The Determinants of Dismissals, Quits, and Layoffs: A Multinomial Logit Approach*

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I. Introduction

In efficiency wage models, workers' productivity depends positively on the wage, giving firms an incentive to pay wages above their market-clearing level. Two models in this literature are the shirking model of Shapiro and Stiglitz [12] and Bowles [1] and the turnover cost model of Stiglitz [13], Schlicht [11], and Salop [10]. In the shirking model, a higher wage and a higher unemployment rate raise the cost of losing one's job, thereby discouraging workers from shirking and increasing their effort. In the turnover cost model, a higher wage reduces quits and thus lowers the firm's cost of hiring and training new workers. Given the role of separations in efficiency wage models, it is important to understand the determinants of separations. This study uses data on individual workers to examine the determinants of dismissals, quits, and layoffs within the first six months of a hire, paying particular attention to dismissals because of the prominence of the shirking model in the efficiency wage literature. The purposes of this study are to test whether higher unemployment lowers dismissals, as predicted by the shirking model, and to examine the effect of firm variables related to the costs of monitoring and shirking on the probability of a dismissal. In addition, this study provides insight into the effects of firm characteristics and worker characteristics on dismissals, quits, and layoffs.[1]

*I would like to thank Michael Haines, Tom Michl, Mark Montgomery, Bob Turner, and an anonymous referee for valuable comments on earlier versions of this paper. I am also grateful to Mark Montgomery and Mike Podgursky for providing the EOPP data to me.

1. Several previous studies have attempted to test the shirking model. Rebitzer [8] and Green and Weisskopf [7] analyzed the effect of unemployment on productivity with data from different industries, and Weisskopf, Bowles, and Gordon [16] and Weisskopf [15] analyzed the effect of unemployment on productivity with aggregate data. All four studies found that higher unemployment raises productivity in the U.S. Cappelli and Chauvin [5] examined the dismissal rate of plants operated by the same firm, but in different locations. They found that the difference between the plant's wage and the average wage for production workers in the plant's SMSA has a negative and significant effect on the plant's dismissal rate, but they did not find a significant effect of the unemployment rate. Campbell [4], using a nonparametric hazard model to analyze dismissals with individual data from the EOPP survey (described in section II), found that the probability of dismissal depends negatively on the unemployment rate. This study also found that dismissals depend negatively on the firm's size and the worker's education, and depend positively on the capital-labor ratio and on a dummy variable for males.

The present study expands on previous work by investigating the determinants of dismissals, quits, and layoffs in the context of a single regression model, with data on individual firms and workers. It can thus examine the effect of firm and worker characteristics, as well as labor market conditions, on the probability of different types of separations. In addition, it considers the behavior of firms operating in many different industries, and includes a richer set of geographical control variables than have previous studies.

II. Results

The equations for dismissals, quits, and layoffs[2] were estimated with data from the Employment Opportunity Pilot Project (EOPP) survey of employers, which was conducted in the spring of 1980. 5302 firms in 28 geographic locations (in 11 states[3]) and 63 2-digit SIC industries were interviewed. The survey included questions concerning the personal characteristics of the last worker hired by the firm between 1 January 1978 and 1 October 1979. Firms were also asked whether this worker was still employed at the firm, and if not, whether the separation was a quit, a layoff, a discharge, or an induced resignation. A worker was considered to be dismissed if he or she were discharged or induced to resign. Table I lists the variables' names, descriptions, means, and standard deviations.

In the shirking model,[4] workers' effort depends on the probability of finding another job if dismissed, which, in turn, depends on the unemployment rate. Two unemployment rates are considered: the unemployment rate in the local labor market and the unemployment rate in the 2-digit SIC industry.[5] Dismissals should also depend negatively on the cost of monitoring since firms with high monitoring costs would be expected to monitor their workers less intensely. This cost cannot be measured directly, so it was proxied by the firm's size since Bulow and Summers [2] and Rebitzer and Robinson [9] suggest that monitoring costs are likely to be higher at large firms. In addition, dismissals should depend positively on the capital-labor ratio since firms with high capital-labor ratios will suffer the greatest losses if their workers shirk and waste the services of the capital with which they work or damage it through their carelessness.[6]

These variables may also affect the probability of a quit or a layoff. High unemployment is likely to reduce quits, since fewer workers should quit if jobs are scarce. On the other hand, high unemployment may raise layoffs, since firms are most likely to lay off workers during recessions. Firm size is likely to raise the cost of hiring and training workers, since part of the cost of being trained involves learning the way the organization operates and forming working relationships with co-workers across the organization. Thus, larger firms have a greater incentive to retain workers during economic downturns and to take actions to discourage workers from quitting.

2. Dismissals and layoffs are considered as distinct processes since dismissals generally result from a worker's poor performance, while layoffs generally result from a decline in demand for the firm's output. Note that a rise in the unemployment rate would be expected to reduce dismissals since higher unemployment should induce workers to work harder, but it would be expected to increase layoffs since the unemployment rate and product demand tend to be negatively correlated.

3. These states were Alabama, Colorado, Florida, Kentucky, Louisiana, Missouri, Ohio, Texas, Virginia, Washington, and Wisconsin.

4. See Campbell [3] for a model in which workers choose the utility-maximizing level of effort to provide and firms choose the profit-maximizing wage and monitoring intensity. Dismissals then depend on the firm's monitoring intensity and on its workers' effort. Both of these are endogenous, but are functions of three exogenous variables: the probability of a dismissed worker finding another job, the firm's cost of monitoring workers, and the firm's capital-labor ratio.

5. The local unemployment rate is a weighted average of the county unemployment rates in the counties comprising the local labor market, with the weights determined by the employment in each county. These data were obtained from the Bureau of Labor Statistics (BLS) publication, *Unemployment in State and Local Areas.* The industry unemployment rates are based on unpublished figures obtained from the Bureau of Labor Statistics. Both the industry unemployment rate and the local unemployment rate are weighted averages of annual unemployment rates, with the weights determined by the proportion of the first six months of a worker's observed employment spell occurring in each year.

6. Since shirkers are more likely to misuse or damage equipment than structures, the measure of capital used in this study includes only capital equipment. This variable is not available at the firm level, so data from the 2-digit SIC industry in 1979 were used. Figures on the capital stock were obtained from *Fixed Reproducible Tangible Wealth in the United States, 1925–1985,* published by the Economic Analysis Bureau of the Commerce Department. Figures on employment were obtained from the BLS publication, *Employment and Earnings.*

Table I. Variable Names, Descriptions, Means, and Standard Deviations

Variable	Description	μ	σ
DISMISS	= 1 if worker dismissed	0.037	0.189
QUIT	= 1 if worker quit	0.128	0.334
LAYOFF	= 1 if worker laid off	0.034	0.181
LOCUR	Local unemployment rate	6.47	1.55
INDUR	Industry unemployment rate	6.43	2.53
FIRMSIZE	Log of firm's employment	2.96	1.56
K/L	Industry ratio of capital equipment to labor (in $millions of capital per worker)	0.0114	0.0160
%UNION	Proportion of firm's workforce unionized	0.107	0.283
WRR	Wage Replacement Ratio (ratio of state's UI benefits to state's average earnings)	0.240	0.0351
WA	Dummy variable for Washington state	0.123	0.328
ENCFDFM	Dummy variable for states where employer is not charged for discharges for misconduct	0.760	0.427
RURAL	Dummy variable for rural areas	0.502	0.500
AGE	Age in years	26.60	9.49
SEX	= 1 if male	0.501	0.500
EDUC	Years of education	12.05	1.66
EXPER	Months of useful job experience	41.2	63.54
%BLACK	Proportion black in local labor market	0.135	0.130

Firms with a high capital-labor ratio also have an incentive to retain workers, since inexperienced workers would be the most likely to damage or misuse the capital with which they work. Thus, we would expect quits and layoffs to depend negatively on the capital-labor ratio.

The firm's unionization rate is included in the regressions, since regulations in unionized firms may make dismissing workers more difficult and since unions can generally negotiate a high wage for their workers, making these workers less likely to shirk or to quit. In addition, according to Freeman [6], unions provide a voice for workers' grievances, reducing the probability that they will quit if dissatisfied with their jobs. Furthermore, unions tend to make wages more rigid, so that highly unionized firms may be more likely to lay off workers in response to a reduction in demand.

Several regional variables are included in the regressions. The first is the ratio of state Unemployment Insurance (UI) benefits to wages in that state.[7] In addition, a dummy variable was created for Washington since a firm's UI tax in that state depends on the change in its payroll from year-to-year and not on the number of workers it discharges or lays off. Because a firm's UI tax in that state is less related to its dismissal and layoff behavior than in other states, we would expect more dismissals and layoffs to occur in Washington. A dummy variable was also created for states in which a firm's UI tax is not raised if it dismisses a worker for misconduct, as firms

7. This variable was obtained by dividing the average of the state's maximum and minimum monthly UI benefits by average monthly earnings in that state. Data on UI benefits were obtained from the Dept. of Labor publication, *Comparison of State Unemployment Insurance Laws* [14]. Average monthly earnings were obtained by multiplying average hourly earnings in manufacturing by 174. Figures from manufacturing were used since aggregate average hourly earnings are not available at the state level. Data on earnings were obtained from the BLS publication, *Employment and Earnings.*

in these states would be more likely to dismiss workers. Finally, a dummy variable was created for rural areas since labor markets are generally thinner in these areas, making it more difficult for workers to find a new job at a given level of the unemployment rate. We would thus expect fewer dismissals and quits in rural areas than in urban and suburban areas.

A worker's age, sex, experience, and education are included because these variables may affect workers' performance, the disutility they derive from effort, and their ability to evade detection. These variables may also affect their propensity to quit or a firm's decisions to lay them off. In addition, dummy variables for occupational groups and 1-digit SIC industries are included because the costs of monitoring, shirking, and turnover may differ across occupations and industries.[8]

In addition, the degree of monitoring, a firm's dismissal and layoff decisions, and a worker's alternative employment opportunities may depend on the race of the worker. While data are not available on the race of the workers in the sample, a variable for the proportion of blacks in the local labor market was included in the regressions.[9]

The wage is not included in the regressions. While much work in the shirking and quit literatures has concentrated on the role of the wage in deterring shirking and quitting, the wage is an endogenous variable that is set at its optimal level by the firm.

The separation equations were estimated with a multinomial logit model, where the dependent variable was a dichotomous variable indicating whether the worker had been dismissed, had quit, or had been laid off within six months of starting work.[10] The reason why separations within the first six months were considered is that the survey asked about the most recently hired worker prior to 1 October 1979, and the interviews started in March 1980, with most (84%) being conducted after 1 April 1980. Thus, almost every worker in the sample can be observed for a minimum of six months. While some workers can be observed for more than six months, restricting the observation length to six months means that the separation behavior of all workers is observed for the same length of time.

A possible source of bias in the EOPP data is that not all the firms in the sample hired workers after 1 January 1978, so the firms hiring workers may not represent a random sample of all firms that were surveyed. To test whether this is a serious problem, a dummy variable indicating whether each firm in the sample had reported a hire after 1 January 1978 was regressed on the variables from Table I that are most related to a firm's hiring decision.[11] It was found that the probability of a hire is affected positively and significantly by firm size and is affected negatively and significantly by the local unemployment rate and the unionization rate. Because of the possibility of sample selection bias, the Inverse Mills Ratio (IMR) was calculated from the hiring equations, and its value was included in one of the separation equations. Some caution must be used, however, in interpreting the regression including the Inverse Mills Ratio since there

8. The coefficients on these dummy variables are not reported in the tables to save space, but the complete tables are available from the author upon request.

9. A variable for the Hispanic proportion of the population in the local labor market was always insignificant, so this variable was not included in the reported regressions.

10. While some studies have used hazard models to examine separations, I know of no hazard model that allows for three different types of risks.

11. The results of this regression are available from the author upon request. In addition, it should be noted that some firms reported hires before 1/1/78 or after 10/1/79, in spite of the fact that the survey asked only about hires between these dates. In the hiring equations, firms that hired before 1/1/78 were treated as not having a hire within the sample period, but firms that hired after 10/1/79 were treated as having a hire, since it is likely that many of these firms also hired between 1/1/78 and 10/1/79. In the separation equations, firms were omitted from the sample if there was less than six months from the date of the hire to the date of the firm's interview.

is some debate among economists on whether it is legitimate to include this ratio in anything besides a linear regression model.

Table II reports the results of the separation equations[12] (t-statistics are in parentheses). The first reported regression omits the Inverse Mills Ratio, while the second includes it. Consider first the determinants of dismissals. The most important finding is that unemployment in the local labor market has a negative and significant (at the 1% level) effect on dismissals. This result suggests that workers shirk less when it is most difficult to find another job in their geographic area. On the other hand, the coefficients on the industry unemployment rate are insignificant and are much lower than the coefficients on the local unemployment rate. The coefficients indicate that the probability of a dismissal falls by 1.2–1.5% in response to a one percentage point rise in the local unemployment rate and by 0.10–0.13% in response to a one percentage point rise in the industry unemployment rate.[13] (The average probability of dismissal is 3.7%.) It thus appears that workers are more deterred from shirking by high unemployment in their geographic region than by high unemployment in their industry. Possible explanations for this finding are that workers are more mobile across industries than across regions or that they have greater knowledge of the unemployment rate in their region than in their industry.

In the first regression firm size has a negative effect on dismissals, and the coefficients indicate that a 10% rise in the size of the firm would reduce the probability of a dismissal by 0.34%. These results may indicate that monitoring is more difficult at a large firm. However, when the Inverse Mills Ratio is included, the coefficient on firm size becomes positive and insignificant, so it is possible that sample selection bias may be responsible for the negative coefficient in the equation omitting this variable. The capital-labor ratio has a positive effect on dismissals, suggesting that firms with more capital per worker may monitor their workers more carefully, but this effect is insignificant. The coefficient on the percentage unionized is insignificant, and it indicates that a 10% increase in a firm's unionization rate would reduce the probability of dismissal by 0.12–0.27%. Thus unions do not appear to make dismissing workers much more difficult. All the variables capturing differences between states in UI regulations have the expected sign, although the coefficient on the wage-replacement ratio is always insignificant.[14]

The personal characteristics with the strongest effects on dismissals are education and sex. The coefficient on education is negative and significant at the 1% level, possibly because better educated workers are more productive and are better at evading detection when they shirk. In addition, they generally perform more enjoyable jobs, so their disutility of effort may be lower. Each year of education reduces the probability of dismissal by 0.54–0.61%. The coefficient on sex is positive and significant at the 1% level, indicating that men are more likely to be dismissed than are women, perhaps because women face greater difficulty in finding another job if dismissed. The probability of dismissal is 2.7–2.8% higher for men than for women.

The coefficients on *%BLACK* indicate that a 10% rise in the black population of the local

12. Note that all three equations include the same variables. It is likely that almost all the independent variables will have an effect on dismissals, quits, and layoffs. The exceptions are that the UI variables may not directly affect quits, and the dummy variable for rural areas may not directly affect layoffs. However, in these cases there may be an indirect effect, since these variables will affect other types of separations, which will affect the probability of a quit or layoff occurring within the worker's first six months of employment.

13. If we let P_j represent the probability of a type j separation, x represent one of the explanatory variables, and β_j represent the coefficient on x for a type j separation, then $dP_j/dx = P_j(\beta_j - \overline{\beta})$, where $\overline{\beta} = \sum P_j\beta_j$.

14. While we would expect more workers to shirk in states with generous UI benefits, this effect may be counteracted by the fact that employers might be reluctant to discharge workers in these states out of fear of higher UI taxes. It is also possible that workers have imperfect information about their state's UI benefits.

Table II. Separation Equations

	(1)			(2)		
	Dismissals	Quits	Layoffs	Dismissals	Quits	Layoffs
LOCUR	−0.356	−0.0524	0.0585	−0.420	−0.0644	0.0499
	(−3.39)[a]	(−1.03)	(0.61)	(−3.57)[a]	(−1.23)	(0.50)
INDUR	−0.0383	−0.0116	−0.0356	−0.0329	−0.0138	−0.0381
	(−0.80)	(−0.42)	(−0.68)	(−0.69)	(−0.50)	(−0.73)
FIRMSIZE	−0.126	−0.160	−0.265	0.218	−0.147	−0.261
	(−1.72)[c]	(−3.81)[a]	(−3.35)[a]	(0.97)	(−1.89)[c]	(−2.07)[b]
K/L	7.77	−2.14	−3.09	5.16	−2.27	−3.25
	(1.11)	(−0.45)	(−0.33)	(0.72)	(−0.47)	(−0.35)
%UNION	−0.399	−0.595	0.422	−0.835	−0.615	0.411
	(−0.91)	(−2.20)[b]	(1.23)	(−1.62)	(−2.16)[b]	(1.11)
WRR	2.49	1.61	−2.67	−2.08	2.07	−2.01
	(0.84)	(0.98)	(−0.80)	(−0.57)	(1.19)	(−0.58)
WA	2.898	0.383	0.0820	3.154	0.458	0.169
	(4.03)[a]	(1.15)	(0.14)	(4.22)[a]	(1.36)	(0.28)
ENCFDFM	1.131	0.0653	−0.346	0.702	0.0942	−0.315
	(2.42)[b]	(0.33)	(−0.89)	(1.35)	(0.44)	(−0.77)
RURAL	−0.156	−0.00986	0.278	−0.360	−0.0412	0.303
	(−0.59)	(−0.07)	(0.94)	(−1.27)	(−0.28)	(1.01)
AGE/100	−0.337	−2.27	−2.52	−0.516	−2.34	−2.59
	(−0.26)	(−2.68)[a]	(−1.48)	(−0.39)	(−2.76)[a]	(−1.52)
SEX	0.793	−0.0268	0.328	0.780	−0.0322	0.318
	(3.04)[a]	(−0.19)	(1.16)	(2.98)[a]	(−0.23)	(1.13)
EDUC	−0.155	−0.0240	−0.0388	−0.176	−0.0308	−0.0493
	(−2.80)[a]	(−0.73)	(−0.59)	(−3.07)[a]	(−0.94)	(−0.76)
EXPER/100	−0.343	−0.172	−0.0449	−0.332	−0.166	−0.0392
	(−1.49)	(−1.23)	(−0.18)	(−1.43)	(−1.18)	(−0.16)
%BLACK	1.439	1.176	−0.530	2.062	1.084	−0.504
	(1.39)	(2.05)[b]	(−0.39)	(1.83)[c]	(1.83)[c]	(−0.36)
λ	—	—	—	2.81	0.0825	0.0825
				(1.59)	(0.10)	(0.10)
Log Likelihood		−1895.4			−1893.6	
# observations		2994			2994	

a. significant at the 1% level
b. at the 5% level
c. at the 10% level

labor market raises the probability of a dismissal by 0.46–0.69%. In addition, when *RURAL* is omitted, *%BLACK* is significant at the 7% level in both regressions, and the coefficients indicate that a 10% rise in this variable raises the probability of dismissal by 0.56–0.82%. (*%BLACK* and *RURAL* are highly correlated with each other, with a correlation coefficient of 0.625.) When *%BLACK* is omitted, *RURAL* is significant at the 10% level in the second regression, and the coefficients indicate that dismissals are 1.1–1.8% more likely in urban areas than in rural areas. It thus appears that dismissals are more common in areas with a high proportion of blacks in the

population and in urban areas. However, because these variables are so highly correlated, it is difficult to determine which has the more important effect on dismissals.[15]

Consider now the determinants of quits. The coefficients on the local unemployment rate and industry unemployment rate are always negative but insignificant. Firm size has a negative effect on quits, and its coefficients indicate that a 10% rise in firm size reduces the probability of a quit by 0.16%. (The average probability of a quit is 12.8%.) These results suggest that larger firms discourage quits through actions such as paying good wages and providing good working conditions. The effect of the unionization rate is negative and significant at the 5% level, possibly because unions raise wages and provide a forum for handling workers' grievances. A 10% rise in a firm's unionization rate reduces the probability of a quit by 0.66%. The only significant demographic variables are *AGE* and *%BLACK*. Each 10 years of age reduces the probability of a quit by 2.5–2.6%, and a 10% rise in the black proportion of the local labor market raises the probability of a quit by 1.1–1.3%.[16]

In terms of the determinants of layoffs, the only variable with a significant effect is firm size, whose coefficients indicate that the probability of a layoff falls by 0.078–0.082% when firm size rises by 10%. (The average probability of a layoff is 3.4%.) This result seems plausible since we would expect hiring and training costs to be the greatest at larger firms, giving them an incentive to hoard labor during economic downturns.[17]

III. Conclusion

The most important result of this study is the finding that the local unemployment rate has a negative and significant effect on the probability that a worker is dismissed, as predicted by the shirking model in the efficiency wage literature. In addition, an advantage of using data on individual workers is that we can also examine the effects of firm and worker characteristics on dismissals, quits, and layoffs. Some important findings are that men are significantly more likely to be dismissed than are women, that better educated workers are less likely to be dismissed, that dismissals and quits both depend positively on the proportion of blacks in the local labor market, and that older workers and workers in more heavily unionized firms are less likely to quit. It is also interesting to note that a firm's unionization rate has an insignificant effect on the probability of dismissal, in spite of the fact that it is often assumed that unions make dismissing workers more difficult.

15. The occupational dummy variable with the strongest effect on dismissals is the one for unskilled workers, which is negative and significant at the 5% level. A possible reason why unskilled workers are less likely to be dismissed is that shirking by these workers is less costly, giving firms less incentive to monitor them closely. The probability of dismissal is 5.7–6.0% lower for unskilled workers than for service workers, who are the most likely to be dismissed. Surprisingly, all the industry dummies are insignificant except for the variable for wholesale and retail trade, and its coefficient is significant at only the 10% level. The probability of dismissal is 1.8% lower in wholesale and retail trade than in manufacturing, the industry in which dismissals are the most common.

16. Almost all of the occupational dummy variables are negative and significant, indicating that service workers are the most likely to quit. The probability of a quit is 8.6% higher for service workers than for managerial workers, the workers least likely to quit. On the other hand, all of the industry dummy variables are insignificant, suggesting that there is little difference between industries in quit propensities once we control for other factors.

17. Of the occupation groups, layoffs are most common among unskilled workers, where the probability of a layoff is 4.9–5.7% higher than for managerial workers, the group for which layoffs are least common. In addition, the coefficients on the industry dummy variables indicate that layoffs are most prevalent in manufacturing and construction, probably because demand is most cyclical in these industries. Workers in manufacturing are 6.4% more likely to be laid off than are workers in mining, the industry in which layoffs are least prevalent.

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