Online Appendix to
Wage Rigidity and Employment Outcomes: Evidence from Administrative Data
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Monte Carlo Simulations of Wage Rigidity Estimator

This section tests the performance of the estimator of wage rigidity proposed in Section III using Monte Carlo simulations. Wage change distributions for 500 establishments facing different levels of wage rigidity are simulated, with the number of years' worth of wage changes observed in the sample for each establishment generated as a random integer uniformly distributed between three and seven. Next, the number of employees per establishment is generated as a random integer uniformly distributed between 15 and 500; the number of employees is fixed over the simulation period. For each establishment the proportion of nominal wage cuts that will be prevented by downward nominal wage rigidity is also simulated as a random variable uniformly distributed over the interval [0, 1]: $wr_i \sim U[0, 1]$.

To simulate counterfactual nominally flexible wage change distributions for each establishment in each year, begin by drawing the mean of the establishment-year wage change distribution from a normal distribution with a mean of four percent and a standard deviation of four percent: $\mu_{it} \sim N(.025, .04^2)$. Then, draw the standard deviation of the counterfactual wage change distribution from a uniform distribution over the interval [0.02 .07] ($\sigma_{it} \sim U[0.02, .07]$) and draw the counterfactual flexible wage changes for each year from the normal distribution $\Delta \ln w_{ijt}^{cf} \sim N(\mu_{it}, \sigma_{it}^2)$, where $\Delta \ln w_{ijt}^{cf}$ is the counterfactual flexible log wage change of individual j at establishment i from year $t-1$ to year t.

Fraction wr_i of counterfactual wage cuts are affected by wage rigidity each period. Wage cuts are chosen to replace randomly: there is no tendency for smaller wage cuts to be more likely to be prevented. Of the wage cuts affected by wage rigidity, 98 percent are set to zero, and 2 percent are replaced with missing values to reflect the proportion of endogenously generated layoffs in the structural model.[66] Finally, compression in the wage change distribution in the face of wage rigidity is introduced by multiplying counterfactual wage changes by a compression factor 0.57.[67]

Figure D displays the estimated and actual proportions of counterfactual wage cuts prevented by wage rigidity in these simulations. A regression of the form

$$\widehat{wr}_i = \alpha + \beta wr_i + u_i \tag{D1}$$

gives an estimate for $\hat{\alpha}$ of -0.03 with a standard error of 0.005 and an estimate

[66] A further five percent of wage changes are selected randomly from the entire counterfactual wage change distribution to reflect exogenous layoffs.

[67] The compression factor was chosen as the ratio of the simulated standard deviation of wage changes with wage rigidity and without wage rigidity in the structural model.

for $\hat{\beta}$ of 1.00 with a standard error of 0.008. Therefore, estimated wage rigidity moves essentially one-for-one with true wage rigidity.

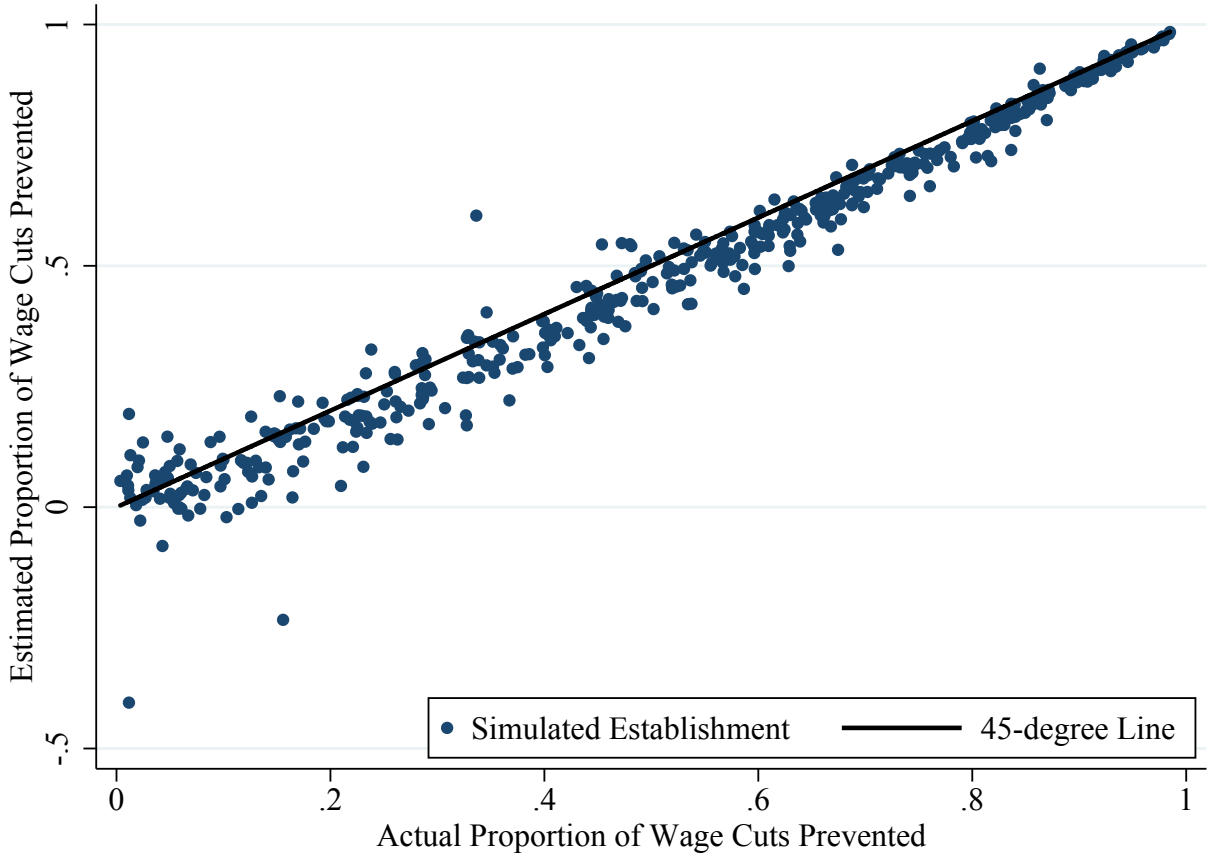

Figure D1. Monte Carlo Simulations of Wage Rigidity Estimates

Aggregate German Wage Change Distributions, 1976-2005

This section displays the aggregate German wage change distributions from 1976 to 2005. The data is taken from the Sample of Integrated Labor Market Biographies (SIAB) described in Section II.A. The dataset contains a 2 percent random sample of workers liable to social security in West Germany during the sample period. The histograms display nominal percent wage changes for job stayers. The sample includes workers whose earnings are top-censored at the social security contribution limit; these workers are excluded from the histograms as their true wage is not known.

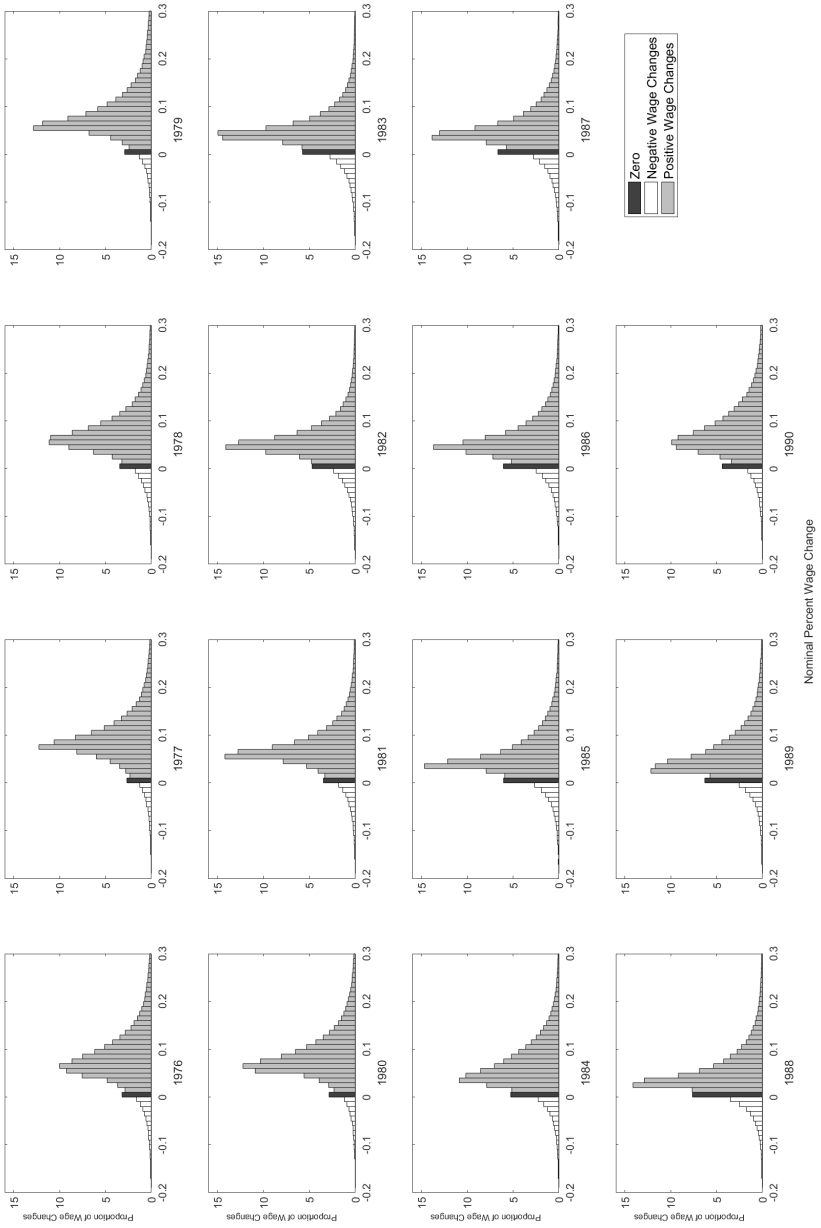

FIGURE E1. AGGREGATE WAGE CHANGE DISTRIBUTIONS 1976 TO 1990

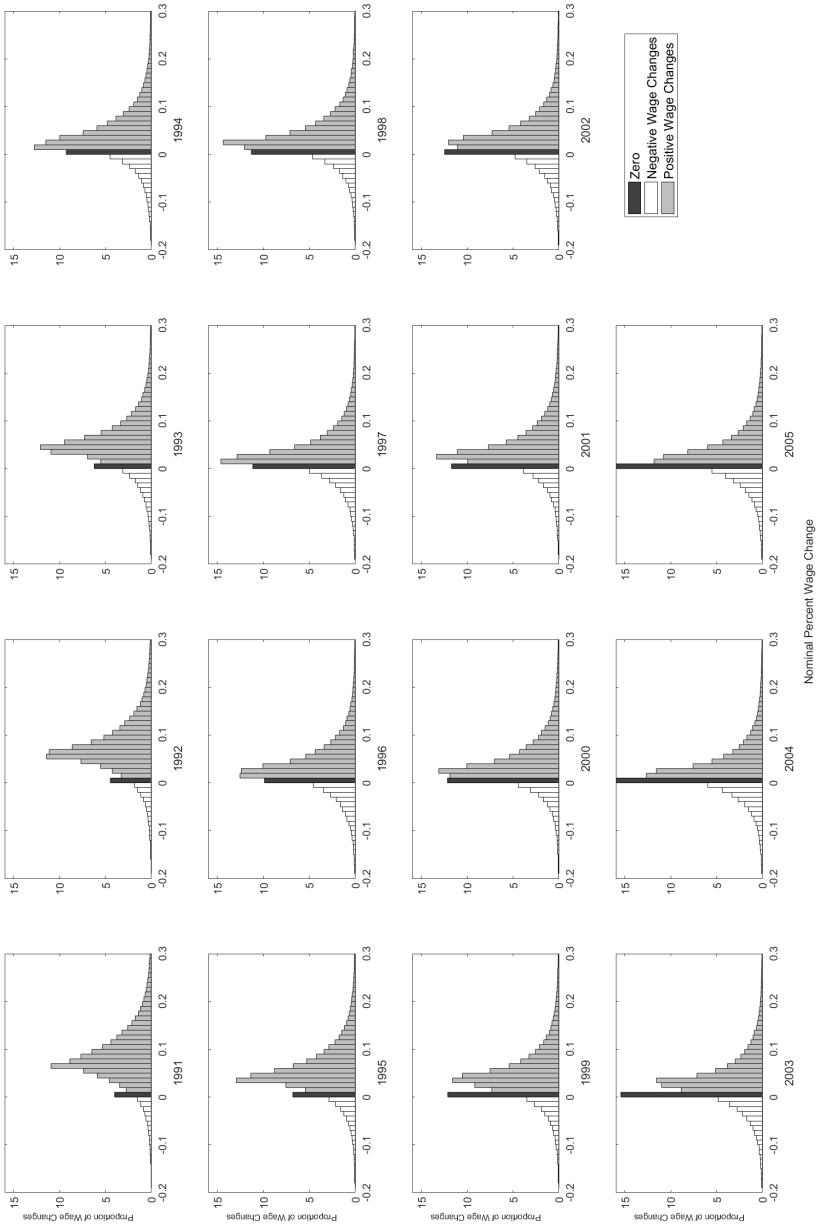

FIGURE E2. AGGREGATE WAGE CHANGE DISTRIBUTIONS 1991 TO 2005

Robustness

This appendix assesses the robustness of the main empirical results in two ways. First, it presents the results from using the "proportion at the wage floor" instrument. Second, the sensitivity of the main results to the sample selection is assessed by splitting the samples into groups of establishments with employment levels below and above the median. The long-lagged participation instrument presented in the main text reduces the size of the sample relative to the "proportion at the wage floor" presented in section F.F1. To maximize the available sample size, all of the specifications in this appendix, most of which involve split samples, use the "proportion at the wage floor" instrument.

F1. "Proportion at the Wage Floor" Instrument

Table F1 presents instrumental variables regression results using the "proportion at the wage floor" instrument instead of the lagged participation instrument. Column (1) of Table F1 shows the results for the layoffs regression and corresponds to column (5) of Table 6. Column (2) of Table F1 shows the results for the layoff rate regression and corresponds to column (5) of Table 7. Finally, Column (3) of Table F1 shows the results for the layoff rate regression and corresponds to column (5) of Table 8. The results from these regressions are largely similar to, but more precise than, the regressions using the lagged participation instrument. Section V dicusses these results in more detail.

Table F2 presents the results from the first-stage regression using the "proportion at the wage floor" instrument. The first-stage F-statistic is 65.5, indicating that the istrument is very strong.

F2. An Alternative Method of Estimating Wage Rigidity

This section briefly describes an alternative method for measuring wage rigidity and the results it produces. The major difference between the method in this section and the method used in the body of the paper is that the method in this section imposes an underlying functional form for the counterfactual wage change distribution. Using a parametric estimation technique adds additional structure to the procedure and has the potential to produce more precise results in the relatively small establishment-level samples. In practice, the results of the two methods are very similar.

The estimation of the observed wage change distribution proceeds as in the fully nonparametric method used in the main results. The counterfactual wage change distribution is estimated by assuming that the distribution is symmetric about its median, with the both the upper and lower tails distributed exponentially.[68]

[68] William T Dickens, Lorenz Goette, Erica L Groshen, Steinar Holden, Julian Messina, Mark E Schweitzer, Jarkko Turunen and Melanie E Ward (2007) report that, "Exponential distributions provide

Specifically, the counterfactual wage change distribution is assumed to be:

$$f(x) = \begin{cases} \frac{1}{2}\lambda e^{-\lambda(m-x)} & x < m \\ \frac{1}{2}\lambda e^{-\lambda(x-m)} & x \geq m \end{cases} \tag{F1}$$

where x is a nominal wage change and m is the observed median nominal wage change.

Then for each establishment i in year t, λ may be estimated as:

$$\hat{\lambda} = \frac{n_u - 1}{n_u}(\overline{x}_u - m) \tag{F2}$$

where n_u is the number of observations in the upper tail of the wage distribution and $\overline{x}_u$ is the sample average wage change in the upper tail of the distribution. Then the counterfactual wage change distribution $\hat{f}_{it}^{cf}$ for establishment i in year t is given by equation F1. As in the kernel estimation approach used in the main analysis, the estimated proportion of wage cuts prevented by wage rigidity is calculated by comparing the implied proportion of counterfactual wage cuts to the number observed. One advantage of the parametric approach assumed here is that it allows estimated wage rigidity to vary year-by-year, which given the small sample sizes is impractical using the kernel density approach.

The parametric approach produces an average level of estimated wage rigidity of 0.31 across establishments, only slightly higher than the average level of 0.27 produced by the kernel density estimation procedure. The standard deviation of estimated wage rigidity is 0.22, also a bit higher than in the kernel density procedure.

Appendix Tables F3-F5 display results analogous to the results in Tables 6-8, but using the parametric estimator for wage rigidity.[69] The results are qualitatively and quantitatively similar to the results from the non-parametric regressions, and indicate a substantial role for downward nominal wage rigidity in affecting employment outcomes.

F3. Split Sample Analysis

As described in Section II.C, establishment-years are excluded if the establishment has fewer than 30 employees or 5 valid wage changes in the year. Estab-

a much better fit to wage changes above the median in our wage change distributions than do normal distributions." They find that the Weibull distribution, which generalizes the exponential distribution, provides a further improvement. For simplicity, however, this section uses the exponential distribution.

[69]The first stage results of the instrumental variables regressions are omitted for brevity but show a strong relationship between the instrument and measured wage rigidity and are quantitatively similar to the first stage results for the nonparametric estimator, with first-stage coefficients on the instrument of approximately 0.2. Additionally, the parametric assumptions in this estimator allow for the inclusion of smaller establishments. The regressions include establishment-years with a minimum of 20 wage change observations.

lishments are excluded altogether if they have fewer than 20 valid wages changes over all of the years they are in the data. These restrictions exclude very small establishments from the sample; the mean establishment size in the main analysis is 466 employees, with a median of 168. To examine whether the main results are driven entirely by large establishments, this section splits the sample in the main analysis into establishment-years with employment levels above the sample median and establishment-years with employment levels lower than or equal to the sample median.

Tables F6 and F9 analyze the layoff results for large and small establishments, respectively. The point estimates for the wage rigidity coefficients in Table F6, which contains large establishments, are larger than in the full sample, although the standard errors are larger also, reflecting the smaller sample sizes. Conversely, the point estimates for the wage rigidity coefficients in Table F9, which contains small establishments, are smaller than in the full sample. These results suggest that wage rigidity has a larger effect on increasing layoffs in larger establishments.

Tables F7 and F10 analyze the quits results for large and small establishments, respectively. The estimates largely mirror the results for the full sample.

Tables F8 and F11 analyze the hires results for large and small establishments, respectively. The standard errors are large for all regressions, once again reflecting the smaller sample sizes from splitting the sample. However, both the OLS and IV results have statistically significant estimated coefficients on wage rigidity for the smaller establishments, suggesting that wage rigidity more clearly affects hires for smaller establishments than for larger establishments. This result stands in contrast to the results for layoffs above, which indicate that wage rigidity more clearly affect layoffs at the larger establishments.

Columns (2) and (4) of Tables F6 through F8 replicate columns (3) and (6), respectively, of Tables 6 through 8 in the main text. They are included here for completeness and ease of comparison.

TABLE F1—WAGE RIGIDITY AND EMPLOYMENT FLOWS – IV REGRESSION RESULTS WITH ALTERNATIVE INSTRUMENT

Dependent Variable	Layoffs (1)	Quits (2)	Hires (3)
Wage Rigidity	0.154	-0.235	-0.128
	(0.074)	(0.056)	(0.116)
Works Council	-0.050	-0.051	-0.129
	(0.010)	(0.008)	(0.018)
P-value of Exogeneity Test	0.008	0.001	0.601
Specification	Sector-Level IV	Sector-Level IV	Sector-Level IV
R-Squared	0.100	0.114	0.112
N	10,906	10,906	10,906

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Layoffs, Quits, and Hires are defined as fractions of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for occupational mix, dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. All regressions have at least 30 employees in a given year and cover the period 1997 to 2003. The instrumental variables in the regressions are estimated by two-stage least squares. All columns use state-sector level wage agreements as an instrument for wage rigidity, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F2—INSTRUMENTAL VARIABLES FIRST STAGE REGRESSIONS FOR ESTIMATED WAGE RIGIDITY: ALTERNATIVE INSTRUMENT

Dependent Variable	Measured Wage Rigidity
	(1)
Fraction Workers at Establishments	0.196
Paying Collectively Bargained Floor	(0.024)
F-Statistic	65.5
R-Squared	0.364
N	10,906

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Results are first-stage estimates for Table F1. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1.

TABLE F3—WAGE RIGIDITY AND LAYOFFS – REGRESSION RESULTS (PARAMETRIC ESTIMATOR)

Dependent Variable	Layoff Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.009	-0.008	0.119	0.113
	(0.019)	(0.018)	(0.060)	(0.060)
Positive Revenue Growth		0.015		0.016
		(0.005)		(0.006)
Negative Revenue Growth		-0.071		-0.074
		(0.014)		(0.014)
Works Council	-0.040	-0.041	-0.046	-0.046
	(0.009)	(0.009)	(0.009)	(0.009)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.007	0.010
R-Squared	0.139	0.143	0.105	0.113
N	12,064	12,064	12,064	12,064

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Layoffs are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated using a parametric estimator assuming an exponential distribution as described in Section F.F2 and varies year-by-year. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. All regressions have at least 20 employees in a given year and cover the period 1997 to 2003. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

Table F4—Wage Rigidity and Quits – Regression Results (Parametric Estimator)

Dependent Variable	Quit Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.089	-0.088	-0.206	-0.213
	(0.015)	(0.015)	(0.046)	(0.047)
Positive Revenue Growth		0.039		0.039
		(0.008)		(0.008)
Negative Revenue Growth		-0.064		-0.061
		(0.016)		(0.015)
Works Council	-0.048	-0.048	-0.043	-0.042
	(0.007)	(0.007)	(0.007)	(0.007)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.002	0.001
R-Squared	0.136	0.140	0.120	0.121
N	12,064	12,064	12,064	12,064

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Quits are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated using a parametric estimator assuming an exponential distribution as described in Section F.F2 and varies year-by-year. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. All regressions have at least 20 employees in a given year and cover the period 1997 to 2003. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F5—WAGE RIGIDITY AND HIRES – REGRESSION RESULTS (PARAMETRIC ESTIMATOR)

Dependent Variable	Hire Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.113	-0.112	-0.115	-0.126
	(0.033)	(0.033)	(0.095)	(0.094)
Positive Revenue Growth		0.125		0.125
		(0.021)		(0.021)
Negative Revenue Growth		0.002		0.002
		(0.029)		(0.029)
Works Council	-0.113	-0.112	-0.113	-0.112
	(0.015)	(0.015)	(0.016)	(0.016)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.983	0.866
R-Squared	0.106	0.113	0.106	0.113
N	12,064	12,064	12,064	12,064

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Hires are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated using a parametric estimator assuming an exponential distribution as described in Section F.F2 and varies year-by-year. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. All regressions have at least 20 employees in a given year and cover the period 1997 to 2003. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F6—WAGE RIGIDITY AND LAYOFFS – REGRESSION RESULTS (LARGE ESTABLISHMENTS)

Dependent Variable	Layoff Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	0.032	0.033	0.196	0.189
	(0.040)	(0.040)	(0.102)	(0.101)
Positive Revenue Growth		0.022		0.023
		(0.009)		(0.010)
Negative Revenue Growth		-0.078		-0.082
		(0.018)		(0.017)
Works Council	-0.092	-0.092	-0.096	-0.096
	(0.030)	(0.030)	(0.030)	(0.030)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.046	0.056
R-Squared	0.247	0.251	0.211	0.219
N	5,439	5,439	5,439	5,439

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Layoffs are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 6, but only establishments with an average number of employees above the sample median are included. TThe instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F7—WAGE RIGIDITY AND QUITS – REGRESSION RESULTS (LARGE ESTABLISHMENTS)

Dependent Variable	Quit Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.113	-0.112	-0.260	-0.266
	(0.029)	(0.029)	(0.081)	(0.082)
Positive Revenue Growth		0.052		0.051
		(0.014)		(0.014)
Negative Revenue Growth		-0.062		-0.058
		(0.024)		(0.024)
Works Council	-0.055	-0.054	-0.052	-0.051
	(0.015)	(0.014)	(0.014)	(0.014)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.024	0.018
R-Squared	0.236	0.241	0.218	0.221
N	5,439	5,439	5,439	5,439

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Quits are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 7, but only establishments with an average number of employees above the sample median are included. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F8—WAGE RIGIDITY AND HIRES – REGRESSION RESULTS (LARGE ESTABLISHMENTS)

Dependent Variable	Hire Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.090	-0.088	-0.043	-0.051
	(0.062)	(0.062)	(0.172)	(0.171)
Positive Revenue Growth		0.150		0.151
		(0.029)		(0.029)
Negative Revenue Growth		-0.012		-0.013
		(0.031)		(0.031)
Works Council	-0.170	-0.164	-0.171	-0.165
	(0.044)	(0.043)	(0.044)	(0.044)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.753	0.797
R-Squared	0.318	0.326	0.318	0.325
N	5,439	5,439	5,439	5,439

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Hires are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 8, but only establishments with an average number of employees above the sample median are included. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F9—WAGE RIGIDITY AND LAYOFFS – REGRESSION RESULTS (SMALL ESTABLISHMENTS)

Dependent Variable	Layoff Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.026	-0.025	0.062	0.051
	(0.014)	(0.014)	(0.073)	(0.071)
Positive Revenue Growth		0.009		0.009
		(0.006)		(0.006)
Negative Revenue Growth		-0.080		-0.082
		(0.017)		(0.018)
Works Council	-0.027	-0.028	-0.031	-0.031
	(0.005)	(0.005)	(0.006)	(0.006)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.169	0.230
R-Squared	0.124	0.13	0.103	0.115
N	5,467	5,467	5,467	5,467

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Layoffs are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls.Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 6, but only establishments with an average number of employees below the sample median are included. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

Table F10—Wage Rigidity and Quits – Regression Results (Small Establishments)

Dependent Variable	Quit Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.049	-0.048	-0.228	-0.240
	(0.017)	(0.017)	(0.056)	(0.056)
Positive Revenue Growth		0.036		0.035
		(0.010)		(0.011)
Negative Revenue Growth		-0.071		-0.065
		(0.024)		(0.024)
Works Council	-0.052	-0.052	-0.046	-0.046
	(0.008)	(0.007)	(0.008)	(0.008)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.002	0.001
R-Squared	0.142	0.146	0.099	0.097
N	5,467	5,467	5,467	5,467

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Quits are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 7, but only establishments with an average number of employees below the sample median are included. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).

TABLE F11—WAGE RIGIDITY AND HIRES – REGRESSION RESULTS (SMALL ESTABLISHMENTS)

Dependent Variable	Hire Rate as a Fraction of Establishment Workforce			
	(1)	(2)	(3)	(4)
Wage Rigidity	-0.070	-0.069	-0.159	-0.174
	(0.030)	(0.031)	(0.105)	(0.104)
Positive Revenue Growth		0.131		0.130
		(0.037)		(0.037)
Negative Revenue Growth		-0.005		-0.002
		(0.046)		(0.045)
Works Council	-0.117	-0.117	-0.114	-0.114
	(0.015)	(0.014)	(0.015)	(0.015)
Specification	OLS	OLS	IV	IV
P-value of Exogeneity Test			0.399	0.322
R-Squared	0.118	0.126	0.116	0.123
N	5,467	5,467	5,467	5,467

Standard errors, clustered at the establishment level, are in parentheses. The unit of observation is the establishment-year. Hires are defined as the fraction of the establishment's total workforce on December 31 of the previous year. Wage rigidity is calculated as described in section III and is fixed by establishment over the sample period. Each regression includes a set of establishment characteristics, individual characteristics, and year dummies as controls. Establishment characteristics include a set of controls for the median year-over-year wage change, occupational mix, and dummies for federal state, establishment size, and large-scale relocations of workers across establishments within the same firm. Individual characteristics include controls for gender and workers' education. Positive revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is positive and zero otherwise. Negative revenue growth is defined as the year-over-year percentage change in revenues when revenue growth is negative and zero otherwise. The regression sample is the same as in Table 8, but only establishments with an average number of employees below the sample median are included. The instrumental variable regressions in columns 3 and 4 are estimated by two-stage least squares. The instrumental variable for wage rigidity is the incidence of binding state-sector level wage agreements, as described in Section F.F1. Test of regressor exogeneity is from Wooldridge (1995).