

Evidence on Adverse Selection and Establishment Size In the Labor Market

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Abstract: Different studies have found that laid-off workers exhibit greater wage losses than those who lose their job due to plant closures, and this evidence has been interpreted as being consistent with the theory of adverse selection. But none of these analyses have considered the effect of establishment size in this framework. Using the National Longitudinal Survey of Youth, this study will show that equally able workers are paid more at larger establishments, layoffs are much more likely than plant closures to occur at larger establishments, and these two groups of workers tend to find post-displacement employment at establishments of similar sizes. Accounting for the effect of establishment size removes virtually all of the difference in wage losses for these two groups of workers. These findings do not support the hypothesis that adverse selection is the cause of the greater wage losses of laid-off workers, suggesting instead that they are due to the layoff group's loss of efficiency wages or greater firm-specific training offered at large establishments.

Introduction

Adverse selection has been employed by many different authors to document different phenomena in the labor market (Spence (1973), Harris and Holmstrom (1982), Greenwald (1986)). Recently, evidence for adverse selection has been sought by different authors (Gibbons and Katz (1991), Doiron (1995), Grund (1997)) with a comparison of the post-job-loss experiences of two different types of displaced workers: those who are laid off from their jobs, and those who are displaced by a plant closing. Specifically, these authors wish to examine whether or not laid-off workers exhibit larger wage reductions due to job displacement than those who lose their job because of a plant closing. An explanation based on adverse selection could rationalize such a finding by asserting that whereas the market would draw no information about a worker's quality as a result of his displacement due to a plant closing, a layoff could signal that a worker is of lower quality because he was selected for displacement by his firm.

This paper provides an alternative explanation for this fact by using data from the National Longitudinal Survey of Youth (NLSY), a survey that collects data on both the reason for a worker's displacement and the establishment size of a respondent's workplace. I use a pooled sample of workers displaced by a plant closing or a layoff to show that both before and after job-loss, workers in larger establishments receive higher wages than comparably skilled workers employed in smaller establishments (a result which has been established by many different authors (Lester (1967), Mellow (1982), Brown and Medoff (1989), Oi (1990)). Also, it is demonstrated that workers suffering layoffs are displaced from significantly larger establishments than those displaced by plant closings, and that these two sets of workers find employment at post-displacement

establishments of similar size. Although laid-off workers have larger wage losses than their counterparts displaced by a plant closing, the evidence on establishment size implies that the relatively larger wage losses exhibited by laid-off workers may be due to the elimination of a pre-displacement wage premium enjoyed by this group of workers, such as efficiency wages paid at these larger establishments prior to job loss. A possible explanation for this result is related to adverse economic shocks and their relation to establishment size. An adverse economic shock would be more likely to cause an establishment with few workers to close down, whereas a large establishment would be more likely to weather this shock by laying off some of its workforce. The resulting wage dynamics of these two groups is thus independent of worker quality, and instead due to the size of the establishments from which the workers are displaced. Evidence for this alternative explanation is derived from the inclusion of establishment size controls in the earnings equation, which result in insignificantly different wage losses for both groups of workers, and diminishes this particular finding's support of adverse selection.

Literature Review

The first use of this test for adverse selection was employed by Gibbons and Katz (1991), who asserted that workers who lose their jobs due to a plant closing are not subject to the same stigma as those who are displaced by a layoff from a non-unionized firm. Unlike workers laid off by rule of seniority, those laid off from non-unionized firms are more likely to be displaced because they are of lower quality; they are thus identified to the market as “lemons”. Conversely, all workers at a given firm are displaced from their jobs by a plant closing, and thus no information about worker quality

is conveyed to the market by this event. Using the 1984 and 1986 Displaced Worker supplements of the CPSⁱ, they find support for their claim that, in comparison to workers displaced by plant closings, laid-off white-collarⁱⁱ workers exhibit 5-6% larger average decreases in their log real weekly earnings. Furthermore, focusing the analysis on high-tenure workers (about whom, compared with low-tenure workers, the firm has relatively more information), this loss is even larger -- approximately 9%. Doiron (1995) conducts the same test with Canadian data. Using the Canadian Survey of Displaced Workers, she finds there is a similar 5-6% differential in wage losses exhibited by laid-off, white-collar workers (furthermore, she finds that estimates of this loss can range as high as 15% with different sample specifications). Interestingly, this finding is evident for both union and non-union white-collar workers, and Doiron establishes that relative wage losses for laid-off, blue-collar workers also do not differ by unionization status.

Two other studies have presented mixed evidence on this test of adverse selection. Using the Panel Study of Income Dynamics, Stevens (1997) conducts a longitudinal study of the wages earned by workers who will suffer displacement from their jobs. She finds that wage changes from 1 year prior to the displacement until several years after displacement are smaller for workers displaced by plant closings, but that predisplacement wage cuts can account for much of this difference.ⁱⁱⁱ Grund (1997) presents further evidence against the adverse selection hypothesis. Relying upon German data for his analysis, he finds no evidence of larger wage losses for laid-off workers in comparison with workers displaced by a plant closing, although he admits that strong institutional differences between the German and American labor markets have much to do with this result.

All of these studies have analyzed the wage dynamics of these two groups of workers in the context of adverse selection. But one alternative approach that is not pursued by any of these authors relies upon the effect of establishment size on the wage dynamics of workers whose plants close and those who are laid off. Using data from the NLSY, I will examine the role of establishment size within this analysis.

Data

For the purpose of conducting this test of adverse selection, the NLSY is a particularly useful data set. Not only does this survey directly identify workers displaced by a layoff or a plant closing,^{iv} but it also has information about whether or not a worker's pre-displacement job was covered by a collective bargaining agreement, which circumvents the need to create a "white collar" sample for this analysis.^v And, as it was previously mentioned, the NLSY contains information about a worker's pre-displacement and post-displacement establishment's size. Although the NLSY is a relatively small sample and the individuals surveyed by the NLSY are younger than the average workers in the labor market, the additional information contained in this data set makes it a valuable source to examine adverse selection in the labor market.

To compensate for the relatively young workers interviewed for the NLSY, a selection rule was employed to assemble a group of male workers with a strong attachment to the labor force (female workers were excluded from this analysis because of complications involved with being displaced and the decision to leave the labor market). As such, workers were included in the sample once they had made a long-term transition from non-work to work. For the purpose of this study, a long-term transition is

classified as a period in which a respondent worked at least 35 hours each week for at least 26 weeks in a year for three consecutive years. Workers are included in the layoff sample if they reported being laid-off from a job held at a given interview period, and a similar classification was used for assembling the observations in the plant-closing sample.^{vi} The two samples' observable characteristics are displayed in table 1, and testing the equality of means at the 5% level of significance reveals that workers in the plant-closing sample are better educated and have more pre-displacement tenure than those in the layoff sample. However, the two samples have similar years of attachment to the labor force, age, and pre-displacement log real weekly earnings.^{vii} The above differences between the two groups will be accounted for in the eventual regression analysis, and it will be shown that they have no bearing on the effect of establishment size in this framework.

Results

To analyze the general effect of pre-displacement establishment size on displaced workers in this sample, establishments were grouped into four categories, depending upon the number of workers they employed.^{viii} Table 2 displays the pre- and post-displacement weekly earnings of workers employed at pre-displacement establishments of different sizes. Pooling the layoff and plant-closing samples, this table clearly illustrates that there is a establishment-size wage effect for all workers in the pre-displacement period. However, once these workers are displaced, their wages are remarkably similar. Regression analysis indicates that equally able workers receive significantly different wages in the pre-displacement period,^{ix} but wages that aren't

significantly different in the post-displacement period.^x This exercise serves to demonstrate that any worker, regardless of his skill, will suffer larger wage losses if he is displaced from a relatively larger pre-displacement establishment. The application of this finding to the adverse selection problem is dependent upon the size of the pre-displacement establishments for the layoff and plant closing samples.

The cross-tabulation presented in table 3 demonstrates the wide variation in pre-displacement establishment size for the sample of workers displaced by a layoff or a plant closing, and these differences are emphasized by a Pearson statistic of 8.363 (with a p-value of 0.039) for the table. Central to this result is the fact that whereas twenty-eight percent of all workers displaced by plant closings come from establishments employing five or fewer workers, only eighteen percent of all laid-off workers came from such establishments.^{xi} Conversely, larger establishments generally employ more workers who will suffer layoffs than those subject to plant closings.

The skewness in the distribution of workers at pre-displacement establishments of different sizes is expected, because large establishments typically endure adverse economic shocks by laying-off some workers, while small establishments are more likely to close when faced with decreased demand. But in the post-displacement period, table 4 illustrates that the two types of workers tend to find work at establishments of the same size. This is reflected by a Pearson statistic of 1.49 for this table (with a p-value of 0.68) and by the fact that there is no statistically significant difference in the proportion of both types of workers in any individual establishment size category.^{xii}

Tables 3 and 4 suggest that laid-off workers generally move to smaller establishments after displacement, while workers displaced by a plant closing tend to

move to somewhat larger establishments. Table 5 details these movements, categorizing a worker as moving to a larger post-displacement establishment, a smaller post-displacement establishment, or a post-displacement establishment of the same size as his pre-displacement establishment. A Pearson statistic of 8.67 (with a p-value of 0.013) and an approximately 12% greater preponderance for laid-off workers to find post-displacement employment at smaller establishments serves to emphasize the different patterns of migration between establishments of various sizes for these two samples. Furthermore, table 5 demonstrates the possible amplification of the “adverse selection” effect due to the greater tendency of laid-off workers to move to relatively smaller post-displacement establishments. This magnified effect is outlined in table 6, which displays the pre- and post-displacement average log real weekly earnings at each establishment size for the two groups of workers, and their relative wage losses, holding establishment size constant. It is apparent that larger average weekly earnings are earned by workers employed at larger establishments in both the pre- and post-displacement periods, and that the difference-in-differences of log weekly earnings differ by establishment size.

To empirically investigate the effect of establishment size within the adverse selection model, both a layoff dummy variable and indicator variables for changes pre- and post-displacement establishment size were included in the earnings equation listed in table 7.^{xiii} Also, to account for the difference in demographic characteristics observed in table 1, the analysis was conducted again with extra controls for educational attainment, and the results remained unchanged.^{xiv} The regression results displayed in the first two columns of table 7 demonstrate that the significance of the wage-change, or difference-in-difference^{xv} estimator is diminished by the inclusion of the establishment size controls.

While the standard error is virtually identical in both cases, the introduction of size controls reduces the absolute value of the coefficient on the layoff dummy in the wage change regression by 40%, and its p-value is increased from 0.034 to 0.203. To address the concern of unionization raised by Gibbons and Katz, the interaction of pre-displacement collective bargaining status with the layoff indicator variable is added to the model. Columns three and four of table 7 display these regression results, which demonstrate that the effect on the absolute value and significance of the layoff coefficient is basically the same, regardless of whether or not collective bargaining controls are included in the regression. Furthermore, in all six regressions that included establishment size controls, F-tests established that the joint significance of these variables was quite strong^{xvi}, which confirms the relevance of establishment-size controls in the model.

In addition to including pre- and post-displacement establishment size controls in the wage change regression, the fifth column of table 7 displays the results of the analysis when the sample is restricted only to those workers who don't change size categories between the pre- and post-displacement jobs. The approach is an alternative one to the strategy employed in the first four columns of table 7 -- namely, it is an attempt to determine whether or not there is any evidence for adverse selection among a sample that has no workers who change establishment size after displacement. The results are quite striking: if a random subsample of workers was analysed, the expected wage loss for laid-off workers would be about 11% larger than that of workers displaced by a plant closing, because this is the wage-change regression result for the full sample, displayed in the first row of column three. However, the wage change-regression in column 5 demonstrates that the difference in earnings losses is only 2.3%, suggesting that virtually no statistical

evidence exists for adverse selection once the analysis accounts for establishment size.^{xvii} Thus, a more accurate measurement of the adverse selection effect is exhibited by regression equations that control for establishment size. Once these controls are introduced into the analysis, no significant earnings difference exists between the two groups of workers in the pre-displacement, post-displacement or wage-change regression results reported in table 7, which suggests that there are no significant differences in the quality of laid-off workers and workers displaced by a plant closing.

Another approach used by both Gibbons and Katz and Doiron to examine adverse selection involved an interaction of the layoff indicator variable with a high-tenure and low-tenure dummy variable.^{xviii} The authors believe that a worker's ability is more easily identified if he has a relatively longer tenure at a given firm; thus, the adverse selection effect should be more pronounced for high-tenure workers. This approach is particularly germane for the younger sample of workers sampled by the NLSY (who have shorter tenures than most workers), and table 8 demonstrates that the effect of establishment-size controls is even more pronounced with higher-tenure workers. The introduction of establishment-size controls changes the magnitude of the layoff indicator from -0.206 to virtually zero. F-tests once again demonstrate the significance of including size controls in the wage-change regressions, indicating that they are relevant to this analysis.^{xix} There is also a striking effect of the establishment size controls on the high-tenure layoff indicator relative to the low-tenure layoff indicator in the wage-change regression. Without establishment-size controls, the high-tenure layoff coefficient is significantly different than the low-tenure layoff coefficient, but this is not evident after these controls are included in the regression.

This analysis explains the existence of a greater wage loss for laid-off workers by claiming that these workers are losing a rent that exists at larger establishments. Since these rents are disproportionately collected by workers who will suffer a layoff, they will naturally have larger wage losses than their counterparts displaced by a plant closing, independent of worker quality. As further evidence that worker quality is not at issue in this analysis, Table 9 displays the relative wage losses of workers laid off from pre-displacement establishments of different sizes. If these workers are of comparable quality, then the wage losses for laid-off workers should increase with the size of their pre-displacement employer. However, if it is the case that more able workers are employed at larger firms, then this trend would not be evident -- workers displaced from larger establishments may be able to obtain better, higher-paying post-displacement jobs. The evidence in Table 9 favors the prior hypothesis: wage losses relative to workers laid-off from the smallest establishment size category are increasing as establishment size grows. This suggests that workers at larger establishments have lost the benefit of firm-specific training or efficiency wages, which increases their wage losses relative to those workers laid-off from smaller firms. To reinforce the point, Table 10 considers the dynamic issue of wage losses for laid-off workers who move to a larger establishment or remain at a similar-sized establishment. Once again, it is clear that establishment size plays a large role in this analysis, as those workers who move to a larger establishment have 28% smaller wage losses than those who move to a smaller establishment.

Further evidence on the issue of ability can be derived from the NLSY using Armed Forces Qualifying Test (AFQT) scores that are in the data. In 1980, the NLSY required all of its respondents, regardless of age or education, to write a battery of tests

used by the armed forces, and calculated an AFQT score based on the test results.^{xx} The results in Table 10 are derived from regressing age- and education-adjusted scores^{xxi} on size indicators for all workers (undisplaced workers, laid-off workers and those displaced by a plant closing), and the findings demonstrate that there is little evidence for differences in ability based on establishment size. The first column of Table 10 shows that adjusted AFQT scores do not greatly differ between never-displaced workers at establishments of different size. More importantly, the second column of this table shows that workers laid-off from each of these establishments are not significantly less able than their never-displaced counterparts, and the same is true for the plant closing sample (as demonstrated in column three). Furthermore, tests of the equality of the coefficients for workers laid-off from establishments of different sizes show that there are no significant differences in ability between these workers,^{xxii} and there are no differences in ability between the layoff and plant closing groups along this same dimension.^{xxiii} This is important because it may be the case that more able workers tend to work at larger establishments, and workers displaced from these establishments may lose their jobs because they are significantly less able. Thus, including size controls in the wage-change regression would only represent the fact that these workers are, in fact, identified to the market as “lemons”. The results in Table 11, however, demonstrate that this is not the case.

To support the evidence found in Table 11, it is also the case that adjusted AFQT scores are not related to the probability that a displaced worker moves to a larger or smaller establishment, or remains at a similar-sized establishment at his post-displacement job.^{xxiv} These findings suggest that there are no differences in ability that

are related to establishment size. Specifically, it is not the case that more able workers are moving to larger establishments, or that less able workers are being laid-off from large establishments. Instead, it appears that efficiency wages are responsible for the establishment-size wage differential, and this loss in efficiency wages causes a greater wage loss for laid-off workers.

Summary and Conclusion

The purpose of this study was to examine a specific test of the adverse selection model in the context of the establishment-size wage differential. Because information on both establishment-size and the reason for displacement were collected by the NLSY, data from this survey were used in this analysis. These data demonstrated that laid-off workers suffered significantly larger wage losses in comparison to those individuals displaced by a plant closing. However, the significance of this finding is due, in part, to the size of these workers' pre- and post-displacement establishments. It was first shown that, prior to job loss, equally skilled workers obtain greater earnings at larger establishments, but workers from pre-displacement establishments of different sizes have similar wages post-displacement wages. As such, establishment size is an important dimension to consider for addressing wage losses. This is especially true in the case of laid-off workers and workers displaced by a plant closing, because workers are laid off from larger establishments than those whose plants close, but find post-displacement employment at comparably size establishments as the plant-closing sample. This establishment size difference contributes to the wage dynamics exhibited by these workers by creating a pre-displacement wage premium for those workers who will be

laid-off from their jobs. Consequently, once adequate controls for establishment size are included into the same earnings regressions that corroborated the adverse selection model, the statistical significance of the difference in earnings losses exhibited by these workers disappears. The NLSY data also demonstrate that this effect is robust to the inclusion of controls for the collective bargaining status of the pre-displacement job, as the difference-in-difference estimate becomes statistically insignificant in both of these cases. This was particularly evident for high-tenure workers, because establishment size controls accounted for virtually all of the difference in wage losses suffered by these two groups of workers.

The importance of this finding is that it reinterprets a result that had been cited as evidence for adverse selection in the labor market, and it provides some insight into the establishment-size wage differential. In the adverse selection model, workers displaced by a layoff are identified as lower quality by the nature of their dismissal. The contribution of the establishment-size effect offers an alternative explanation independent of worker quality: regardless of whether the worker is high- or low-quality, a larger earnings loss will be exhibited by workers who are laid off because they are displaced from larger establishments. Therefore, because of this size effect, findings from wage-change regressions can no longer be unconditionally regarded as evidence for an adverse selection model, and must be considered in conjunction with this alternative explanation for the same finding. Furthermore, it was determined using AFQT scores that workers employed at establishments of different sizes are not differently able, especially those workers who are displaced from establishments of different sizes. A large concern for this analysis was that laid-off workers may come from large establishments because they

are less able. If this were the case, then the layoff would be evidence of adverse selection. However, it was demonstrated that AFQT scores are not different for workers displaced from establishments of different size, regardless of the reason for displacement. This is additional evidence for the hypothesis that it is not a stigma effect that causes laid-off workers to have greater wage losses, but instead it is the loss of efficiency wages at these large establishments that is the cause for this larger loss.

Table 1: Demographic Characteristics from the 1986-1998 Supplements of the NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

Variable	Layoff Sample	Plant Closing Sample
Sample Size	770	167
Highest Education Attained (In Years)	12.01 (0.08)	12.59 (0.15)
Age (In Years)	27.75 (0.11)	28.00 (0.27)
Years Since Attachment to the Labor Force	7.43 (0.13)	8.54 (0.33)
Pre-displacement Tenure (in Months)	18.66 (0.81)	33.48 (2.96)
Pre-displacement Log Real Weekly Earnings	5.57 (0.02)	5.56 (0.05)
Post-displacement Log Real Weekly Earnings	5.46 (0.02)	5.57 (0.04)
Change in Log Real Weekly Earnings	-0.106 (0.02)	0.005 (0.04)

Standard errors are listed in parentheses.

Table 2: Pre- and Post-displacement wages received by all displaced male workers, Organized by their Pre-displacement Establishment Size, from the 1986-1998 Supplements of the NLSY

	Size of the Worker's Pre-displacement Establishment				Totals
	1-5 Workers	6-20 Workers	21-80 Workers	Over 80 Workers	
Pre-displacement Real Weekly Earnings	5.391 (0.048)	5.537 (0.039)	5.627 (0.035)	5.667 (0.039)	5.565 (0.020)
Post-displacement Real Weekly Earnings	5.354 (0.046)	5.438 (0.035)	5.530 (0.035)	5.601 (0.042)	5.482 (0.020)

Standard errors are listed in parentheses below real weekly earnings.

Table 3: Pre-displacement Establishment Size from the 1986-1998 Supplements of The NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

	1-5 Workers	6-20 Workers	21-80 Workers	Over 80 Workers	Totals
Pre-displacement Layoff	141 (0.183)	231 (0.300)	183 (0.238)	215 (0.279)	770
Pre-displacement Plant Closing	46 (0.275)	42 (0.252)	41 (0.246)	38 (0.228)	167
Totals	187 (0.200)	273 (0.291)	224 (0.239)	253 (0.270)	937

Row percentages are listed in parentheses below the number of workers at the specific establishment size.
Pearson chi-squared statistic = 8.363, p-value = 0.039

Table 4: Post-displacement Establishment Size from the 1986-1998 Supplements of The NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

	1-5 Workers	6-20 Workers	21-80 Workers	Over 80 Workers	Totals
Post-displacement Layoff	175 (0.227)	227 (0.295)	178 (0.231)	190 (0.247)	770
Post-displacement Plant Closing	33 (0.198)	49 (0.293)	37 (0.222)	48 (0.287)	167
Totals	199 (0.2298)	264 (0.3048)	194 (0.2240)	209 (0.2413)	937

Row percentages are listed in parentheses below the number of workers at the specific establishment size.
Pearson chi-squared statistic = 1.49, p-value = 0.684

Table 5: Change in Establishment Size from the 1986-1998 Supplements of The NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

	Move to a Smaller Establishment	No Change in Establishment Size	Move to a Larger Establishment
Layoff Sample	279 (0.362)	259 (0.336)	232 (0.301)
Plant Closing Sample	41 (0.246)	63 (0.377)	63 (0.377)

Row percentages are listed in parentheses.
Pearson chi-squared statistic = 8.67, p-value = 0.013

Table 6: Average Log Real Weekly Earnings at Different Establishments from the 1986-1998 Supplements of the NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

	1-5 Workers	6-20 Workers	21-80 Workers	Over 80 Workers	Totals
Pre-displacement Plant Closing	5.387 (0.121)	5.445 (0.100)	5.661 (0.063)	5.764 (0.067)	5.557 (0.048)
Pre-displacement Layoff	5.393 (0.051)	5.554 (0.043)	5.619 (0.041)	5.650 (0.044)	5.567 (0.022)
Post-displacement Plant Closing	5.562 (0.099)	5.439 (0.067)	5.580 (0.075)	5.716 (0.075)	5.574 (0.040)
Post-displacement Layoff	5.314 (0.052)	5.438 (0.041)	5.520 (0.039)	5.572 (0.049)	5.462 (0.022)
Difference-in- Differences	-0.254	-0.110	-0.018	-0.026	-0.110

Standard errors are listed in parentheses below the average real weekly earnings at the specific firm size.

Table 7: Earnings equation regression results from the 1986-1998 Supplements of the NLSY, for Males Displaced by a Layoff or a Plant Closing who were Re-employed at the Survey Date

Dependent Variable	Layoff Coefficient				
Wage Change	-0.113 (0.053) [0.034]	-0.069 (0.054) [0.203]	-0.111 (0.053) [0.037]	-0.068 (0.054) [0.196]	-0.023 (0.074) [0.759]
Pre-Disp. Wage	0.059 (0.054) [0.275]	0.022 (0.053) [0.678]	0.051 (0.054) [0.345]	0.020 (0.053) [0.708]	-0.023 (0.080) [0.777]
Post-Disp. Wage	-0.042 (0.040) [0.305]	-0.036 (0.041) [0.375]	-0.042 (0.040) [0.300]	-0.037 (0.040) [0.364]	-0.046 (0.071) [0.259]
Collective Bargaining Control?	No	No	Yes	Yes	Yes
Establishment Size Controls?	No	Yes	No	Yes	N/A
Restricted Sample	No	No	No	No	Yes

Note: Standard errors are listed in parentheses and p-values are listed in brackets. The wage-change regressions included the log(post-displacement weekly earnings/pre-displacement weekly earnings) as its dependent variable, and the independent variables include: a spline function of pre-displacement tenure (at 3,6,12 and 24 months), years of attachment to the labor force and its square, the highest grade level attained, age, a dummy variable equal to one if the individual is married, six year-of-displacement dummy variables, ten industry dummy variables, seven occupational dummy variables, and three region dummy variables. To control for establishment size, fifteen dummy variables (indicative of every possible combination of pre- and post-displacement establishment size) were used in the wage-change regression, and three dummy variables were used in the pre-displacement and post-displacement earnings equations.

Table 8: High-tenure and Low-tenure Layoff Coefficients of the Layoff dummy variable in the Wage-Change Earnings Equation from the NLSY for workers displaced from their jobs by a Plant Closing or a Layoff

Dependent variable	Coefficient Estimates			
<u>Wage Change:</u>				
High-tenure Layoff dummy	-0.206 (0.070)	-0.002 (0.135)	-0.207 (0.070)	-0.001 (0.136)
Low-tenure Layoff dummy	-0.043 (0.064)	-0.040 (0.065)	-0.043 (0.064)	-0.040 (0.065)
<u>Pre-displacement:</u>				
High-tenure Layoff dummy	0.132 (0.065)	0.020 (0.077)	0.127 (0.065)	0.036 (0.077)
Low-tenure Layoff dummy	0.013 (0.062)	0.012 (0.063)	0.009 (0.063)	0.009 (0.063)
<u>Post-displacement:</u>				
High-tenure Layoff dummy	-0.054 (0.053)	0.013 (0.070)	-0.052 (0.053)	0.015 (0.069)
Low-tenure Layoff dummy	-0.032 (0.042)	-0.032 (0.043)	-0.033 (0.042)	-0.034 (0.042)
Collective Bargaining Controls?	No	No	Yes	Yes
Establishment-size Controls?	No	Yes	No	Yes

Note: Standard errors are listed in parentheses. The wage-change regressions included the log(post-displacement weekly earnings/pre-displacement weekly earnings) as its dependent variable, and the independent variables include: a spline function of pre-displacement tenure (at 3,6,12 and 24 months), years of attachment to the labor force and its square, the highest grade level attained, age, a dummy variable equal to one if the individual is married, six year-of-displacement dummy variables, ten industry dummy variables, seven occupational dummy variables, and three region dummy variables. To control for establishment size, fifteen dummy variables (indicative of every possible combination of pre- and post-displacement establishment size) interacted with the high-tenure dummy variable were used in the wage-change regression, and three establishment size dummy variables interacted with the high-tenure layoff dummy were used in the pre-displacement and post-displacement earnings equations.

Table 9: Regression-Adjusted Relative Wage Losses of Workers Laid Off from Pre-Displacement Establishments of Different Sizes, using the 1986-1998 Supplements of the NLSY

	Relative Wage Losses			
6-20 Employees	-0.063 (0.074)	-0.083 (0.074)
21-80 Employees	...	-0.200 (0.079)	...	-0.191 (0.073)
80+ Employees	-0.308 (0.105)	-0.242 (0.085)

White standard errors are listed in parentheses. All wage losses are in comparison with workers displaced from establishments which employ 5 or fewer workers. The wage-change regressions included the log(post-displacement weekly earnings/pre-displacement weekly earnings) as its dependent variable, and the independent variables include: a spline function of pre-displacement tenure (at 3,6,12 and 24 months), years of attachment to the labor force and its square, the highest grade level attained, age, a dummy variable equal to one if the individual is married, six year-of-displacement dummy variables, ten industry dummy variables, seven occupational dummy variables, and three region dummy variables.

Table 10: Regression-Adjusted Relative Wage Losses of Workers Laid Off from Pre-Displacement Establishments of Different Sizes, using the 1986-1998 Supplements of the NLSY

	Relative Wage Losses		
Increase in Establishment Size	0.281 (0.064)	...	0.280 (0.064)
Same Establishment Size	...	0.211 (0.059)	0.210 (0.058)

White standard errors are listed in parentheses. All wage losses are in comparison with workers who move to smaller establishments after they are displaced. The wage-change regressions included the $\log(\text{post-displacement weekly earnings}/\text{pre-displacement weekly earnings})$ as its dependent variable, and the independent variables include: a spline function of pre-displacement tenure (at 3,6,12 and 24 months), years of attachment to the labor force and its square, the highest grade level attained, age, a dummy variable equal to one if the individual is married, six year-of-displacement dummy variables, ten industry dummy variables, seven occupational dummy variables, and three region dummy variables.

Table 11: Adjusted AFQT Scores for Displaced and Undisplaced Workers Employed at Establishments of Different Sizes, using the 1986-1998 Supplements of the NLSY

	Undisplaced Coefficients	Layoff Coefficients	Plant Closing Coefficients
Less than 5	1.52 (1.15)	-1.68 (1.89)	1.83 (2.42)
6-20	-0.95 (1.07)	-2.07 (1.53)	-2.66 (2.84)
21-80	-0.56 (1.04)	-1.83 (1.58)	1.46 (2.39)
More than 80	...	-2.08 (1.32)	-4.38 (2.53)

White Standard Errors are listed in parentheses under the coefficient estimates. The regressand is AFQT score, adjusted for age and educational attainment in 1980. The sample is comprised of three groups: the layoff subsample, the plant-closing subsample, and one observation from other respondents in the NLSY who have never been displaced, denoted as the “undisplaced sample”. The regressors in the equation include three size category dummy variables (excluding “more than 80 workers” as the reference group), four size indicators equal to one if the respondent was in the layoff sample and employed in a pre-displacement establishment of a given size, and four size indicators equal to one if the respondent was in the plant closing sample and employed in a pre-displacement establishment of a given size. Other regressors included: the number of years of attachment to the labor market, and the square of this number; 10 industry dummy variables, and current level of education.

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Endnotes

ⁱ The authors restrict their sample to "...male workers between the ages of 20 and 61 who were permanently displaced from a private sector, full-time, nonagricultural job because of a plant closing, slack work or a position or shift that was eliminated..." (which are classified as layoffs), and "...those individuals who were re-employed in wage and salary employment at the survey date and who had re-employment earnings of at least \$40 a week..." (p.361). Construction workers were also excluded from the sample.

ⁱⁱ The Displaced Worker supplements of the CPS for the years 1984-1992 do not have information on union coverage. Due to this shortcoming, Gibbons and Katz (1991) focus on a white-collar sample of workers because of lower unionization rates in these jobs, as opposed to the higher unionization rates in blue-collar jobs.

ⁱⁱⁱ Stevens (1997), p.178.

^{iv} NLSY Employer supplements 1986-1994, p.ES5

^v Refer to endnote (ii).

^{vi} A "pre-displacement job" included in this study was either the most recent job held by a respondent unemployed at the time of the interview because of a layoff or plant closing, or a job held at the time of the interview which was reported lost because of a layoff or plant closing at the following interview (whereupon the respondent had a different job). The post-displacement job was defined as that new job held with a different employer in the interview directly following last interview period in which the respondent was still employed at the pre-displacement job. Pre- and post-displacement weekly earnings were thus calculated using the information in these two interview periods.

^{vii} The p-values of the t-tests are: 0.013 for highest education attained, 0.878 for age, 0.888 for years since attachment to the labor force, 0.00002 for pre-displacement tenure and 0.609 for average pre-displacement log weekly earnings.

^{viii} These categories were created by calculating quartiles for the size of the pre-displacement establishments employing workers in the plant-closing sample.

^{ix} Inserting three establishment-size indicator variables into the pre-displacement wage equation indicate that at the 5% level of significance, workers in the smallest establishment category earn significantly smaller pre-displacement weekly earnings than workers at all other establishments. Inserting indicator variables for the second-smallest, second-largest and largest establishment size categories yields coefficient and standard error estimates for these variables of 0.202 and 0.057; 0.326 and 0.059; and 0.308 and 0.066 respectively. The three size indicators are jointly significant in the pre-displacement earnings regression, with a p-value of less than 0.0001.

^x The indicator variables representing the worker's pre-displacement establishment size were inserted into the post-displacement earnings regression. Not only were none of these variables significant at the 5% level, but the test-statistic for the joint significance of these variables had a p-value of 0.4285.

^{xi} The p-value of this t-test for the difference in the mean proportion of workers from the two samples at the smallest pre-displacement establishment size category is 0.0024.

^{xii} The p-values for these t-tests for the difference in the mean proportion of workers from the two samples at different post-displacement establishment size categories is: 0.2949 for establishments employing 1-5 workers, 0.880 for establishments employing 6-20 workers, 0.866 for establishments employing 21-80 workers, and 0.5238 for establishments employing over 80 workers.

^{xiii} The regression also included all the covariates employed by Gibbons and Katz, except for advanced notification of a layoff. This variable is not collected by the NLSY, and while it would be desirable to include it in this analysis, there exists a substantial literature establishing the insignificance of the effect of advanced notice on post-displacement earnings.

^{xiv} Three indicator variables for educational attainment (high school dropout, high school graduate, and some college education) and the interaction of these three variables with the three pre-displacement establishment size indicators were included in the wage-change regression, and this inclusion did not cause the significance of the layoff coefficient to change in any of the twelve regressions. Further, the value of the layoff coefficient was not significantly changed by the inclusion of these controls -- a test for the equality of the layoff coefficient with and without the controls yields p-values which range from 0.76 to 0.99 for all four wage-change regressions.

^{xv} This estimator is derived by comparing the difference in wage losses between the layoff and plant closing samples, so it is a "difference-in-difference" estimator in this sense.

^{xvi} The F-test on the three establishment-size dummy variables in the Pre-displacement earnings equation had a p-value of less than 0.0001, regardless of whether or not collective bargaining controls were used. The same F-test for the post-displacement earnings equation has a p-value of 0.0001 with a collective bargaining control and 0.0003 without such a control. The F-test of the joint significance of the fifteen size controls in the wage-change earnings equation has a p-value of 0.0005 when no collective bargaining control is used and 0.0006 when such a control is employed.

^{xvii} A wage-change regression was also calculated for samples of workers displaced from each pre-displacement category. None of the wage changes were statistically different for any of the four categories. In fact, workers displaced because of a plant closing from establishments employing 5 or fewer employees had greater wage losses (approximately 10% larger) than their laid-off counterparts.

^{xviii} The “high-tenure” dummy variable is equal to one if the individual’s pre-displacement tenure is greater than two years, and the “low-tenure” dummy variable is equal to one if the worker’s pre-displacement tenure is less than two years.

^{xix} The F-test on the three establishment-size dummy variables in the Pre-displacement earnings equation had a p-value of 0.53 with collective bargaining controls and 0.42 without such controls. The same F-test for the post-displacement earnings equation has a p-value of 0.153 with a collective bargaining control and 0.159 without this control. While these p-values are not significant, it should be noted that splitting the layoff sample into a high- and low-tenure group has decreased the power of these tests. Nevertheless, the F-test of the joint significance of the fifteen size controls in the wage-change earnings equation has a p-value of 0.0003 with collective bargaining controls and 0.0002 without these controls.

^{xx} The AFQT score was compiled from scores on the Armed Service Vocational Aptitude Battery test. This test examines respondents in ten areas: general science, arithmetic reasoning, word knowledge, paragraph comprehension, numerical operations, coding speed, auto and shop information, mathematics knowledge, mechanical comprehension, and electronics information. The ASVAB was administered to over 94% of all respondents. AFQT scores were calculated from ASVAB scores. Specifically, AFQT is the sum of the number of correct scores in the sections for arithmetic reasoning, word knowledge, and paragraph comprehension, plus half of the correct scores from the section on numerical operations.

^{xxi} The respondent’s AFQT score was regressed on age and education in 1980, and the residual was then used in the regression analysis.

^{xxii} The p-values for testing the equality of the coefficients between workers laid-off from smallest establishment size category, and the other three size categories are: 0.87, 0.94, and 0.85 for the 6-20 worker, 21-80 worker and 80+ worker category, respectively.

^{xxiii} Testing the equality of the adjusted AFQT score of workers displaced by a plant closing from the smallest size category and workers laid off from all four different size categories yields the following p-values: 0.21, 0.17, 0.20, 0.15 for the comparison with the smallest size category up to the largest size category, respectively.

^{xxiv} Regressing