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**THE IMPACT OF PREVIOUS TRAINING IN SCHOOLS AND ON JOBS
ON
PRODUCTIVITY, REQUIRED OJT, AND TURNOVER OF NEW HIRES**

John H. Bishop
Cornell University

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Center for Advanced Human Resource Studies
New York State School of Industrial and Labor Relations
Cornell University
Ithaca, NY 14851-0952
607/255-2742

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THE IMPACT OF PREVIOUS TRAINING IN SCHOOLS AND ON JOBS ON PRODUCTIVITY, REQUIRED OJT, AND TURNOVER OF NEW HIRES

1. Introduction

Workers who are assigned to the same job and paid the same wage often differ greatly in productivity. Coefficients of variation of individual productivity in specific jobs based on hard measures of physical output average .144 for factory operatives, .35 for sales clerks and .28 for craft workers (Hunter, Schmidt and Judiesch 1988). This paper examines whether and to what extent variations in productivity (and other job outcomes) across workers doing the same job at the same firm can be predicted by information on the background and training of the individual worker.

Our primary goal in undertaking this analysis is to test for third party benefits to employer provided training. When employers are asked why they do not do more training, they often say that most firms find it is cheaper to poach trained workers from competitors than to train their own skilled workers. Since trained workers are paid more than untrained workers, these employers are saying that the wage premium is smaller than extra productivity net of training cost of the trained worker. Put in economics jargon, what these employers are claiming is that "training generates third party externalities." This claim will be tested in this paper. Five specific questions are considered:

- o Does the time required to train a new employee tend to be lower if the individual has already received relevant training at a school or in a previous job? By how much? Which type of training has the bigger effect?
- o Is the reported productivity of a new employee higher if the individual has previous relevant training? By how much? Which type of training has the bigger effect?
- o Are probabilities of a quit or discharge related to whether the new employee has previous relevant training? Which type of training has the bigger effect?
- o Is the wage paid a new employee higher if the individual has previous relevant training? Which type of previous training has the bigger effect?
- o Does the firm obtain greater profits if it successfully recruits workers who have previous relevant training? In other words, is the productivity net of

training, turnover, and wage costs consistently higher for new hires who have previous relevant training? What type of previous training increases profits the most?

The purpose is **not** to estimate the structural relationship between indicators of skill and job performance so that we may predict the performance of prospective new hires. The unknown character of the selection process by which job applicants are selected for and retained in jobs makes unbiased estimates of structural relationships impossible.¹ We are examining instead what kind of relationship between personal characteristics and productivity survives the selection process which determines who gets hired and who is retained in a job.

The issues raised by the first four questions are different from those raised by the last. Employees with equal tenure in a job are not always paid the same wage, particularly at small firms. In the EOPP-NCRVE employer survey--a sample dominated by small establishments--the standard deviation of the log of the wage paid to incumbents in a particular job was 0.146. Variation in the wage paid for particular jobs accounted for 4 percent of the total variation of starting wage rates in the sample and 5 percent of the variation in the current wage rates of job incumbents. When firms offer different wage rates to different hires, a perfectly competitive labor market is quite consistent with substantial differences in the expected productivity, training requirements or turnover rates of new employees hired for a specific job.

2. Hypotheses

2.1 Are Employer Expectations of New Hire Productivity Rational?

If assessments of differences in the expected productivity of job applicants grouped by traits such as schooling and training are generally accurate, we would expect wage differentials for visible worker traits to approximate productivity differentials. Thus, if expectations regarding the productivity of new hires are rational and perfect competition prevails in the labor market, the ex post profitability of a new hire should not be predictable by information that is generally available to hiring decision makers. Therefore, the null hypothesis is:

Ho: When new hires for a particular job are compared, measures of the expected profitability of the new hire and of the discrepancy between expected and realized productivity--the surprise in productivity realizations--should not be predictable by information on worker characteristics that is available to all participants in the market at the time the hiring decision is made.

Labor markets are not perfect, however. Information about job applicants and about alternative jobs is incomplete and costly to obtain. Even when good costless information on skills is available to all participants in the labor market, the null hypothesis that new hire profitability is unpredictable may be violated if:

1. The size of the match specific component of worker productivity and job attractiveness varies a good deal across jobs and this variation is predictable. Match specificity can result from skills which are useful at only one firm or only a few local firms. This occurs when OJT or school-provided training develops industry- or occupation-specific skills, and there are only a few firms in the locality that use these skills. Employers who do use these skills will not have to pay wages that fully reflect the high productivity of these workers at their firm. The attractiveness of a specific job to a particular worker--which is indicated by the worker's reservation wage for taking the job--is also match specific. For example, mothers who are able to work only at certain times of the day or a short commute from their home will have lower than average reservation wages for jobs which meet these criteria. A good fit with coworkers and supervisors may also lower an individual's reservation wage. When match specific rents are large, a whole range of wage rates may be consistent with preservation of the job-worker match. From the firm's point of view a wide gap between a worker's productivity and her reservation wage is a good thing, because it means turnover will be low and the expected profitability of the match will be high. Worker characteristics such as occupation specific training and being a married woman which are associated with a larger gap between productivity and the worker's reservation wage should, therefore, have a positive relationship with the expected profitability of a match.

2. The quality of the new hires a firm is able to attract varies cyclicly and seasonally. When the economy is in recession, firms are able to hire workers with greater-than-average amounts of previous training and experience and higher-than-average levels of expected productivity. At the peak of the cycle, when labor markets are tight, employers are often forced to hire workers who have less training and experience and who are less productive. The result is that some of the firm's employees (those hired during a recession) are simultaneously more productive and better credentialed (i.e., have greater training and experience) than other employees. Thus, cyclical and seasonal variations in the tightness of labor markets can produce a positive within-firm correlation between credentials and the profit generated by particular employees even if all new hires at any given point in time have identical expected productivity.

Information imperfections are a second major reason why the profitability of new hires may be predictable.

3. Workers are not well informed about the wages they can command at another firm. The costs of a job search--travel costs, lost earnings, and mental anguish--are considerable. In unskilled and semiskilled labor markets, job seekers seldom have the chance to accumulate job offers and choose between them when a thorough search has been completed. Consequently, three-fourths of these job seekers accept the first job offer they receive. The result is considerable random variation in the expected productivity of new hires. Employers find that some of the time they are able to recruit and hire a worker with exceptionally strong credentials and higher-than-average expected productivity. On other occasions, the highly qualified applicants can not be recruited and the firm must settle for someone with average credentials and expected productivity. In this way, random variation in the expected quality of the new hires produces a positive correlation between productivity and credentials, even among people doing the same job who are paid the same wage.

4. Employers also lack good information on the occupational skills that job applicants have developed on previous jobs. At the National Federation of Independent Business firms surveyed for this paper, 60 percent of recent hires had been selected

without a single contact being made with a supervisor on a previous job. Only 24 percent had been asked to demonstrate their skills prior to being hired. Only 7 percent of the new hires had shown their prospective employer a certificate of training received on previous jobs. When clerical, service and blue collar jobs are being filled, employers devote less than ten hours on average to recruiting and selecting workers for each opening.

In many cases employers learn of the existence of previous training and its relevance to their job **after** the employee has been working at the firm for awhile. Under these circumstances, one might expect that new information on previous training to be a good predictor of the relative productivity of workers even while information that was publicly available during the hiring process is not predictive. One way to test specifically for this is to measure and then predict the difference between productivity realizations and employer expectations of that productivity held at the time the hiring decision was made. Such a test will be conducted in this paper. These four considerations lead me to propose the following hypotheses:

H1: When workers doing the same job are compared, the profitability of a new hire--realized productivity, net of training, wage and turnover costs--should be positively related to indicators of occupation and firm specific skills such as previous relevant work experience and relevant school-based occupational training.

H2: When workers doing the same job are compared, the profitability of a new hire should be negatively related to indicators of high reservation wages such as schooling, total work experience and being a married male and positively related to indicators of low reservation wages such as being a married women and Hispanic (because of its association with being an undocumented worker).

H3: When workers doing the same job are compared, the surprise in the productivity realizations of new hires--realized productivity minus expected (at time of hiring) productivity--should be positively related to indicators of the relevance of previous work experience and training that may not have been available to hiring decision makers at the time hiring decisions were made.

2.2 The Empirical Model

The best method of testing for relationships between worker characteristics and the job performance and profitability is to compare two individuals at the same firm in the same job and see how differences in reported productivity, training costs, turnover and wages are related to differences in background characteristics.

Let us assume that in a sample of people who have been recently hired for the j^{th} job, that job performance outcomes (\underline{Y}_{ij}) depend upon a vector of personal characteristics describing the individual's background and general education (\underline{X}_i), skills and training of the individual relevant to this specific job (\underline{S}_{ij}) and characteristics of the job (\underline{Z}_j). Real world relationships are not, however, additive in the levels of these characteristics. Shop floor practices and technology often constrain the degree to which individual differences in learning ability or competence can generate individual differences in productivity or training. If the workers of firm A are more adaptable and competent than firm B's workers, firm A may be able to introduce profitable changes in technology and work assignments that firm B is unable to introduce. Comparable differences in adaptability and competence between occupants of a particular job might generate much smaller effects on individual productivity.

Alternatively, the opposite might prevail. Work might be structured such that equipment breakdowns can be diagnosed and repaired by just a few highly skilled operatives. Once a few highly skilled operatives are recruited or trained, there may be little need to train others. Either way, the effect of individual characteristics on worker productivity will differ depending on whether one is analyzing productivity differences within firms and or productivity differences across firms. Processes by which individuals are selected and retained in particular jobs may also cause \underline{B} coefficients to be different from \underline{A} coefficients. A specification which takes this into account is:

$$(1) \underline{Y}_{ij} = \underline{B}(\underline{X}_i - \underline{X}_j) + \underline{B}_j(\underline{S}_{ij} - \underline{S}_j) + \underline{A}\underline{X}_j + \underline{A}_j\underline{S}_j + \underline{O}\underline{Z}_j + u_{ij} + v_j$$

where

\underline{Y}_{ij} is a vector of outcomes such as training time, supervisor reports of a worker's productivity, or wage rate of employee "i" in job "j",

\underline{X}_i is a vector of background characteristics of individual "i" which describe generic competencies (means of these characteristics for a job are \underline{X}_j),

hires effect the amount of on-the-job training they are given and the productivity they achieve during the first year or so on the job. It provides retrospectively longitudinal data on the time devoted to training and the reported productivity of two new hires at 659 different firms.

The sample of jobs for which paired data are available was generated in the following manner. Telephone interviews were conducted with the owner/manager of 3,412 randomly selected establishments. Of these 2457 were single establishment firms and 930 were parts of corporations with multiple establishments. 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." A total of 818 employers could not provide information for a recent new hire. Most of these firms were small organizations that had not hired anyone in recent memory. The employers that provided information on one new hire were asked to provide data on a second new hire in the same job but with contrasting amounts of vocational education. Of the 2,594 employers that provided data on 1 new hire, 1,511 had not hired anyone else in that job in the last 2 years, and 424 had not hired anyone with a different amount of vocational training for that position in the last 2 years. As a result, data are available for 659 pairs of individuals who have the same job at the same establishment. Missing data on specific questions used in the model further reduced the sample used for estimation to about 480.

Most of the establishments from which paired data are available are small. Seventy percent have fewer than 50 employees, and only 12 percent have more than 200 employees. 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. At larger firms the personnel director provided information about the firm and a line supervisor reported on the training costs and the productivity of the individual worker(s) sampled for the study.

Information was obtained on how many hours each of the two new hires for this job spent during the first three months of employment in three different kinds of training activities: (1) formal training programs (T_{Fi}), (2) informal individualized training and extra supervision by management and line supervisors (T_{Si}), and (3) informal individualized

training and extra supervision by co-workers (T_{Ci}). A copy of the relevant portions of the questionnaire is available from the author.

A training time index was constructed by first making assumptions regarding the relative value of trainer and trainee time and then combining the time invested in training activities by these various individuals during the first three months on the job. Expressed in coworker time units:

$$(3) \text{ Training Investment in the } i^{\text{th}} \text{ new hire} = 1.8T_{Fi} + T_{Ci} + 1.5 * T_{Si} + .8T_{Wj} + 4$$

At the firms which supplied data on training of a second employee, this index had an arithmetic mean of 168 hours and a geometric mean of 93 hours.

The survey asked the employer (or in larger firms the immediate supervisor) to report on productivity of both new hires during the first two weeks, during the next 11 weeks and at the time of the interview (or just before leaving for those who leave 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." The fact that the non-response rate for this question was only 4.4 percent (while it was 8.2 percent for previous relevant experience, 6.7 percent for education, and 5.7 percent for the questions about starting wage rate) suggests that respondents felt capable of making such judgments and augurs well for the quality of the data that results. For the sample of firms which provided data on two new hires the mean values of these indexes of reported productivity were 49.2 for the first two weeks, 64.7 for the next 11 weeks and 75.4 at the time of the interview. A more thorough description of the EOPP-NCRVE data is provided in Appendix A.

3.2 The National Federation of Independent Business Survey

A survey was conducted of a stratified random sample of the 500,000 members of the National Federation of Independent Business (NFIB) during the first half of 1987. In order to increase the representation of larger firms, NFIB members was stratified by employment and large firms were over sampled. Salaried managers in charge of subunits of large publicly owned corporations are not eligible for membership in NFIB, so the sample does

not contain data on employment outcomes at large multi-establishment firms. A four page questionnaire was mailed to approximately 11,000 firms, and after 3 follow up waves, 2599 response were obtained. Business owners with no employees in the previous year or who had not hired anyone in the last three years, were asked to check a box and send the questionnaire back completely blank. Five hundred and sixty nine of the returned questionnaires were of this type. The questionnaire focussed on the owners experiences in hiring and training workers in a particular job. This job was selected by asking the owner the following question: "For which job have you hired the most people over the last two or three years. (If you have more than one job for which you have done a lot of hiring, please select the job requiring the greatest skill.) **All future questions refer to this job.**" After a series of general questions about the character of the job, the owner was asked to select two individuals who had been hired for this job and answer all future questions specifically with reference to those two workers. The selection was made in response to the following question:

Please think of the last person hired for this job (job X) by your firm **prior to August 1986 regardless of whether that person is still employed by your firm.** Call this individual person A. The individual hired for job X immediately before person A is called person B. Do not include rehires of former employees.

The owner was then asked two and a half pages of questions about these two employees. Information of varying degrees of completeness were obtained on 1624 person A's and 1403 person B's. Non response to particular questions reduced the sample further, so the number of firms included in estimation was 1164 for starting wage rate and 1121 for initial productivity.

Owners were asked both about starting wages and initial productivity at the beginning of the second week of employment and about current wage rates and current productivity. If one or both of the new hires had left the firm prior to the date of completing the questionnaire, the owner was asked to provide information on the circumstances which prevailed "at the time of separation." Nevertheless, a number of respondents failed to provide data on outcomes "at time of separation," so the sample size for analysis of current productivity was 833 and for current wage rates was 714.

The constraints of a mail questionnaire forced a simplification of questions about time devoted to training. Whereas the EOPP questionnaire distinguished formal from informal, and informal training from supervisors from informal training by coworkers, all three of these forms of training were combined in one very short question: "How many hours did you or an employee spend training or closely supervising A or B?" Two other types of training investment were distinguished. The questions were: "How many additional hours (beyond training and close supervision) did A/B spend learning the job by **watching others** rather than doing it?" and "How many hours did A/B spend reading manuals, etc. in order to learn the job?" Owners were asked to complete this question for the "first week" of employment and for the "next six months."² The training differential analyzed below is the logarithm of the ratio of the total number of hours spent in the three forms of training over the six month period.

3.3 The Productivity Indexes: Validity of the Ratio Scale Assumption

The questions asked in these two surveys about the productivity of particular individuals do not yield measures of productivity that are comparable across firms or across jobs within the firm. They are assumed, however, to be ratio scale measures of the relative productivity of two particular workers who have the same job. Measurement errors are assumed to be uncorrelated with the true ratio scale. Since the productivity indexes are used as dependent variables not independent variables, measurement error only lowers the significance of hypothesis tests, it does not result in biased coefficients. If these assumptions are wrong and the variations in the productivity scores assigned by supervisors exaggerate the proportionate variations in 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. Furthermore, respondents who were not well informed about the relative productivity of their employees would probably tend to describe them as similar in productivity and not to exaggerate the differences between them. 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 ratio scale 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 in the EOPP-NCRVE 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 in sales clerk jobs, .144 in semi-skilled blue collar jobs, .28 in craft jobs, .164 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 background characteristics on relative 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 the estimated models might be influenced by this problem.

4. Results

Our hypotheses relate to the partial relationship between measures of previous training and experience and various indicators of job performance while controlling characteristics of the job that may vary within the pair and for other background characteristics. Parallel analyses were conducted in the two data sets. Both data sets had measures of the following skill and training indicators--previous relevant work experience and its square, total work experience and its square, schooling, vocational education relevant to the job, training received at a private vocational/technical institution that is relevant to the job, and gender--which were entered simultaneously into the model. Characteristics of the job-worker match that might influence the outcome were also included in the model. When current or most recent reported productivity, current wage, and current profitability are predicted, tenure, tenure squared and tenure during the first year were included as controls. For models predicting starting wage rates and initial profitability, the date of the hire and its square were controlled. In the models estimated in EOPP-NCRVE data, controls were entered for hours worked per week, a dummy equal to one when the job was supposed to be temporary, a dummy equal to one when the new hire was subsidized by a CETA-OJT contract, a dummy equal to one when the employee was eligible for Targeted Jobs Tax Credit subsidy and the employer knew this when the hire decision was made, and a dummy equal to one when the employee was going to school part-time while working.

An almost identical specification was estimated in the NFIB data. The difference was that the NFIB model contained no controls for receipt of subsidies for hiring particular workers but does contain controls for race and Hispanic. Results for the EOPP and NFIB data sets are presented next to each other in columns 1 and 2 respectively of Tables 1 to 6. Column 3 presents results of estimating a more complete model in NFIB data which contains additional information on previous training received by the new hire. The additional variables are: a dummy for having received relevant formal training at the work site on a previous job, a dummy for having received relevant formal off site training sponsored by a previous employer, a dummy for having received relevant training from the military, a dummy for having received relevant training from Job Training Partnership Act

Table 1
Log Training Time

<u>Previous Employer Training</u>	<u>EOPP</u>		<u>NFIB</u>		<u>NFIB</u>	
Relevant Experience	-.064***	(5.22)	-.050***	(4.53)	-.045***	(3.97)
Relevant Experience Squared	.0013***	(3.04)	.00140**	(3.34)	.0012***	(3.02)
First Years Relevant Exp.	-.082*	(1.69)	-.125**	(2.21)	-.044	(.68)
Formal Training On Job					-.168***	(2.81)
Formal Training Off Job					.070	(.64)
<u>Schooling</u>						
Years of Schooling	.0084	(.69)	.005	(.38)	.006	(.43)
Relevant Vocational Training	-.082**	(2.30)	.047	(.76)	.063	(.86)
Private Vocational Training	-.108*	(1.33)	-.081	(1.01)	-.040	(.50)
Relevant Training From Military					.218*	(2.21)
Relevant Training from JTPA					.105	(.59)
Years of Occupational Training					-.025	(1.05)
<u>Total Experience</u>						
Total Experience Squared	.0041	(.69)	.0064	(.98)	.0041	(.61)
	-.00013	(.79)	-.00020	(1.13)	-.00018	(.95)
<u>Demographic Background</u>						
Female	-.105*	(1.71)	-.083	(1.23)	-.139***	(1.92)
Married Female					.109*	(1.99)
Married Male					-.053	(1.08)
Black			.026	(.27)	.038	(.39)
Hispanic			.148	(1.30)	.145	(1.27)
Temporary Job	-.239***	(3.32)	-.082	(1.14)	-.081	(1.13)
F Test On Model	8.4***		6.2***		5.0***	
R ²	.209		.075		.094	
RMSE	.225		.701		.696	
Number of Observations	494		939		939	

Table 2
Productivity At End Of First Week

	<u>EOPP</u>		<u>NFIB</u>		<u>NFIB</u>
<u>Previous Employer Training</u>					
Relevant Experience	.029***	(4.38)	.045***	(7.36)	.042*** (6.80)
Relevant Experience Squared	-.00046**	(2.01)	-.00105***	(4.66)	-.00097*** (4.25)
First Years Relevant Exp.	.020	(.76)	.047	(1.49)	.004 (.11)
Formal Training On Job					.095*** (2.83)
Formal Training Off Job					.003 (.06)
<u>Schooling</u>					
Years of Schooling	.0096	(1.50)	.0120	(1.49)	.0100 (1.20)
Relevant Vocational Training	.042**	(2.10)	.044	(1.29)	.020 (.49)
Private Vocational Training	.125***	(2.78)	.101**	(2.30)	.100** (2.21)
Relevant Training From Military					-.032 (.62)
Relevant Training From JTPA					.080 (.74)
Years of Occupational Training					.015 (1.17)
<u>Total Experience</u>	-.0097***	(2.98)	-.0019	(.53)	-.0023 (.60)
Total Experience Squared	.00026***	(2.91)	-.00004	(.42)	.00004 (.38)
<u>Demographic Background</u>					
Female	.006	(.16)	.013	(.36)	.002 (.04)
Married Female					.024 (.79)
Married Male					-.007 (.25)
Black			.031	(.57)	.032 (.57)
Hispanic			-.062	(1.01)	-.058 (.94)
Temporary Job	.078**	(1.97)	.008	(.21)	.008 (.21)
Intercept	.005	(.37)	.023*	(1.79)	.021* (1.66)
F Test On Model	8.9***		12.9***		8.8***
R ²	.218		.123		.132
RMSE	(.262)		.422		.421
Number of Observations	494		1121		1121

* significant at the 10% level (two-sided)
 ** significant at the 5% level (two-sided)
 *** significant at the 1% level (two-sided)

Table 3
Starting Wage

<u>Previous Employer Training</u>	<u>EOPP</u>	<u>NFIB</u>	<u>NFIB</u>
Relevant Experience	.016*** (3.69)	.026*** (7.13)	.023*** (6.40)
Relevant Experience Squared	-.00037** (2.49)	-.00052*** (3.85)	-.00046*** (3.42)
First Years Relevant Exp.	.0010 (.06)	.025 (1.42)	.015 (.74)
Formal Training On Job			.019 (1.00)
Formal Training Off Job			.001 (.04)
<u>Schooling</u>			
Years of Schooling	.014*** (3.49)	.019*** (4.09)	.016*** (3.52)
Relevant Vocational Training	.031** (2.44)	.033* (1.70)	.015 (.64)
Private Vocational Training	.044 (1.55)	.068*** (2.70)	.069*** (2.71)
Relevant Training From Military			-.004 (.13)
Relevant Training From JTPA			.0003 (.01)
Years of Occupational Training			.011* (1.51)
<u>Total Experience</u>			
Total Experience	.0079*** (3.76)	.0116*** (5.72)	.0094*** (4.43)
Total Experience Squared	-.00014** (2.35)	-.00052*** (3.85)	-.00020*** (3.63)
<u>Demographic Background</u>			
Female	.024 (1.1)	-.074*** (3.43)	-.030 (1.33)
Married Female			-.018* (1.04)
Married Male			.092*** (5.97)
Black		-.008 (.26)	-.015 (.49)
Hispanic		-.110*** (3.19)	-.119*** (3.51)
Temporary Job	.035 (1.36)	-.028 (1.30)	-.027** (1.30)
Years Before Hired	.039*** (6.06)	.002 (.16)	.006 (.44)
Years Before Squared	.0020*** (3.78)	.0027* (1.74)	.0023 (1.48)
F Test On Model	10.8***	29.2***	22.2***
R ²	.296	.263	.290
RMSE	.026	.244	.240
Number of Observations	454	1164	1164

* significant at the 10% level (two-sided)
 ** significant at the 5% level (two-sided)
 *** significant at the 1% level (two-sided)

Table 4
Current Productivity

	<u>EOPP</u>		<u>NFIB</u>		<u>NFIB</u>
<u>Previous Employer Training</u>					
Relevant Experience	.0157** (2.14)		.023*** (3.33)		.022*** (3.17)
Relevant Experience Squared	-.00004 (.18)		-.00046* (1.85)		-.00043* (1.74)
First Years Relevant Exp.	.033 (1.08)		-.026 (.74)		-.031 (.77)
Formal Training On Job					-.003 (.08)
Formal Training Off Job					.159** (2.36)
<u>Schooling</u>					
Years of Schooling	.017** (2.35)		.024*** (2.60)		.028*** (2.87)
Relevant Vocational Training	.024 (1.09)		.039 (1.01)		.045 (.97)
Private Vocational Training	.069 (1.39)		.082* (1.69)		.103** (2.06)
Relevant Training From Military					.098 (1.62)
Relevant Training From JTPA					.154 (1.39)
Years of Occupational Training					-.021 (1.38)
<u>Total Experience</u>					
Total Experience Squared	.0015 (.43)		-.0042 (1.01)		-.0046 (1.06)
	.00002 (.21)		-.000004 (.04)		.000004 (.03)
<u>Demographic Background</u>					
Female	.028 (.72)		.024 (.56)		.009 (.20)
Married Female					.020 (.58)
Married Male					-.027 (.86)
Black			-.048 (.79)		-.047 (.77)
Hispanic			-.070 (.97)		-.069 (.96)
Temporary Job	.031 (.68)		.076* (1.79)		.076* (1.80)
<u>Tenure</u>					
Years of Tenure	-.108*** (2.62)		+.0885** (2.04)		.088** (1.80)
Tenure Squared	.0014*** (3.19)		-.0090** (2.04)		-.0088** (2.01)
Tenure First Year	.430*** (6.86)		+.328*** (4.98)		.324*** (4.92)
F Test On Model	8.7***		8.7***		6.5***
R ²	.234		.138		.150
RMSE	.305		.412		.411
Number of Observations	534		833		833

* significant at the 10% level (two-sided)
 ** significant at the 5% level (two-sided)
 *** significant at the 1% level (two-sided)

Table 5
Current Wage

	<u>EOPP</u>		<u>NFIB</u>		<u>NFIB</u>	
<u>Previous Employer Training</u>						
Relevant Experience	.011**	(2.13)	.026***	(5.22)	.025***	(4.86)
Relevant Experience Squared	-.00023	(1.33)	-.00050**	(2.55)	-.00047**	(2.36)
First Years Relevant Exp.	.031	(1.42)	.011	(.50)	.020	(.80)
Formal Training On Job					-.013	(.52)
Formal Training Off Job					-.003	(.06)
<u>Schooling</u>						
Years of Schooling	.016***	(3.12)	.018***	(3.23)	.016***	(2.66)
Relevant Vocational Training	.034**	(2.17)	.025	(1.05)	.014	(.50)
Private Vocational Training	.064*	(1.78)	.068**	(2.09)	.048	(1.42)
Relevant Training From Military					-.066*	(1.66)
Relevant Training From JTPA					-.106	(1.52)
Years of Occupational Training					.019*	(1.86)
<u>Total Experience</u>						
Total Experience	.0050*	(1.95)	.0099***	(3.72)	.0103***	(3.71)
Total Experience Squared	-.00008	(1.14)	-.00026***	(3.51)	-.00026***	(3.44)
<u>Demographic Background</u>						
Female	.008	(.26)	-.113***	(4.45)	-.088***	(3.22)
Married Female					-.038*	(1.72)
Married Male					.033*	(1.68)
Black			-.011	(.31)	-.010	(.28)
Hispanic			-.136***	(3.08)	-.131***	(2.99)
Temporary Job	-.082**	(2.52)	-.060**	(2.17)	-.057**	(2.02)
<u>Tenure</u>						
Years Of Tenure	.045	(1.50)			.086***	(3.99)
Tenure Squared	.0002	(.50)			-.0056**	(2.07)
Tenure First Year	.074	(1.62)	-.0054**	(1.97)	.022	(.50)
Intercept			-.014	(1.40)	-.019	(1.83)
F Test On Model	9.0***		18.9***		13.6***	
R ²	.240		.290		.302	
RMSE	.220		.242		.240	
Number of Observations	534		714		714	

* significant at the 10% level (two-sided) ** significant at the 5% level (two-sided) *** significant at the 1% level (two-sided)

Table 6
Profit In First Months

	<u>First Quarter</u> EOPP		<u>First Week</u> NFIB		<u>End of 6</u> Month NFIB		<u>First Week</u> NFIB		<u>End of 6</u> Month NFIB	
<u>Previous Employer Training</u>										
Relevant Experience	.0239***	(2.69)	.025***	(2.88)	.0124	(1.64)	.025***	(2.84)	.013*	(1.65)
Relevant Experience Squared	-.00030	(.97)	-.0008**	(2.39)	-.0004	(1.51)	-.0008**	(2.41)	-.0004	(1.50)
First Year Relevant Experience	.044	(1.24)	.076*	(1.74)	-.060	(1.58)	.051	(1.01)	-.053	(1.22)
Formal Training On Job							.046	(.98)	-.011	(.27)
Formal Training Off Job							.104	(1.20)	.138*	(1.84)
<u>Schooling</u>										
Years of Schooling	-.015*	(1.79)	-.032***	(2.81)	-.013	(1.32)	-.030**	(2.52)	-.012	(1.16)
Relevant Vocational Training	.047*	(1.82)	.025	(.54)	-.016	(.40)	.032	(.56)	.008	(.16)
Private Vocational Training	.055	(.93)	-.004	(.05)	-.005	(.09)	-.009	(.14)	-.0005	(.09)
Relevant Training From Military							.026	(.34)	-.006	(.10)
JTPA Vocational Training							-.127	(.90)	.128	(1.04)
Years of Occupational Schooling							-.0088	(.46)	-.015	(.90)
<u>Total Experience</u>										
Total Experience	-.014***	(3.24)	-.012**	(2.29)	-.021***	(4.77)	-.0093*	(1.71)	-.0196***	(4.17)
Total Experience Squared	.00035***	(2.74)	.00026*	(1.80)	.00046***	(3.96)	.00022	(1.48)	.0004***	(3.15)
<u>Demographic Background</u>										
Female	.044	(.98)	.161***	(3.12)	.112**	(2.50)	.134**	(2.38)	.063	(1.30)
Married Female							-.023	(.55)	.038	(1.05)
Married Male							-.088**	(2.29)	-.087***	(2.64)
Black			.021	(.27)	-.062	(.93)	.026	(.34)	-.058	(.87)
Hispanic			-.076	(.88)	.020	(.26)	-.054	(.63)	.038	(.51)
Temporary Job	.096*	(1.84)	.106*	(1.92)	.077	(1.60)	.110	(2.00)	.078	(1.63)
Knew TJTC	.028*	(1.84)								
CETA OJT Contract	-.075	(.53)								
SUBSIDIZED Hire	.079	(.67)								
Coop Student	-.0016	(.03)								
F Test On Model	4.0***		3.5***		3.6***		2.75***		3.07***	
R ²	.135		.058		.059		.068		.075	
RMSE	(.328)		.506		.440		.505		.438	
Number of Observations	454		819		819		819		819	
* significant at the 10% level (two-sided) ** significant at the 5% level (two-sided) *** significant at the 1% level (two sided)										

Table 7

	Surprise at 6 Mo. Actual-Expected		Actual Productivity At 6 Mo.		Current Wage Minus Alternative Wage	
<u>Previous Employer Training</u>						
Relevant Experience	.015**	(2.53)	.029***	(5.23)	.0003	(.21)
Relevant Experience Squared	-.0003	(1.47)	-.0006***	(3.11)	-.00007	(1.25)
First Years Relevant Exp.	-.004	(1.36)	-.027	(.86)	.0004	(.06)
Formal Training On Job	-.046	(1.48)	-.009	(.30)	-.005**	(.61)
Formal Training Off Job	.042	(.75)	.066	(1.21)	-.012	(.83)
<u>Schooling</u>						
Years of Schooling	.044	(.52)	.013*	(1.79)	-.0037**	(2.01)
Relevant Vocational Training	-.011	(.31)	-.031	(.85)	.005	(.55)
Private Vocational Training	.080*	(1.90)	.123***	(2.98)	-.010	(1.01)
Relevant Training From Military	.096*	(1.92)	.106**	(2.15)	-.013	(1.10)
Relevant Training From JTPA	.089	(.99)	.157*	(1.70)	-.031	(1.45)
Years of Occupational Training	.003	(.23)	.005	(.45)	-.004	(1.29)
<u>Total Experience</u>						
Total Experience	-.0076**	(2.14)	-.0079**	(2.30)	.0012	(1.40)
Total Experience Squared	.0001	(1.03)	.00009	(.99)	-.00002	(.89)
<u>Demographic Background</u>						
Female	-.005	(.13)	.007	(.20)	.006	(.70)
Married Female	.039	(1.39)	+.024	(.90)	-.0004	(.06)
Married Male	.002	(.08)	-.005	(.22)	.013**	(2.19)
Black	-.028	(.56)	-.065	(1.32)	-.0067	(.57)
Hispanic	.002	(.04)	-.049	(.90)	.005	(.41)
Temporary Job	.004	(.11)	.008		-.0128	(1.56)
F Test On Model		1.38		3.79***		.53
R ²		.028		.068		.038
RMSE		(.35)		(.36)		(.08)
Number of Observations		937		872		872

* significant at the 10% level (two-sided)

** significant at the 5% level (two-sided)

*** significant at the 1% level (two-sided)

program, total number of years of school based vocational training and separate dummies for being a married female or a married male.

Despite differences in sampling, selection processes and in variable definitions, the two data sets generate remarkably similar findings. The data analysis strategy being employed in this paper has not been tried before so it is quite heartening that the results turn out to be remarkably robust. For example, in both data sets initial productivity and required training are significantly influenced by relevant vocational education and years of previous relevant work experience but not by years of schooling or total work experience. Consequently, the discussion of the results will be organized not around data set, not even around dependent variable but around categories of right hand side variables.

- * Work Experience--contrasts between relevant experience and total experience.
- * The firm specificity of skills--as indicated by contrasts between the effect of tenure and previous relevant work experience on current productivity.
- * Schooling and relevant occupational training obtained at schools.
- * Demographic characteristics--gender interacted with marital status and minority status.

4.1 Relevant Versus Irrelevant Prior Work Experience

The effects of both relevant and irrelevant work experience on training costs, productivity, turnover, wage rates and profitability are summarized for the EOPP data in Table 8. Results from analysis of NFIB data are presented in Table 9.

Relevant Work Experience: According to their employers, the new hires in the EOPP data had an average of 2.3 years of relevant work experience and the new hires in the NFIB data had an average of 5.3 years of relevant work experience when hired. Relevant work experience significantly increased the productivity of new hires and significantly reduced the time required to train them (see columns one and two of the table). Substituting five years of relevant experience while holding total experience constant raised productivity by 25 percent in the first 2 weeks, by 15 percent over the course of the next 10 weeks, and by 8 or 9 percent at the time of the interview. It also reduced training costs by one-third and raised productivity net of training costs by 44 percent. Because

