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PRIVATE SECTOR TRAINING AND ITS IMPACT ON THE EARNINGS OF YOUNG WORKERS

Lisa M. Lynch

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ABSTRACT

While there have been numerous studies devoted to examining the impact of governmental training programs on workers who have experienced difficulties in the labor market, there has been remarkably little research on the actual occurrence and consequences of training provided by the private sector in the U.S.. Using data from the new National Longitudinal Survey youth cohort, this paper analyzes how personal characteristics including employment histories, and local demand conditions determine the probability of receiving training and its effect on wages and wage growth of young workers. More specifically, some of the issues addressed here include the relative importance of training and tenure for wage determination and the rate of return to company provided training compared to the rate of return to training received outside the firm and schooling. The portability of company training from employer to employer and the existence of differentials in the returns to training by union status, race and sex are also investigated.

Lisa M. Lynch
Sloan School of Management
M.I.T., E52-563
50 Memorial Drive
Cambridge, MA 02139

I. Introduction[1]

While there have been numerous studies devoted to examining the impact of governmental training programs on workers who have experienced difficulties in the labor market, there has been remarkably little research on the actual occurrence and consequences of training provided by the private sector. Since one of the explanations of lower productivity in the U.S. relative to countries such as Germany and Japan is that firms in the U.S. underinvest in their workers, it is crucial to have a better understanding of the human capital investment strategy of firms and of its consequences. It has been estimated that as much as $210 billion is spent annually on formal and informal training in the U.S.[2] of which $25 billion is spent on young workers entering their first jobs[3]. So the issue is not that U.S. firms do not invest in their workers but rather that there are differences in the size and nature of the investments made compared to their European and Japanese counterparts.

Apart from the difficulty of measuring exactly how much is spent each year by firms on training, we know little about who receives training, what types of training programs are provided and where, the degree of firm specificity and portability of firm provided training, and the impact of training on the productivity and consequently on the wages and wage growth of workers. Due to the lack of appropriate data, few researchers have been able to examine directly the characteristics of private sector training and many have had to infer the impact of this source of human capital from the shape of wage profiles. The problem with examining the shape of wage profiles to

infer training investments and productivity is that there are several alternative theories which imply rising wage profiles that have nothing to do with productivity enhancing training. Therefore, in order to examine the impact of training on the workforce it is critical to distinguish between the impact of training and other factors on wage profiles. Given the potential long term consequences of training (or lack of) in the early years of a worker's labor market experience and the amount of resources spent currently by U.S. firms on young workers, this paper focuses on the early training experience of young workers and the long term impact of this on their productivity and wages.

This paper builds upon studies such as Mincer's (1974) fundamental work, Chapman and Tan (1980), Gustman and Steinmeier (1981), Hashimoto (1981), Ohashi (1983), Carmichael (1985), and Hanushek and Quigley (1985) which have attempted to model, theoretically and/or empirically, the returns to on-the-job training and schooling. Most of these studies, however, have been constrained by the quality of the data available to them. In particular, there is little accurate information concerning the occurrence and especially the duration of private sector training. In addition, there is usually not a complete history available on schooling status and labor market status of the workers.

Some of the few empirical studies on the returns to private sector training using actual measures of training rather than inferring training from the shapes of wage profiles include Mincer (1983, 1988), Brown (1983), Lillard and Tan (1986), Pergamit and Shack-Marquez (1986), and Barron et. al. (1987). Unfortunately, each

of these studies is subject to different limitations. Some of the more critical issues include the lack of complete employment, training and schooling histories on individuals in the various surveys, difficulties in actually measuring the amount of private sector training the respondent received, and problems in distinguishing firm-specific from general types of training. To highlight these problems, Table 1 shows the different questions contained in the surveys used in each of these studies. Few of these questions actually ask about the training the respondent has acquired on the current and past jobs. For example, the question from the Panel Study of Income Dynamics, PSID, on training is how long it took the "average" person to become qualified for the job, not how long the respondent actually took to become qualified. In the older National Longitudinal Survey, NLS, cohorts, training is measured as training received or used on the current job, therefore, one is not able to observe when the training actually took place or other types of training undertaken by the respondent. The lack of information on the timing of training is also a limitation with the Current Population Survey, CPS, data. In addition, if most training is concentrated during the early years of a worker's employment experience, these questions will not pick up this training experience. The data used by Barron et. al. (1987, 1988) is interesting since it is a good measure of the "representative" costs of training to an employer. However, the data collected is restricted to information on the most recent hire in the firm.

It is possible to overcome many of these problems and gain new insights into training in the U.S. using data from the new NLS youth

cohort. This data allows one to reconstruct the entire training history for each individual including the occurrence and length of each training spell. Moreover, the data is particularly useful in distinguishing between different sources of private sector training (on-the-job training, training received outside the firm or off-the-job training, and apprenticeships). This paper analyzes how personal characteristics including employment histories and local demand conditions determine the probability of receiving training and its effect on wages and wage growth of young workers. More specifically, some of the issues addressed here include the relative importance of training and tenure for wage determination and the rate of return to company provided training compared to training received outside the firm and schooling. The portability of company training from employer to employer and the existence of differentials in the returns to training by union status, race and sex are also investigated. Section II presents a summary of the theoretical framework used for the analysis of wage growth. Section III contains a description of the data used to analyze training in the U.S., and Section IV presents a discussion of the results on the impact of training on wages and wage growth for young workers.

II. The Theoretical Framework

There are many theories of individual variation in wages and wage profiles. In particular, there are several different explanations of why wage profiles are upward sloping. In Mincer's (1974) seminal work, wage profiles slope upwards as human capital or skills increase

with experience. Therefore, as a worker acquires more training there should be an increase in the individual's productivity and consequently in their earnings. However, there have been several alternative explanations of upward sloping profiles that have little to do with training. Specifically, Stiglitz (1975) and Lazear (1981) discuss how firms offer upward-sloping wage profiles to discourage "shirking" among workers. An alternative explanation (see Salop and Salop (1976) and Rothschild and Stiglitz (1978)) might be that firms use upward sloping profiles to discourage "movers" from seeking employment. Recent papers by Abraham and Farber (1987), Altonji and Shakotko (1987), and Topel (1987) have examined the importance of job matching in explaining upward sloping wage profiles. These studies have examined whether or not (in the absence of data on training) the inclusion of tenure in a wage equation simply measures job specific returns (such as training) or captures the fact that workers in long jobs are either better workers, in better jobs, or in better worker-employer matches. If some measure of job-match quality is not included in the estimation then it is argued that the coefficient on tenure is biased upwards.

All of these alternative models of compensation are not necessarily mutually exclusive. In fact, the most likely case is that compensation is affected by some combination of all of these factors. The purpose of some of the recent studies on wages, however, has been to show that after controlling for job match quality that the impact of tenure or seniority on wages is small and to infer from this that human capital investments such as training have a negligible role in the determination of wages. With detailed information on quantities

and timing of training it should be possible to finally sort out the real returns to human capital investments such as training. With this information it will also be possible to examine the appropriateness of tenure on the job as a proxy for training.

In the simplest human capital model we would expect an individual's wage to grow only during periods when an individual worker's productivity increases due to investments in human capital. As Mincer has discussed, if this is indeed what is really happening, the observed concavity of the tenure-wage profile is due to the completion of training. If there is no explanation for wage growth other than productivity enhancing training, then tenure on the job should have little impact on wages once training has been controlled for. If instead, there are other factors which influence the growth of wages, then tenure will continue to be significant even after including training. One straightforward way to specify a wage equation to take these various factors into account is as follows:

$$\log w_t = X'_t B + T'_t \zeta + a_1 S_t + a_2 Exp_t + a_3 tenure \qquad (1)$$

where X'_t is a vector of individual characteristics and local demand conditions, T' is a vector containing information on the occurrence and total number of weeks of different types of training received from the private sector, S is the highest grade of schooling completed, EXP is total work experience and tenure is total work experience with the current employer. Equation 1 allows for non-training related wage growth during periods of training but it is difficult to infer from this specification what the wage growth is outside of spells of

training. As Brown (1983) has discussed, by replacing the tenure variable in equation 1 with (tenure - time in training) it is possible to measure the growth of wages outside of spells of training. However, this does not allow for non-training related wage growth during training. Taken together these two equations should give a clearer sense of the importance of training relative to other factors.

Given the detailed nature of the training data used in this paper the vector of training variables T´ contains information on on-the-job training (OJT), training received outside the firm or "off-the-job" training (OFF), and apprenticeships (APPT). The specification of equation 1 allows for each of these three types of training to have different returns. Since the data is also longitudinal it is possible to distinguish between spells of training in each of these categories received during employment with a previous employer and spells received during current employment. In addition, for training received on the current job, it is possible to identify both completed and uncompleted spells of training and to allow for different returns to training depending on whether or not the training spell is completed. This means that the training vector, T´, will include:

$$T_t = [\text{Time in OJT, OFF and APPT before current employer, Time in completed spells of OJT, OFF, and APPT from current employer, Time in uncompleted spells of OJT, OFF, and APPT from current employer, DOJT, DOFF, and DAPPT}] \quad (2)$$

All of these variables are measured in weeks with the exception of the last three dummy variables that are equal to 1 if the individual ever had the particular type of training and 0 otherwise. The training

dummies can also be expanded to include dummies for previous employer and current employer provided spells of training.

With this specification of the wage equation it is possible to determine whether or not on-the-job training is general in nature for young workers and therefore portable from employer to employer. The specification of training as shown in equation (2) separates OJT into OJT from a previous employer and OJT from a current employer. Therefore, examining the coefficient on training from a previous employer may reveal how general OJT is. If it is primarily general then the coefficient on this variable should be positive and significant in the wage equation. However, if "better" workers are more likely to receive on-the-job training, then simply including a measure of OJT in a wage equation without controlling for the selection of these "better" workers into training will result in an upward bias in the coefficient on OJT. This means that a significant and positive coefficient on OJT from a previous employer may be capturing the uncontrolled selection or identifying that employer provided training is general and portable for young workers. If instead the coefficient is insignificant then it must be the case that training is not general and, therefore, not portable from employer to employer.* This issue is of particular importance in judging policies that subsidize employers who provide training to young workers. The assumption is that such training contains significant general components that individuals will carry with them even if they leave their employer. A test of this assumption is important in deciding the level of government support and the degree of monitoring of employer provided training. In addition, given that European and

Japanese employers do invest in general training, especially for their younger workers, finding OJT to be firm specific reveals an interesting difference in the nature of private sector training in the U.S. and its competitors.

In order to measure the true impact of training on wages of young workers it is necessary to first examine the characteristics of those individuals who actually receive training. It is unlikely that individuals are randomly assigned to training. The decision of whether or not to acquire training by an individual worker or to place a worker in a firm provided training program can be described in terms of an index function. Let NB_i be an index of net benefits to the appropriate decision maker (the individual worker or the firm) of either OJT, off-the-job training, or an apprenticeship:

$$NB_i = Z'_i\delta + v_i \qquad (3)$$

where Z' is a vector of individual characteristics. An individual experiences training if $NB_i > 0$, otherwise there will be no investment in training. There are a variety of factors which might influence an individual's probability of having some training such as their work experience, and educational background. For firm specific training it is more likely that a firm will invest in those individuals who appear more attached to the workforce and the firm. Therefore, tenure on the job, total work experience and demographic factors may be expected to influence the firm's decision making on training.

Discrimination may also affect a firm's human capital investment

policy. As Lazear (1979) has discussed, the narrowing of the black/white and male/female wage differentials since the passage of affirmative action legislation may have been accompanied by a widening of the gap in the job-experience induced rate of wage growth. In other words, as employers responded to affirmative action legislation by paying higher wages to women and blacks they may have at the same time reduced the amount of training provided to these groups. These workers may have responded to not receiving on-the-job training by obtaining "visible off-the-job" training to improve their productivity and to signal their commitment to the workplace. There is some evidence of this type of behavior in the schooling decisions of blacks (see Lang and Ruud (1986)).

Schooling may also affect an individual's probability of receiving training. In particular, additional years of schooling may signal "stick-to-itness" and an interest and aptitude in learning. On the other hand, workers with poorer initial skills due to fewer years of schooling may require more training to get up to speed.

III. The Data

The NLS youth cohort of 12,686 males and females (who were 14 to 21 years of age at the end of 1978) has some of the most comprehensive data on education, jobs, military service, training programs, marital status, health and attitudes of young workers. The respondents have been interviewed every year since 1979 on all aspects of their labor market experience. The response rate in 1985 was over 95% of the original cohort. The data on types of training (other than

governmental training) received are some of the most comprehensive data available on private sector training. Some of the questions respondents were asked included what types of training they had received over the survey year (they were asked about all spells not just the longest), and dates of training periods by source. The training spells had to be at least four weeks in length to be included. Potential sources of training included business college, nurses programs, apprenticeships, vocational and technical institutes, barber or beauty school, a correspondence course, company training and other miscellaneous training. This final category of training seemed to consist primarily of short term adult education courses taken in the evening and does not appear to be work related. All of these sources of training should not be confused with any training received in a formal regular schooling program which is included in the schooling variable. However, given the way in which the questions are asked it may be possible that the respondents are giving information only on formal training spells rather than more informal on-the-job training. For this reason, the tenure variable may be picking up both non-training related returns to seniority and returns to informal training.

Using a constructed weekly event history of private sector training, employment, and schooling it is possible to examine the patterns and outcomes of training for young U.S. workers.[5] Over the period of January 1978 through the respondent's interview date in 1983 almost a quarter of the entire sample of 12,686 youths had been involved in some sort of private sector training. For the analysis presented in this paper a subsample of the 12,686 respondents has been

selected. This sample is composed of individuals who had completed their schooling by the 1980 interview date and who were not in the military. In addition, these individuals had to have wage observations at both the 1980 and the 1983 interview dates. This restriction does not imply that the respondent had to be working at the interview date since this wage data is wages in current or last job over the survey year.

For the empirical work as discussed earlier, the training data has been separated into three categories - company training, apprenticeships, and training obtained outside the firm. Training outside the firm or "off-the-job" training, includes training from business colleges, barber or beauty school, nurses program, vocational and technical institutes, and correspondence courses. Other miscellaneous training has been excluded from this analysis since it does not appear to be remotely related to any job relevant training. In Table 2 characteristics of this sample are presented. The major source of training for this sample comes from "off-the-job" both in terms of the percentage of the sample (15%) who have experienced this type of training and the amount of time spent in this training. This is particularly true for women and nonwhites. The number of women and nonwhites who are in apprenticeship programs is small and this needs to be kept in mind when interpreting some of the results in the next section. In general, however, Table 2 shows that there are distinct differences in the types of training received and the duration of this training by race and sex.

IV. Results

In Table 3 estimates of the probabilities of an individual receiving each of the three types of training are presented. Differentiating among these types of training reveals some interesting patterns. The probability of investing in off-the-job training is lower if the youth is male or has longer tenure on the job. On the other hand, company provided on-the-job training is concentrated among white married unionized males with greater work experience. At the same time, it is lower for those who live in high unemployment areas. This suggests that as unemployment rates rise companies cut back on the amount of on-the-job training provided to young workers. The most important determinants for participating in an apprenticeship are being white, unionized, and male.

The role of schooling in training decisions varies by type of training. When schooling is included as years of completed schooling in each of the equations, it is never significant. However, when the schooling variable is broken down into four categories - less than high school degree, high school degree, more than high school but less than college degree, college degree or more - some interesting patterns emerge. Having finished schooling with a high school degree or some years of post high school enrollment significantly raises the probability of participating in off-the-job training. Having just a high school degree also raises the probability of being in an apprenticeship. However, completing college has no impact on the probability of receiving any type of training and none of the schooling variables affect the probability of receiving company

provided on-the-job training. This result holds even when schooling is interacted with work experience. The complementarity between schooling and training appears to be limited to training off-the-job and apprenticeships. There does not appear to be strong evidence of complementarity between schooling and on-the-job training. Finally, tenure on the job has either no effect on the probability of having had some training or even a negative effect on the probability of receiving on-the-job training. This suggests that for young workers, in the absence of data on training, tenure does not seem to be a very good proxy for training.

Keeping these differential patterns in the acquisition of training in mind, I now examine how these three types of training affect the wages of young workers. In addition to the tenure, work experience, schooling and training variables presented in equation (1) the determinants of the log wages of young workers will include factors such as personal characteristics and local demand conditions. These variables include the local unemployment rate, the number of jobs held since finishing school, whether or not the respondent lives in a city, marital status, race, sex, whether or not they are covered by a collective agreement, and health. Equation 1 in Table 4 presents results from a standard Mincer type of wage equation excluding the training variables. Only the coefficients on the tenure, work experience, training and schooling variables are presented. (A full listing of all the estimated coefficients is available from the author.) Equations 2 and 3 in Table 4 include the tenure variable in the two forms described in the text. The estimated coefficients do not change significantly between these two specifications.

One of the striking results of this table is the insensitivity of the estimated coefficient on tenure to the inclusion of the training variables. It appears that training and tenure are orthogonal since the coefficient on tenure does not alter between equations 1, 2 and 3. This result is consistent with the findings in Table 3 of no tenure effect on the probability of receiving training. The tenure variable is always significant and there are many factors which it may be capturing. The training variables in the NLS are good measures of spells of formal training lasting at least one month but they may not capture all spells of informal on-the-job training. If this is the case then the tenure variable will pick up not only a "tenure" effect but also this informal training. In addition, tenure, as shown in the job-matching literature, may represent job match quality so the coefficient is biased upwards (see Topel (1987) for a discussion on the size of this bias). Finally, a positive tenure effect could reflect incentives provided to reduce shirking and/or to lower turnover.

Equations 2 and 3 in Table 4 show the significant role that training plays in wage determination. The size of the training effect is much larger than the size of the tenure effect. Periods of off-the-job training and apprenticeship training acquired before the current employer raise wages significantly. Weeks of on-the-job training and apprenticeship with the current employer also raise wages. The specification of equations 2 and 3 in Table 4 was also estimated to allow for different coefficients on completed and uncompleted weeks of training with a current employer. The resulting coefficients were not statistically different so the restriction of

equating these coefficients was made in Table 4.

Some of the more interesting results in Table 4 are the variables that are not significant. For example, it may be the case that employers only place employees in training programs who have some unobservable characteristic, "trainability". Or, employers may only put workers into jobs which have a significant training component when they decide the worker is a good match. However, if this is true we would expect that the dummy variables on training would be biased upwards yet they are never significant. It does not appear to be the case that ever having been in training raises wages but rather how long one has been in training.

Other insignificant variables of interest include spells of on-the-job training acquired before the current job. These spells have no effect on wages with subsequent employers. This suggests that OJT is not portable from employer to employer for young workers. In other words, company training is quite firm specific for young workers rather than general. Lester (1954) gives some insight into this finding with a quote from an employer on young workers: "We would rather hire a young man with no moulding experience and train him ourselves, than to hire a man with moulding experience from another firm and have to break him of acquired habits and really retrain him."[6] Weeks of off-the-job training acquired before current employment have a significant and positive impact on wages, however, weeks in off-the-job training during current employment are not significant. This may be because current off-the-job training is training to allow the respondent to move to a different job where it would be more relevant, or it reflects some sharing of costs of this

training with the employer through lower wages. Unfortunately, it is not possible to identify clearly who is paying for the direct costs of training received off-the-job.

In order to examine how the different training variables affect hourly wages, table 5 presents calculations of hourly wages for different characteristics of the sample. This table shows that training, especially company provided on-the-job training from the current employer, raises wages significantly. The impact of additional amounts of time in schooling (1 more year of school) has about the same impact as six months of off-the-job training and a smaller impact than six months of on-the-job training. We know from Table 3 that nonwhites and females are much less likely to receive on-the-job training. But Table 5 shows that a nonwhite who obtains some off-the-job training can almost eliminate completely the wage gap between himself and a white male with no training. Female wages rise as well with off-the-job training but the gap between female and male wages remains. This table also shows that the wage gap between nonwhite and white males rises from 8 percent for no training to 19 percent if the white male has on-the-job training and the nonwhite male has none.

Table 6 presents the findings using the specification of equation 2 from Table 4 but broken down by various sub-samples of interest. There are some interesting differences across these groups. Mincer (1983) has discussed the potential impact of unions on wage profiles and job training. He finds some evidence, using data from the NLS young men's cohort, that while unions raise the wage of their members, the wage profiles of union workers are flatter than that of their

nonunion counterparts. He concludes that there is a higher rate of return to on-the-job training for nonunion workers than for union workers. The results presented here confirm those findings. The union wage premium for the sample as a whole is approximately twenty percent. However, the equations in Table 6 show that the nonunion workers' wages rise much faster during training spells than union workers' wages. Another interesting finding concerns the effect on wages of ever having been in an apprenticeship (APPT dummy). There is a significant positive effect for this dummy variable for white males and union workers while it is significant but negative for black workers. When the sample is split by educational achievement it appears that company training and tenure on the job are very important for high school graduates, while off-the-job training and total work experience are much more important for those who remain in school beyond high school.

Before reaching any final conclusions on the basis of the results presented in Tables 4 and 6 it is necessary to discuss in more detail the possible sources of bias in the training estimates due to self-selection. As already mentioned, employers may only place employees in training programs who have some unobservable characteristic, "trainability", or individuals who are more motivated would be more likely to pursue off-the-job training. In either case the estimated coefficient on the various training variables will be biased upwards (i.e. a "treatment" selection problem). However, if this problem is serious then one would expect that the training dummies and weeks of on-the-job training from a previous employer would be significant, yet they are not. The problem of treatment

selection, therefore, may not be as critical for young workers receiving private sector training as it is for older workers or those on government training programs.

This is confirmed by a formal treatment of treatment selection along the lines suggested by Heckman (1979) and Heckman and Robb (1986) using a two step estimator or simply using two stage least squares. I have used a specification which allows for multiple sources of treatment selection in the occurrence of various types of training. To estimate the true impact of training on wages, the coefficients from both the probit estimates of the probability of receiving on-the-job training and off-the-job training (from eqs. 1 and 2 in Table 3) are used to calculate the conditional expectation of receiving training for those who receive training and those who do not. This is a relatively straightforward procedure if the error terms in the two probit equations are not correlated. To examine whether or not this would be an appropriate assumption for this sample I estimated a bivariate probit for the probability of receiving on-the-job and off-the-job training (results available on request) and found the correlation coefficient to be very small (-0.00997) and insignificant (T-statistic of -0.127). Therefore, independence of the error terms has been assumed and the results from the two probit equations in Table 3 are used. These estimates of the conditional expectation of receiving training or the inverse Mills ratios are then included as regressors (lamdal and lamda2) in the wage equation. These results are presented in equation 4 in Table 4 and indicate little difference from those of equations 2 or 3. Neither of the coefficients on the inverse Mills ratios are significant. Therefore,

it appears that treatment selection may not be a major problem for this sample. As argued above this result is not surprising given the lack of significance of the training dummies and the coefficient on time in on-the-job training with a previous employer.

Finally, to control for unobserved individual characteristics that remain constant over time, I estimated a fixed effects model of wage growth for the respondents' wages between the 1980 and the 1983 interview dates. An individual's wage at time t can be expressed as follows:

$$\log (w_{it}) = (Z'B)_{it} + f_i + u_{it} \qquad (4)$$

where Z' is a vector of variables affecting wages that vary for each individual over time, and f_i are all of those characteristics which are individual specific but time invariant. These time invariant characteristics would include observed factors such as race and sex and unobserved factors such as ability. Therefore, in this model, by differencing individuals' wages between 1980 and 1983 all time invariant effects (both observed and unobserved) will drop out leaving only time varying variables. By estimating a fixed effects model it is possible to control for some of the biases introduced into standard wage equations due to unobserved differences in ability.

The results from this approach are presented in Table 7. In the first column of results for the entire sample, additional weeks of general training acquired outside the firm and apprenticeships significantly raise wage growth. Additional weeks of OJT, are not significant as they were in the previous tables. However, this may be

due to some of the small cell sizes in this equation. The three union dummies capture the effects of being in a union job at both interviews, moving from a nonunion to a union job, and moving from a union to a nonunion job, respectively. Moving to a union job from a nonunion job has a significant payoff while the opposite significantly reduces wage growth. While increases in tenure with the current employer raise wage growth this effect is still smaller than the effect of weeks of training on wage growth. When the sample is divided into various sub-groups some interesting patterns emerge. Changing union status has the largest impact on white males. Turnover has no effect on the wage growth of women and blacks but a significant and negative effect on the wage growth of white males. Changes in tenure on the job has a much greater impact on the wage profiles of nonunion workers than union workers. Finally, all of the estimated coefficients in Table 7 are smaller than those in Table 4 suggesting that individual unobserved fixed effects are important. However, the relative importance of the various variables remains unchanged.

V. Conclusions

This paper has shown that private sector training plays a significant role in the wage determination and career patterns of young workers in the U.S.. Specifically, when private sector training is divided into different types (on-the-job training, off-the-job training, and apprenticeships) some very different patterns emerge. For example, the characteristics that appear to influence the probability of receiving training are primarily race and sex. Women

and nonwhites are much less likely to receive training within a firm either through an apprenticeship or other forms of on-the-job training. This differential pattern in the acquisition of training by race and sex may be a partial explanation of the persistent wage gap between males and females and whites and nonwhites and this issue will be explored in greater detail in future work. Schooling raises the probability of receiving off-the-job training and apprenticeships but it has no impact on the probability of receiving firm provided on-the-job training. Therefore, the link between schooling and on-the-job training does not seem to be particularly strong.

All types of training raise wages significantly. The impact of these training variables also seems to be larger than the impact of tenure on wages. In addition, tenure does not appear to be a particularly good proxy for training. Therefore, in the absence of data on training, a small coefficient on tenure does not necessarily imply that productivity enhancing training is not important for wages of workers. This paper does not argue that there is no role to be played by job matching or other explanations of rising wage profiles, rather that when there is appropriate data on training, the impact of training on wages is quite large relative to other factors for young workers.

Finally, while on-the-job training with the current employer increases wages with the current employer, this type of training seems to be quite firm specific since on-the-job training from a previous employer is never significant for current wages. The fact that U.S. firms are more willing to invest in firm specific training than in general training is understandable given the inability to "capture"

the returns on investments in general training. However, justifications of wage subsidies to employers who hire young workers, based on the assumption that the subsidy will induce employers to provide training which is general and portable, may be misguided. Therefore, it will be necessary to monitor the type of training provided if the policy objective is to enhance the general skill level of young workers.

Footnotes

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[2] A. Carnevale, "The Learning Enterprise: A Report on the Size and Scope of Training", Training and Development Journal, 1986, pp. 18-26.

[3] David Kearns, CEO Xerox Corp. in W. Miller "Employers Wrestle with Dumb Kids", Industry Week, July 4, (1988)

[4] Unless there is also some factor which results in a downward bias in the coefficient. One possibility is that workers who receive OJT and then leave their employer are "worse" workers than even those workers who receive no training at all. Even if this is the case, this bias is not likely to offset the upward bias due to selection so this statement will still hold.

[5] The data for the training variables come from starting and ending dates of spells of training by source. These dates are given by month and year. In order to match this to the weekly employment and schooling histories I assume that all training commences and ends at the beginning of the month. In the case of a spell which has the same beginning and ending month I make the ending week the first week of the following month. If many spells of training were quite short in duration this approximation might be inadequate. However, all training spells that are measured in the NLS have to be a minimum of a month in duration to be observed. In addition, most spells of training for this sample are around six months in duration.

[6] R. Lester, Hiring Practices and Labor Competition, Princeton University Industrial Relations Section, 1954, p. 36.

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Table 1: Examples of Training Questions

Data:

Panel Study of Income Dynamics, 1976-1980

"On a job like yours, how long would it take the average person to become fully qualified?"

"Are you learning skills on the current job which could lead to a better job or promotion?"

National Longitudinal Survey, Young & Older Mens and Young Women Cohorts

"Do you receive or use additional training (other than schooling training) on your job?"

"What was the longest type of training you have had since the last interview?"

Current Population Survey, Jan. 1983

"What training was needed to get the current or last job and what training is needed to improve skills on current job?"

Employment Opportunity Pilot Project Survey - Individuals

"Describe up to 4 training events occurring between Jan 1, 1979 and the interview date in 1980 (approx 1 1/2 years)"

EOPP - Employer survey

"Number of hours typically spent by a new employee in the position last filled watching other people doing the job rather than doing it himself during the first 3 months of employment"

"Number of hours a new employee in the position spends in formal training"

NLS Youth Cohort

"In addition to your schooling, military and government-sponsored training programs, did you receive any other types of training for more than one month?"

"Which category best describes where you received this training?"
(Questions asked for up to 3 types of programs per survey year)

Table 2: Mean Sample Charateristics (unweighted)

Variable	All	White Males	White Females	Nonwhites
Wage 80	$3.93	$4.36	$3.56	$3.80
Wage 83	$5.10	$5.73	$4.67	$4.68
No. with On-the-job Train	134	79	40	15
No. with Off-the-job "	462	181	192	89
No. with Apprenticeship	55	42	9	4
Duration of OJT	30.72	34.18	25.00	27.73
Duration of OFF	40.69	43.38	39.71	38.43
Duration of APPT	63.11	74.05	18.78	48.00
No. of observations	3183	1373	1144	666

Variable Name		Variable Name	
Male	55%	1983 Unemployment Rate	9.89%
Black	21%	SMSA	72%
School	12.12 years	Healthy	95%
Tenure in '83	101.11 wks	Married	30%
Work experience	192.89 wk		

Table 3: Probits for the Probability of Receiving Training by Type by 1983
T-Statistics in ()

Variable	Off-the-Job Probit	On-the-Job Probit	Apprentice Probit
Constant	-2.26	-5.04	-6.73
	(-7.79)	(-8.54)	(-7.65)
Male	-0.31	0.55	1.28
	(-3.10)	(2.89)	(3.58)
Black	-0.08	-0.69	-1.28
	(-0.61)	(-2.42)	(-2.41)
Tenure	-0.002	-0.001	-0.001
	(-2.50)	(-1.00)	(-0.50)
Work Experience	0.001	0.008	0.002
	(0.80)	(3.50)	(0.66)
High School	0.66	0.38	0.79
	(4.71)	(1.52)	(2.06)
Incomplete College	0.39	0.44	0.30
	(2.44)	(1.54)	(0.60)
College	-0.22	0.43	-0.35
	(-0.63)	(0.89)	(-0.33)
Union	0.02	0.77	0.89
	(0.14)	(3.85)	(2.87)
Unemployment Rate	0.02	-0.06	-0.02
	(1.23)	(-2.00)	(-0.50)
Marry	-0.04	0.42	-0.007
	(-0.36)	(2.21)	(0.02)
Turnover	0.01	0.02	0.12
	(0.50)	(0.66)	(3.00)
Log Likelihood =	-1294.35	-521.41	-251.12

Number of observations = 3183

Table 4: Determinants of log wages at 1983 interview date (All=3183)

Variable	Eq. 1	Eq. 2	Eq.3	Eq. 4
Tenure (wks)	0.0006 (5.63)	0.00067 (5.95)	-	0.00046 (2.16)
Tenure-wks train	-	-	0.00067 (5.95)	-
Work experience (wks)	0.0018 (11.72)	0.0017 (11.41)	0.0017 (11.41)	0.0018 (8.03)
Prev. off-job training (wks)	-	0.002 (3.36)	0.002 (3.36)	0.002 (3.21)
Prev. on-job training (wks)	-	-0.0005 (-0.31)	-0.0005 (-0.31)	-0.0006 (-0.65)
Prev. Apprentice (wks)	-	0.004 (2.83)	0.004 (2.83)	0.004 (2.71)
School (years)	0.04 (9.13)	0.04 (8.93)	0.04 (8.93)	0.04 (7.84)
Current off-job train (wks)	-	0.00 (0.02)	0.00 (0.02)	-0.0003 (-0.31)
Current on-job train (wks)	-	0.0026 (2.17)	0.003 (2.73)	0.0026 (1.88)
Current Apprentice (wks)		0.002 (1.69)	0.002 (2.36)	0.002 (1.58)
Off-job Training Dummy (if OFF then=1)		-0.002 (-0.08)	-0.002 (-0.08)	-0.79 (-1.30)
On-job Training Dummy (if OJT then=1)		0.05 (1.05)	0.05 (1.05)	0.23 (0.85)
Apprentice Dummy (if APPT then=1)		0.07 (0.83)	0.07 (0.83)	0.07 (0.63)
Lamda1 (OJT probit)				-0.08 (-0.67)
Lamda2 (OFF probit)				0.43 (1.30)
R squared	.256	.27	.27	.27

Other variables included in estimation - constant, local unemployment rate, number of job changes, and dummies for SMSA, male, nonwhite, health, married, and union.

Table 5: Predicted Hourly Wage by Selected Characteristics

Case 1.)	White, male, average characteristics*:	
	no training:	$5.88
	6 months of off-the-job training:	6.19
	6 months of OJT from current employer:	6.69
	1 additional year of schooling:	6.13
Case 2.)	Nonwhite, male, average characteristics:	
	no training:	$5.43
	6 months of off-the-job training:	5.71
	6 months of OJT from current employer:	6.17
	1 additional year of schooling:	5.65
Case 3.)	White, female, average characteristics:	
	no training:	$4.99
	6 months of off-the-job training:	5.24
	6 months of OJT from current employer:	5.66
	1 additional year of schooling:	5.19
Case 4.)	Nonwhite female, average characteristics:	
	no training:	$4.60
	6 months of off-the-job training:	4.84
	6 months of OJT from current employer:	5.23
	1 additional year of schooling:	4.79

*where average characteristics are single, high school graduate, 2 years of tenure on the job, 4 years of work experience, local unemployment rate of 9.9%, living in inner city, healthy, not covered by a collective agreement, and one job change since finishing school.

Table 6: Determinants of log wages at 1983 interview date

Variable	White males N=1373	White females N=1144	Blacks N=666	Union N=573	Nonunic N=2610
Tenure (wks)	.0005	.0007	.001	.0007	.0006
	(2.73)	(4.32)	(4.02)	(3.13)	(5.06)
Work experience	.002	.001	.001	.001	.002
	(8.99)	(5.66)	(3.46)	(3.72)	(10.76)
Prev. Off-job T	.001	.002	.004	-.001	.002
	(0.85)	(2.54)	(2.63)	(-0.89)	(3.75)
Prev. OJT	-.001	-.001	-.001	-.001	-.001
	(-0.54)	(-0.17)	(-0.28)	(-0.52)	(-0.51)
Prev. APPT	.003	-.016	.008	.002	.006
	(1.59)	(-0.68)	(2.27)	(1.08)	(1.71)
School	.04	.043	.03	.04	.04
	(5.80)	(6.12)	(2.92)	(3.31)	(8.40)
Current Off-job Training	-.003	.001	.0002	-.004	.001
	(-1.75)	(1.33)	(0.12)	(-1.74)	(0.71)
uncomplete current OJT	.003	.003	-.005	.001	.003
	(1.44)	(1.20)	(-0.57)	(0.31)	(1.71)
completed current OJT	.001	.002	.016	-.003	.005
	(0.69)	(0.24)	(0.84)	(-0.86)	(2.21)
uncomplete current APPT	.0006	-.05	-	-.001	.004
	(0.43)	(-1.41)		(-0.79)	(2.19)
completed current APPT	.00	-.007	-	-.002	.003
	(0.00)	(-0.34)		(-0.88)	(1.75)
OFF Dummy	.04	-.004	-.04	.11	-.02
	(0.83)	(0.10)	(-0.62)	(1.56)	(-0.68)
OJT Dummy	.07	.03	-.02	.05	.09
	(1.10)	(0.29)	(-0.07)	(0.58)	(1.55)
APPT Dummy	.21	.15	-.46	.42	-.10
	(1.94)	(0.29)	(-1.77)	(2.96)	(-0.91)
R squared	.29	.22	.23	.31	.22

Other variables included in estimation - constant, local unemployment rate, number of job changes, and dummies for SMSA, male, nonwhite, health, married, and union.

Table 6 cont. Determinants of log wages at 1983 interview date

Variable	Less than H. School N=766	High school N=1857	More than H. Schoo N=899
Tenure (wks)	.0004	.0008	.0006
	(1.81)	(5.95)	(2.64)
Work experience	.0016	.0015	.002
	(5.36)	(7.72)	(6.97)
Prev. Off-job Train	.003	.002	.003
	(1.96)	(2.54)	(2.46)
Prev. OJT	-.006	-.002	.001
	(-1.18)	(-0.99)	(0.55)
Prev. APPT	-.005	.004	.007
	(-0.94)	(2.13)	(2.30)
Current Off-job Training	-.003	-.0005	.001
	(-1.04)	(-0.46)	(0.95)
uncomplete current OJT	-.006	.003	.003
	(-1.25)	(1.66)	(1.45)
completed current OJT	.003	-.0005	.008
	(1.18)	(-0.22)	(1.13)
uncomplete current APPT	-.002	.001	.004
	(-0.58)	(1.00)	(1.55)
completed current APPT	-	.001	.04
		(0.80)	(1.33)
OFF Dummy	.03	-.0004	-.06
	(0.44)	(-0.01)	(-0.93)
OJT Dummy	.06	.11	-.03
	(0.53)	(1.81)	(-0.30)
APPT Dummy	.47	.09	-.19
	(2.52)	(0.95)	(-0.92)
R squared	.24	.30	.21

Other variables included in estimation - constant, local unemployment rate, number of job changes, and dummies for SMSA, male, nonwhite, health, married and union.

Table 7 Fixed Effects estimates of the change in log wages 1980-83

Variable	All	White males	White females	Blacks	Union	Nonunion
ΔWexp	.00001	.00002	.000008	.000008	.00001	.00001
	(5.87)	(5.30)	(2.25)	(1.46)	(2.76)	(5.09)
Uniond1	-.0003	-.0007	-.0003	.0004		
	(-1.23)	(-1.71)	(-0.59)	(0.74)		
Uniond2	.0007	.001	.0007	.0001		
	(2.66)	(2.98)	(1.61)	(0.21)		
Uniond3	-.002	-.002	-.001	-.0006		
	(-7.28)	(-6.42)	(-3.46)	(-1.24)		
Δ Turnover	-.00006	-.0001	.000002	.0001	-.0001	-.00005
	(-1.48)	(-2.44)	(0.04)	(0.92)	(-0.87)	(-1.07)
Δ Previous OJT	-.00001	-.00001	.00	-.00006	-.00005	.000003
	(-0.49)	(-0.43)	(0.01)	(-1.06)	(-1.39)	(0.14)
Δ Previous OFF	.00003	.00003	.00003	.00007	.00007	.00004
	(5.30)	(2.37)	(3.46)	(4.08)	(3.57)	(4.91)
Δ Previous APT	.00004	.00004	.0001	-.0002	.00002	.00006
	(2.61)	(2.62)	(1.44)	(-1.40)	(1.56)	(2.14)
Δ Present OJT	.000003	-.000002	.00001	.00001	-.00001	.00001
	(0.29)	(-0.16)	(0.85)	(0.19)	(-0.39)	(0.50)
Δ Present OFF	.000002	-.000003	-.000002	.000002	.00	-.000004
	(0.30)	(-0.21)	(-0.20)	(1.07)	(1.92)	(-0.48)
Δ Present APT	.00001	.00001	-.0002	-.0008	.00001	.000002
	(0.92)	(0.80)	(-1.67)	(-1.38)	(1.27)	(0.15)
Δ Tenure	.000004	.000004	.000005	.000006	-.000001	.000006
	(3.52)	(1.89)	(2.81)	(1.92)	(-0.35)	(4.12)
R squared	.06	.09	.05	.05	.05	.04

Table 7 cont. Fixed Effects estimates of the change in log wages 1980-83

Variable	Less than H. School	High School	More than High School
ΔWexp	.00001 (3.31)	.00001 (4.19)	.00001 (2.46)
Uniond1	-.0004 (-0.62)	-.0001 (-0.34)	-.0007 (-0.96)
Uniond2	.0006 (1.10)	.0009 (2.63)	.0001 (0.27)
Uniond3	-.002 (-3.39)	-.002 (-6.58)	-.001 (-2.63)
ΔTurnover	-.0001 (-1.05)	-.0001 (-1.76)	-.0001 (-0.97)
ΔPrevious OJT	.00001 (0.18)	-.00002 (-0.73)	.000005 (0.12)
ΔPrevious OFF	.00005 (2.98)	.00005 (5.40)	.00002 (1.56)
ΔPrevious APT	.00007 (1.59)	.00004 (2.06)	.00003 (1.20)
ΔPresent OJT	.00001 (0.66)	.00 (0.04)	-.000003 (-0.14)
ΔPresent OFF	.00002 (0.69)	.00 (0.0)	.000004 (0.28)
ΔPresent APT	-.00002 (-0.76)	.00001 (1.26)	.00001 (0.44)
ΔTenure	.000002 (0.70)	.000005 (3.05)	.000004 (1.52)
R squared	.06	.08	.03