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ON-THE-JOB TRAINING OF NEW HIRES

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ABSTRACT

This paper presents an analysis of a unique data set containing measures of the time devoted to training during the first three months on a job and the productivity consequences of that training. The major findings derived from the analysis of the data on new hire training may be summarized as follows:

* Training investments in new hires are substantial even for jobs that are generally considered unskilled.

* Formal training provided by specialized training personnel accounts for only a small portion of the training received by new hires.

* Productivity rises substantially during the first year on the job.

* To fill jobs requiring a great deal of on-the-job training, employers prefer applicants who have previous relevant work experience, who are well educated and who have vocational training in a relevant field.

* Large establishments invest more in the training of their new hires than small and medium sized establishments because (1) they have lower turnover, (2) they have better access to capital markets, (3) the marginal product of an hour of training time is higher at large establishments and (4) training lowers turnover more substantially at large establishments.

* The elasticity of demand for training is below unity.

* When it is a binding constraint, the minimum wage lowers training investment by roughly 17 percent during the first 3 months on the job and productivity growth by 5 to 10 percent.

* Informal training by coworkers and training by watching others do the job appear to have a higher benefit cost ratio than informal training by management.

* Estimates of rates of return to training derived from this data should be treated with a great deal of caution. Nevertheless, **marginal rates of return to training appear to be quite high.**

* The estimated benefit cost ratio for formal training depends on how the model is specified. The productivity growth effects of formal training are bigger at large establishments. Formal training has significantly larger effects on wage growth than informal training. Formal rather than informal training significantly increases the worker's propensity to quit.
Formal training's tendency to have larger effects on wage growth and quit rates than informal training probably results from the fact that formal training is better signaled to the labor market.

* The reported generality of training has no significant effects on the its marginal productivity or on the effects of training on turnover.

* When training is reported to be highly general, training has a larger effect on wage growth than when training is reported to be specific. Nevertheless, **training that is reported to be entirely general has much larger effects on productivity growth than wage growth implying that the labor market treats this training as if it were largely specific to the firm.**

These results provide support for the view that workers do not pay the full costs of general training and do not receive wage increases equal to the full productivity effects of general training. They also lend support to our hypothesis that the outcomes of training, particularly informal training, are poorly signaled to the labor market. Because other employers are unaware of its exact character and unable to assess its quality prior to making hiring decisions, training that is technically general often becomes effectively specific to the firm and employers choose to share the costs and benefits of investments in general training. The second hypothesized reason why shared financing of general training may be in the joint interest of employees and employers is the fact that young workers are typically liquidity constrained while employers are not.

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> If the Germans had any secret weapon in the post-1973 economic difficulties, it is the technical competence of their work force, which is in turn the product of their apprenticeship system.
>
> --Limprecht and Hayes, 1982, p.139.

> I think that the Japanese education system is not very good.... employer training is much more effective.
>
> --Yutaka Kosai, President, Japan Center for Economic Research, 1989

> The heart of this new [flexible] manufacturing landscape is the management of manufacturing projects: selecting them, creating teams to work on them, and managing workers' intellectual development.
>
> --Ramchandran Jaikumar, 1986, p. 75.

A growing number of commentators are pointing to employer sponsored training as a critical ingredient in a nation's competitiveness. American employers appear to devote less time and resources to the training of entry level blue collar, clerical and service employees than employers in Germany and Japan (Limprecht and Hayes 1982, Mincer and Higuchi 1988, Koike 1984, Noll et al 1984, Wiederhold-Fritz 1985). In the 1983 Current Population Survey, only 33 percent of workers with 1 to 5 years of tenure reported having received skill improvement training from their current employer (Hollenbeck and Wilkie 1985). Analyzing 1982 NLS-Youth data, Parsons (1984) reports that only 34 to 40 percent of the young workers in clerical, operative, service and laborer jobs reported that it was "very true" that "the skills [I am] learning would be valuable in getting a better job." The payoffs to getting jobs which offer training appear to be very high, however. In Parson's study, having a high learning job rather than a no learning job in 1979 increased a male youth's 1982 wage rate by 13.7 percent. While the 1980 job had no such effect, the 1981 job raised wages by 7.2 percent when it was a high learning job rather than a no learning job.

If the payoffs to such jobs are so substantial, why aren't such jobs more common? If one were to put this question to an employer, he would point to the high turnover rates of youth as the primary reason why he cannot afford to train new employees more intensely. For American workers with less than one year of tenure, the probability of a separation in the next 12 months is 59 percent. Since comparably defined turnover is only 20 percent in the United Kingdom and 24 percent in Japan, national differences in turnover could be a major reason for the low levels of training investment in the US, if the employer's explanation is right (OECD, 1984, Table 33 and 34).

The theory of on-the-job training says, however, that if training is general, turnover propensities should not matter. The worker pays the full costs of the training and reaps the full benefits whether or not there is subsequent turnover, so the decision to undertake training should be independent of prospective turnover. The problem with the prediction that workers pay all of the costs of general training is that analyses of large representative data sets generally fail to confirm it. In Parson's (1985, table 7.6) study, when a youth reported that it was "very true" that "the skills [I am] learning would be valuable in getting a better job", his job paid on average 2.4 to 14 percent more than when the above statement was "not at all true" even with an extensive set of controls for schooling and academic achievement included in the model. Bishop and Kang (1988) have conducted another test of this hypothesis in the 1984 follow up of the High School and Beyond seniors by regressing the log of the deflated starting wage of the current or most recent job on indicators of the receipt of employer sponsored training. Here again, the jobs offering some training rather than none or which offer greater amounts of training paid higher starting wage rates even when a whole array of human capital characteristics were controlled. For females the positive effect of receiving training on the starting wage was statistically significant. Adding dummies for occupation and industry did not change the results appreciably.

It could be argued, however, that these findings do not constitute a decisive refutation of the proposition that workers pay all of the costs of general training. Hiring decision makers are probably better at assessing the ability of job candidates than econometricians who are limited to the information in the NLS or HSB data file. The positive association between wages and training arises, it could be argued, because workers who are highly able (in ways not observed by the analyst) are both paid more and also recruited for jobs that require large amounts of training.

Unobserved heterogeneity no doubt contributes to the positive association between training and starting wage rates, but to transform a large negative structural relationship into a statistically significant positive relationships just described, sorting of more able job applicants into high training jobs would have to be very powerful indeed. If such a selection process were operating, access to training should depend on ability factors that are visible to the analyst as well as on factors that are not visible to the analyst. Yet models estimated by Parsons and by Bishop and Kang failed to find large effects of ability proxies such as test scores, grades, and being a disciplined student on the probability of receiving training.

One possible explanation of these anomalous findings is that the training is specific and the employer is financing all of its costs. But standard models of the sharing of the costs of specific training do not predict that employers pay all of its costs and some of the new revisionist

theories--Salop and Salop's (1976) adverse selection theory--predict that employers pay none of the costs of specific training. A specific training explanation of the these findings is particularly perplexing when to all outward appearances the training is largely general.

Empirical tests of the theory of on-the-job training have been severely hampered by the absence of data on the key theoretical constructs of the theory--general training, specific training and productivity growth. Data on wage growth and turnover have been used to test various propositions of the theory, but definitive results have been elusive because the large number of unobservables result in there being at least two explanations for any given set of phenomena (Garen, 1987). I hope in this paper to overcome some of the limitations of previous research by analyzing the first large-scale data set to contain measures of the time devoted to training activities during the first three months on the job, who does the training, the generality of training and the productivity of the employees both during and after the receipt of training.

The paper is organized as follows. The first section describes how the data has been collected and how the measures of worker productivity and of time devoted to new hire training were constructed. Section 2 presents tabulations of this data by occupation, establishment size, industry, previous relevant work experience, age and education. Section 3 contains a very simple theory of training investment and then offers a multivariate analysis of the determinants of training investment. Section 4 analyzes the effect of training on productivity growth of new hires focusing on how the impacts of training depend on who provides the training, the size of the establishment and the generality of the training. Section 5 examines the effect of training on wage growth during the first 2 years on the job and then compares these wage rate effects with the productivity effects estimated in section 4. Section 6 examines the effect of training on turnover and promotions. The paper concludes with a summary of the major findings and a discussion of how the findings may illuminate the causes of the lower levels of on-the-job training for new hires in the US than in Germany and Japan.

I. DATA ON TRAINING AND PRODUCTIVITY GROWTH

The analysis is based on data from a survey of 3,412 employers sponsored by the National Institute on Education (NIE) and the National Center for Research in Vocational Education (NCRVE) conducted between February and June 1982. The survey was the second wave of a two-wave longitudinal survey of employers from selected geographic areas across the country. The first wave was funded by the U.S. Department of Labor to collect data on area labor market effects of

the Employment Opportunity Pilot Projects (EOPP). The survey encompassed 10 EOPP pilot sites and 18 comparison sites selected for their similarity to the pilot sites. The ES-202 lists of companies paying unemployment insurance taxes provided the sample frame for the survey. Because of the interest in low wage labor markets, the sample design specified that establishments in industries with a relatively high proportion of low-wage workers be over sampled. The tax paying units were stratified by the estimated number of low wage employees and the number of establishments selected from each strata was roughly in proportion to the estimated number of low wage workers at the establishments in that strata. Within strata the selection was random. The survey was conducted over the phone and obtained a response rate of 75 percent.

The second wave attempted to interview all of the respondents in the first-wave survey. About 70 percent of the original respondents completed surveys for the second wave. Most of the respondents were the owner/manager of small firms who were quite familiar with the performance of each of the firm's employees. Seventy percent of the establishments had fewer than 50 employees, and only 12 percent had more than 200 employees. In large organizations the primary respondent was the person in charge of hiring, generally the personnel officer. If the primary respondent was unable to answer questions about the training received by newly hired workers in the sampled job, that part of the interview was completed by talking to a supervisor or someone else with line responsibility.

The employers who received the full questionnaire were asked to select "the last new employee your company hired prior to August 1981 regardless of whether that person is still employed by your company." Only 2594 employers had hired someone in the time frame requested and these employers constitute the sample used in the study.

The respondent was asked to report how much time typical new hires for this job spent during the first three months of employment in four different kinds of training activities: (1) watching others do the job rather than doing it themselves, (2) formal training programs, (3) informal individualized training and extra supervision by management and line supervisors, and (4) informal individualized training and extra supervision by co-workers. For the sample of firms and jobs, the means for the typical worker were 47.3 hours watching others do the job (T_W), 10.7 hours for formal training programs (T_F), 51 hours for informal training by management (T_S), 24.2 hours for informal training by co-workers (T_C). A copy of the relevant portions of the questionnaire is available from the author.

A training time index was constructed by first valuing trainer and trainee time relative to that of workers with two years of tenure in that job and then combining the time invested in

training activities during the first three months on the job. The employers reported that workers with two years of tenure in the job averaged between 22 and 50 percent (depending on occupation and other worker characteristics) more productive than new hires during their first three months on the job. This ratio was calculated for each job/worker category and used to place a relative value on coworker time devoted to training.[1] The management staff members who provide formal and informal training were assumed to be paid 1.5 times the wage of coworkers. Formal training involves four kinds of costs: development costs, facility costs, trainer time and trainee time. Sometimes, it is one-on-one and sometimes it is done in groups but since most of the establishments in this study are small, class size was probably small as well. Consequently, it was assumed that when all the costs of formal training other than the trainee's time are lumped together--development costs, training materials costs and the value of the trainer's time--they are about 25 percent greater than the time costs of the trainee.[2] When supervisors and coworkers are giving informal training to a new employee, the trainee is almost invariably directly involved in a production activity. Employers report that for informal training, the trainees are typically as productive while being trained as they are when working alone (Hollenbeck and Smith 1984). Consequently, informal training is assumed to involve only the investment of the trainer's time. Thus in units of coworker time the value of trainer time is:

(1) Valued Trainer Time = $T_C + 1.5*T_S + T_F$

In units of trainee time, the time the trainee spends not producing because of training activities is:

(2) Trainee Time = $T_W + T_F$

The total investment in training in trainee time units[3] is:

(3) Total Training Investment = $T_W + T_F + (T_C + 1.5*T_S + T_F)/RP$.

where

RP = the productivity of the average new hire during the first 3 months divided by the productivity of typical worker with two years' tenure

The arithmetic mean of this index is 209 hours, implying that the value of the time invested in training a typical new employee in the first three months is about 40 percent of the output that the trainee can produce working full-time during the first three months on the job.

The survey asked the employer (or in larger firms the immediate supervisor) to report on productivity of the typical individual hired in the job after two weeks, during the next 11 weeks

and at the end of two years at the firm. The rating was made on a "scale of zero to 100 where 100 equals the maximum productivity rating any of your employees in (NAME'S) position can obtain and zero is absolutely no productivity by your employee." For the full data set at the mean values of these indexes of reported productivity were 49.0 for the first two weeks, 64.6 for the next 11 weeks and 81.4 at the time of the interview. The questions asking for a rating of the productivity of particular workers had a nonresponse rate of only 4.4 percent. Comparably defined nonresponse rates for other questions were 8.2 percent for previous relevant experience, 3.2 percent for age, 6.7 percent for education, 8.6 percent for time spent in informal training by supervisor, and 5.7 percent for a three-question sequence from which starting wage rate is calculated. The low-nonresponse rate implies that our respondents felt that they were capable of making such judgments and augur well for the quality of the data that results.

The interview questions about the productivity of recently hired employees do not measure productivity in any absolute sense and therefore are not comparable across firms or across jobs in a firm. Rather, they are intended as ratio scale indicators of the relative productivity of a typical (or a particular) worker at different points in their tenure at a firm. Under an assumption that these productivity indexes are proportional transformations of true productivity plus a random error, percentage differences in cell means of the productivity index will be unbiased estimators of percentage differences in true productivity. If the variations in the productivity scores assigned by supervisors exaggerate the proportionate variations in the true productivity, our estimates of percentage differences in productivity between two workers will be biased upward. Even though it is possible for a worker's true productivity to be negative, the scale was defined as having a lower limit of zero. Floors and ceilings on a scale typically cause measurement errors to be negatively correlated with the true value. If this is the case, then our estimates of percentage differences in productivity between two workers will be biased downward. This latter type of bias appears to be more likely than the former.

Further evidence that the proportionality assumption results in an understatement of percentage differences in productivity between individual workers doing the same job comes from comparing the coefficients of variation of productivity in this and other data sets. If pairs of workers who are still at the firm are used to construct a coefficient of variation for this data set, it averages .13 for sales clerks, clerical, service and blue collar workers. This estimate of the coefficient of variation is smaller than the estimates of the coefficient of variation for yearly output derived from analysis of objective ratio scale measures of output. These estimates were .35 for sales clerks, .144 for semi-skilled blue collar workers, .28 in craft jobs, .164 for workers in routine

clerical jobs and .278 in clerical jobs with decision making responsibilities (Hunter, Schmidt and Judiesch 1988). This means that the estimates of the effect of training on productivity growth reported in this paper are probably conservative. The fact that the employer is reporting on the past productivity of particular employees may also generate biases in data but it is not clear how estimates of productivity growth rates might be influenced by this problem.

Estimates were also prepared of the short run productivity penalty that results when new workers are hired. This productivity penalty has two elements: the opportunity costs of trainer time and the lower output of the trainee resulting from the worker's lack of familiarity with the job and the time devoted to training. When expressed in terms of the opportunity cost of the time of a worker with two years of tenure at the firm, the new hire penalty during the first three months on the job is equal to:

(4) Productivity Penalty = 1 - NP

$$(5) \quad NP = \frac{RP \cdot TP}{520} - \frac{T_C + 1.5*T_S + T_F}{520}$$

where

NP = productivity net of training cost of typical new hire

TP = time attempting to produce.

There is some uncertainty about the correct way to aggregate training time and productivity growth effects, so three different estimates of the penalty are presented. The preferred "liberal" estimate of the penalty assumes TP = 520 - T_W - T_F. This estimate assumes there is no double counting of training costs: ie. that when the employers told us that new employees were 26 percent less productive than workers with 2 years of tenure, they were not factoring into that calculation the fact that about 11 percent of the new hires time was spent in a training activity which produced virtually no output (watching others and formal training). The conservative double counting estimate of training costs assumes that TP = 520. In other words, it is assumed that the lower productivity reported for new workers reflects in part that portion of their time devoted to formal training and watching others do the work. The ultra conservative estimate of the penalty uses the conservative double counting assumptions and also substitutes an average of RP and 1 for RP. This estimate assumes that the reports of productivity growth made by respondent employers exaggerates true productivity growth by a factor of 2.

II. Estimates of the Magnitude of On-the-Job Training in the First Three Months of a Job

We will begin by examining how the costs and consequences of initial on-the-job training vary by occupation, industry, establishment size, and the previous relevant job experience, age, and schooling of the employee. Multivariate models of the determinants of the length and intensity of training are presented in section 3 of the paper.

Occupation

The impact of occupation on the amount of on-the-job training typically received by a new employee is examined in Table 1. The first four rows of the table describe how the average number of hours devoted to four distinct training activities during the first 3 months after being hired varies by occupation. Even jobs that are thought to require little skill--service jobs--seem to involved a considerable amount of training during the first 3 months: an average of 33 hours of watching others, 5.7 hours of formal training, 35 hours of informal training by management and 17 hours of training by coworkers. Other occupations devoted considerably more time to training. The distribution of training activities was similar across occupations, however. The typical trainee spent most of his training time watching others do the job or being shown the job by a supervisor. Roughly equal amounts of time were spent in each. Informal training by coworkers is next most important and formal training provided by specialized training personnel accounted for an average of only 5 to 10 percent of the time new hires were engaged in a training activities.

The fifth row of the table summarizes this information into an estimate of investment in training during the first 3 months on the job. The index valued the time that managers, coworkers and the trainee devote to training and expressed it in terms of hours of trainee time. Training investment for service jobs was estimated to be 130 hours implying that the time invested in training a typical newly hired service worker in the first 3 months was equal in value to about 25 percent (130/520) of that worker's potential productivity during that period. Investments in training were considerably greater in other occupations. Retail (and service sector) sales and blue collar jobs had a mean index of 185 to 200 hours respectively or 35 to 38 percent of the new employee's potential productivity. Clerical jobs typically required the equivalent of about 235 hours of training or about 45 percent of the new worker's potential output. Professional, managerial and non retail sales workers required the equivalent of about 300 hours of on-the-job training or nearly 60 percent of the new worker's potential output.

TABLE 1
TRAINING AND PRODUCTIVITY GROWTH OF TYPICAL NEW EMPLOYEES BY OCCUPATION

	Profes-ssional	Mana-geral	Sales Not Retail	Retail Sales	Clerical	Blue Collar	Service
Hours Spent in Training in First 3 Months							
Watching others do the job	60.0	65.0	82.8	39.2	50.4	48.1	32.7
Formal training programs	9.1	12.1	23.9	8.2	13.5	9.1	5.7
Informal training by management	76.6	80.4	71.8	48.5	54.6	49.3	35.1
Informal training by co-workers	31.8	23.0	33.9	23.9	26.2	26.8	16.7
Investment in Training Time	293	295	350	185	235	200	130
Weeks to become fully trained if no previous experience	11.1	13.4	9.2	6.5	6.7	9.0	3.4
Increase in Reported Productivity (%)							
Betw. first 2 wks. & next 10 wks.	28%	32%	50%	30%	40%	32%	28%
Betw. first 3 mo. & end of year 2	38%	33%	56%	25%	32%	23%	17%
New Hire Productivity Penality as a % of Productivity of Wkr. with 2 Yrs. Tenure							
Liberal assumptions	69%	69%	74%	51%	60%	50%	39%
Conservative assumptions	58%	56%	59%	44%	50%	43%	33%
Ultraconservative assumptions	43%	43%	43%	32%	37%	30%	23%
Increase in Real Wage in First 2 Yrs. (%)	5.0%	7.7%	22.6%	9.7%	11.5%	11.5%	3.7%
Number of cases	95	112	76	203	429	649	334

NOTE: Sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

The sixth row of the table reports the geometric mean of the answers to the question "How many weeks does it take for a new employee hired for this position to become fully trained and qualified if he or she has no previous experience in this job, but has the necessary school-provided training." Service jobs were reported to require an average of only 3 to 4 weeks of training, retail sales and clerical jobs slightly under 7 weeks, and professional and managerial over 10 weeks.[4]

This training seemed to have the hoped-for result of increasing the productivity of the new employees. The reported productivity of new employees increased quite rapidly (by roughly a third) during the first month or so at the firm (see row 7). Despite the much greater time interval, the percentage increases between the first quarter and the end of the second year (see row 8) were smaller than those during the earlier period for blue collar, service, clerical and sales jobs. For these occupations training investments and learning by doing seem to be large in the first few months on the job but to diminish rapidly thereafter. In the higher level, managerial and professional jobs, reported increases in productivity were larger between the third and 24th month than in the first few months. This reflects the more prolonged training period for these occupations. The occupations which devote the least time to training--the service occupations--were the occupations with the smallest increase in productivity with tenure. The reported productivity of service workers improved an average of 28 percent in the first month or so and a further 17 percent in the next 21 months. Occupations for which a lot of time is devoted to training in the first 3 months--professionals, clerical workers, managers and sale representatives outside of retail and service industries--also seemed to have larger than average increases in reported productivity as the worker gains in tenure. Clerical workers, for instance, were reported to be improving their productivity by 40 percent in the first month or so and by a further 32 percent by the end of the second year on the job.

These very rapid rates of productivity growth suggest that the ratio of the productivity increase to the costs of training (combining both worker and employer benefits and costs) may be extremely high during the first months of employment. For clerical workers the total costs of training during the first 3 months was 235 hours or .113 of a year's output by a worker whose skill level is equal to that of a new employee. Since this figure is an upper bound on the investment that contributed to the 40 percent gain during the first months on the job, the average gross rate of return must have been above 354% per year (.40/.113). Since the intensity of training investment falls with tenure at the firm, the cost of training investment during the next 21 months cannot have exceeded .7875 (1.75*235/520) of a year's productivity by a newly hired worker. This implies that the average gross rate of return to training investments during this 21 month

period exceeded 40% per year (.32/.7875). However, marginal gross rates of return to training investment are lower and some of the gain in productivity results from learning by doing not training. Multivariate cross section models of productivity growth which yield evidence on the marginal productivity of training are presented in section 4 of the paper.

One of the consequences of the heavy investments in the training of new hires is that new employees make significantly smaller contributions to the firm's current output than other workers who have been with the firm for a couple of years or more. The time specifically devoted to formal and informal training activities is not the only penalty incurred when a new employee is hired. In most jobs, skills are developed and refined through practice. Learning by doing as it is called may not actually involve spending time away from a directly productive activity. It is costly, nevertheless, for the new worker is less productive than experienced workers. Thus the productivity penalty when a new worker is hired has two components: training investments and the lower productivity of the new worker and the time others devote to raising the new worker's productivity.

Estimates of the short run productivity penalty when a new worker is hired are presented in row 9-11 of the table. These numbers provide a rough guide to the magnitude of the adjustment costs associated with expansions carried out by hiring additional workers rather than by scheduling extra hours. The other major component of adjustment costs--recruitment and selection costs--tend to amount to only about 1 percent of a year's output by an experienced worker. The new hire productivity penalty is much larger. During just the first 3 months, it was equivalent in value for service workers to an average of about 1 months output by an experienced worker using conservative assumptions about double counting. For professional, managerial and sales representatives outside the retail and service sector, the penalty averaged about 1.65 months of output by experienced occupants of the job. The large magnitude of these costs helps explain why employers tend to hire new employees only when the increase in demand is perceived to be long lasting.

Establishment Size

The relationship between establishment size and training was curvilinear (see Table 2). The very largest and very smallest (10 or fewer employers) establishments invested the greatest amount of time in training. Managers spent 59 hours training the new employee at the smallest establishments and only 44 hours at establishments with 11 to 50 employees. The very smallest establishment invested 43 percent of a new hire's potential productivity (224 hours) during the

TABLE 2

TRAINING AND PRODUCTIVITY GROWTH OF TYPICAL NEW EMPLOYEE BY ESTABLISHMENT SIZE

	Number of Employees			
	0-10	**11-50**	**51-200**	**201+**
Hours Spent in Training in First 3 Months				
Watching others do the job	48.7	45.4	48.3	55.4
Formal training programs	11.8	7.4	9.2	17.0
Informal training by management	59.1	44.4	52.8	48.0
Informal training by coworkers	23.3	24.3	27.5	32.4
Investment in Training Time	224	1835	213	248
Weeks to become fully trained if no previous experience	8.1	6.4	6.1	8.3
Increase in Reported Productivity (%)				
Betw. first 2 wks. & next 10 wks.	29%	33%	37%	49%
Betw. first 3 mos. & end of year 2	26%	24%	26%	34%
New Hire Productivity Penality as a % of Productivity of Wkr with 2 Yrs. Tenure				
Liberal assumptions	55%	50%	55%	61%
Conservative assumptions	46%	42%	46%	51%
Ultraconservative assumptions	34%	30%	34%	37%
Increase in Real Wage in First 2 Yrs. (%)	12.1	7.3	8.7	9.6
Number of cases	792	678	296	123

NOTE: Sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

first 3 months in training while the next largest size category (11-50 employees) invested only 35 percent of the new hire's time. Those with more than 200 employees invested 48 percent of the new hires time in training. The curvilinearity remains when other determinants of training are controlled. Reflecting the pattern of investment in training, wage increases also exhibited a curvilinear pattern being bigger in the very smallest and very largest establishments.

Reported increases in productivity did not, however, have a curvilinear pattern. Rather there was a consistent tendency for the reported increases in productivity to be larger at the larger establishments. The very smallest establishments reported a 29 percent productivity increase in the first few months and a further 26 percent increase by the end of the second year. The largest establishments reported a 49 percent increase in the first few months and a 34 percent increase during the next 21 months. Such a dramatic contrast between the pattern of training investments (input) and training outcomes is unusual. The relationship between training investment measured in time units (line 5 of Tables 1 - 5) and returns to that investment, the increase in productivity (line 7 or line 8) is described by:

$$(6) \qquad \frac{P_{2YR}-P_{1Q}}{P_{1Q}} = \%\Delta P = AGROR_j(\Theta_j)(\text{Total Training Investment})$$

where

$AGROR_j$ is the average gross rate of return on dollars of investment in the training of stayers at the j^{th} establishment

Θ_j is the opportunity cost of training time at the j^{th} establishment

The lower percentage productivity growth to investment ratio of tiny establishments implies that either they have a lower AR_j or a lower Θ_j. It is unlikely that tiny establishments have lower $AGROR_j$ for they have higher turnover and poorer access to capital markets. The probable explanation of their small $\%\Delta P$ is a lower opportunity cost of time devoted to training (Θ_j). The opportunity cost of managerial, coworker and trainee time devoted to informal training are likely to be lower because small establishments are unable to spread the risk of stocastic demand as well as larger establishments and so must typically operate with a higher ratio of capacity (staff on hand) to demand (staff interacting with a customer or engaged in production). Scheduling of training is also probably more flexible so training can be done during periods of slack work when opportunity costs of trainer and trainee time are low.

TABLE 3
TRAINING AND PRODUCTIVITY GROWTH OF TYPICAL NEW EMPLOYEES
BY
PREVIOUS RELEVANT EXPERIENCE

Typical New Employees	None	Under 1 Year	1-3 Years	3-5 Years	5-10 Years	More Than 10 Years
Hours Spent in Training in First 3 Months						
Watching others do the job	49.8	53.6	47.0	39.3	43.6	35.4
Formal training programs	11.0	11.2	8.2	11.4	11.1	4.9
Informal training by management	51.7	60.9	47.0	43.9	56.7	41.6
Informal training by coworkers	26.9	27.1	24.1	19.5	21.2	18.7
Investment in Training Time	220	242	185	171	203	149
Weeks to become fully trained if no previous experience	6.3	7.0	6.7	9.1	8.6	11.1
Increase in Reported Productivity (%)						
Betwn. first 2 wks. & nest 10 wks.	37%	35%	27%	29%	29%	29%
Betw. first 3 mos. & end of year 2	30%	29%	21%	19%	21%	21%
New Hire Productivity Penality as a % of Productivity of Wkr with 2 Yrs. Tenure						
Liberal assumptions	56%	60%	48%	48%	51%	45%
Conservative assumptions	47%	50%	40%	40%	43%	38%
Ultraconservative assumptions	34%	36%	29%	29%	32%	27%
Wage Rate						
Current wage	$ 4.66	5.05	5.62	6.91	6.42	7.90
Increase in real wage	13.9	10.8	8.2	4.7	4.7	0.0
Number of cases	699	382	404	124	193	96

NOTE: Sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.

Relevant Work Experience

The association between training investments that are typically made in new hires and previous relevant experience of the individual actually hired is presented in Table 3. Jobs which were filled by new hires with less than one year of previous relevant experience, typically involve new hire training investment that was 45 percent of the new hire's potential productivity. For jobs filled by new hires with 10 years of previous relevant experience training investment averaged 29 percent of potential productivity. This occured in the face of a strong tendency for the jobs obtained by those with a great deal of relevant experience to be jobs that require a considerably longer training period (see line 5). Clearly when employers filled jobs that require a great deal of training if workers have no previous experience, they tended to give preference to candidates that because of their previous experience were less costly to train. Note also that jobs filled by new hires with greater previous relevant experience received substantially higher wage rates (see line 10).

The pattern of productivity and wage increase follow the pattern of investment. Those with the least experience started out considerably less productive but their productivity grew from this lower base at a faster rate. Their wage rates start lower but rise faster. The new hires with more than 10 years of previous experience, started out more productive and were paid a higher wage. Their productivity rose but at a slower rate and they received no increase in their real wage.[6]

Age

The association between the training normally given to new hires and the age of the new hire is described in Table 4. The relationship was curvilinear. The 25 to 29 year old age group appears to obtain jobs offering the greatest amount of training to typical new hires--235 hours. Teenagers typically entered jobs requiring about 206 hours and those over forty typically entered jobs requiring the least training--156 hours. Productivity growth and wage increases seem to follow an irregular pattern that was roughly curvilinear with a peak in the 20-24 age group. The average wage of a worker with 2 years of tenure in the firm was curvilinearly related to age with the peak in the 30 to 39 age bracket.

Schooling: Type and Amount

The relationship between type and amount of schooling of the new hire and the on-the-job training typically received by the typical occupant of the job is explored in Table 5.

TABLE 4
TRAINING AND PRODUCTIVITY OF TYPICAL NEW EMPLOYEES BY AGE

Typical New Employees	16-19	20-24	25-29	30-39	40+
Hours Spent in Training in First 3 Months					
Watching others do the job	43.7	52.6	52.0	45.5	38.9
Formal training programs	8.9	7.8	17.2	12.1	2.9
Informal training by management	54.7	52.8	58.4	45.9	43.3
Informal training by coworkers	23.8	29.4	23.1	23.3	20.4
Investment in Training Time	206	220	235	192	156
Weeks to become fully trained if no previous experience	5.6	7.4	7.4	8.2	7.0
Increase in Reported Productivity (%)					
Betwn. first 2 wks. & nest 10 wks.	33%	38%	30%	31%	28%
Betw. first 3 mos. & end of year 2	27%	29%	24%	23%	23%
New Hire Productivity Penality as a % of Productivity of Wkr with 2 Yrs. Tenure					
Liberal assumptions	53%	37%	56%	51%	46%
Conservative assumptions	45%	47%	46%	42%	39%
Ultraconservative assumptions	33%	34%	34%	32%	28%
Wage Rate					
Current wage	$4.12	5.25	5.84	6.20	5.80
Increase in real wage	11.8	12.1	9.3	7.5	3.6
Number of cases	346	582	409	332	229

NOTE: Sample is limited to jobs for which all the necessary questions on wage rates, training time, and productivity were answered.