in structure see declining employment. There is also a greater seasonal pattern of employment from 1996Q4 to 2006Q4 in the employers that had mass layoffs in 2001Q4 than in the comparison employers. This is not surprising, as some of the mass layoffs in 2001Q4 were seasonal layoffs, and employers with seasonal layoffs in one year may have similar seasonal layoffs in other years.
We use the regression methodology described in equation (1) to generalize the comparison of employers with mass layoffs to comparison employers without mass layoffs in all quarters of the MLS data. Figure 2 graphs the coefficient estimates $\hat{\delta}_k$ from equation (1), showing the relationship between mass layoffs and employment for 5 years (20 quarters) before and after mass layoff events. The QCEW data we use is linked longitudinally from 1990Q2 to 2013Q1, and so this analysis considers mass layoff events that occurred from 1995Q2 to 2012Q4. Figure 2 shows the difference in employment at employers with a mass layoff, relative to comparison employers, for 5 years before and after a mass layoff. This figure controls for the quarter of observation and employer industry at the 4-digit NAICS level, but it does not control for employer age or the reason for the layoff.

Figure 2 shows that there is a pronounced seasonality of employment for the employers with mass layoffs, relative to their comparison employers. Employers with mass layoffs are growing more quickly than comparison employers before the mass layoffs, with higher employment in the quarter preceding the mass layoff, and permanently lower employment afterwards. Employers with only one establishment or with multiple establishments but no changes in the structure of their unemployment insurance account during this period have the least employment growth before the mass layoffs and the

\[ \hat{\delta}_k \]

For ease of interpretation, the ‘omitted quarter’ in this regression is chosen as the quarter of the layoff.
smallest declines in employment after the mass layoff. Patterns of employment growth before the quarter of the mass layoff are very similar for employers with only one establishment and employers with constant structure, but these types of employers diverge in employment after the mass layoff, with sharper declines in employment for employers with more than one establishment.

Figure 2: Regression estimates $\hat{\delta}_k$ of the impact of Mass Layoff on Employment

Comparing patterns for employers with different reasons for the layoff

The seasonality of employment patterns for employers with mass layoffs, shown in Figure 2, strongly suggests that the patterns of employment before and after mass layoffs, relative to comparison employers, differs by the reason for the layoff. Employment patterns by primary layoff reason are calculated from equation (1) with the set of parameters $\hat{\delta}_k$ interacted with primary layoff reasons, with quarter and industry controls at the 4-digit NAICS level. The resulting parameter estimates, as well as 95% confidence intervals for these estimates, are plotted in Figure 3. In this figure, as well as all subsequent figures, estimates are presented for all employers appearing in the mass layoff statistics, and are not broken out by the complexity of their establishment structure.
The first panel of Figure 3 shows the pattern of employment changes before and after mass layoffs for business demand reasons. This category includes “Contract cancellation and completion,” “Domestic or import competition,” “Excess inventory / saturated market,” and “Slack work / insufficient demand / non-seasonal business slowdown.” It shows a steep increase in employment growth relative to comparison employers without mass layoffs before the mass layoff, and a steady long-term decline in employment after the mass layoff. This is a very different pattern from that shown in the second panel, seasonal layoffs. Employers with seasonal layoffs show minimal long-term trends in employment, relative to comparison employers. Employment recovers quickly following seasonal layoffs, only to fall again each year. Employers which report mass layoffs due to other reasons, such as “Organizational Reasons,” “Financial Reasons,” “Production Reasons,” “Disaster/Safety Reasons,” or “Other/Miscellaneous reasons,” show slowly growing levels of employment before the mass layoff, and particularly sharp declines in employment which continue well after the initial quarter of the mass layoff. Employers which do not give a reason for the mass layoff appear similar in their long term employment trends to employers giving business demand and other reasons for mass layoffs.
Comparing patterns for employers in different industries

These employment patterns also differ markedly by industry. We calculate the set of parameters $\hat{\delta}_k$ from equation (1), interacted with broad industry categories, classifying employers with multiple establishments according to the industry of the establishments employing the greatest number of their employees. We used industry as one of the criteria for identifying comparison employers, and so these estimates compare employment patterns for employers with mass layoffs to employers in the same industry\(^5\) that do not have a mass layoff at that time. The resulting coefficient estimates for selected industry groups are plotted in Figure 4.

Figure 4: Regression estimates $\hat{\delta}_k$ of the impact of Mass Layoff on Employment, by Industry of Employer

![Figure 4](image)

Figure 4 shows how layoffs in different industry groups are associated with very different patterns of employment before and after layoffs. For manufacturing employers (31.0% of mass layoffs), there is no sign of employment growth before a mass layoff; mass layoffs are the initial, steepest, portion of a continuously declining figure of employment. Construction employers (18.3% of mass layoffs) show increasing employment immediately before mass layoffs, and declines in employment.

\(^5\) There were a few very large employers for which no comparison employer in the same industry could be found without a layoff, in which case comparison employers were chosen from other industries. See the data appendix for more details.
after the mass layoffs (though there is a seasonal component to their employment levels). Mass layoffs appear to return employment to long-run trends for employers in the construction industry. Retail employers (6.3% of all mass layoffs) also have a seasonal component to employment, but these employers have increasing employment trends before the mass layoffs, and decreasing trends in employment afterwards. Patterns for other sectors are shown in Appendix Figure A5: these patterns vary widely.

Comparing patterns for employers of different ages

Haltiwanger, Jarmin, and Miranda (2013) and Fort, Haltiwanger, Jarmin, and Miranda (2013) show that employment dynamics vary greatly by employer age, and so we examine differences in employment patterns before and after layoffs by employer age, calculating the set of parameters \( \delta_k \) from equation (1), interacted with 4 categories of employer age, classifying employers with multiple establishments according to the age of their oldest establishment. The resulting coefficients, and their 95% confidence intervals, are plotted in Figure 5. Employer age is one of the criteria used in identifying comparison employers, and so these estimates compare employment patterns for employers with mass layoffs to employers of the same age without mass layoffs.

Figure 5: Regression estimates \( \delta_k \) of the impact of Mass Layoff on Employment, by Employer Age
Since a Mass Layoff involves 50 or more workers, by definition, young employers could not have a mass layoff without rapid growth in employment before the layoff date. Figure 5 shows that the younger an employer with a mass layoff, the more quickly that employer was growing before the mass layoff, relative to employers the same age without mass layoffs. However, patterns of employment decline after mass layoffs are much more similar across employer age groups. Five years after layoffs, employment declines relative to the layoff quarter ranged from 623 for employers that existed for less than two years at the time of the layoff to 410 for employers that existed for 2-3 years at the time of the layoff.

Employment Patterns by Business Cycle

The pattern of employment changes may also differ by the portion of the business cycle in which mass layoffs take place. The upper panel of Figure 6 shows the relationship between mass layoffs and employment by the date when these layoffs take place. Layoffs occurring during the Great Recession of 2007-2009 and during the week expansion that has followed show more muted patterns of long-term employment changes, relative to comparison employers, than layoffs occurring during earlier periods—even during the recession of 2001. In earlier periods, mass layoffs occurred at employers that had gained about 300 employees more than comparison employers over the 5 years before the layoff, and lost more than 450 employees more than comparison employers over the 5 years after the layoff. However, in the more recent periods, mass layoffs have occurred at employers that had gained about 100 employees more than comparison employers over the 5 years before the layoff, and were on track to lose about 300 employee more than comparison employers over the 5 years after the layoff. The convergence of employment trends between employers with mass layoffs and their comparison employers in more recent periods suggests that mass layoffs in these recent periods have been less driven by employer-specific conditions, and driven more by larger forces that have impacted the entire economy.

Indeed, the results we find in the upper panel of figure 6 are largely driven by the changing age, industry, and reason composition of employers with mass-layoffs over the business cycle. As described in Section 2, layoffs during the Great Recession were more likely to occur due to Business Demand and Financial Reasons and layoffs in young employers have been falling over time. Thus, we also show these trends controlling for layoff reason, industry, and age, adding all of these variables as interactions with the number of quarters before and after the layoff, with the regression $y_{it} = \alpha_i + \sum_{1995Q2\leq t\leq 2011Q2} T_t \gamma_t + x_{it}\beta + \sum_{|k|\leq 20} D_{reason\ group1}^k \delta_{reason\ group1k} + \cdots + \sum_{|k|\leq 20} D_{reason\ group4}^k \delta_{reason\ group4k} + \sum_{|k|\leq 20} D_{industry\ group1}^k \delta_{industry\ group1k} + \cdots + \sum_{|k|\leq 20} D_{industry\ group4}^k \delta_{industry\ group4k} + \sum_{|k|\leq 20} D_{age\ group1}^k \delta_{age\ group1k} + \cdots + \sum_{|k|\leq 20} D_{age\ group4}^k \delta_{age\ group4k} + \sum_{|k|\leq 20} D_{time\ period1}^k \delta_{time\ period1k} + \cdots + \sum_{|k|\leq 20} D_{time\ period4}^k \delta_{time\ period4k} + \epsilon_{it}$. The lower panel of Figure 6 shows that after controlling for the time-pattern of employment changes due to employer and layoff characteristics, there are no significant differences in employment dynamics between layoffs occurring in different periods.
Figure 6: Regression estimates $\hat{\delta}_k$ of the impact of Mass Layoff on Employment, by layoff date.
4. Patterns of Wages

Employers report quarterly total wage bills for each establishment to state unemployment insurance agencies, and these are aggregated into the data of the Quarterly Census of Employment and Wages. States vary slightly in their instructions to employers about what to include in wage reports, but these wage reports generally include bonuses, stock options, profit distributions, the cash value of meals and lodging, tips and other gratuities, and—particularly relevant for examining employers with mass layoffs—severance pay. In Appendix Figure A6, we show the average wage bill per quarter for employers with mass layoffs in 2001Q4 and their comparison employers. This figure shows a sharp spike in wages in the quarter of the mass layoff. This spike is likely caused by some combination of severance pay and final paychecks being paid in the quarter after laid-off workers are included in employment counts. There is also a strong seasonal component of average wages in the employers with mass layoffs, relative to the comparison employers. This seasonality of pay is less prominent in the second panel of the figure, where we omit employers with seasonal mass layoffs. The figure also shows that average wages in employers with mass layoffs are higher than average wages in comparison employers after the date of the layoff, consistent with lower-paid employees being let go in a mass layoff.

Generalizing these results to layoffs in all quarters using the regression framework of equation (1), we show the set of parameters $\delta_k$ that estimate the relationship between mass layoffs and wages in Figure 7, as well as the 95% confidence intervals surrounding these coefficient estimates. For clarity of presentation, in this figure, as well as the wage figures that follow, the omitted quarter (in which the difference in wages is zero by construction) is the quarter before the layoff, and we include controls for employer size groups as well as for industry at the 4-digit NAICS level. Figure 7 shows a slight downward trend in pre-layoff average quarterly wages for employers with mass layoffs, amounting to a fall in wages of about $250/quarter over the 5 year period before the layoff date, relatively to comparison employers. During the quarter when mass layoffs took place, there is a spike in wages for employer with mass layoffs—perhaps due to the payment of severance pay—followed by a permanent relative increase in the level of average quarterly wages per employee. This permanent increase in wages at MLS employers is about $760 per quarter for all MLS employers and about $995 for employers with non-seasonal layoffs. After the layoff date, the gap in wages between the employers with mass layoffs and the comparison employers has greater seasonal variation, but has no overall trend. For employers with non-seasonal layoffs, the gap in average wages remains roughly constant from 2 quarters following the layoff date until the end of the period we study.

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6 In certain states, reported wages also include employer contributions to deferred compensation plans, such as 401(k) plans.
7 Total quarterly nominal wage bill in each quarter divided by the number of employees in that quarter
These average wage patterns differ quite dramatically by industry groups. Here again, our estimates compare employment patterns for employers with mass layoffs to employers in the same industry that do not have a mass layoff at that time. The resulting coefficient estimates for selected industry groups are plotted in Figure 8. This figure shows that Manufacturing employers with layoffs have a very slight downward trend in average wages before the layoff date, a spike in average wages in the quarter of the layoff, and a permanent increase in average wages following the layoff of more than $1040/quarter, with an increasing trend in wages after the layoff date. Construction employers with layoffs show a strongly seasonal pattern of average wages, with a slight overall trend of increasing wages through the whole period, and no real break in average wage trends in the quarter of the layoff. In contrast, Retail trade employers with layoffs have a strongly downward trend in wages both before and after the layoff date. Wage patterns for employers in other industry groups are shown in Appendix Figure A7. These show a very wide range of difference in average wages before and after mass layoffs.
Average wage patterns before and after layoffs by employer age and layoff reason groups do not vary quite so dramatically. Wage patterns by employer age are shown in Appendix Figure A8. The patterns of wage changes look very similar across different employer age groups, although the spike in average wages, relative to comparison employers, in the quarter of the mass layoff is greatest for employers that were in business for 2-3 years before the layoff date. Wage patterns by layoff reason are shown in Appendix Figure A9. Unsurprisingly, the strongly seasonal pattern of differences in average wages between employers with mass layoffs and comparison employers is a feature only of employers with seasonal layoffs. All other layoff reasons yield patterns of average wages before and after layoffs that are similar to the overall pattern shown in the non-seasonal panel of Figure 7, although the magnitude of the difference in wages before and after the layoff varies by the layoff reason. Employers that specified specific other reasons for layoffs, such as “Organizational Reasons,” “Financial Reasons,” “Production Reasons,” “Disaster/Safety Reasons,” or “Other/Miscellaneous reasons,” have larger permanent increases in average wages following mass layoffs, relative to comparison employers, than employers with layoffs for Business Demand reasons or employers that did not report a reason for the layoff.
Figure 9: Regression estimates $\hat{\delta}_k$ of the impact of Mass Layoff on Wages, by Layoff Date

**Business Cycle**

- Expansion: 1995 Q2 - 2000 Q4
- Expansion: 2002 Q1 - 2007 Q4
- Expansion: 2009 Q3 - 2012 Q4

- Contraction: 2001 Q1 - Q4
- Contraction: 2007 Q4 - 2008 Q2

Legend:
- Average Wages
- Lower 95% CI
- Upper 95% CI

**Business Cycle**

Controlling for Layoff Reason, Age, and Industry

- Expansion: 1995 Q2 - 2000 Q4
- Expansion: 2002 Q1 - 2007 Q4
- Expansion: 2009 Q3 - 2012 Q4

- Contraction: 2001 Q1 - Q4
- Contraction: 2007 Q4 - 2009 Q2

Legend:
- Average Wages
- Lower 95% CI
- Upper 95% CI
The upper panel of Figure 9 shows how these changes in wages differ for employers with mass layoffs by layoff date (the same figure without layoffs for seasonal reasons is shown in Appendix Figure A10, showing these trends more clearly). Differences in wage patterns by layoff date are relatively small. However, employers with mass layoffs taking place during the expansionary periods of the 1990s and the 2000s and in the Great Recession have slightly declining average wage levels relative to their comparison employers before the layoff date, while employers with mass layoffs taking place during the 2001 recession and the 2010s expansion have wage levels similar to those in comparison employers before the layoff date. Within a year after the layoff date, employers with mass layoffs taking place during all of the expansionary periods or during the 2001 recession have constant levels of average wage levels relative to comparison employers (about $1000/employee greater than just before the layoff date). However, employers with mass layoffs taking place during the Great Recession of 2007-2009 show some decline in average wage levels after the layoff, relative to comparison employers. This pattern was not seen in MLS employers with layoffs taking place during any other time period.

Because layoffs in different periods have different distributions by layoff reasons and employer ages, the lower panel of Figure 9 shows these trends in average wage differences, adding full controls for the time patterns of wages by layoff reason, age, and industry, as above. This figure shows that after controlling for employer and layoff characteristics, there is little difference in the pattern of average wages changes for layoffs occurring during different periods.

5. Patterns of closures

Employers are required by law to report their employment each quarter to state Unemployment Insurance offices, and these records are compiled into the Quarterly Census of Employment and Wages. Employers may appear in the QCEW for several quarters after closing, with zero employment recorded in their records. Thus, we use zero employment as a marker of employer closure, and examine the likelihood of having zero employment for employers with mass layoffs, relative to the likelihood of zero employment for comparison employers. Employers will also have zero employment before they open, and so differences in the likelihood of zero employment before a mass layoff can be interpreted as differences in employer age between employers with mass layoffs and comparison employers (although age was one of the factors used in selecting appropriate comparison employers). We use the methodology presented in equation (2), omitting employer fixed effects $\propto$, so that we can examine absolute differences in probabilities.

Figure 10 shows the differences in the probability of zero employment between employers with mass layoffs and comparison employers. Overall, employers with mass layoffs are more likely to have zero employment than comparison employers. This difference decreases before the layoff date, and increases monotonically as time elapses after the layoff date. However, in the quarters surrounding the layoff quarter, the MLS employers are less likely than comparison employers to have zero employment; they would not be covered by the MLS without laying off 50 workers who filed for unemployment benefits, and thus appearing in the QCEW with 50 or more workers in the quarter before the layoff. The
probability of zero-employment following a layoff is higher for employers with layoffs for non-seasonal reasons.

Figure 10: Regression estimates $\delta_k$ of the impact of Mass Layoff on the probability of zero employment

![Figure 10](image)

The pattern of differences in the probability of zero employment by a more complete set of reasons for the layoff is shown in Appendix Figure A11. All layoff reasons yield similar patterns of the probability of zero employment before and after layoffs, with differences only in the magnitude of these patterns. There is also little difference in the probability of zero employment before the layoff date among non-seasonal layoff reasons. After the layoff date, employers that specified specific other reasons for layoffs, such as “Organizational Reasons,” “Financial Reasons,” “Production Reasons,” “Disaster/Safety Reasons,” or “Other/Miscellaneous reasons,” have the largest probabilities of zero employment, relative to comparison employers.

Greater differences in these patterns occur by industry sector, as shown in Figure A12. The greatest probability of zero employment following a mass layoff, relative to comparison employers in the same industry, is found among manufacturing and wholesale and retail trade employers. For employers in these groups, five years after a mass layoff, there is a 25% increase in the probability of zero employment, relative to comparison employers. For wholesale and retail trade employers, much of this increased probability of zero employment happens in the first year after the mass layoff, while for

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manufacturing employers, the probability of zero employment increases more linearly with each quarter following the layoff.

The patterns of differences in the probability of zero employment before and after mass layoffs vary considerably by age. As shown in Figure 11, the relationship between mass layoffs and zero employment at an employer is driven largely by the strength of this relationship among younger employers. Before the date of the mass layoff, the relationship between mass layoff and the probability of zero employment appears to be completely driven by the fact that employers with mass layoffs are younger than their comparison employers, within each employer age group. After the mass layoff, younger employers appearing in the MLS are more likely to close than older employers, relative to each group’s comparison employers. By 5 years after the layoff date, employers that were less than 2 years old at the time of the layoff are 27.3% more likely to close than comparison employers and employers that were 2-3 old at the time of the layoff are 27.9% more likely to close than comparison employers. In contrast, employers that were more than 5 years old at the time of the layoff are only 13.7% more likely to close than comparison employers.

Figure 11: Regression estimates $\delta_k$ of the impact of Mass Layoff on the probability of zero employment, by employer age

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8 As an example, the panel of Figure 11 for employers aged 2-3 years as of the layoff date shows that employers with mass layoffs are less likely to have zero employment between 0 and 2 years of the layoff date than their comparison employers. However, between 2 and 4 years of the layoff date, they are increasingly likely to have zero employment as the time before the layoff date increases. Within the age range of 2 and 4 years pre-layoff date, the employers with mass layoffs must be younger than their comparison employers. This same pattern holds for all other panels of the figure as well.
Figure 12: Regression estimates $\hat{\delta}_k$ of the impact of Mass Layoff on the probability of zero employment, by layoff date.
The upper panel of Figure 12 shows how these changes in the probability of zero employment differ for employers with mass layoffs by layoff date. This figure shows a decline over time in the probability that an employer with a mass layoff will close, relative to comparison employers. For employers with layoffs during the 1990s expansion or the 2001 contraction, the increased probability of closure was 0.18 and 0.19 respectively by 5 years after the layoff date, while the increased probability 5 years after a mass layoff during the 2000s expansion was only 0.13, and the increased probability 5 years after a mass layoff during the Great Recession was only 0.02. In the expansion following the Great recession, the probability 3 ½ years after a mass layoff also increased by only 0.02.

These falling probabilities of closure stem in part from the falling proportion of mass layoffs at manufacturing and young employers, which have particularly high probabilities of zero employment following mass layoffs. The lower panel of figure 12 includes interactions of layoff reasons and employer age, industry, and size with the number of quarters before and after the layoff date, and the inclusion of these additional variables partially ameliorates the decline over time in the probability of zero employment following mass layoffs. Controlling for these observable factors, employers with layoffs during the 1990s expansion or the 2001 contraction, the increased probability of closure was 0.24 and 0.25 respectively by 5 years after the layoff date, while the increased probability 5 years after a mass layoff during the 2000s expansion was 0.21, and the increased probability 5 years after a mass layoff during the Great Recession was 0.13. In the expansion following the Great recession, the probability 3 ½ years after a mass layoff increased by 0.09.

6. Conclusions

This paper gives (to our knowledge) the first estimates of the relationships between mass layoffs and employer outcomes over time, such as employment patterns, wage patterns, and the probability of employer closures. It also shows how these relationships differ for employers with different industries or ages, for layoffs occurring in different portions of the business cycle, and by the reason for the mass layoff. These relationships are estimated using the microdata of the Mass Layoff Statistics program, linked with the microdata of these employers in the administrative records of the Unemployment Insurance system. All estimates are relative to the patterns observed among a comparison group of employer similar in age, industry, and size, but without contemporaneous mass layoffs.

We show that employers with mass layoffs were growing more quickly than comparison employers before the mass layoffs, with higher employment in the quarter preceding the mass layoff, and permanently lower employment afterwards. The impact of mass layoffs on long-term employment patterns of employers varies by the complexity and age of the employer. Employers with only one establishment have the least employment growth before the mass layoffs, and the smallest declines in employment after the mass layoff. Employers that add or subtract establishments to their Unemployment Insurance accounts during the 5 years because of breakouts or consolidations before or after a mass layoff have the greatest increases in employment before the mass layoffs, and the greatest declines in employment afterwards. Young employers with mass layoffs had particularly strong employment growth before the layoff, relative to comparison employers.
The impact of mass layoffs on long-term employment patterns varies by the reason for the mass layoff, the industry of the employer, and the date of the mass layoff. Mass layoffs for seasonal reasons have much less impact on long-term employment levels than layoffs for other reasons. Mass layoffs for business demand reasons follow periods of sharp employment growth. Mass Layoffs to manufacturing employers are associated with permanent declines in employer size, while mass layoffs to construction employers look like returns to baseline levels of employment after a boom. Mass layoffs in the 2001 recession look very similar to mass layoffs in the 1990s expansion and the 2000s expansion, but mass layoffs in the Great Recession of 2007-2009, and in the weak expansion that has followed, occurred at employers with more stable employment levels before and after the layoff. However, after we fully control for differences in the composition of employers by age and industry, and differences in the composition of layoffs by reason, we see no differences in long-term employment patterns by the period in which the layoff took place.

We observe permanent increases in average wages per employee following mass layoffs, consistent with low-wage workers being let go during mass layoffs. This pattern holds in every time period except for the layoffs taking place during the Great Recession of 2007-2009. Average wage levels for firms that had layoffs during the Great Recession slowly fall after the layoff date. This is consistent either with continuing wage declines for non laid-off employees at these firms, or with rehiring of low-wage workers as some of these employers recovered. However, once we fully control for employer age and industry and layoff reason, there are no remaining differences in wage patterns by the period in which layoffs took place.

Mass layoffs also increase the probability of observing zero employment at an employer in a later period. This increased likelihood of closure following mass layoffs is particularly high in young employers and in manufacturing employers. We observe smaller relationships between mass layoffs and later closures for layoffs taking place in the Great Recession or the expansion that has followed. These differences in the probability of closure by the period in which the layoff takes place are only partially explained by differences in employer ages, industries, and layoff reasons over time. Overall, it appears that the mass layoffs that took place during the Great Recession or the current expansion may have less permanent impact on employers than mass layoffs that took place in earlier periods.
Bibliography


Data Appendix

The MLS data

The MLS microdata contain detailed information on major employment cutbacks, collected directly from the employers. This survey was conducted by state workforce agencies from 1995 through March 2013 (when funds for the program were cut as part of the government funding sequester). These state agencies contacted employers with at least 50 initial claims for unemployment insurance filed against them during a consecutive 5-week period and determined whether the layoffs would last at least 31 days. If so, the MLS program collected information (by Unemployment Insurance (UI) account) on the total number of people laid off, the reason for the layoff, and so forth.

This ‘50 initial claims for unemployment insurance from one UI account during a 5-week period’ definition of a mass layoff has several important differences from the definition of mass layoffs used by several other authors. These authors, beginning with Jacobson, Lalonde, and Sullivan (1993), generally define mass layoffs as permanent separations of 30% or more of long-tenured workers from an employer with 50 or more employees. This is a different definition of a layoff—a permanent separation of workers in the academic literature, and separation notices given to the UI system in the MLS. In some cases in the MLS, ‘laid-off’ workers are eventually recalled to work. Second, there is a difference in the workers considered—workers who have been at the same firm for several years in the academic literature, and workers who are eligible for unemployment insurance in the MLS. Last, there is a difference in the size requirement for a mass layoff—30% below an earlier level in the academic literature, and 50 workers in the MLS. In a companion paper (Handwerker and Mason 2012), we show that employers in the MLS are larger, with more establishments and more workers, paying higher wages, and having larger layoffs, than employers with large declines in employment that do not appear in the MLS. They are also more likely (in earlier sub-periods) to be in manufacturing.

The MLS program began tracking employers who were eligible for the survey but refused to answer starting in 2002, and began tracking employers who could not be contacted for MLS interviews starting in 2006. As shown in Appendix Figure A1, more than 85% of layoff events in the MLS have occurred to employers that answer the survey. Employers that cannot be contacted or refused the survey appear to be somewhat larger and pay higher quarterly wages on average (as measured in the QCEW data in the quarter before the layoff) than the employers that do answer the survey. They are also more likely to be engaged in manufacturing or wholesale trade.
Examinining the employers who respond to the MLS and whose employment histories can be matched to the QCEW data, about 90% answer key questions such as the reason for the layoff and whether they expect to recall laid-off employees. Fewer employers answer these questions during periods with more layoffs. The employers in the MLS are large employers, with average pre-layoff employment levels of 1,827 employees and median employment levels of 484 employees in the QCEW. As shown in Figure A2, there are no strong trends in mean or median employer size (as measured in the QCEW). Employers tell the MLS program that they let go an average of 189 employees in these layoffs, while the difference in quarterly employment in their QCEW records is 193, although these two measures vary considerably from quarter to quarter, as shown in Figure A3. Although the total number of layoffs in the MLS, shown in Figure A1, is seasonal, the number of employers appearing in the MLS for the first time, shown in Figure A4, has little seasonal pattern. Both the number of employers appearing in the MLS for the first time and the number of employers appearing in the MLS multiple times in the same quarter increase during recessions.
Figure A2: Mean and Median Employer pre-layoff size (as measured in the QCEW), by quarter
Figure A3: Mean layoff sizes reported to the MLS and quarter-to-quarter employment changes for these same employers in the QCEW, by quarter.
The QCEW data

The records of the QCEW summarize employment and wage data for workers covered by State unemployment insurance (UI) laws. These data are collected at the establishment level. Most employers have only one establishment, but larger employers can be comprised of multiple establishments. When the establishments of the QCEW are linked into the Longitudinal DataBase (LDB), notations are made of the changing structure of employers over time, as establishments merge, breakout, and pass from the ownership (and UI accounts) of one employer to another over time.

Selecting Comparison Employers from the QCEW data

To examine the impact of layoffs on the long-run employment and wage patterns of employers in a regression framework, we work with a set of comparison employers without mass layoffs. For every mass layoff event in the MLS, we randomly select a comparison employer from the QCEW in the same quarter as the layoff. These comparison employers do not have mass layoffs in the selection quarter.

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9 An establishment is an economic unit, such as a farm, mine, factory, or store that produces goods or provides services. It is typically at a single physical location and engaged in one, or predominantly one, type of economic activity for which a single industrial classification may be applied.
although some of them may have mass layoffs in other quarters. We select each comparison employer to match the age group\(^{10}\) and size class of an employer in the MLS, in an industry that is as close a match as possible to the MLS employer.

To select these comparison employers, we aggregate the establishments of the LDB up to the UI account level, summing employment and total wages each quarter over all establishments within each UI account. Some employers are involved in consolidations (combining many previous establishments into one) and break-outs (turning one previous establishment into many) from any quarter to the next during the 5 years before and after the quarter of a layoff. We want to account for changes in employment and wage dynamics due to layoffs, rather than to changes in employer structure. Thus, for employers with multiple establishments, we use the full set of establishments that are ever part of the employer’s UI accounts over the five years (20 quarters) before and after the event quarter. Overall, 46% of the events in the MLS data are associated with an employer consisting of a single establishment with unchanging structure, 32% are associated with employers consisting of multiple establishments without changes in structure, and 22% are associated with an employer involved in the breakup or consolidation of multiple establishments.\(^{11}\)

Choosing appropriate comparison employers from the QCEW:

1. Employers with multiple establishments can have multiple establishment ages. We choose the oldest age among the establishments in selecting an appropriate comparison employer.

2. Employers with multiple establishments can have multiple NAICS codes. We choose the code with the largest fraction of employment in selecting an appropriate comparison employer.

3. We choose comparison employers prior to adjusting for breakouts and consolidations. Thus both the MLS employer and/or the sampled comparison employers can be involved in breakouts/consolidations changing the size class and possibly the industry group as well.

4. Comparison groups are less comparable as size classes get larger. There are only so many “big” employers. Also, layoff events can be related to the demand and supply shocks affecting particular industries. There may be few appropriate comparison employers without mass layoffs for large employers in industries with many mass layoffs.

\(^{10}\) Drawing on the work of Haltiwanger, Jarmin, and Miranda (2010), we group employers into the following age groups: < 1 year, 1 year, 2 years, 3 years, 4 years, 5 years, and more than 5 years

\(^{11}\) Over time, there has been a small decrease in the fraction of events associated with single establishments, and a large increase in the fraction of events associated with multiple establishments with changes in structure. Single-establishment employers have fewer workers than the multi-establishment employers, and their layoffs are smaller. Examining the total number of people laid off in an MLS event, 38% are laid off from single establishment employers, 35% are laid off from multi-establishment employers without changes in structure, and 26% are laid off from employers with changing structure. Looking at the total number of pre-layoff employees at employers reporting events in the MLS, 17% of the employees are with single establishment employers, 35% of the employees are with multi-establishment employers with unchanging structure, and 48% of employees are with employers that have breakouts and/or consolidations.
Additional Graphs Appendix

Figure A5: Regression estimates of the impact of Mass Layoffs on Employment, by Sector
Figure A6: Average wages for employers with mass layoffs in 2001Q4 and comparison employers

Average Wages in Employers with a Mass Layoff
Relative to Employers without a Mass Layoff

Overall

Not Seasonal

Comparison Employers
All MLS Employers
Constant Structure
Single Establishments

Average Quarterly Wages
Figure A7: Regression estimates of the impact of Mass Layoffs on Wages, by Industry Sector

Sector of Employer

- Natural resources and mining
- Construction
- Manufacturing
- Wholesale trade
- Retail trade
- Transportation and warehousing
- Utilities
- Information
- Financial activities
- Professional and business services
- Education and health services
- Leisure and hospitality
- Other services

Legend:
- Blue: Average wages
- Red: Lower 95% CI
- Green: Upper 95% CI
Figure A8: Regression estimates of the impact of Mass Layoffs on Wages, by Employer Age

**Employer Age**

- **Less than 2 years**
- **2 - 3 years**
- **4 - 5 years**
- **Greater than 5 years**

**Legend:**
- Blue: Average Wages
- Red: Lower 95% CI
- Green: Upper 95% CI
Figure A9: Regression estimates of the impact of Mass Layoffs on Wages, by Layoff Reason

Reason for Separation

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<th>Non-response</th>
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<td><img src="image3" alt="Graph" /></td>
<td><img src="image4" alt="Graph" /></td>
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</tbody>
</table>

Legend:
- **Average Wages**
- **Lower 95% CI**
- **Upper 95% CI**
Figure A10: Regression estimates of the impact of non-Seasonal Mass Layoffs on average wages, by Layoff date

**Business Cycle: Not Seasonal**

- **Expansion: 1995 Q2 - 2000 Q4**
- **Expansion: 2002 Q1 - 2007 Q4**
- **Expansion: 2009 Q3 - 2012 Q4**
- **Contraction: 2001 Q1 - Q4**
- **Contraction: 2007 Q4 - 2009 Q2**

Legend:
- **Blue**: Average Wages
- **Red**: Lower 95% CI
- **Green**: Upper 95% CI
Figure A11: Regression estimates of the impact of Mass Layoffs on the probability of zero employment, by Layoff Reason

Reason for Separation

**Business Demand**

**Seasonal**

**All Other Reasons**

**Non-response**

- **Prob(Zero Employment)**
- **Lower 95% CI**
- **Upper 95% CI**
Figure A12: Regression estimates of the impact of Mass Layoffs on the probability of zero employment, by Sector