DETERMINANTS OF TRAINING: AN ANALYSIS USING BOTH EMPLOYER AND EMPLOYEE CHARACTERISTICS

Abstract. Despite the fact that employee training is now measured in a number of surveys, important gaps remain in our knowledge of such fundamental questions as how much training takes place, who provides it and who gets it. The goal of this paper is to fill in some of these gaps, making use of data from the 1995 Survey of Employer-Provided Training (SEPT95). SEPT95 collects data from employers as well as employees, enabling a more complete analysis of the determinants of training than has been possible in the past. Though the determinants of training show some differences across our measures of incidence and intensity, we find strong support for the notion that those establishments that encourage long-term relationships with their employees also provide more training.

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I. Introduction

        In recent years, the issue of worker training has been pushed to the forefront of

public policy circles. Renewed interest in training has resulted in part from concerns about

the decline in real wages of less educated workers, the effect of changes in work

organization on the demand for skills, and whether U.S. workers are appropriately trained

to adapt to changes in job requirements brought about by the introduction of new

technology.[1] In spite of the importance of this issue, serious gaps exist in our knowledge

of such fundamental questions as how much training takes place, who provides it and who

gets it (Lynch, 1995). Because of data limitations, little empirical work has been done

analyzing the determinants of training using both worker and firm characteristics.

        The goal of this paper is to fill in some of these gaps, making use of matched

employee-employer data recently collected by the Bureau of Labor Statistics. This survey,

the 1995 Survey of Employer-Provided Training (SEPT95), has a number of unique

features that make it a valuable source of data for studying training practices. First, the

intensity (not just the incidence) of training was measured at the establishment level.

Second, training logs were used to measure training as it was occurring in order to

minimize recall problems. Third, both establishments and employees at those

establishments were surveyed, allowing the use of both employee characteristics and quite

detailed employer characteristics such as average establishment wage. Fourth, information

on both formal and informal training was collected. Accurate information on the latter is

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[1] See Levy and Murnane (1992) for a survey of recent changes in the earnings structure, Osterman (1995) for a discussion of the relationship between work organization and training, and Bartel and Sicherman (1995) for an analysis of the effect of technological change on the skill acquisition of young workers.

especially important, given the well-known inconsistencies in the few previous attempts to measure informal training (Lowenstein and Spletzer 1996).

We examine the effect of establishment and employee characteristics on the incidence and intensity of training using a variety of measures. We find that the determinants of training differ across some of the measures. However, almost all of our measures indicate that establishments that use more innovative workplace practices and firms that provide more fringe benefits train more.

The following section contains a detailed discussion of the features of SEPT95. Section III presents descriptive statistics on the dependent variables used in the analysis, namely the incidence, hours, and costs of training. This is followed by a discussion of some of the independent variables available from the survey. In section IV, we use data collected from employers to conduct a multivariate analysis of the relationship between formal training and establishment characteristics. In section V, data from employees are used to analyze the determinants of formal and informal training by examining the role of both employee and employers characteristics. Section VI offers conclusions.

II. The 1995 Survey of Employer-Provided Training

The 1995 Survey of Employer-Provided Training (SEPT95) was conducted by the Bureau of Labor Statistics (BLS) for the Employment Training Administration (ETA) in order to provide nationally representative data on the current training practices of employers. A sample of 1,433 establishments for the survey was drawn to represent the

universe of private establishments that had fifty or more employees.[2] The survey was

limited to establishments of this size after an earlier survey had found relatively little

formal training in smaller establishments. See Frazis, Herz, and Horrigan (1995).

Establishments of fifty or more employees accounted for over 57 percent of private

employment in the first quarter of 1995.

In addition to collecting data from establishments, randomly-selected employees in

the responding establishments were interviewed.[3] A primary objective of SEPT95 was to

go beyond the collection of data on training incidence and obtain solid estimates on the

intensity of training, namely the hours and costs of training. Hours and costs of <u>formal</u>

training were obtained from the respondent to the establishment survey,[4] whereas hours

and wage and salary costs of both <u>formal and informal</u> training were collected from

randomly sampled employees.

The establishment survey consists of two survey instruments – a questionnaire and

a training log. The employer questionnaire collected information on a variety of

establishment characteristics and information on selected costs of formal training. The

cost items include the dollar amount spent during 1994 on: the wage and salaries of in-

house trainers, fees paid to outside training companies, and tuition reimbursement. These

items were included in the survey because field testing indicated that records were more

likely to be available on these items than on other costs of training such as materials or

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[2] The sample frame for the survey was the list of private ownership establishments on the Bureau of Labor Statistics' Universe Data Base (UDB). The frame units were classified into strata based on nine industries and five employment size classes.

[3] Two employees were randomly selected at each establishment.

[4] Experienced BLS interviewers were instructed to administer the survey to the person at the establishment who was most familiar with the training policies and practices. At larger establishments they were told to ask for the training or human resource director and at smaller establishments the person who handles personnel and training issues.

overhead. Information on the total dollar amount spent on training during the year (i.e. a training budget) was not asked in SEPT95.[5] Usable employer questionnaires were obtained from 1,062 of the respondents for a response rate of 74.1 percent.

In the employer log, employers reported on all the formal training events provided or financed by the establishment during a two-week period.[6] For each event, data was obtained on the number of employees in attendance, the hours of training, the type of training and who conducted the training. Given that recordkeeping on training is not centralized in some establishments, a relatively short reference period was deemed necessary to provide high quality data on the hours of formal training. Usable logs were collected from 949 respondents, implying a response rate of 66.2 percent.

A similar design was used to collect information from randomly selected employees. An employee questionnaire obtained information on such demographic characteristics as age, sex, race/ethnicity, occupation, education, earnings, and tenure, in addition to general questions on past training received. From the 2,124 potential employees (2 employees from each of the 1,062 establishments that responded to the employer survey), 1,074 employee questionnaires were collected for a response rate of 50.6 percent.

The employee log captured the number of hours of both formal and informal training. Employees kept a log for 10 calendar-days.[7] Employees reported on any activity

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[5] Previous surveys that asked for total expenditures on training experienced very low response rates. The 6% response rate for the Columbia HRM survey is one such example. See Bartel (1991).

[6] Interviewers had the option of collecting the training log data for the past two weeks at the time of interview or leaving the log with the respondent to complete over the following two weeks. This decision was based on the availability and quality of training records.

[7] Interviewers trained the employees on the log by having them recall their activities over the prior three days and then to keep a daily log over the next seven days.

in which they were 'taught a skill or provided with new information to help them do their job better.' For each learning activity, the following questions were asked: who or what helped them learn the skill or information, how they learned the skill or information, what type of skill or information was learned, and how much time was spent learning this skill or information. Based on answers to the first two of these questions, BLS used an algorithm to classify each activity as formal training, informal training or self-learning.[8] The response rate for the employee log was 47.7 percent.

SEPT95 was collected through personal interviews and made use of already existing records as much as possible or information from logs that respondents kept for the purposes of the survey. We believe this approach represents a significant improvement in the quality of data on hours of training, particularly hours of informal training, since employees were not assumed to have a definition of informal training in mind nor were they asked to recall information from far back in time. Recall and definition problems have caused estimates of informal training to vary greatly by survey (Loewenstein and Spletzer, 1996).

III. Descriptive Statistics on Training from SEPT95

A. Dependent variables: Incidence, Hours, and Costs of Training

Numerous surveys have collected information on job training but as Jacob Mincer put it, 'available data on job training suffer from poverty amidst plenty'.[9] Comparisons between sources are plagued by differences in definitions, reference periods and sampling frames. As a result, basic estimates on the incidence and extent of job training vary

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[8] Hours spent doing self-learning are not counted as training.

considerably across surveys. In this section, we present the findings from SEPT95 and compare them to findings from other surveys.[10]

Table 1 indicates that nearly 93 percent of establishments with 50 or more employees provided formal training to their employees in the last 12 months and almost 70 percent of employees working in those establishments received some formal training during that time. The percent of establishments providing training in SEPT95 is substantially higher than the estimate found in the 1992 Small Business Administration Training survey. In that survey, only 42 percent of those with more than 100 employees reported having formal training programs. Part of the discrepancy between the two incidence estimates is likely due to a difference in the training concept under measure. In SEPT95, the incidence measure is capturing the provision of any formal training during the year which could reflect as little as one training course provided to just one employee. The SBA survey, on the other hand, is measuring the existence of a formal training 'program' which is likely to involve multiple courses offered to a number of employees.

Our incidence estimate from the employees' perspective is also on the high end of a broad spectrum of incidence estimates obtained from a number of household surveys. In the 1975-76 Michigan Time-Use Study (see Stafford and Duncan, 1980) 60 percent of respondents reported having received 'any learning that may lead to a better job or promotion' and 41 percent of workers in the 1991 January supplement of the CPS said they received 'training to improve their skills on their present job' (See Amirault, 1992). One reason for our relatively high estimate is that SEPT95 was limited to employees

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[9] Mincer (1989) p. 5.

[10] A fuller set of descriptive results from SEPT95 is found in Frazis, Gittleman, Horrigan, and Joyce (1997).

working in establishments with 50 or more employees and we know that larger establishments are more likely to provide formal training.[11] Also, SEPT95 provided detailed examples of formal training which may have helped respondents recall training events.

The second panel of Table 1 goes beyond the incidence of training and gives estimates on the intensity of training. From the employer log, it was estimated that employers provided an average of 10.7 hours of formal training to their employees during May-October of 1995. The similar estimate from the employee log was 13.4 hours. The results also show that informal training is an important way in which employees acquire skills, with 70 percent of the training for that purpose being informal. Assuming an average work week of 40 hours, these findings suggest that workers spend roughly 4 percent of their working hours in training when both formal and informal training are considered.

Estimates on the extent of training are considerably more limited than those on incidence. They mainly come from household surveys and tend to measure time spent in highly structured training. For example, Veum (1993) found that young adults in the NLSY79 spent an average of 12 weeks in various formal training programs during the 1986-91 period, or roughly 2.5 weeks per year. Hours estimates from SEPT95 suggest that workers spend closer to between a half and two-thirds of a week per year in formal training.[12]

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[11] The 1993 Survey of Employer Provided Training included establishments of all sizes and found that the provision of formal training increased with establishment size.
[12] By doubling the six-month estimate, we are implicitly assuming that there are not seasonal patterns in hours of training.

Another way of gauging the size of an employer's investment in training is to measure the amount of money spent on training-related activities. Given the unique design of SEPT95, BLS was able to collect information on both direct and indirect costs of training. From the employer survey, data were obtained on the following direct costs: wages and salaries of in-house training personnel, fees to outside-training companies, and tuition reimbursements. From data obtained in the employee survey, an estimate of the wage and salary costs paid to employees while in training was constructed.

Table 2 shows that employers with 50 or more employees spent roughly $16 billion in 1994 on the selected cost items that were covered in the survey. They spent approximately $37 billion from May-October of 1995 on the indirect wage and salary costs of training, $13 billion for time spent in formal training and $24 billion for time spent in informal training. By either measure of intensity--hours or expenditures-- considerable resources are being spent by employers on training. We now turn to the factors influencing an employer's decision to train.

B. Covariates of Training

In the human capital model, training is viewed as an investment decision. Firms invest in training if the costs incurred during the training period are more than offset by future gains in productivity. Given that the returns to training are realized over time, considerable attention has been given to the question of who should pay for the training. The model predicts that workers pay for general training (i.e. training that is portable to other firms) and workers and firms share in the costs of firm-specific training. With cost-sharing there is an incentive for both employers and employees to maintain their

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employment relationship.[13] Employers will be reluctant to lay off trained workers and trained workers are less likely to quit before realizing a return on their shared investment. As a result, the human capital model predicts a negative relationship between training and turnover. With SEPT95, we are able to directly examine the relationship between training and turnover at the establishment. [14]

A further implication of the human capital model is that training will be related to other policies that may reduce turnover. The offering of fringe benefits is one tool that employers can use to encourage workers to stay at the company. Employer-provided health insurance and pensions are two fringe benefits that have been shown to tie workers to their current employers. (See Madrian, 1994; Gruber and Madrian 1994 for research on health benefits and Lazear, 1986 for pensions). Besides pension and health, the existence of other benefits may reduce turnover by demonstrating the employer's commitment to workers' general well-being. For example, the provision of family leave or employer-financed child care might encourage workers with children to stay at their present firm. Another way in which firms may try to reduce labor turnover is by using contract workers during periods of fluctuations in product demand. By relying on contract employees, employers can protect a "core" group of workers from layoffs during slack periods.

The firm's decision to train may also be viewed as part of a broader business strategy undertaken to become more competitive. Many argue that the conditions that

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[13] Recent papers by Loewenstein and Spletzer (1998) and Acemoglu and Pischke (1998) suggest that employers are also sharing in the costs of general training.
[14] To our knowledge, no study has examined the relationship between training and turnover at the establishment level. Of course, the relationship has been studied at the individual level. See Mincer (1988) for empirical evidence that training serves to reduce turnover.

made mass production techniques advantageous are no longer present and companies need to "transform" themselves, or to adopt "high performance" workplace practices.[15] The reorganization of work at the firm is likely to be related to training policies. If a firm adopts new workplace practices, it must, at least in theory, train workers in the skills needed to carry out these practices. Training practices may also influence the adoption of new workplace practices. A firm with a strong commitment to training may have a workforce that is better equipped to successfully implement these alternative workplace practices.[16] Certain practices may also affect training through their influence on employee turnover. For example, employee involvement programs or profit sharing may reduce turnover by making workers more invested both emotionally and financially in the outcomes of the firm.

Both the view of the firm embodied in traditional human capital theory and that implicit in recent discussions surrounding so-called "high-performance" workplaces suggest that the more important it is to maintain a long-term employee-employer relationship, the more likely an establishment is to invest in training. Data from SEPT95 is uniquely equipped to test hypotheses associated with these views, as they include detailed information on a variety of establishment characteristics that are associated with an employer's efforts to retain workers.

A further advantage of SEPT95 is that it provides a rich set of other establishment characteristics beyond those that have received a significant amount of study. A complete

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[15] While often described as new or innovative, many of these practices do, of course, have a long history. See Bailey (1993) and Parks (1995) for further elaboration. For recent surveys of the literature on high performance workplaces, see Appelbaum and Batt (1994), Kling (1995), Mavrinac and Jones (1995).

list of establishment characteristics used in the analysis and their means are provided in

Table 3. Variable definitions are contained in Appendix A. In addition to establishment

size, which is a variable that has received some attention as a correlate of training, we are

also able to control for the size of the larger legal entity to which the establishment

belongs. We refer to this independent variable as EIN size.[17] Other establishment

characteristics available in SEPT95 include the number of part-time employees, the

presence of a labor union and employment growth at the establishment.

IV. Determinants of Training Provision-- Results from the Employer Survey

Though the main purpose of this section is to examine the relationship between

training intensity and establishment characteristics, we will first focus briefly on the

determinants of the incidence of formal training, in order to assess whether the results for

this dataset are in accord with past findings and whether these findings are robust to the

inclusion of controls for the fairly rich set of establishment characteristics contained in

SEPT95. For our multivariate analysis of the correlates of having provided formal training

in the past 12 months, we make use of the sample of 1,062 establishments that completed

questionnaires.[18] Probit estimates, shown in Table 4, have been transformed to show the

effect that a one-unit change (starting from the mean) in an explanatory variable will have

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[16] See Osterman (1994, 1995) and Gittleman, Horrigan and Joyce (1995) for additional discussion of the relationship between training and work organization.

[17] From the UDB, we are able to obtain information on the total number of employees working in establishments with the same Employer Identification Number (EIN) as the surveyed establishment. Because EINs are used by businesses for tax purposes, the EIN size captures the size of the larger legal entity to which the establishment belongs. The EIN size does not in all cases capture the size of the firm as some large companies may have more than one EIN number.

[18] Missing items on the employer questionnaire as well as the other three instruments were imputed using a hotdeck procedure. The multivariate analysis makes use of observations with imputed values.

on the probability of providing training. The significance levels, indicated by asterisks, are for the coefficient itself. We follow this practice for all probit regressions throughout the paper.

We find that establishments that tend to offer more generous benefits and that use more of the so-called innovative workplace practices are more likely to train. Note that because the regressions also control for the average wage at the establishment, we are measuring the generosity of benefits at a given wage level, rather than the possibility that a larger proportion of total compensation is being offered in the form of benefits. Given the weak effect of average establishment wages, it appears unlikely that the effect for benefits merely reflects the association of training with compensation.

Consistent with past results, the probability of having a formal training program increases with establishment size, even when controls for other establishment characteristics are included. Characteristics associated with a reduced likelihood of providing training are higher proportions of part-time workers and the presence of a labor union. Though a number of studies have examined the relationship between labor union status and training, a consensus has not been reached. The survey by Brown (1989) finds examples of studies where unions have a positive, negative and no appreciable effect on training. More recent findings have also been mixed, with Frazis, Herz and Horrigan (1995) finding a positive effect of unions on incidence, while Lynch and Black (1995) found no significant effect. One explanation for the results for labor unions differing from the findings of Frazis, Herz and Horrigan (1995) and Lynch and Black (1995) is that the universe of the present study is establishments with 50 or more employees, versus all

Comparisons between establishments with and without imputations did not suggest any systematic

establishments and those establishments with 20 or more employees in the other studies, respectively. When the sample for Frazis, Herz, and Horrigan (1995) is restricted to establishments with fifty or more employees, the estimated effect of unions is still positive but not significant at conventional levels. We will return to the question of the impact of unions on training when we discuss the determinants of training intensity.

We now turn to the relationship between the extent of formal training and employer characteristics.[19] The data from SEPT95 extends the literature in a number of different directions. The bulk of data on the intensity of training, as measured by hours, is derived from household surveys, so much less is known about the effect of establishment characteristics on training hours. In addition, SEPT95 allows the intensity of training to be measured not only by the hours but also by expenditures on training.

Many of the dependent variables on training intensity used in the analysis are mixed continuous-discrete variables. For example, some employers reported zero training expenditures during 1994 and many employees had no training during the log period. In order to distinguish between the determinants of the incidence of training and the determinants of intensity, we use the following two-part model:

$$y_{1i} = X\boldsymbol{b}_{1i} + u_{1i};$$
$$y_{1i}^* = 1 \quad if \ y_{1i} > 0, = 0 \quad otherwise;$$
$$\ln y_{2i} = X\boldsymbol{b}_{2i} + u_{2i}; \qquad y_{2i} \ observed \ if \ y_{1i}^* = 1$$

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difference in training practices between the two groups.

[19] For the analysis on training intensity, we are limited to the sample of 943 establishments that completed employer logs. Actually 949 establishments completed employer logs but six of these were excluded because they were extreme outliers either in terms of hours of training or training expenditures reported. To test for differences between the sample of establishments that responded to questionnaires and the subset that completed logs, we ran a probit on the incidence of formal training in the past 12 months with a dummy variable included to indicate whether or not an establishment returned a log. The coefficient of this variable was not statistically significant.

where i subscripts observations (i=1,…,n), y_1 is a latent variable reflecting propensity to be trained, y_2 is hours of training, X is the matrix of regressors, u_1 and u_2 are normally distributed mean zero error terms independent of X and each other, and β_1 and β_2 are vectors of parameters. The assumed independence of u_1 and u_2 allows us to consistently estimate β_1 and β_2 by simple methods; a probit regression of y_i* on X estimates β_1 and an OLS regression of ln y_2 on X consistently estimates β_2.[20]

Table 5 displays the results of the two-part analysis for the determinants of hours of formal training. The table shows the effects of each of the independent variables on the incidence of training and on the log of the hours trained for those establishments that did train. The final column gives the resulting marginal impact the covariates have on hours of formal training.[21] The estimates make clear that the number of fringe benefits offered as well the number of workplace practices in use are strong predictors not only of the incidence of training, but of the intensity of training for those establishments that do at least some training. The estimates shown in the marginal impact column suggest that, *ceteris paribus*, the amount of training an employee receives tends to rise about 2.8 hours

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[20] When u_1 and u_2 are correlated, as is likely to be the case, in theory a Heckman-type correction or maximum-likelihood procedure is required for consistent estimation. However, Monte Carlo evidence has shown that in practice the two-part model without taking the correlation between u_1 and u_2 into account is likely to perform as well or better than models that take the correlation into account. See Hay, Leu, and Rohrer (1987) and Manning, Duan, and Rogers (1987).

[21] Marginal impacts are derived as follows. The expected value of the variable of interest y_2 evaluated at sample mean $\overline{X}$ is:

$$M = E(y_2) = \Phi(\overline{X}\boldsymbol{b}_1)\exp(\overline{X}\boldsymbol{b}_2 + \frac{\boldsymbol{s}^2}{2}),$$ where Φ is the standard normal cdf, and σ^2 is the variance of u_2. The marginal effect of a unit increase in X_j, where j denotes variable, is:

$$\frac{dM}{dX_j} = (\boldsymbol{b}_{1j}\boldsymbol{f}(X\boldsymbol{b}_1) + \boldsymbol{b}_{2j}\Phi(X\boldsymbol{b}_1))\exp(X\boldsymbol{b}_2 + \frac{\boldsymbol{s}^2}{2})$$

where β_{1j}, β_{2j} are elements of β_1, β_2 corresponding to X_j. Standard errors are estimated by the delta method; see Goldberger (1991), Efron and Tibshirani (1993, p. 313).

a year with each additional benefit provided and roughly 2.3 hours per year with each additional workplace practice. Using the sample standard deviations of 1.93 for benefits and 2.28 for practices, establishments who are a standard deviation above the mean on benefits provide 5.4 hours a year more training and establishments who are a standard deviation above the mean on practices provide 5.3 hours a year more training per employee than establishments at the mean.

The only other employer characteristics (besides industry) to have a significant impact on training are the proportion of part-time employees and the presence of unions, both of which have a negative impact. The result for part-time workers is consistent with a shorter working time reducing an establishment's incentives to invest in its employee. We find that the presence of a union is associated with a nearly six hour per employee annual reduction in formal training, with most, though not all, of the impact coming from a reduced probability that the establishment trains.

One may expect unionized establishments to provide more training than their non-union counterparts because of the requirements of collective bargaining. However, there are a number of reasons why the presence of a labor union may reduce training. Mincer (1983) argues that incentives for general (transferable) training are reduced for union workers because such training is not adequately rewarded within the union firm and because union workers are less likely to move in the first place. He predicts that the volume of total training (general plus specific) will be smaller in union firms and finds evidence of this using data from the NLS and PSID. Duncan and Stafford (1980) also found less training among union workers using data from the Michigan Time-Use Study. Another reason why unionized employees may receive less training is that they may

already have more job-specific skills, some of which were obtained in apprenticeship programs or through union-sponsored training. The higher level of skills may result in part from management efforts to recruit more skilled workers to offset higher union wage costs and from generally higher levels of experience among union workers resulting from the inverse relationship between layoff/quit rates and tenure in union firms. In the analysis below using the employee data, where worker tenure is controlled for, the presence of a labor union continues to be associated with reduced training but the impact is only statistically significant for formal training.

As is well known, theory predicts that larger establishments provide more formal training than their smaller counterparts, owing to such factors as the presence of economies of scale in training, lowered required rates of return on training investments (Barron, Black and Loewenstein 1987), greater ability to absorb losses associated with turnover among trained employees, or a better capacity to screen potential employees before hiring them (Holtmann and Idson 1991). In terms of hours of training, however, neither measure of size has a significant overall impact. Larger establishments tend to be more likely to train, but this is largely offset by a tendency to train less intensively. Entity size has no significant effect on either the likelihood of training or its intensity. Surprisingly, employee turnover does not have a significant negative effect on hours of formal training. The point estimates are positive with high standard errors.

SEPT95 also allows the intensity of training to be measured by selected items of the establishment's training expenditures. The survey asked specifically about tuition spent for courses taken at educational institutions, payments to outside training companies, and wages and salaries spent on full-time and part-time training personnel.

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Wages and salaries of in-house trainers is the largest of these items, at $139 per employee, as shown in Table 2. These components of training expenditures were totaled and divided by the number of employees to arrive at our second measure of intensity.

As shown in Table 6, higher numbers of benefits and practices are associated with higher expenditures on formal training. In contrast to the case for hours, establishments with higher average wages spend more on training per employee, owing to higher expenditures at establishments that do train. Both the proportion of part-time employees and the presence of unions continue to have a negative impact on training intensity, though for expenditures the driving force is lower expenditures per employee rather than a reduced incidence rate.

The presence of contract workers -- which was not a significant variable in explaining hours intensity -- is associated with greater expenditures, both because of higher incidence and greater expenditures per employee. The reason for this association warrants further attention, as it may depend on the establishment's motivation for relying on contract workers.[22] If establishments use contract workers to protect a "core" group of workers from fluctuations in workload (as we speculated above), they would be expected to provide substantial amounts of training to this low-turnover core group. Another possibility is that establishments relying on contractors for specialized services may need their employees to be technologically sophisticated enough to interact with the specialized contractors.

Turnover, which was not an important correlate of hours intensity, proves to be a significant influence on expenditures. This relationship stems both from a lower incidence

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[22] See Abraham and Taylor (1993) for a discussion of theory and evidence for contracting relationships.

of expenditures at high turnover establishments, as well as lower expenditures per employee. As with hours, establishment size is not a significant overall determinant of intensity, though it is again associated with higher incidence. Entity size, however, is associated with greater expenditures.

A few results stand out as being robust across the two measures of intensity. On the negative side, higher proportions of part-time workers and the presence of a union are associated with reduced formal training. On the other side of the coin, the number of fringe benefits and workplace practices are consistently associated with higher-intensity of training.

To see if certain benefits or practices are more important than others in predicting training, Table 7 provides results from two-part regressions where the benefits and practices are entered individually. Though the hypothesis that all benefits or practices have zero effects can be rejected in three of four cases, it is never possible to reject the hypothesis that all the benefits or practices have equal coefficients. The only benefit or practice to have a significant marginal impact for both measures of intensity is the presence of an employee assistance plan.

V. <u>Determinants of Training Receipt—Results from the Employee Survey</u>

Given the availability of training information from a number of household surveys, much more is known about the characteristics of workers who receive training than about the characteristics of employers that provided it. Past research has shown consistently that more educated workers receive more training. Race has also tended to be a predictor of training incidence, with whites being more likely to receive training than other groups.

The findings on sex are less clear (Brown, 1989) but there is some evidence that men are more likely to receive formal company training (Veum, 1993).

A limitation of much past research has been an inability to control for establishment characteristics. As a result, it is not possible to tell whether a certain demographic group receives more training, regardless of employer, or if the correlation with training is primarily due to this group being more likely to find employment in establishments that do substantial amounts of training. We can address this issue with SEPT95 data.

Given the response rate of 51 percent mentioned in Section II, the representativeness of the employee data is a concern. One of the sources of employee nonresponse came about from employers denying BLS interviewers access to their employees. To investigate this concern, we reran the two-part model on training hours and expenditures with a dummy variable for whether the employer allowed access to their employees. In both the probits, the access variable is positive and significant at the ten percent level, suggesting that employers who provide training are somewhat more willing to have their employees interviewed. However, conditional on positive training hours or positive expenditures, the coefficients on the access variable in the OLS regressions are negative but not significant. The estimated total marginal effect of access on hours and expenditures is small and not significant at conventional levels in both cases.

As in the employer section, we first examine the relationship between the incidence of formal training and employee, as well as employer, characteristics. The receipt of formal training is measured by the following two questions from the employee questionnaire: 1) While working for your current employer, have you ever received

formal training? 2) In the last 12 months, have you received any formal training from your current employer?[23]

In addition to the establishment characteristics included as independent variables in the previous analysis of the employer data, the following worker characteristics are included: indicators for black, Hispanic, and female; six indicator variables for level of education (with high school graduate omitted); an indicator for married; age and age squared; tenure on the current job and tenure squared; and indicator variables for occupation at the one-digit level. (Industry and occupation dummies are omitted from the tables.) Sample means for the employee characteristics are shown in Table 8. The probit results on the receipt of training are shown in Table 9.

Again, we find substantial positive effects of fringe benefits and workplace practices on the receipt of training. At the sample mean, a standard deviation increase in benefits increases the probability of ever having received formal training by 2.0 percent and the probability of having been formally trained in the past 12 months by 4.4 percent. Similarly, a standard deviation increase in workplace practices increases the probability of ever having received training by 3.6 percent and the probability of having been trained in the past 12 months by 5.1 percent. (These compare to probabilities of 87.7 percent and 75.8 percent for ever having been trained and being trained in the past 12 months, respectively.)

The other establishment variables show some different patterns than those found in the analysis of the provision of formal training from the employer perspective. Ever

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[23] For this analysis, we used the 1,073 respondents who completed employee questionnaires. We excluded one observation from an establishment that reported only one employee. As with the employer

having received formal training is positively related to EIN size but establishment size per se does not have a statistically detectable effect on either dependent variable. Turnover has a negative effect, as predicted by the human capital theory, on both dependent variables, significant at the 10 percent level in both cases. The presence of contract workers has a positive effect on the receipt of formal training, while unionization appears to have a negative effect.

The effects of individual characteristics are similar to those found in the existing literature using household surveys. Education has a positive effect on receipt of formal training, with bachelor's degree holders significantly more likely (at the 5 percent level) than high-school graduates to have ever had formal training from the current employer. The effects of education on training in the last 12 months are not significant; the p-value on the hypothesis that all the education coefficients are equal to zero is .112. The point estimates tend to be larger than for ever having had formal training, however. Men are significantly more likely to have formal training than women are, both overall and in the last 12 months (at the 5 percent level).

While theory suggests that training should decrease with tenure, receipt of formal training over the last 12 months shows no statistically detectable tendency to decline with tenure at the mean level of tenure (p=.15). Age has a small effect at the sample mean but clearly decreases the probability of being trained at the high end of the range, as an additional year at age 55 decreases the probability of being trained by 1 percentage point.

data, imputed values were retained. Examination of results omitting imputed values did not show systematic differences with the results reported here.

We now examine the intensity of training using data collected in the employee logs.[24] The two-part model discussed in the previous section is used to examine the extent of training by separating out the effect of the incidence of training during the log period and the duration of training conditional on having received training. The model is estimated for total hours of training and separately for hours of formal and informal training. In this analysis the log of the hourly wage rate is included as an additional control for employee skill.[25]

Although employees were asked to report their training activities over a 10 day period, in practice, respondents reported for varying lengths of time--197 of the 1,003 reported for three days or fewer. Moreover, they were asked to report for 10 calendar days, not 10 work days. Accordingly, the dependent variable used in the intensity regression is the log of the proportion of work time spent in training, and the probit regression includes hours worked in the log period as an additional independent variable. We present only the combined effects of each variable on the unconditional proportion of work time spent in training. Unfortunately, with a 10 day log period at best and roughly a thousand observations, our statistical power is limited, so the effects of many variables are not precisely estimated.

Table 10 shows the marginal impacts on total training, formal training and informal training. Looking at firm characteristics first, the estimated effects of fringe benefits are

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[24] For this analysis, we use the 1,003 respondents who completed logs for at least one day, had reported establishment sizes greater than one, and worked positive hours during the period they completed the log. Of 1,013 log respondents, 9 were excluded because they reported no hours worked, and 1 was excluded for having an establishment size of 1.

[25] In theory, for equally skilled workers, the pre-training wage rate should be negatively related to training. We tend to find a positive relationship, indicating that wage is proxying for initial skill level or previous training.

statistically significant at the ten percent level for proportion of time spent in training (combined formal and informal). A standard deviation increase in benefits increases the proportion of time spent in training by 0.7 percent. Note that both the employee wage and the average wage in the establishment are controlled for, so this does not simply reflect the effect of high compensation. A standard deviation increase in the number of workplace practices is estimated to increase the proportion of time spent in training by 0.5 percent, but this is not quite significant (t=1.48). These compare to the sample mean of 3.9 percent.

While the number of benefits and work practices was found to be positively related to the provision and receipt of formal training, the effect of these variables on the intensity of training as measured by the employee log works mostly through their effect on informal training. A standard deviation increase in benefits increases the proportion of time spent in informal training by 0.4 percent (t=1.60), as does a standard deviation increase in workplace practices (t=2.12), while the effects on formal training are both smaller in magnitude and with smaller t-statistics. This is relative to a sample mean of 2.6 percent for informal training. None of the establishment variables other than number of benefits has a significant effect at the 10 percent level on the total proportion of time spent in training.

Turnover has a strong negative effect on formal training, consistent with results on training expenditures, but the point estimates on its effect on informal training and total training are both positive though insignificant. Similar to the findings from the employer section, presence of unions appears to have a negative effect on formal training during the

log period; the presence of a union is predicted to reduce the proportion of time spent in formal training by 0.6 percent (t=1.94). This compares to a sample mean of 1.3 percent.

We now turn to employee characteristics to see if they have the expected effects even after controlling for establishment characteristics. Education has a very strong effect on training during the log period. Those with more than a high-school degree get substantially more training than those with high-school or lower education. (GEDs appear to get more training than high-school graduates. This is a somewhat anomalous finding in view of Cameron and Heckman 1993 and related literature on the small labor market effects of GED acquisition.) Bachelor's degree holders spend 2 percent more of their time in training and graduate degree holders 4 percent more than do high-school graduates. Once again, this appears mostly due to informal training, with bachelor's degree holders spending more than 1.3 percent and graduate degree holders 2.6 percent more time in informal training.

The log data indicate that training decreases substantially with job tenure. A one-year increase in job tenure at the sample mean tenure decreases the proportion of time spent training by 0.38 percent. This is almost entirely due to its effect on informal training; a year of tenure reduces the proportion of time spent in informal training by 0.34 percent. This finding is consistent with the typical version of the human capital model. Note the contrast with formal training, for which the hypothesis that training declines with tenure is not confirmed either in the employee log or in the incidence question about the receipt of training in the last 12 months.[26]

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[26] Since the unit of analysis is the person and not the job, these results may not accurately reflect the time-path of training on the typical job. Since jobs with high eventual tenure are in theory more likely to be high-training jobs, one would expect even stronger declines in informal training with tenure and perhaps

The specifications thus far have included both establishment and individual characteristics. One use of the linked employee-employer data is to see whether inferences from unlinked household or establishment data characteristics are seriously biased. In specifications not shown here, establishment characteristics were used as independent variables without individual characteristics, and in other specifications individual characteristics were used without establishment characteristics. The pattern and strength of the individual-level variables were largely unaffected by the exclusion of the establishment variables, and vice versa.[27]

Similar to the analysis of the employer data, we now turn to the effects of individual benefits and practices on training by examining the specifications with benefits and practices entered singly rather than as sums. The results are shown in Table 11. The strongest results are for the incidence of formal training from the employee questionnaire. The largest coefficients in the probit for ever having been formally trained by the current employer are for employer-financed child care and for employee wellness benefits. For training during the past 12 months, the highest coefficients are for employee assistance programs and pensions. The hypothesis that all benefits have the same effect is rejected at p=.053 for ever having had formal training and p=.019 for formal training in the past 12 months. In contrast, the hypothesis that all work practices have equal effects is accepted at any reasonable level of significance for both dependent variables.

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declines in formal training. For evidence on "belated" formal training in the NLSY, see Loewenstein and Spletzer (1997). They estimate the probability of ever having received training from a given employer. They find that estimates of this probability from cross-section data are close to those from following jobs longitudinally.

[27] One exception is that the estimated effect of the log of establishment wage tends to increase when personal characteristics are omitted.

As might be expected, the results for the employee log are weaker. The results from the two-part model of training in the log period are shown in column 3 of Table 11. The hypothesis that all benefits have an equal effect can be rejected only at the p=.156 level.

Considering both the employee and the employer results for individual benefits and practices, no clear pattern emerges. The generally strong association of employee assistance plans with training, especially in the employer data, confirms a result in Frazis, Herz, and Horrigan (1995). It was argued there that the presence of employee assistance plans may be an especially good indicator of a long-term implicit contract between employees and employers, as employers seek to assist employees with difficulties rather than replace them. The homogeneity of effects of alternative work practices is consistent with the idea from the high-performance workplace literature[28] that the successful transformation of a workplace requires the adoption of several practices at the same time.

VI. <u>Summary and conclusions</u>

Using a new and rich database, SEPT95, we analyzed training intensity as measured by both employer and employee surveys. On the employer side, hours of training tended to be higher at establishments that are larger, non-union, have higher numbers of benefits and workplace practices, and smaller proportions of part-time workers. Turnover has the predicted negative effect when intensity is measured by training expenditures.

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[28] See the references in footnote 15.

The analysis of employee data confirmed many of the findings in the literature concerning the relationship between individual characteristics and the receipt of formal training. Using the matched nature of SEPT95, we found that these relationships were not significantly altered by the inclusion of establishment characteristics. Data from the survey of employees also allowed us to compare the correlates of informal training with those of formal training. Some variables, such as education, that affect formal training have similar effects on informal training. However, turnover and the presence of contract employees have opposite effects on formal and informal training such that they appear to have small relation to total hours of training. Job tenure has evident effects on informal training but no apparent effects on formal training.

Although the determinants of training differ somewhat across some of the measures, in general we find that employers who show signs of promoting a long-term relationship with their employees tend to train and to train more intensively. Our most consistent set of results in terms of statistical significance is the effect of fringe benefits and workplace practices. We find that establishments with many fringe benefits and innovative workplace practices are more likely to provide formal training and to spend more on training. Furthermore, employees working for employers who offer many fringe benefits or who employed many innovative workplace practices received more hours of both formal and informal training.

References

Abraham, Katharine G. and Susan K. Taylor. 1993. "Firms' Use of Outside Contractors: Theory and Evidence." NBER Working Paper No. 4468, September.

Acemoglu, Daron and Jorn-Steffen Pischke. 1998. "Why do Firms Train? Theory and Evidence." *Quarterly Journal of Economics*, forthcoming.

Amirault, Thomas. 1992. "Training to Qualify for Jobs and Improve Skills, 1991." *Monthly Labor Review*. Vol. 115, No. 9 (September), pp. 31-36.

Appelbaum, Eileen and Rosemary Batt. 1994. *The New American Workplace: Transforming Work Systems in the United States*. Ithaca, NY: ILR Press.

Bailey, Thomas. 1993. "Discretionary Effort and the Organization of Work: Employee Participation and Work Reform Since Hawthorne." Teachers College, Columbia University, January.

Barron, John M., Dan A. Black and Mark A. Loewenstein. 1987. "Employer Size: The Implications for Search, Training, Capital Investment, Starting Wages and Wage Growth." *Journal of Labor Economics*, Vol. 7, No. 1 (January), pp. 1-19.

Bartel, Ann. 1991. "Formal Employee Training Programs and Their Impact on Labor Productivity: Evidence from a Human Resources Survey", in David Stern and Jozep Ritzen, eds., Market Failure in Training, Springer and Verlag.

Bartel, Ann P. and Nachum Sicherman. 1995. "Technological Change and the Skill Acquisition of Young Workers." Unpublished, April.

Brown, Charles. 1989. "Empirical Evidence on Private Training." In *Investing in People*, vol. 1, Washington, DC: Commission on Workforce Quality and Labor Market Efficiency, U.S. Department of Labor, pp. 301-329.

Cameron, Steven V., and James J. Heckman. 1993. "The Nonequivalence of High School Equivalents." *Journal of Labor Economics,* Vol. 11, No. 1, Part 1 (January), pp. 1-47.

Duncan, Gregg and Frank Stafford. 1980. "Do Union Members Receive Compensating Wage Differentials?" *American Economic Review*, Vol. 70 (June), pp. 355-371.

Efron, Bradley and Robert J. Tibshirani. 1995. *An Introduction to The Bootstrap.* New York: Chapman and Hall.

Frazis, Harley, Maury Gittleman, Michael Horrigan, and Mary Joyce. 1997. "Formal and Informal Training: Evidence from a Matched Employee-Employer Survey." In Gary D. Libecap, ed., *Advances in the Study of Entrepreneurship, Innovation, and Economic Growth,* vol. 9, Greenwich, CT: JAI Press, pp. 9-46.

Frazis, Harley J., Diane E. Herz and Michael W. Horrigan. 1995. "Employer-Provided Training: Results from a New Survey." *Monthly Labor Review*, Vol. 118, No. 5 (May), pp. 3-17.

Gittleman, Maury, Michael Horrigan and Mary Joyce. 1995. "'Flexible' Work Organizations: Evidence from the Survey of Employer-Provided Training." Unpublished, September.

Goldberger, Arthur. 1991. *A Course in Econometrics.* Cambridge, MA: Harvard University Press.

Gruber, Jonathan and Brigitte C. Madrian. 1994. "Heath Insurance and Job Mobility: The Effects of Public Policy on Job-Lock. *Industrial and Labor Relations Review*, Vol. 48, No. 1 (October), pp. 86-102.

Hay, Joel W., Robert Leu, and Paul Rohrer. 1987. "Ordinary Least Squares And Sample-Selection Models Of Health-Care Demand: A Monte Carlo Comparison." *Journal of Business and Economic Statistics* Vol. 5, pp. 499-506.

Holtmann, Alphonse G. and Todd L. Idson. 1991. "Employer Size and On-the-Job Training Decisions." *Southern Economic Journal*, October, pp. 33-55.

Kling, Jeffrey. 1995. "High Performance Work Systems and Firm Performance." *Monthly Labor Review*, Vol. 118, No. 5 (May), pp. 29-36.

Levy, Frank and Richard J. Murnane. 1992. "U.S. Earnings Levels and Earnings Inequality: A Review of Recent Trends and Proposed Explanations." *Journal of Economic Literature*, Vol. 30, No. 3 (September), pp. 1333-1381.

Lazear, Edward P. 1986. "Retirement from the Labor Force." In Orley Ashenfelter and Richard Layard, *Handbook of Labor Economics*, Volume 1, Amsterdam: North-Holland.

Loewenstein, Mark and James Spletzer. 1996. "Formal and Informal Training: Evidence from the NLSY." Paper prepared for conference "Employer-Provided Training: Who Pays? Who Benefits?", Cornell University, November.

Loewenstein, Mark and James Spletzer. 1997. " Delayed Formal On-the-Job Training." *Industrial and Labor Relations Review,* Vol. 51, No. 1 (October), pp. 82-99.

Loewenstein, Mark and James Spletzer. 1998. "Dividing the Costs and Returns to General Training." *Journal of Labor Economics*, Vol. 16, No. 1 (January), pp 142-171.

Lynch, Lisa. 1995. "A Needs Analysis of Training Data: What Do We Want, What Do We Have, Can We Ever Get It?" in Labor Statistics Measurement Issues, J. Haltiwanger, M. Manser and R. Topel, eds. NBER/University of Chicago Press, forthcoming.

Lynch, Lisa M. and Sandra E. Black. 1995. "Beyond the Incidence of Training: Evidence from a National Employers Survey." NBER Working Paper No. 5231, August.

Madrian, Brigitte C. 1994. "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job-Lock." *Quarterly Journal of Economics*, Vol. 109 (February), pp. 27-51.

Manning, Willard G., Naihua Duan and W. H. Rogers. 1987. "Monte Carlo Evidence On The Choice Between Sample Selection And Two-Part Models", *Journal of Econometrics*, vol. 35, pp. 59-82.

Mavrinac, Sarah C. and Neil R. Jones. 1995. "The Financial and Non Financial Returns to Innovative Workplace Practices: A Critical Review." Report prepared for the Office of the American Workplace, Department of Labor.

Mincer, Jacob. 1983. "Union Effects: Wages, Turnover, and Job Training." Research in Labor Economics, Supplement 2, JAI Press, pp. 217-252.

Mincer, Jacob. 1988. "Job Training, Wage Growth and Labor Turnover." NBER Working Paper No. 2690, August.

Mincer, Jacob. 1989. "Job Training: Costs, Returns, and Wage Profiles", NBER Working Paper No. 3208, December.

Osterman, Paul. 1994. "How Common is Workplace Transformation and Who Adopts It?" *Industrial and Labor Relations Review*, No. 2 (January), pp. 173-188.

Osterman, Paul. 1995. "Skill, Training and Work Organization in American Establishments." *Industrial Relations*, Vol. 34, No. 2 (April), pp. 125-146.

Parks, Susan. 1995. "Improving Workplace Performance: Historical and Theoretical Contexts." *Monthly Labor Review*, Vol. 118, No. 5 (May), pp. 18-28.

Stafford, Frank and Greg J. Duncan. 1980. "The Use of Time and Technology by Households in the United States", Research in Labor Economics, Vol. 3, pp. 335-375.

Veum, Jonathan. 1993. "Training among young adults: who, what kind, and for how long?". *Monthly Labor Review*, (August), pp. 27-32.

Appendix A
Definitions of Variables from Employer Survey

Establishment size: The number of employees on the payroll of the establishment for the pay period that included the 12th of the present month.

EIN Size: The number of employees in all establishments with the same Employer Identification Number (EIN) as the surveyed establishment. This captures the size of the larger legal entity to which the establishment belongs. It does not correspond to the firm size because some large companies have more than one EIN number.

Establishment wage: Total payroll of the establishment for the fourth quarter of 1993 divided by the sum of employment in each month of the quarter. This information was obtained from the BLS Universal Data Base (UDB).

Labor turnover: The ratio of the sum of hires and separations over the three months prior to the reference period to the average employment for the three months.

Benefits: Respondents were asked to check which of the following benefits were offered at their establishment: paid vacation; paid sick leave; health care benefits; an employee assistance program; an employee wellness program; pension plans profit sharing; flexible work schedules; flexible work site or telecommuting; employer-financed child care; and paid parental/family leave.

Workplace practices: SEPT95 asked whether establishments used any of the following practices: pay increases that are directly linked to mastering new skills; employee involvement in the firm's technology and equipment decisions; job redesign or reengineering ; job rotation; just-in-time inventories; co-worker review of employee performance; quality circles; total quality management; and self-directed work teams.

Use of contract employees: Indicates whether the establishment used any contract workers or workers employed by temporary-help agencies during the pay period used for reporting establishment size.

Proportion of part-time employees: The number of employees considered by the establishment to be part-time workers divided by reported establishment size.

Presence of labor union: Indicates whether or not any of the employees are represented by a union agreement.

Employment growth: The ratio of net change in employment over the three months prior to the reference period to average employment for those three months.

Table 1
Incidence and Intensity of Training

INCIDENCE	Percent of establishments with 50 or more employees who provided	Percent of employees in establishments of size 50 or more who received
Formal training in last 12 months	92.5	69.8

INTENSITY	Hours per employee in establishments with 50 or more employees, May-October, 1995	
	Employer survey	Employee survey
Formal training	10.7	13.4
Informal training	NA	31.1
Total	NA	44.5

Table 2
Expenditures on Training among Establishments with 50 or more employees

			In billions of dollars	
1994	$ per employee	Level	Error range of expenditures*	
Selected costs of formal training:				
Wage and salaries of in-house trainers	$139	$7.7	$7.0 - $8.5	
Payments to outside trainers	98	5.5	4.8 - 6.1	
Tuition reimbursements	51	2.8	2.6 - 3.0	
May-October 1995				
Wage and salary paid to trainees while in				
Formal training	$224.1	$12.8	$11.0 - $14.7	
Informal training	422.8	24.2	19.9 - 28.5	
Total	646.9	37.1	32.8 - 41.4	

*Plus or minus one standard deviation.

Table 3
Establishment Characteristics, Employer Survey
Means

Establishment Characteristic	Unweighted	Weighted
Employment	665.44	162.94
Establishment wage	2981.24	2177.14
EIN size	10185.41	7041.95
Turnover rate	0.240	0.353
Number of benefits	6.127	5.483
Use of contract workers	0.434	0.283
Number of workplace practices	3.238	2.785
Employment growth rate	0.010	0.001
Proportion of part-time	0.110	0.225
Presence of labor union	0.309	0.183
Sick Leave	0.863	0.806
Employee Assistance Plan	0.624	0.474
Wellness	0.408	0.266
Pension	0.831	0.725
Profit Sharing	0.469	0.374
Flexitime	0.439	0.449
Flexisite	0.172	0.135
Child Care	0.072	0.063
Family Leave	0.295	0.249
Pay for Knowledge	0.363	0.389
Employee Involvement	0.501	0.439
Job Redesign	0.442	0.313
Job Rotation	0.375	0.344
Just-in-Time Inventories	0.274	0.218
Peer Review	0.182	0.179
Quality Circles	0.310	0.267
Total Quality Management	0.511	0.437
Worker Teams	0.282	0.199
Number of observations	1062	

Table 4

Determinants of the Incidence of Formal Training, Employer Survey

Probit Maximum-Likelihood Estimates, Unweighted

Dependent variable	Any formal training in past 12 months (Derivatives)	
Employer Characteristics	**Estimate (x 100)**	**Standard Error**
Ln(Employment)	0.176*	0.137
Ln(Estab. Wage)	-0.180	0.170
Ln(EIN size)	0.044	0.049
% Part-time	-0.904***	0.610
Union present	-0.312*	0.226
Contract workers used	0.151	0.168
Turnover rate	0.270	0.261
Employment growth rate	0.934**	0.690
Number of benefits	0.207***	0.001
Number of workplace practices	0.188***	0.104
Mining	-0.125	0.351
Construction	0.085	0.253
Nondurable manufacturing	-0.146	0.297
Durable Manufacturing	-0.698***	0.459
T.C.P.U.	0.379	0.421
Wholesale trade	0.171	0.347
Retail trade	-0.400	0.341
F.I.R.E.	-0.201	0.281
Constant	1.816	2.331
Log likelihood	-103.569	
Observations	1062	

* Coefficient significant at 10 percent level

** Coefficient significant at 5 percent level

*** Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives does not correspond to significance of coefficients.

Table 5

Determinants of the Intensity of Formal Training: Hours, Employer Survey

Two-Part Model, Unweighted

Dependent variable	Any formal training (Derivatives)		Ln(hours of formal training per employee)		Marginal impact on hours of formal training per employee	
Sample	All		Hours of formal training per employee >0			
Employer Characteristics	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Ln(Employment)	0.135***	0.018	-0.140**	0.055	0.036	0.050
Ln(Estab. Wage)	-0.002	0.039	0.037	0.141	0.028	0.125
Ln(EIN size)	0.005	0.009	0.043	0.031	0.042	0.028
% Part-time	-0.174*	0.103	-0.558	0.389	-0.660*	0.342
Union present	-0.157***	0.038	-0.064	0.120	-0.230**	0.109
Contract workers used	0.016	0.035	0.170	0.110	0.033	0.101
Turnover rate	0.031	0.042	0.072	0.113	0.094	0.105
Growth rate	0.124	0.084	-0.051	0.300	0.097	0.267
Number of benefits	0.042***	0.010	0.070**	0.031	0.106***	0.028
# of workplace practices	0.025**	0.008	0.072***	0.026	0.089***	0.023
Mining	0.071	0.077	0.483**	0.214	0.482**	0.199
Construction	0.029	0.067	-0.356	0.235	-0.263	0.211
Nondurable manufacturing	0.004	0.067	-0.145	0.223	-0.117	0.200
Durable Manufacturing	0.004	0.070	-0.049	0.208	-0.029	0.190
T.C.P.U.	0.063	0.070	0.390*	0.221	0.396**	0.202
Wholesale trade	-0.029	0.070	-0.237	0.238	-0.230	0.213
Retail trade	0.034	0.067	-0.508*	0.279	-0.384	0.246
F.I.R.E.	0.057	0.074	0.238	0.202	0.262	0.187
Constant	-0.845**	0.029	-1.084	1.044		
Log likelihood	-467.37					
R^2			0.105			
Observations	943		646			

*   Coefficient significant at 10 percent level

**   Coefficient significant at 5 percent level

*** Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives in column 1 does not correspond to significance of coefficients.

Table 6

Determinants of the Intensity of Formal Training: Expenditures, Employer Survey

Two-Part Model, Unweighted

Dependent variable	Any expenditures on formal training (Derivatives)		Ln(expenditures on formal training per employee)		Marginal impact on expenditures on formal training per employee	
Sample	All		Hours of formal training per employee >0			
Establishment Characteristics	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Ln(Employment)	0.038***	0.010	0.024	0.062	17.8	17.3
Ln(Estab. Wage)	0.008	0.017	0.652***	0.137	182.6***	41.4
Ln(EIN size)	-0.002	0.004	0.073**	0.035	19.5*	10.0
% Part-time	-0.052	0.038	-0.619**	0.315	-186.1**	88.6
Union present	0.007	0.018	-0.466**	0.129	-126.9**	36.9
Contract workers used	0.045**	0.018	0.230**	0.115	76.6**	34.1
Turnover rate	-0.038**	0.017	-0.336*	0.179	-104.1**	50.0
Growth rate	0.011	0.031	-0.389	0.412	-104.2	114.9
Number of benefits	0.024***	0.005	0.103***	0.033	35.8***	9.4
# of workplace practices	0.010***	0.004	0.129***	0.026	38.6***	7.4
Mining	-0.005	0.039	-0.118	0.233	-34.1	65.4
Construction	-0.020	0.032	-0.626***	0.244	-178.8***	69.0
Nondurable manufacturing	-0.047	0.031	-0.786***	0.228	-230.9***	64.9
Durable Manufacturing	-0.015	0.035	-0.667***	0.201	-188.9***	58.5
T.C.P.U.	-0.060*	0.033	0.129	0.222	17.9	62.2
Wholesale trade	-0.044	0.030	-0.510**	0.241	-154.0**	67.6
Retail trade	-0.106***	0.030	-0.523**	0.231	-175.9***	65.9
F.I.R.E.	0.026	0.040	0.208	0.204	64.9	57.6
Constant	-0.221	0.133				
Log likelihood	-266.02					
R^2			0.275			
Observations	943		808			

*   Coefficient significant at 10 percent level

**   Coefficient significant at 5 percent level

*** Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives does not correspond to significance of coefficients.

Table 7
Marginal Impacts of Individual Benefits and Practices on
the Intensity of Formal Training, Employer Survey
Two-Part Model, Unweighted

Dependent variable	Marginal impact on hours of formal training per employee		Marginal impact on expenditures of formal training per employee	
	Estimate	Standard Error	Estimate	Standard Error
Benefits:				
Sick Leave	0.148	0.159	25.7	53.3
Employee Assistance Plan	0.369***	0.116	66.3*	38.2
Wellness	0.015	0.143	16.3	34.0
Pension	0.001	0.146	-2.5	48.9
Profit Sharing	0.078	0.092	51.1	31.1
Flexitime	0.211*	0.103	32.3	33.2
Flexisite	-0.004	0.121	36.2	41.1
Child Care	-0.099	0.198	34.3	55.4
Family Leave	0.210**	0.105	29.2	34.3
Practices:				
Pay for Knowledge	0.135	0.096	-36.2	31.7
Employee Involvement	-0.005	0.103	19.3	33.5
Job Redesign	0.179	0.109	62.2	36.5
Job Rotation	-0.034	0.106	6.6	31.7
Just-in-Time Inventories	0.111	0.115	46.0	36.6
Peer Review	-0.105	0.123	52.3	36.4
Quality Circles	0.125	0.108	100.4***	33.6
Total Quality Management	0.256**	0.111	31.7	35.0
Worker Teams	-0.006	0.107	55.5	37.1
p-value, equality of benefits	0.455		0.983	
p-value, joint effects of benefits	0.001		0.168	
p-value, equality of work practices	0.501		0.285	
p-value, joint effects of practices	0.017		0.000	

*   significant at 10 percent level
**   significant at 5 percent level
*** significant at 1 percent level

Table 8
Employee Variables, Employee Survey
Means

Variable	Unweighted	Weighted
Dependent variables		
% ever trained with current employer	0.875	0.820
% trained in last 12 months	0.757	0.669
% of employee log hours in training	0.039	0.040
% of employee log hours in formal training	0.013	0.010
% of employee log hours in informal training	0.026	0.029
Independent variables		
Black	0.088	0.119
Hispanic	0.062	0.064
Male	0.518	0.500
HS Dropout	0.073	0.113
GED	0.033	0.023
Some College	0.277	0.286
Associates Degree	0.093	0.097
BA	0.195	0.134
Graduate Degree	0.060	0.068
Married	0.664	0.641
Age	38.630	38.564
Job Tenure	4.540	3.834
Part-time	0.059	0.112
Manager	0.068	0.058
Professional or Technical	0.188	0.207
Sales or Clerical	0.358	0.257
Service Occupation	0.064	0.168
Observations	1,003	

Table 9

Determinants of the Incidence of Formal Training, Employee Survey

Probit Maximum-Likelihood Estimates, Unweighted

Dependent variable	Ever formal training from current employer (derivatives)		Formal training from current employer in last 12 months (derivatives)	
	Estimate	Standard Error	Estimate	Standard Error
Employee Characteristics				
Black	-0.014	0.018	-0.006	0.018
Hispanic	0.019	0.024	-0.013	0.020
Male	0.033**	0.012	0.078**	0.012
HS Dropout	-0.042	0.046	-0.029	0.021
GED	0.019	0.030	0.103	0.035
Some College.	0.022	0.020	0.060*	0.014
Assoc. Degree	0.001	0.030	-0.023	0.022
BA	0.046**	0.021	0.058	0.020
Graduate Degree	0.061	0.073	0.147*	0.043
Married	0.001	0.008	0.001	0.007
Age	0.006	0.013	0.016**	0.012
Age Squared/100	-0.009**	0.015	-0.024**	0.014
Job tenure	0.010***	0.002	-0.008	0.003
Tenure Sq./100	-0.022*	0.007	0.019	0.009
Part-Time	0.003	0.024	-0.035	0.032
Employer Characteristics				
Ln (Employment)	0.000	0.004	0.010	0.007
Ln (Estab. Wage)	0.028	0.129	0.018	0.079
Ln (EIN size)	0.016***	0.005	0.015	0.002
% Part-Time	-0.039	0.119	-0.019	0.101
Union Present	-0.047**	0.022	-0.051	0.013
Contract Workers	0.040**	0.014	0.056*	0.010
Turnover Rate	-0.044*	0.053	-0.097*	0.033
Growth Rate	-0.042	0.059	-0.046	0.046
Number of Benefits	0.011**	0.003	0.023**	0.002
Number of Workplace Practices	0.015***	0.003	0.022***	0.001
Observations	1,073		1,073	

*   Coefficient significant at 10 percent level

** Coefficient significant at 5 percent level

*** Coefficient significant at 1 percent level

NOTE: Statistical significance of derivatives does not correspond to significance of coefficients.

Table 10
Determinants of the Intensity of Training:
Hours of Formal and Informal, Employee Survey
Two-Part Model, Unweighted

Dependent variable	Marginal impact on % time in training in log period		Marginal impact on % time in formal training in log period		Marginal impact on % time in informal training in log period	
Employee Characteristics	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Black	0.002	0.010	0.003	0.006	0.003	0.006
Hispanic	-0.005	0.011	-0.001	0.005	-0.005	0.008
Male	0.003	0.007	-0.000	0.003	0.005	0.004
HS Dropout	0.007	0.017	-0.003	0.008	0.002	0.010
GED	0.029**	0.015	0.006	0.006	0.022**	0.010
Some College	0.014*	0.008	0.002	0.004	0.013**	0.005
Assoc. Degree	0.028***	0.010	0.010**	0.005	0.017**	0.007
BA	0.019**	0.009	0.006	0.005	0.013**	0.006
Graduate Degree	0.038***	0.012	0.008	0.005	0.026***	0.007
Married	0.006	0.006	0.002	0.003	0.004	0.004
Age	0.001	0.002	0.002**	0.001	0.000	0.001
Age Squared/100	-0.002	0.002	-0.002**	0.001	-0.001	0.001
Job tenure	-0.005***	0.002	0.001	0.001	-0.005***	0.001
Tenure Sq./100	0.000**	0.000	0.000	0.000	0.000***	0.000
Part-Time	-0.014	0.015	-0.004	0.006	-0.007	0.010
Ln Wage	0.010	0.009	0.005	0.004	0.004	0.005
Employer Characteristics						
Ln (Employment)	-0.002	0.003	0.001	0.001	-0.002	0.002
Ln (Estab. Wage)	-0.000	0.008	-0.001	0.004	0.000	0.005
Ln (EIN size)	0.002	0.002	-0.000	0.001	0.001	0.001
% Part-Time	-0.001	0.022	-0.000	0.008	-0.002	0.013
Union Present	-0.011	0.007	-0.006*	0.003	-0.005	0.005
Contract Workers	-0.004	0.006	0.003	0.003	-0.006	0.004
Turnover Rate	0.006	0.011	-0.014***	0.005	0.010	0.007
Growth Rate	-0.011	0.015	-0.001	0.007	-0.009	0.010
# of benefits	0.004*	0.002	0.001	0.001	0.002	0.001
# of workplace Practices	0.002	0.001	0.001	0.001	0.002**	0.001
Observations	1,003		1,003		1,003	

* significant at 10 percent level
** significant at 5 percent level
*** significant at 1 percent level

Table 11

Table 11
Marginal Impacts of Individual Benefits and Practices on
the Formal Training, Employee Survey
Two-Part Model, Unweighted

Dependent variable	Ever formal training with current employer (derivatives)		Formal training with current employer in last 12 months (derivatives)		Marginal impact on % time in training in log period	
	Estimate	Standard Error	Estimate	Standard Error	Estimate	Standard Error
Benefits:						
Sick Leave	0.018	0.038	0.049	0.023	0.019*	0.010
Employee Assistance Plan	0.027*	0.014	0.086***	0.008	0.009	0.007
Wellness	0.040**	0.010	0.012	0.009	0.009	0.007
Pension	0.012	0.015	0.077*	0.013	-0.003	0.011
Profit Sharing	-0.013	0.011	-0.041	0.009	-0.003	0.006
Flexitime	0.001	0.014	0.040	0.011	-0.001	0.006
Flexisite	-0.028	0.024	-0.088**	0.022	0.006	0.008
Child Care	0.057	0.048	0.025	0.045	0.029**	0.012
Family Leave	0.006	0.019	0.049	0.013	-0.011*	0.006
Practices:						
Pay for Knowledge	0.005	0.012	0.017	0.008	0.000	0.006
Employee Involvement	0.009	0.014	0.021	0.008	0.006	0.006
Job Redesign	0.014	0.011	-0.001	0.011	-0.006	0.007
Job Rotation	0.021	0.011	0.027	0.013	-0.003	0.006
Just-in-Time Inventories	-0.008	0.021	0.033	0.020	0.008	0.007
Peer Review	0.027	0.022	0.023	0.018	0.009	0.008
Quality Circles	0.018	0.017	0.027	0.010	0.006	0.007
Total Quality Management	0.015	0.018	0.012	0.009	0.007	0.007
Worker Teams	0.034*	0.013	0.071*	0.012	0.000	0.007
p-value, equality of benefits	0.053		0.019		0.156	
p-value, joint effect of benefits	0.012		0.004		0.060	
p-value, equality of work practices	0.862		0.979		0.908	
p-value, joint effect of work practices	0.040		0.161		0.658	

*   Coefficient significant at 10 percent level
**   Coefficient significant at 5 percent level
*** Coefficient significant at 1 percent level
NOTE: Statistical significance of derivatives does not correspond to significance of coefficients.