Employer Size: The Implications for Search, Training, Capital Investment, Starting Wages, and Wage Growth

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An employer must choose a procedure for screening job applicants, a rate of hire, a training program for new employees, a criterion for the retention of new employees after observing their on-the-job performance, a compensation package, and a rate of capital investment so as to minimize production costs across time. This paper examines the effects of employer size on these hiring and training decisions when larger employers have greater monitoring costs. A unique data set is employed to estimate the empirical relation among employer size and employer search, training, capital investment, and wages.

I. Introduction

In an important paper, Alchian and Demsetz (1972) point out that, when individuals work cooperatively to produce a joint output, it is difficult to ascertain the output attributable to any individual team member. Thus a crucial task of an employer is the monitoring of the

Barron and Loewenstein gratefully acknowledge research support by the National Science Foundation under grant 8408903. Research support for Black was provided by an Ashland Oil, Inc., research grant to the College of Business and Economics of the University of Kentucky.

[*Journal of Labor Economics*, 1987, vol. 5, no. 1]

0734-306X/87/0501-0006$01.50

effort of each worker in order to prevent shirking. The employer's monitoring, supervising, and metering roles have received considerable attention in the principal agent literature. Harris and Raviv (1978), Holmstrom (1979), Harris and Townsend (1981), Lazear and Rosen (1981), and Green and Stokey (1983) analyze optimal compensation schemes when workers' output depends not only on their effort but also on random elements beyond their control. Lazear (1981) and Eaton and White (1982) show how upward-sloping wage profiles and bonding arrangements can be used to reduce worker shirking.

Of course, a worker's output depends on his natural ability as well as on his work effort. In his paper on information in the labor market, Stigler (1962, p. 102) conjectures that the "small company has distinct advantages in the hiring process, so far as judging the quality of workers is concerned. The small employer can directly observe the performance of the new worker and need not resort to expensive and uncertain practices to estimate the worker's performance. It is well known that wage rates are less in small plants than in large, and the difference reflects at least in part (and perhaps in whole) the lower costs to the small-scale employer of judging quality."

There is strong empirical support for Stigler's claim concerning the positive relation between wage rates and employer size. Masters (1969), Rosen (1970), Haworth and Reuther (1978), Pugel (1980), Mellow (1982), and Garen (1985) all have found that larger employers pay higher wages. Two papers accounting for this observation have recently appeared in the literature. One, by Weiss and Landau (1984), examines the relation between firm size and the size of the labor pool from which the firm draws. A second, by Walter Oi (1983), focuses on monitoring costs that increase with employer size. Oi suggests that larger employers find it optimal to produce with a higher output to labor ratio.

This paper examines in detail the predicted effects of employer size on hiring and training decisions when it is assumed that larger employers have greater monitoring costs. In Section II, we discuss the interrelations among an employer's search, training, capital investment, and wage decisions. Section III analyzes the effect of employer size on these decisions. A unique data set is employed to estimate the empirical relation between employer size and employer search, training, capital investment, starting wages, and wage growth. Section IV reinterprets some of our results based on an expanded view of the labor market. Section V summarizes our findings and provides concluding remarks.

II. Employer Search, Training, Capital Investment, and Wages: A Theoretical Framework

Each period an employer inherits inputs of labor and capital that reflect prior decisions. The size and average productivity of the employer's

work force are determined by past search, hiring, training, and retention decisions. The size of the employer's capital stock is determined by past capital investment decisions. The problem facing the employer is to choose a procedure for screening job applicants, a rate of hire, a training program for new employees, a criterion for the retention of new employees after observing their on-the-job performance, and a rate of capital investment so as to minimize production costs across time. In addition, the employer picks a wage compensation package that influences turnover.[1]

In analyzing the employer's cost-minimization problem, it is useful to distinguish between two types of workers: "probationary" workers and "retained" workers. Probationary workers are newly hired workers whose ability and consequent job performance have not yet been completely determined by the employer. Retained workers are workers whose ability the employer has both discovered during a period of employment and deemed to be sufficiently high to warrant retention.

The productivity of probationary workers depends directly on the initial on-the-job training received. The productivity of probationary workers also depends on an employer's search decisions prior to hiring since search affects the average ability of newly hired workers. During a worker's probationary period of employment, an employer monitors his on-the-job performance. At some point in time this monitoring provides the employer with a better measure of the worker's true ability. Monitoring then ends, and the employer decides whether to retain the worker.[2] The more stringent are the requirements for retention, the higher is the average ability of retained workers, but the lower is the proportion of probationary workers retained.

In sum, an employer can raise the productivity of his work force by screening applicants more extensively prior to hiring, by providing increased training to new hires, and by adopting more stringent requirements for retention. In addition to these screening, training, and retention decisions, the employer must decide on the compensation to be paid to probationary and retained workers. An increase in wage compensation to probationary workers reduces their quit rate.[3] An increase in the wage

[1] In essence, the employer faces an optimal control problem. A formal statement of this optimal control problem is set forth in our more detailed working paper (Barron, Black, and Loewenstein 1985).

[2] Barron and Loewenstein (1985) utilize this assumption that employers gather information on worker ability during employment to generate employment relations like those suggested in the internal labor market literature.

[3] Our focus on the effect of wages on turnover alone simplifies the analysis in several ways. For example, we ignore the fact that an increase in compensation will also affect the likelihood of an applicant accepting an employment offer. As discussed in Sec. IV, introducing such an effect does not substantially alter the analysis.

paid retained workers reduces not only their quit rate but also the quit rate of probationary workers since probationary workers anticipate receiving this wage if they are retained in the future.

III. The Effects of Size on Employer Search, Training, Capital Investment, and Wage Decisions

As outlined in the preceding section, the problem facing an employer is to choose the expected number of applicants screened per hire, the precision of the ability signal for applicants, the number of hires, the extent of training, the proportion of probationary workers retained, the wage rate for probationary workers, the wage rate for retained workers, and capital investment so as to minimize discounted production costs.[4] Now consider the effects of size on employers' search, training, capital investment, and wage decisions. An increase in employer size alters such decisions if, as Oi (1983) suggests, larger employers have greater costs of monitoring employees.

The higher monitoring cost incurred by a larger employer induces him to choose a method of production that economizes on monitoring. As a result, the larger employer increases employment proportionately less than output. Increased training, more extensive search for newly hired workers, and a larger capital stock tend to be substituted for increases in the work force.[5] The higher search and training provided by a larger employer makes it more costly to replace workers who quit. Thus a larger employer pays higher wages to reduce turnover.

A 1982 employer survey sponsored by the National Institute of Education and the National Center for Research in Vocational Education provides a basis for testing our hypotheses concerning the effects of employer size on training, search, capital investment, and wages.[6] Each

[4] A solution to the employer's optimal control problem is presented in Barron, Black, and Loewenstein (1985). A characterization of the optimal steady-state values of the employer's choice variables can also be found there. While our focus here is on steady-state solutions, a dynamic view of employers' hiring, layoff, and recall decisions is presented in Barron, Black, and Loewenstein (1984).

[5] At least one of these three variables must rise. As the result of possible substitution effects, it is possible that some may fall.

[6] The survey, conducted between February and July 1982, represents the second wave of a two-wave longitudinal survey of employers from selected geographic areas across the country. The first wave, not utilized in this study, was funded by the U.S. Department of Labor to collect data on the area-wide labor market effects of the Employment Opportunity Pilot Project (EOPP). The first wave encompassed 10 EOPP pilot sites and 18 comparison sites selected for their similarity to the pilot sites. The survey design specified a strategy of oversampling firms with a relatively high proportion of low-wage workers. A more detailed discussion of the first wave survey is contained in Barron, Bishop, and Dunkelberg (1985). The second wave made an attempt to interview all the respondents to the first wave survey. About 70% of the original respondents

employer surveyed was asked about the wages, hiring activities, and training activities associated with the last position he filled prior to August 1981.[7] In addition, each employer provided information concerning the most expensive equipment the newly hired worker worked on or with.

Two measures of employer size are available from information provided by the survey. The first, denoted by N, is the number of full- and part-time employees at the establishment. The second, denoted by D, is a dummy variable equal to one if the employer has divisions or subsidiaries outside the area. Below we consider separately the effects of employer size on search, training, capital investment, and wage decisions.

A. Employer Size and Search

The survey provides unique data on the number of job applicants an employer screened prior to hiring, the number of offers made prior to hiring, and the total number of hours that company personnel spent recruiting, screening, and interviewing applicants.[8] Using these three variables, we can construct two measures of employer search. One measure is the expected number of applicants screened per employment offer (A). Search by an employer entails sampling from a pool of applicants, with employment offers made to applicants having estimated ability (or ability signal) at least as high as some minimal acceptable (reservation) level. To raise the expected ability of probationary workers, an employer can increase his reservation signal, but this means an increase in the average number of applicants screened before locating an acceptable applicant.[9]

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completed surveys for the second wave. The data collected by this second-wave survey on the circumstances surrounding a recently hired worker are more extensive than those available on the first wave.

[7] In the bulk of the sample, the respondent was the owner/manager of the establishment. In large organizations, the primary respondent was the person in charge of hiring, generally the personnel officer. When the primary respondent was unable to answer a question, he was asked if someone else in the organization would have the information, and that part of the interview was completed with this other official. The other respondents that resulted from this process were controllers, wage and salary administrators, and line supervisors. A copy of the questionnaire used as well as other related information is available on request from the authors.

[8] In their recent analysis of employer search, Barron and Bishop (1985) also utilize this employer-survey data.

[9] For simplicity, our discussion of employer search in this section abstracts from the recruitment problem identified by Weiss and Landau (1984). That is, we assume that the size of the pool of workers from which an employer samples rises proportionately with employer size and that changes in wages and hiring standards do not affect the pool of applicants from which the employer draws. Sec. IV examines the effects of relaxing these assumptions.

A second measure of employer search is the number of hours devoted to recruiting, screening, and interviewing each applicant (c_a). Changes in this variable proxy changes in an employer's choice of the precision of the ability signal. To raise the average ability of probationary workers, an employer can increase the precision of the ability signal, but this requires that the employer devote more resources to evaluating each job applicant.

As indicated in the previous section, high monitoring costs are predicted to induce a large employer to economize on the size of his work force by acquiring more able workers. Specifically, larger employers, seeking to hire more able workers, are predicted to screen a greater number of applicants for a vacant position and/or to spend more time screening each applicant.[10] To test our prediction that larger employers devote more resources to screening job applicants prior to hiring, we estimate the following three equations:

$$\ln(A) = \alpha_a + \beta_a \ln(N) + \delta_a D + \theta_a Z, \tag{1}$$

$$\ln(c_a) = \alpha_c + \beta_c \ln(N) + \delta_c D + \theta_c Z, \tag{2}$$

$$\ln(c_a A) = \alpha_{ca} + \beta_{ca} \ln(N) + \delta_{ca} D + \theta_{ca} Z, \tag{3}$$

where Z denotes a vector of control variables, such as the industrial classification of the employer, the occupational classification of the employer's position, the stability of the employer's position (temporary/seasonal vs. permanent), and the union status of the employer's work force. Estimation results are reported in table 1.[11]

As table 1 indicates, larger employers denote substantially more resources to search. Unexpectedly, this investment is entirely in the form of the number of applicants screened. Specifically, a 10% increase in employer size is associated with a 1.65% increase in the number of applicants screened per position. The unanticipated insignificant effect of employer size on the number of hours spent screening each applicant may reflect the fact that, besides having higher monitoring costs, larger employers have a comparative advantage in screening (such that, if they spend the same amount of time screening an applicant as do smaller employers, they obtain a more precise signal of the applicant's ability).

B. Employer Size and Training

A large employer who faces high monitoring costs can economize on the size of his work force not only by hiring workers of greater ability

[10] As a result of substitution effects, it is possible that the expected number of individuals screened and the precision of the signal may not both increase.

[11] For the sake of brevity, we do not report the estimated coefficients on the occupation and industry dummies. A listing of these coefficients is, however, available on request.

Table 1
Estimates of the Effects of Employer Size on Training, Search, Starting Wage, and Wage Growth

	Independent Variables*			
Dependent Variable	Logarithm of Number of Employees in the Area: $\ln(N)$†	Other Divisions or Employees in Subsidiaries Outside Area: D‡	Proportion of Workforce Unionized: UNION§	Temporary or Seasonal Position: TEMPSEA‖
Logarithm of the number of applicants screened per acceptable applicant: $\ln(A)$#	.165 (8.47)	.306 (4.88)	.03 (.30)	−.401 (5.58)
Logarithm of the number of hours spent recruiting, screening, and interviewing per applicant: $\ln(c_a)$**	.004 (.23)	.033 (.57)	−.177 (1.83)	−.209 (3.11)
Logarithm of the number of hours spent recruiting, screening, and interviewing per acceptable applicant: $\ln(c_aA)$††	.169 (8.52)	.339 (5.34)	−.145 (1.38)	−.610 (8.36)
Logarithm of $P_1/(1-P_1)$, where P_1 is the probability of training that involves watching others do job‡‡	.191 (4.28)	.21 (1.49)	−.315 (1.51)	−.199 (1.38)
Logarithm of $P_2/(1-P_2)$, where P_2 is the probability of formal training (by management)§§	.169 (3.41)	.284 (1.88)	−.281 (1.01)	−.435 (2.00)
Logarithm of $P_3/(1-P_3)$, where P_3 is the probability of informal training (by management)‖‖	.161 (2.98)	.529 (2.89)	−.137 (.52)	−.261 (1.55)
Logarithm of $P_4/(1-P_4)$, where P_4 is the probability of informal training (by coworkers)##	.227 (6.16)	.436 (3.80)	.037 (.20)	−.213 (1.70)
Logarithm of $P_5/(1-P_5)$, where P_5 is the probability of orientation training***	.447 (9.38)	.705 (4.58)	−.359 (1.58)	−.202 (1.45)
Logarithm of the most expensive machine people in the position work with: $\ln(k)$†††	.122 (5.23)	−.074 (1.00)	.251 (2.05)	−.160 (1.89)
Logarithm of the starting wage: $\ln(w_p)$‡‡‡	.028 (5.05)	.03 (1.89)	.286 (10.23)	−.050 (2.53)
Logarithm of the wage after 2 years: $\ln(w_r)$§§§	.015 (2.73)	.017 (1.02)	.290 (10.56)	−.07 (3.65)
Logarithm of the ratio of the typical wage after 2 years to the starting wage: $\ln(w_r/w_p)$‖‖‖	−.013 (3.76)	−.015 (1.42)	.004 (.24)	−.021 (1.68)

Table 1 *(Continued)*

NOTE.—The table lists coefficients, with t-statistics (unless otherwise noted) given in parentheses.

* As indicated in the text, a number of other independent variables are also part of the equations estimated. These variables indicate the industrial classification of the employer (seven variables) and the occupational classification of the position (five variables). A complete report of the estimation results is available from the authors on request. The equations estimated correspond to equations (18)–(26) in the text. The numbers in parentheses are absolute values of t-statistics.

† The mean number of employees is 68.3. The mean of the logarithm of the number of employees is 2.85.

‡ Twenty-seven percent of the employers have other divisions or subsidiaries outside the area.

§ The mean proportion of employees unionized is .10.

‖ Fifteen percent of the positions are temporary or seasonal positions.

Reported coefficients reflect estimation of a simple OLS model. The number of employers who answered questions on their search activity is 2,336. The mean number of applicants per acceptable applicant is 9. The mean of the logarithm of the number of applicants per acceptable applicant is 1.25.

** Reported coefficients reflect estimation of a simple OLS model. The number of employers who answered questions on their search activity is 2,336. The mean number of hours spent per applicant is 2.44. The mean of the logarithm of the number of hours spent per applicaant is .14. A Glejser test (1969) indicates that the size variable is correlated with the error term in the regression equation, implying heteroscedasticity. Making the requisite correction, however, does not alter our findings.

†† Reported coefficients reflect estimation of a simple OLS model. The number of employers who answered questions on their search activity is 2,336. The mean number of hours spent per acceptable applicant is 12.2. The mean of the logarithm of the number of hours spent per acceptable applicant is 1.39.

‡‡ Reported coefficients reflect estimation of a logit model; the numbers in parentheses are absolute values of asymptotic t-statistics. The implied derivatives evaluated at means for the size variables $\ln(N)$ and D are both .03. The sample for estimating the five training equations involves the 2,172 employers who answered questions on all five training measures. Four hundred sixty-one employers indicated no training of the first type. For employers who offered such training, the average amount provided over the first 3 months of employment was 50.8 hours. Owing to computational limitations, three variables (one industry dummy and two occupational dummies) are omitted from the logit estimations for the training variables. For the second, third, and fourth training variables, the data set provided a second measure of training—the actual training received by the person hired (as opposed to typical training for a person hired in that position). The number of employers who answered questions on such training activities, as well as the questions concerning the first and fifth training activities, is 2,213. Reestimating the five training logit equations does not alter any of the findings.

§§ Reported coefficients reflect estimation of a logit model. The implied derivatives evaluated at means for the size variables $\ln(N)$ and D are .02 and .03, respectively. Eighteen hundred ninety-three employers indicated no training of this type. For employers who offered such training, the average amount provided over the first 3 months of employment was 10.1 hours.

‖ ‖ Reported coefficients reflect estimation of a logit model. The implied derivatives evaluated at means for the size variables $\ln(N)$ and D are .02 and .06, respectively. Two hundred eighty-three indicated no training of this type. For employers who offered such training, the average amount provided over the first three months of employment was 52.4 hours.

Reported coefficients reflect estimation of a logit model. The implied derivatives evaluated at means for the size variables $\ln(N)$ and D are .05 and .10, respectively. Eight hundred fifty-five employers indicated no training of this type. For employers, who offered such training, the average amount provided over the first 3 months of employment was 25.3 hours.

*** Reported coefficients reflect estimation of a logit model. The implied derivatives evaluated at means for the size variables $\ln(N)$ and D are .07 and .12, respectively. Five hundred thirty-two employers indicated no training of this type. For employers who offered such training, the average amount provided over the first 3 months of employment was 5.7 hours.

††† Reported coefficients reflect estimation of a simple OLS model. The number of employers who provided information on the cost of machinery the newly hired employed worked on or with is 2,512. For those answering less than $2,000 or greater than $200,000, the values of $1,000 and $250,000 are assigned. Otherwise, the value assigned is the geometric mean of the interval chosen, where the intervals to choose from were $2,000–$10,000, $10,000–$50,000, and $50,000–$200,000. A Glejser test indicates that the size variable is correlated with the error term in the regression equation, implying heteroscedasticity. Making the requisite correction does not alter our findings. The mean of $\ln(k)$ is 8.59.

‡‡‡ Reported coefficients reflect estimation of a simple OLS model. The number of employers who provided information on the starting wage and the wage for the typical worker after 2 years is 2,288. The mean starting wage is $5.05, while the mean of the logarithm of the starting wage is 6.12.

§§§ Reported coefficients reflect estimation of a simple OLS model. The number of employers who provided information on the starting wage and the wage for the typical worker after 2 years is 2,288. The mean wage for the typical worker after 2 years is $6.01, while the mean of the logarithm of the starting wage is 6.31.

‖‖‖ Reported coefficients reflect estimation of a simple OLS model. The number of employers who provided information on the starting wage and the wage for the typical worker after 2 years is 2,288. The mean ratio of the wage 2 years later to the starting wage is 1.23, while the mean of the logarithm of this ratio is .181.

but also by increasing the on-the-job training that the workers he hires receive. The employer survey provides the following five measures of training: the number of hours typically spent by a new employee in the position last filled watching other people do the job rather than doing it himself during the first 3 months of employment (T_1); the number of hours a new employee in the position typically spends receiving formal training (T_2); the number of hours management and line supervisors typically spend away from other activities giving informal individualized training or extra supervision to a new employee in the position (T_3); the number of hours coworkers who are not supervisors typically spend away from their normal work giving informal individualized training or extra supervision to a new employee in the position (T_4); and, finally, the number of hours spent by company personnel providing the new employee with job orientation (T_5).

The above training measures are not quantities but rather costs. However, our analysis and estimations both suggest that larger employers hire workers of greater ability. Since it is presumably less costly to train more able workers, the predicted effect of employer size on the *total* cost of training (but not on the amount) is ambiguous.[12] There is, however, no ambiguity with respect to the effect of employer size on the *likelihood* that training is provided. That is, our model predicts that larger employers are more likely to provide training. To test this prediction, we estimate the following logit equations:

$$\mathrm{pr}(T_i > 0) = 1/\{1 + \exp[-\alpha_i - \beta_i \ln(N) - \delta_i D - \theta_i Z]\}, \tag{4}$$

$i = 1, 2, 3, 4, 5$. Estimated coefficients are reported in table 1.

Note that the results in table 1 are strongly supportive of our hypothesis that larger employers provide more training. In each of the estimated equations, the coefficients on both size variables are positive (and all but one of these coefficients are significantly different from zero).

C. Employer Size and the Cost of Machinery

A third way that the larger employer economizes on the size of his work force is by choosing a higher capital/labor ratio. The employer survey provides a measure of the capital intensity of each employer's production process: namely, the cost of the most expensive machine worked with by a worker in the position last filled, k. We therefore estimate the following equation:

[12] The implications for job matching of this complementarity between ability and training are examined and tested in Barron, Black, and Loewenstein (1986).

$$\ln(k) = \alpha_k + \beta_k \ln(N) + \delta_k D + \theta_k Z. \tag{5}$$

As may be seen from table 1, the data provide support for our hypothesis that larger employers choose more capital intensive production processes. Specifically, the coefficient on number of employees is significantly positive. (The coefficient on other establishments is negative but insignificant.)

D. Employer Size and Wages

The greater search and training provided by the larger employer makes it more costly for him to replace workers who quit. As a consequence, the larger employer should pay higher wages. Our employer provides information not only on the starting wage paid by the employer for the position he last filled but also on the wage paid by the employer to the typical worker who has been in this position for a period of 2 years. Using these as measures of what we call the probationary wage (w_p) and the wage paid to retained workers (w_r), we estimate the following two wage equations:

$$\ln(w_p) = \alpha_{wp} + \beta_{wp} \ln(N) + \delta_{wp} D + \theta_{wp} Z, \tag{6}$$

$$\ln(w_r) = \alpha_{wr} + \beta_{wr} \ln(N) + \delta_{wr} D + \theta_{wr} Z. \tag{7}$$

Estimation results appear in table 1. The coefficients for the employer size variables are positive and significant in both regression equations, providing support for our hypothesis that larger employers offer higher wages. Specifically, a 10% increase in employer size is associated with an increase in the starting wage of approximately .28% and an increase in the wage after 2 years of approximately .15%.

IV. An Expanded View of the Labor Market and a Reinterpretation of the Results

In our analysis so far, we have assumed for simplicity that an employer's wage decisions do not affect the likelihood that an applicant accepts employment. If, as one expects, higher compensation increases the likelihood an employment offer is accepted, then larger employers have an additional reason to offer higher wages, Given that larger employers screen more applicants prior to making an employment offer, an increase in compensation (and consequent increase in the probability that an applicant accepts employment) results in a greater saving on screening costs to the larger employer since it leads to a greater fall in the expected total number of applicants screened.

Our analysis so far has also assumed for simplicity that an employer's screening decisions do not affect the applicant pool. Suppose that

workers know the screening procedures of the various employers but not their own abilities. Then an increase in an employer's screening activities will discourage job applicants, resulting in a reduction in the size of the employer's applicant pool, thereby making hiring more costly. This extra cost would tend to reduce, but not eliminate, the larger employer's incentive to screen more extensively.

As discussed by Ramaswami (1983), an employer who screens more extensively can offset the resulting reduction in the size of his applicant pool by paying higher wages. Consequently, in addition to their desire to reduce turnover and increase the likelihood of an applicant accepting employment, we have still another rationale for the higher wages at larger employers; the decision by larger employers to screen more extensively means that they will offer higher wages so as to attract applicants who otherwise would be discouraged by the fact that their chance of being hired is less.

Our analysis has also assumed for simplicity that workers do not know their own abilities. If workers have some knowledge of their own abilities, there are at least two effects. First, larger firms hiring more able workers must offer higher wages just to have the same likelihood that an applicant accepts employment and the same rate of turnover. Naturally, this reduces the gain to hiring more able workers. Second, if larger employers' policy of screening workers more extensively is known to potential job applicants, low-ability job seekers will be discouraged from applying to larger employers to a greater extent than high-ability job seekers. Larger employers can thus increase the proportion of high-ability workers in their applicant pool by screening more extensively. This self-selection on the part of job seekers will tend to reduce the cost to larger employers of hiring more able workers.[13] It also will tend to weaken the observed relation between employer size and search.

Finally, suppose that employers have some knowledge of the screening procedures of other employers. In particular, suppose that it is known that larger employers engage in more extensive screening procedures and consequently hire workers of greater average ability. Then competition among employers for workers will force larger employers to pay higher wages simply to maintain the same turnover rate as smaller employers. On the one hand, this mitigates the gain to larger employers engaging in more extensive search. On the other hand, it reinforces the prediction that larger employers pay higher wages. However, as discussed below, the effect of employer size on the wage rate should diminish over time.

Higher monitoring costs cause the larger employer to substitute

[13] Barron and Loewenstein (1986) analyze another method by which employers can induce self-selection, namely, by more closely tying compensation to an imperfect measure of a worker's contribution to output.

screening activity before hiring for on-the-job determination of ability. Thus the larger employer will screen new applicants more extensively but will be less likely to weed out and dismiss workers of lower-than-average ability. As a consequence, the difference in ability between a probationary (new) worker at a larger employer and a probationary worker at a smaller employer is likely to be greater than the difference in ability between a retained (experienced) worker at the larger employer and a retained worker at the smaller employer. Thus we would expect the ratio of the *typical* wage of an employee with 2 years tenure to the starting wage of a new hire to be less at larger employers.

In order to see more clearly the empirical relation between employer size and the rate of wage growth, we estimate the following wage-growth equation:

$$\ln(w_r/w_p) = \alpha_r + \beta_r \ln(N) + \delta_r D + \theta_r Z. \tag{8}$$

As may be seen from table 1, there is a significant inverse relation between employer size and the ratio of the wage paid the typical worker in the position after 2 years to the starting wage. In particular, note that a 10% increase in employer size is associated with a .13% reduction in the ratio of the wage of the typical worker after 2 years to the starting wage of the new hire.

V. Concluding Remarks

Coase (1937) points out that, "as a firm gets larger, there may be decreasing returns to the entrepreneur function, that is, the costs of organising additional transactions within the firm may rise" (p. 340). The analysis in the current paper has focused on one likely factor behind such decreasing returns, namely, the greater difficulty faced by the larger employer in ascertaining the productive capabilities of his workers. We began by discussing the search, training, investment, and wage decisions of an employer who finds it costly to monitor the on-the-job performance of his workers. This led to the prediction that the larger employer would compensate for his increased monitoring costs by economizing on the size of his work force. He would do so by devoting more resources to the screening of job applicants, by providing more on-the-job training to new workers, and by choosing a higher capital/labor ratio. In addition, because of the resulting higher cost of worker quits, the larger employer would pay higher wages.

The predictions concerning the effects of employer size were tested with a new data set. The evidence indicates that larger employers do search more (a 10% increase in employer size raises screening expenditures by 1.7%), are more likely to provide various types of training, choose a

higher capital/labor ratio (a 10% increase in employer size raises the value of capital an employee works with by 1.2% and offer a higher starting wage (a 10% increase in employer size raises the starting wage by close to .3%).

Our analysis has emphasized the difficulty faced by the employer in determining the ability of his workers. Other authors (in what has become known as the principal agent literature) have been concerned with the moral hazard problem in the employment relation. For instance, Lazear has noted that greater difficulty on the part of larger employers in monitoring the work effort of their employees will cause them to offer steeper wage profiles. In contrast, our analysis suggests that the rate of wage growth may be lower at the larger employer. The evidence we have presented indicates that this is indeed the case.

Other possible effects of employer size are a reduction in the average cost of screening job applicants and a reduction in the employer's discount rate (reflecting such considerations as a lower probability of bankruptcy). An analysis of these effects is beyond the scope of the present paper.

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