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ABSTRACT

This document discusses some dimensions of post-school training in the United States--who gets trained, what are the types of training, who provides it, and how training affects subsequent labor market outcomes. An introduction discusses reasons for the research questions and the reliability of existing reported measures of training. An overview describes the most important data sources which contain self-reported training measures and the limitations of this information. The overview also contains a broad description of who gets trained, by whom, the types of training provided, and estimates of how much training is provided. The determinants of training are taken up in the next section. The determinants investigated include educational attainment, industrial rates of technical change, labor market experience, race, union membership, and labor market conditions. The final section addresses the effects of training on earnings, earnings growth, and employment stability. The document includes a 30-item bibliography and an appendix with five tables. Twenty other tables appear in the text. (CML)

PRIVATE SECTOR TRAINING IN THE UNITED STATES: WHO GETS IT AND WHY

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INTRODUCTION

In recent years, there has been growing interest in private sector training in the United States, motivated in large part by concerns about the productivity slowdown, technological change, structural change, and the changing demographics of the labor force. Many, especially in the popular press, have advocated policies for increased training as a solution to the perceived loss of U.S. international competitiveness, to projected future skill shortages in the baby bust years, and to the disadvantaged economic status of minorities and women. This training debate, however, has been based on relative little scientific knowledge of how much job training actually takes place in the U.S. economy, what kinds of training are received by different groups, and why. Even less is known about trends in training over time, or whether declining postschool training investments contributed to the productivity slowdown of the past two decades.

Surprisingly, information on postschool training needed to address some of these questions has been available in a number of surveys for some time. However, until recently, it has rarely been exploited by the labor economists.[1] In part, this reticence is attributable to the widely-held perception that available survey data on training are unreliable, and that only the most memorable (formal) kinds of training are reported while potentially more important forms of informal on-the-job training (OJT) are ignored. To date, little effort has been made to assess the reliability of reported training measures, or their usefulness in labor market research. One consequence is that most tests of the predictions of human capital theory have been indirect, using education, years of labor market experience, and job tenure as proxies for unobserved training.[2] The continued reliance in the literature on training proxies precludes a better understanding of the empirical correlates of training and its effects which can only come from using actual measures of training taken.

The objective of this paper is to sketch out some of the most important dimensions of postschool training in the U.S.--who gets training, of what types and from which sources, and how training affects subsequent labor market outcomes--using currently available data. I draw heavily on earlier work (Lillard & Tan, 1986), in which training information was assembled from nationally reported data sources: the 1981 Current Population Survey (CPS) and three National Longitudinal Surveys (NLS). These data sources are used to paint a broad brush picture of postschool training distributions in the U.S. labor market. We pursue the analysis of training determinants by source, such as company programs or business and technical schools, and investigate their sensitivity to technological change and labor market conditions. Finally, we examine the labor market outcomes of training for a sample of CPS men and NLS young men. Many of the hypotheses examined here are guided by other developments in human capital theory; others, such as the postulated relationships between private sector training, technological change, and local labor market conditions, are tests of hypotheses developed previously by the author (Tan, 1980; Tan 1986; and Lillard, 1985).

How reliable are reported measures of training, and what can be learned from them? In the first place, these measures clearly understate how much training actually goes on by failing to report more informal kinds of training. In one survey which comprised a more comprehensive set of training questions, informal OJT was found to be as prevalent as training in formal company programs. This caveat notwithstanding, a remarkably consistent picture of more formal kinds of training emerges from our comparison of the different surveys. Patterns of training observed in the data--by source, by demographic group, and over the life cycle--are broadly consistent with the predictions of human capital theory. Systematic differences in training propensities by race and sex are found, even controlling for a wide range of other correlates. Particularly striking are findings which suggest that rapid rates of technical change in an industry are associated both with increased in-house company training and a diminished reliance on training from outside sources, and with higher returns to schooling. Indeed, as the rest of the paper demonstrates, analysis of reported training measures can yield important new insights into many aspects of labor market behavior.

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[1] A number of earlier studies have used these training measures but typically only as control variables to better measure the effects of school attainment or curriculum (for example, see Grasso & Shea, 1979; Meyer & Wise, 1982; Tannen, 1984); training *per se* has seldom been the focus of their analyses.

[2] The notable exception has been in evaluation studies of government training programs, for which there is a large body of literature.

The second section describes the four surveys used in the paper and provides a broad overview of the amounts and sources of training obtained by different groups. The main hypotheses to explain decisions to take (or give) training are also described there. In Section III, selected probit estimates of the most important determinants of training by source are presented. In Section IV, the effects of training on a number of labor market outcomes--earnings and the probability of unemployment--are explored for males in the CPS and for NLS young men. A limitation of the results reported here is the treatment of training as exogenous. The concluding section summarizes the main findings and highlights areas for future research.

AN OVERVIEW

In this section, we describe the most important data sources which contain self-reported training measures, and the richness and possible limitations of this training information. These data are then used to paint a broad-brush picture of who gets postschool training, from which sources and of what types, and how much.

Sources Of Training Data

Self-reported information on training is currently available from a number of data sources, including the Current Population Survey (CPS) and the National Longitudinal Surveys (NLS). The CPS, which surveys a nationally representative sample of the non-institutional population, implemented a special supplement in January 1983 to elicit information on job tenure and training. Panel data on training and labor market experiences of four NLS age cohorts (young men, young women, women, and mature men) are available for the period from 1966 to 1980. The new NLS youth surveys, beginning in 1979, also contain training information that is in many ways more detailed than earlier surveys. However, the youth surveys are not included in the training analyses reported here.

Training information is also available in the Panel Survey of Income Dynamics (PSID), and has been analyzed by Mincer (1988). However, PSID training measures are not directly comparable to those described above. First, the training question is not directed specifically at the respondent but rather at how long it would take the average person to become fully qualified in that job. In the other surveys, the respondent is asked whether he (or she) got training. More importantly, unlike the CPS and NLS, no information is elicited on the sources or types of training. As will become apparent in subsequent sections, these are critical dimensions of postschool training--the correlates and labor market effects are very different depending upon the source and type of training.

Each data set has several important features which make it unique. Each survey asks a different but overlapping set of training questions, with more detail on certain kinds of training in some (informal OJT in the CPS and types of training in the NLS) than in others. The relevant reference period for training also differs both within and across surveys: fixed intervals in the NLS (ranging from one to five years), and a variable interval (years on the current job) for the CPS.

The CPS asked about training needed to get the respondent's current or last job, and about training to improve skills on the current job. Thus, the reference job may have begun many years ago or as recently as the past month. To mitigate potential recall errors, the sample is restricted to individuals entering the current job since 1959. The CPS questions on training to improve skills refer to the period implied by the phrase "since you obtained your present job." In the analysis of training propensity, we will want to control for this since the individual is exposed to increased training possibilities the longer the time spent on the current job. Fortunately, the survey includes information on years of job tenure. Finally, the CPS questions permit multiple responses about sources of training, with a response given for each training source.

The NLS asked about training taken since the last interview, a fixed period of time. However, the interval may be of varying length (one, two, or five years) depending on the date of the last interview. As such, we use subsamples based on the length of the reference period, pooling data for reference periods of the same length. Furthermore, because the person may have changed jobs during the interval, been unemployed and so forth, we will want to control for job changes or entry and exit from the labor force when they are known. Unlike the CPS, which allows multiple responses, the NLS training questions refer only to the

"longest" training event in the interval. Multiple training episodes are thus not adequately covered. This limitation is avoided in the more recent NLS youth surveys, where up to three training events are permitted. Multiple episodes of training in a one-year interval are not common in the youth surveys (at least in 1979 and 1980), which suggests that under-reporting in the NLS young men samples may not be a major problem. In any case, while only one event in an interval is known, there is information on multiple events for each person over the panel.

The substantive content of the training questions are broadly similar across surveys, with more detail in some than in others. The surveys first ascertained whether any occupational or job-related training had been taken (termed ANY). Then the CPS and NLS asked about the sources of training. By source, we mean where the training was obtained, whether from regular schools, company training programs, informal OJT, business and technical schools, or from "other" sources. The NLS then also asked about types of training. By type, we refer to the nature or content of training, which include managerial, professional and technical, clerical, semi-skilled manual, or "other" types of training. Unlike the other surveys, the CPS also elicited information on the sources of training that respondents felt were important in getting the current or last job. It is unclear whether this refers to training from prior jobs (or schools), or to entry-level training in the current job. This definitional ambiguity is reflected throughout the paper.

With these differences in the form and scope of training questions in mind, we next describe the most important dimensions of postschool training distributions revealed in the CPS and the NLS surveys.

Who Gets Training

Table 2.1 summarizes the scope and sources of private sector training in these four surveys. It should be kept in mind that these are more formal dimensions of training and that, with the exception of the CPS, more informal training and learning on the job are covered less adequately.

Consider the prevalence of training in fixed-length intervals in the three NLS cohorts. These values are reported in panel A for young men, mature men, and women with varying degrees of attachment to the labor force. Several points are noteworthy. First, the proportion reporting any training varies considerably among the three cohorts, in part reflecting changes in training propensities over the life-cycle predicted by human capital theory (Ben-Porath, 1967). This is evident from comparisons of training taken in a two-year interval. Young men and career women (who always worked throughout the 12-year panel) are the most likely to receive any training--30 percent and 24 percent, respectively--which is more than twice that of mature men (10 percent). Second, striking differences are found in the kinds of training received by different groups. In particular, compared to both young and mature men, a smaller fraction of career women report getting company training, and the most prevalent source of training is of the unspecified "other" category. Finally, compared to career women, women who do not work (except possibly once) report very little training; these tend to be from the miscellaneous "other" sources. Women with low labor force attachment report training patterns that fall somewhere in between.

TABLE 2.1
PREVALENCE OF TRAINING IN THE U.S. BY SOURCE

	Survey Sample	ANY	SOURCE OF TRAINING				
			Regular School	Company Training Programs	On-the-Job Training	Business Technical Schools	Other Training
A.	NLS[1]		Longest training event since last survey				
	Young Men						
	1 Yr	24.3	3.6	7.6	n.a.	3.7	9.4
	2 Yr	29.7	5.2	10.4	n.a.	5.2	9.0
	Mature Men						
	2 Yr	10.2	n.a.	3.3	n.a.	.4	6.4
	5 Yr	17.2	n.a.	5.6	n.a.	1.0	10.6
	Women (Always Work)						
	1 Yr	22.9	n.a.	3.6	n.a.	1.1	18.1
	2 Yr	23.7	n.a.	3.2	n.a.	1.3	19.2
	5 Yr	36.1	n.a.	7.6	n.a.	2.9	25.6
	Women (Works Intermittently)						
	1 Yr	16.3	n.a.	3.0	n.a.	.8	12.6
	2 Yr	20.1	n.a.	1.6	n.a.	.6	17.9
	5 Yr	31.1	n.a.	4.0	n.a.	3.6	23.4
	Women (Never Worked)						
	1 Yr	6.6	n.a.	.1	n.a.	.2	5.3
	2 Yr	5.0	n.a.	.0	n.a.	.5	4.5
	5 Yr	10.7	n.a.	.5	n.a.	1.0	9.2
B.	CPS		Training needed to get the current job (Working at the time of survey)				
	Men	55.5	22.2	11.7	30.8	n.a.	8.5
	Women	55.0	27.9	7.5	26.0	n.a.	2.7
			Training to improve skills on the current job (Working at the time of survey)				
	Men	38.0	13.6	11.6	15.1	n.a.	5.4
	Women	36.7	10.3	13.1	15.1	n.a.	4.5

[1] Intervals refer to time since last survey in the NLS.

Panel B indicates that more than half of all CPS men and women reported some training to get their current or last job.[3] While the overall proportions were the same, women were more likely to cite regular schools and men tended to cite company training, OJT and other sources as being important. Nearly forty percent of both men and women in the CPS report getting training to improve skills on their current job. Regular schools, company training, and on-the-job training each are reported ten to fifteen percent of the time as a source of training.[4] Traditional schools appear to be an important continuing source of job training for workers who have completed formal schooling. The marked male/female differences in company training reported in the NLS are not found here--CPS women are as likely as men to report training source--but differences in training questions, the reference period, and demographic composition may account for this discrepancy. Finally, the table indicates that informal training (OJT) is as common as (if not slightly more prevalent than) training from formal company programs. It is clear that the NLS training measures understate how much training actually goes on by failing to report informal OJT.

Training in the Current Population Surveys

Tables 2.2 through 2.5 provide an overview of the distribution of postschool training in the employed labor force in 1983. Training distributions are summarized separately for CPS men and women, by the level of schooling attainment and race, for broad one-digit occupations and industries, and by the rate of total factor productivity growth in the two-digit industry of current employment.

Table 2.2 shows the proportion of the labor force reporting any entry-level training and training to improve skills, separately by sex, level of educational attainment, and race. It also shows the fraction that get this training from the employer, either in company training programs or through informal OJT. Several relationships are clear from panels A and B. First, the proportion of men and women getting entry- level training and skill upgrading rises continuously with years of schooling completed. For entry-level training, this figures ranges from between 27 and 32 percent for non-high school graduates to over 90 percent for the most highly educated. A similar relationship is found for training to upgrade skills, though at a somewhat lower level. Second, entry-level training from in-house sources also rises with schooling, but to a peak for the group with some college. In the case of skill-upgrading, the proportion peaks for college graduates; those with a post-graduate degree are less likely to report getting training in-house. Thirdly, men at every schooling level are more likely to report getting training from in-house sources than women, who tend to get it from schools and other sources (not shown here).

Panel C of Table 2.2 highlights the presence of important black/white differences in postschool training, both entry-level and for skill upgrading. For black men, 39 and 26 percent report getting these two kinds of training; the corresponding figures for white males are 56 and 38 percent, respectively. While black/white differences in training are also found among women, they are of a substantially smaller order of magnitude. In Section II, when we control for education and other factors, female black/white differentials in training probability disappear altogether; for men, however, significant differences persist.

The distributions of training by broad occupational groups are reported on Table 2.3, separately by males and females and by entry-level training and training to upgrade skills. Among white-collar occupations, professional and technical workers report getting the most training, followed by those in administrative and managerial jobs; those getting the least training are in service occupations. Among blue-collar occupations, craft and precision workers get the most training, followed by machine operators; those reporting the least training are, not unexpectedly, low-skill farm operators and laborers. Given the well-known association between education and occupation on one hand, and the relationship between training and education reported earlier in Table 2.1 on the other, these observed rankings by occupation were not unexpected.

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[3] The CPS and NLS training figures are not directly comparable. CPS figures are cumulative training probabilities over time on the current job, which can reach 40 years for older persons.

[4] 16.5 percent of men and 14.9 percent of women reported multiple sources of training to improve skills. Company training and OJT were the most frequent multiple source reported.

TABLE 2.2
PERCENT GETTING TRAINING BY EDUCATION AND RACE--CPS MEN AND WOMEN

Sex Education Race	Training Needed to Get Current Job		Training to Improve Job Skills	
	Any Training	Company+OJT	Any Training	Company+OJT
A. Males				
ED<12	32.5	27.2	18.8	12.9
ED=12	46.7	37.7	30.5	20.7
13<=ED<=15	58.7	44.2	43.4	27.3
ED=16	76.9	42.5	50.9	31.7
ED>16	90.6	32.0	61.9	25.5
B. Female				
ED<12	26.9	22.4	17.2	12.3
ED=12	45.8	31.1	29.8	19.8
13<=ED<=15	63.2	36.3	42.3	25.4
ED=16	79.3	32.0	49.6	27.1
ED>16	90.8	27.0	65.2	21.9
C. Race/Sex				
White males	56.8	38.0	38.8	23.2
Black males	38.6	26.0	25.9	14.8
White females	55.7	31.3	35.9	21.4
Black females	46.7	27.2	34.4	18.8

TABLE 2.3
TRAINING BY OCCUPATION

1-Digit Occupation	Training to Get Job					Training to Upgrade Skills				
CPS MEN	Any	School	Company	OJT	Other	Any	School	Company	OJT	Other
Admin./Managerial	74.7	44.7	14.1	40.7	8.6	49.8	17.9	19.4	14.9	8.9
Professional/Technical	92.7	76.0	11.5	26.2	8.5	61.7	30.5	17.3	15.5	12.8
Sales	50.5	16.7	15.0	32.7	6.8	40.7	8.8	19.4	15.7	5.7
Clerical/Support	44.2	14.4	10.6	26.7	5.1	37.5	7.1	13.8	20.0	3.5
Services	35.6	8.3	10.7	19.2	4.8	29.7	8.0	10.9	14.6	2.7
Farm Operators/Workers	29.0	7.0	1.1	16.4	12.9	20.3	7.7	2.1	6.3	6.3
Craft/Precision Workers	65.2	11.0	17.0	40.4	13.3	38.9	8.1	16.2	17.2	3.2
Machine Operators	43.2	6.7	8.4	29.8	4.7	26.6	5.2	5.4	16.5	1.4
Transport Workers	37.7	1.3	6.6	27.3	8.4	16.9	1.6	5.3	9.3	1.4
Laborers	15.3	1.2	1.5	11.8	2.1	14.9	1.7	2.9	9.8	0.8
CPS WOMEN										
Admin./Managerial	68.3	36.7	10.6	39.8	3.7	49.9	17.6	17.9	17.3	9.5
Professional/Technical	92.4	74.3	9.3	19.7	2.9	63.8	35.4	16.3	16.0	9.4
Sales	36.1	7.2	8.6	24.9	3.0	29.1	4.9	10.4	15.8	2.9
Clerical/Support	60.7	32.2	6.0	32.4	2.4	33.5	10.8	9.5	14.6	3.1
Services	35.0	7.3	7.7	17.6	1.7	24.0	5.1	5.9	12.2	3.2
Farm Operators/Workers	26.2	6.7	1.3	16.1	6.7	14.1	2.2	0.0	8.0	3.6
Craft/Precision Workers	45.7	7.3	9.8	29.0	8.2	31.1	5.6	8.4	17.7	1.4
Machine Operators	29.5	1.3	3.1	24.0	2.4	19.5	1.4	2.5	15.5	1.1
Transport Workers	53.8	0.9	17.9	33.3	5.1	44.9	5.1	18.2	17.2	5.1
Laborers	15.6	0.5	1.0	14.6	0.5	17.2	1.1	3.4	13.1	0.6

Source: January 1983, CPS

A breakdown of training by source reveals two other noteworthy points. First, Table 2.3 indicates that most of the entry-level and subsequent skill upgrading training is concentrated among white collar workers; only among craft and precision workers and machine operators do levels of training approach those of white-collar workers. A second point is that, unlike white-collar occupations, those in blue-collar occupations get relatively little additional training from schools; most entry-level training and skill upgrading is gotten from in-house company sources, in particular through informal OJT. For reasons that are not immediately apparent, a high proportion of women in transport occupations report getting training from company and informal OJT sources.

Table 2.4 shows the training distributions reported by male and female workers in broad one-digit industries. On closer scrutiny, several broad patterns of training by industry emerge. In general, for both male and female workers, industries with low levels training are agriculture, forestry and fishing, non-durable manufacturing, and retail. Industries with a great deal of training include durable manufacturing, transportation, communications and utilities, finance, insurance and real estate, professional services, and public administration. Looking at training by source, a fairly high proportion of both male and female workers report getting informal OJT, typically between 20 and 35 percent for entry-level training, and between 10 and 20 percent for training to upgrade job skills. Formal company training and training from schools appears to exhibit greater variation across industries than informal OJT, and is most common in durable manufacturing; transport, communications, and utilities, finance, insurance and real estate, and public administration.

These aggregate tabulations, while useful, are nonetheless not very illuminating. Durable manufacturing, for example, includes both industries that (for want of a better term) are "high tech" and "low tech". Table 2.5 examines training distributions at the two-digit industry level, using as our metric Gollop

TABLE 2.4
TRAINING BY INDUSTRY

1-Digit Industry	Training to Get Job					Training to Upgrade Skills				
CPS MEN	Any	School	Company	OJT	Other	Any	School	Company	OJT	Other
Agri.,Forest., Fishing	30.8	8.4	0.9	16.1	13.9	22.7	9.2	2.3	6.6	6.7
Mining	58.5	16.4	11.5	41.0	5.2	37.5	5.6	18.8	17.2	3.3
Construction	57.8	10.0	12.3	39.2	12.3	26.4	7.9	5.6	12.9	3.1
Manufacturing: durables	56.1	21.1	11.3	33.1	7.2	37.3	10.4	13.7	17.0	3.6
Manufacturing: nondurables	48.9	18.6	9.3	30.9	4.4	34.1	8.3	11.6	16.3	3.8
Trans., Comm., Utilities	53.1	12.9	17.1	28.9	9.9	39.5	5.6	20.6	16.8	3.4
Wholesale	47.1	16.8	11.5	30.4	6.9	36.6	7.6	16.7	14.7	4.2
Retail	37.9	8.2	7.6	26.4	4.8	27.6	3.7	10.1	13.7	3.2
Finance, Ins., Real Estate	70.2	35.1	23.8	33.4	6.9	53.6	16.6	26.9	18.2	7.6
Non-prof. services	59.6	19.6	11.2	35.4	12.0	28.6	7.2	8.2	11.5	5.6
Professional services	77.1	61.1	8.6	21.7	6.1	55.2	29.8	11.1	12.2	11.7
Public Administration	72.7	34.7	20.7	31.1	14.4	65.6	22.9	32.3	24.2	7.9
CPS WOMEN										
Agri., Forest., Fishing	33.0	14.8	1.1	18.2	7.4	15.6	4.3	0.6	7.4	3.7
Mining	71.7	35.0	5.0	41.7	1.7	23.5	7.8	2.0	13.7	3.9
Construction	56.4	37.8	5.8	28.2	5.8	20.0	11.0	2.9	5.9	2.9
Manufacturing: durables	43.2	14.4	5.5	27.3	1.3	32.1	8.0	8.2	17.2	2.0
Manufacturing: nondurables	38.1	12.1	3.5	25.3	1.9	19.9	4.3	3.2	12.0	1.8
Trans., Comm., Utilities	57.2	19.8	15.3	32.5	3.3	45.6	9.5	21.4	19.0	3.7
Wholesale	53.5	25.1	2.4	36.0	2.4	21.8	7.5	4.2	11.8	1.3
Retail	30.8	6.7	4.1	22.3	2.7	21.2	2.7	5.2	13.3	2.0
Finance, Ins., Real Estate	65.7	26.5	13.1	39.5	2.5	46.4	13.6	19.6	18.5	5.5
Non-prof. services	53.6	19.0	9.4	24.7	4.2	28.1	7.3	6.0	12.5	6.3
Professional services	72.8	50.7	7.8	22.2	2.4	49.5	24.1	12.1	15.1	6.8
Public Administration	68.0	39.9	11.4	34.7	2.7	52.4	17.5	20.6	20.6	5.8

SOURCE:January 1983, CPS
NOTES:a. Absolute standard errors of probit estimates in parentheses.
b. In addition to variables in tables 2 through 4, the probit model includes controls for region, union membership, work experience, job

and Jorgenson's estimates of industry rates of total factor productivity growth (TFP).[3] It has been argued that the demand for educated and highly skilled workers is greater in those industries experiencing rapid technical change (see Tan, 1980; Tan, 1986; Bartel & Lichtenberg, 1985; Welch, 1970; Schultz, 1975). Because many skills required to manage and operate new technologies are not readily available outside the firm, employers must develop these skills in-house through company training programs and informal OJT.

In Table 2.5, male workers in the CPS are aggregated by the TFP growth rate of the industry of current employment; TFP in panel A refers to the 1947-73 period, and in panel B to the more recent 1973-1979 period. Training to improve skills is distinguished by whether training is acquired from in-house company sources (formal company training and informal OJT), or from outside sources such as schools or business and technical institutions. For reference, low TFP industries (with negative TFP growth) include construction, mining, primary metals, and service industries; average TFP industries (with positive growth less than 1 percent per annum) include paper products, printing and publishing, retail, and stone-glass products; and high TFP industries (growth greater than 1 percent) are industries such as electrical machinery, chemicals, motor vehicles, and photographic equipment.

TABLE 2.5
INDUSTRY RATES OF TFP GROWTH AND TRAINING TO IMPROVE SKILLS

Industry TFP Growth Rate (percent per annum)	Mean TFP	In-house Training	Outside Training
A. TFP Growth Rate 1947-73			
< 0.0	-.791	.2976	.0899
> 0 & < 0.5	.070	.2274	.2240
> 0.5 & < 1.0	.709	.1468	.2274
> 1.0 & < 1.5	1.287	.2225	.0892
> 1.5	2.469	.3661	.1457
B. TFP Growth Rate 1973-79			
< -0.5	-2.926	.2787	.1138
> -0.5 & < 0.0	-.374	.1907	.2737
> 0.0 & < 0.5	.094	.2395	.1075
> 0.5 & < 1.0	.576	.2774	.1163
> 1.0	2.537	.3841	.2246

Note: In-house and outside training are not mutually exclusive; some respondents receive training from both sources.

[3] The TFP estimates were developed by Gollop and Jorgenson (1980) for the 1947-73 period. The measures are derived from constant returns to scale translog production functions which included as inputs both quality adjusted indices of capital and labor and intermediate products. They are available for 45 two- and three-digit industrial groupings. The TFP figures for the more recent period were calculated from unpublished figures provided by the authors.

In panel A, it is difficult to see any systematic training pattern by industry TFP, except for the sample of workers in the mid to high TFP growth industries (over 0 5 percent per annum). For these workers, the proportion getting in-house company training rises from 14 percent to over 36 percent; conversely, training from outside sources generally falls in higher TFP industries. The lack of a strong relationship may, in part, be attributable to the fact that TFP measures pertain to a much earlier period (1947-73) than the 1983 CPS questions. In panel B, when TFP measures for a more recent period (1973-79) are used, the postulated relationships are stronger. Excluding those industries with the lowest TFP growth, the fraction reporting in-house training increases with TFP, from 19 percent in the low TFP industries to over 38 percent in the highest TFP industries. Interestingly, there is also some evidence of increased training from outside sources in the most technologically progressive industries.

A major limitation of the CPS is the cross-sectional nature of the data and the kinds of training questions asked. From the CPS questions, we can only infer whether any entry-level training or training to improve skills was received, but not how much or when this training occurred. For that information, we turn to the NLS young men survey where relatively complete training histories are available.

Training Among NLS Young Men

The length of the NLS young men allows us to examine training among young males over successively longer intervals of time. In Table 2.6, we report the cumulative probability of receiving any training between 1967 (or whenever the individual first began work as a major activity) and 1980, the last year of data collection. Each individual enters the calculation several times, until he either drops out of the sample or reaches the end of the longest interval of continuous participation in the panel. Separate figures are reported for selected sources and types of training.

The first row of Table 2.6 shows the cumulative probability of engaging in training other than from regular schools, over intervals several periods (survey years) long. In the first year after completion of full-time schooling, only about 14 percent of young men get some kind of training. This probability rises rapidly to over 50 percent by the fifth period in the labor market, and tapers off subsequently to about 67 percent by the ninth period. These patterns of training are consistent with life-cycle patterns of postschool training predicted by human capital theory (Ben-Porath, 1967).

The aggregate figures conceal important variations across different training sources and types. Some kinds of training are concentrated in the first few years in the labor market; others are acquired more gradually over time. For example, panel B reveals that the cumulative probability of receiving any company training rises steadily over time, to over 27 percent by the ninth year in the labor market. Over the same interval, about 20 percent report some training in business and technical schools, but most of the increase is concentrated in the first five years. Perhaps because these are skills useful to many firms, employers have few incentives to provide general training and individuals must get (and pay for) this training themselves prior to joining the firm or early in his career (Becker, 1975). In panel C, differences are also found by type of training. Professional and technical training (the most common type of training) tends to be concentrated early in the career. The probability of managerial training is low initially, but rises over time as might be expected if it takes a long time to acquire managerial rank. The cumulative probability of getting semi-skilled manual training over time lies somewhere in between the other two training types.

On Tables 2.7 through 2.10, we turn to the distribution of training events that each individual accumulates by 1980. Unlike Table 2.6, which "controls" for time in the labor market, these training figures on the tables average over the underlying distribution of work experience, and we seek to identify the most important worker and job attributes that are associated with multiple training events or, conversely, the absence of any training over an extended period of time in the labor force.

TABLE 2.6
CUMULATIVE PROBABILITY OF TRAINING
TAKEN OVER EXTENDED PERIODS OF TIME
BY SOURCE AND TYPE OF TRAINING

	Number of Potential Periods of Work								
	1	2	3	4	5	6	7	8	9
A. ANY TRAINING	13.8	27.5	40.3	48.4	54.1	56.0	61.5	64.8	67.0
B. SOURCE OF TRAINING									
Company	3.1	8.2	15.0	20.2	24.2	27.5	29.5	34.9	36.9
Business or Technical	1.7	7.2	10.8	13.1	15.1	15.9	17.7	18.5	19.7
C. TYPE OF TRAINING									
Managerial	.5	3.2	5.9	7.3	9.0	10.0	11.2	16.4	19.7
Professional Technical	2.2	17.8	27.3	32.6	38.8	38.8	40.8	43.7	46.8
Semi-Skilled Manual	5.4	7.9	11.4	15.0	19.1	21.0	23.5	25.3	26.2

SOURCE: NLS Young Men.

Table 2.7 presents distributions of training by major sources and types of training, for the total sample and separately by race. First, consider the total sample of young men. Reading across rows, we note that a fairly high proportion of young men (about 27 percent) report getting no training even after as many as 13 years in the labor market. Over 50 percent report getting between 1 and 3 training events; another 20 report in excess of 4 training events over this period. Among the sources of training, multiple training events are most common from company sources, and least common from regular schools and from vocational and technical institutes. Multiple training events are most commonly reported for professional and technical types of training, and to a lesser extent, for semi-skilled manual training. Repeated training is least likely for managerial training, but this may be due to the relative youth of the NLS sample.

Table 2.7 also highlights the presence of important race differences in the frequency of training, and in the sources and types of training received. Just over 23 percent of white male youth get no postschool training, as compared to 39 percent of non-whites. A chi-square test of no racial differences in training distribution is soundly rejected at the 1 percent level of significance. For the most part, statistically significant race differences are also found in training from company and regular school sources, and in managerial, professional and technical types of training. Only in training from vocational and technical schools, and in semi-skilled types of training, are race differences not found.

TABLE 2.7
DISTRIBUTION OF TRAINING EVENTS TAKEN BY 1980

Any Training Sources and Types	Race Groups	Distributions of Accumulated Training by 1980 0	1	2	3	4+	Chi-2 Test and Signif.
A. ANY TRAINING							
	Whites	23.6	20.3	18.7	13.5	23.7	
	Non-whites	38.9	23.3	16.0	9.8	11.8	
	Total	26.9	20.9	18.1	12.7	21.2	91.6 **
B. SOURCES OF TRAINING							
Company	Whites	61.2	20.4	8.7	4.8	4.7	
	Non-whites	72.8	17.9	4.8	2.7	1 6	
	Total	63.7	19.8	7.8	4.4	4.0	41.2 **
Voc-Tech Schools	Whites	77.8	15.3	4.7	1.4	0.6	
	Non-whites	79.8	14.5	3.5	1.3	0.7	
	Total	78.2	15.1	4.5	1.3	0.6	2.4
Regular Schools	Whites	74.7	17.7	5.6	1.4	0.4	
	Non-whites	82.6	13.3	2.7	0.7	0.4	
	Total	76.4	16.8	5.0	1.2	0.4	20.9 **
C. TYPES OF TRAINING							
Managerial	Whites	81.1	12.5	4.0	1.2	1.0	
	Non-whites	91.9	6.4	1.0	0.1	0.4	
	Total	83.4	11.2	3.3	1.0	0.8	47.8 **
Prof & Technical	Whites	55.7	22.3	11.8	5.6	4.3	
	Non-whites	75.6	14.5	4.9	3.2	1.6	
	Total	59.9	20.7	10.4	5.1	3.7	92.4 **
Semi-Skilled Manual	Whites	71.7	16.7	5.8	2.6	3.0	
	Non-whites	69.1	17.7	8.0	2.5	2.5	
	Total	71.2	16.9	6.3	2.6	2.9	5.8

SOURCE: NLS Young Men, 1980 survey

Plausibly, these differences reflect race differences in schooling attainment. To explore this possibility, Table 2.8 further disaggregates training by education for two major kinds of training-- training in company programs, and professional/technical types of training. For both whites and non-whites, increased schooling is associated with a greater likelihood of getting both kinds of training, and also with multiple training episodes. In both these dimensions of training, the least educated in both race groups--those not completing high school--are strikingly disadvantaged as compared to the others. Nonetheless, for those with

less schooling (up to and including those with some college), statistically significant race differences are found within each schooling group for both kinds of training. Only among college graduates and those with post-graduate degrees can we not reject the null hypothesis of no race differences. Mirroring the aggregate training patterns in Table 2.7, no race differences are found by level of schooling either in training from vocational and technical school sources, or in semi-skilled manual types of training (tabulations not reported here).

On Table 2.9, we revisit the issue of whether observed patterns of training are systematically related to rates of TFP growth in the industry of current employment. Here, however, we are interested not only in the likelihood of training by source but also the frequency of training. The table reports training distributions for two sources of training--company training programs and vocational and technical schools--corresponding (roughly) to firm-specific and general training. Distributions, presented separately for each schooling level, allow us to examine the auxiliary hypothesis that highly educated workers respond more readily to technological change (Welch, 1970). The hypothesis is that employers in industries experiencing rapid technical change are more likely to use highly educated workers and provide them with more technical training.

Several patterns emerge in panel A, which shows the distribution of company training by TFP growth and level of schooling. First, consider the fraction of workers getting no training. This figure declines with education much more rapidly in industries experiencing rapid technical change (TFP > 1.0) than in low TFP industries (negative TFP); in other words, the likelihood of company training rises more with education in high tech industries than in low tech industries. Note that 59 percent of college graduates in high TFP industries get some company training as compared to 51 percent in low TFP jobs, a difference that widens for those with postgraduate degrees. Also noteworthy is the higher proportion of non-high school graduates getting no company training in high tech industries (88 percent) as compared to low tech industries (84 percent). Finally, multiple episodes of company training are much more common in high tech industries, especially among the most educated. Between 11 and 14 percent of college graduates and those with post-graduate degrees report getting 4 or more training events; the corresponding figures for low tech industries range between 4 and 5 percent.

Thus far, we have focused on the question of who gets training. Who is not getting any training? Table 2.10 presents summary measures of the attributes of those with and without training of any kind, as well as those with and without company training. The latter group, it should be noted, may have training from sources outside the firm of current employment.

Echoing the patterns described in previous tables, the educational attainment of the group without training is heavily skewed towards the less educated. Of those getting no training, over 26 percent are non-high school graduates and 23 percent have a college degree or more. The corresponding figures for the group with some training--10 and 34 percent, respectively--are heavily weighted towards the highly educated. Though less pronounced, similar differences in schooling distributions are found for samples with and without company training. Blacks are over-represented in the groups without training, as are those from the South. No striking differences are apparent in years of work experience or job tenure of the different groups.

These differences in youth training experiences are reflected in their relative economic status in 1980. On average, those without any training are unemployed for about 2.4 weeks longer than those with some training (10.2 versus 7.8 weeks), differences that are repeated for those with and without formal company training. Sizeable differences in annual earnings and weekly wages are apparent, but this may reflect differences in the distribution of education (and race). The last few rows crudely control for differences in education between groups: with one exception, sharply lower within-education differences in weekly earnings still persist--weekly earnings are 3-4 percent lower for the least educated in the sample without training, rising to 15-25 percent for those with more education. The effects of training on these earnings (and unemployment) differences are taken up in greater detail in the section on the Labor Market Effects of Training.

TABLE 2.8

TRAINING SOURCE OR TYPE: Years of Schooling	Race	Distributions of Accumulated Training by 1980: 0	1	2	3	4+	Chi-2 Test and Signif.
A. TRAINING IN COMPANY PROGRAMS							
	Whites	49.7	24.4	9.6	7.8	8.3	
<12 yrs	Non-whites	60.4	22.9	11.4	4.1	1.0	
	Total	54.6	23.7	10.4	6.1	4.9	15.9 **
	Whites	24.7	20.6	18.7	12.2	23.6	
12 yrs	Non-whites	43.5	19.9	13.8	9.7	12.9	
	Total	29.0	20.4	17.6	11.6	21.2	32.3 **
	Whites	18.5	19.3	19.3	14.0	28.8	
13-15 yrs	Non-whites	23.5	27.3	21.0	9.5	18.4	
	Total	19.5	20.9	19.6	13.1	26.7	12.7 *
	Whites	21.0	18.6	19.9	15.3	25.0	
16 yrs	Non-whites	20.4	20.4	24.4	14.2	20.4	
	Total	20.9	18.8	20.4	15.2	24.5	0.9
	Whites	19.1	20.4	21.0	15.9	23.4	
>=17 yrs	Non-whites	10.6	28.7	18.1	24.2	18.1	
	Total	18.2	21.3	20.7	16.8	22.8	7.6
B. PROFESSIONAL/TECHNICAL TYPES OF TRAINING							
	Whites	89.9	8.3	1.3	0.4	0.0	
<12 yrs	Non-whites	95.8	4.1	0.0	0.0	0.0	
	Total	92.6	6.4	0.7	0.2	0.0	6.5 *
	Whites	68.9	18.2	7.8	2.8	2.0	
12 yrs	Non-whites	83.8	11.5	2.3	1.8	0.4	
	Total	72.3	16.7	6.5	2.6	1.7	20.5 **
	Whites	53.4	25.2	11.5	5.4	4.3	
13-15 yrs	Non-whites	67.5	22.9	4.4	3.1	1.9	
	Total	56.2	24.7	10.1	5.0	3.8	14.2 **
	Whites	44.4	24.5	16.4	9.7	4.8	
16 yrs	Non-whites	42.8	2[illegible]4	18.3	12.2	2.0	
	Total	44.2	24.5	16.6	10.0	4.5	1.2
	Whites	33.5	29.0	19.1	9.1	9.0	
>=17 yrs	Non-whites	33.3	27.2	19.7	10.6	9.0	
	Total	33.5	28.8	19.2	9.3	9.0	0.2

TABLE 2.9

Years of Schooling	Industry TFP 66-73	Distributions of Accumulated Training by 1980: 0	1	2	3	4+	Chi-2 Test and Signif.
A. COMPANY TRAINING PROGRAMS							
<12 yrs	TFP < 0%	83.7	10.4	4.0	1.1	0.5	
	TFP 0-1%	74.7	12.0	5.4	5.4	2.2	
	TFP > 1%	88.0	7.3	2.6	1.3	0.6	11.6
12 yrs	TFP < 0%	69.1	17.0	8.2	3.4	2.2	
	TFP 0-1%	57.9	25.7	6.8	5.5	3.8	
	TFP > 1%	69.8	17.7	5.6	2.0	4.7	19.4 *
13-15 yrs	TFP < 0%	56.0	23.9	11.0	4.8	4.0	
	TFP 0-1%	52.6	23.0	11.0	8.4	4.8	
	TFP > 1%	55.4	20.9	6.8	8.1	8.6	11.4
16 yrs	TFP < 0%	48.8	27.2	12.8	6.4	4.8	
	TFP 0-1%	44.3	28.4	12.5	6.8	7.9	
	TFP > 1%	40.7	24.4	11.6	8.1	15.1	7.6
>=17 yrs	TFP < 0%	62.9	23.4	6.5	3.2	3.7	
	TFP 0-1%	58.5	25.7	5.7	5.7	4.2	
	TFP > 1%	46.8	17.7	13.9	10.1	11.3	20.7 **
B. VOCATIONAL & TECHNICAL SCHOOLS							
>12 yrs	TFP < 0%	91.8	6.9	0.5	0.5	0.0	
	TFP 0-1%	87.9	8.7	3.3	0.0	0.0	
	TFP > 1%	90.0	8.0	2.0	0.0	0.0	4.5
12 yrs	TFP < 0%	73.3	16.1	7.0	1.9	1.4	
	TFP 0-1%	75.1	13.7	5.1	3.4	2.5	
	TFP > 1%	78.1	13.9	4.7	1.4	1.7	6.7
13-15 yrs	TFP < 0%	67.5	19.5	9.5	2.9	0.3	
	TFP 0-1%	76.5	15.0	5.7	2.2	0.4	
	TFP > 1%	70.4	20.4	7.2	1.3	0.4	7.3
16 yrs	TFP < 0%	81.6	16.0	0.8	1.6	0.0	
	TFP 0-1%	77.2	18.1	4.5	0.0	0.0	
	TFP > 1%	88.3	10.4	1.1	0.0	0.0	9.3
>=17 yrs	TFP < 0%	76.5	16.4	5.7	0.8	0.4	
	TFP 0-1%	80.0	18.5	1.4	0.0	0.0	
	TFP > 1%	74.6	20.2	3.8	1.2	0.0	4.4

THE DETERMINANTS OF TRAINING

With this broad overview of patterns of postschool training as background, we now report findings on some of the most important factors which determine individual probabilities of getting training in a fixed interval (two years) in the NLS or over a variable reference period (time on the current job) in the CPS. These results, based on separate probit models estimated for each source and type of training, draw upon previous work by Lillard and Tan (1986). Each probit model included a common set of regressors on schooling, race, labor force experience, the industry rate of technical change, and local and national labor market conditions. Other demographic control variables included region of residence, and for NLS young men and women, measures of job change or labor force attachment when available.

Tables 3.1 through 3.5 report selected results for the determinants of training, focusing in particular on the role of schooling, technical change, work experience, race, union membership, and local and national economic conditions. For brevity, only the results for training sources are reported in these tables, though references are made to findings for training types when pertinent. The complete probit estimates by source and type of training in the CPS and NLS samples are shown on Tables A.1 through A.5 in the appendix.

TABLE 2.10
CHARACTERISTICS OF YOUNG MEN WITH AND WITHOUT TRAINING

Attributes	Any Training		Company Training	
	Some (n=2492)	None (n=858)	Some (n=1321)	None (n=2029)
Education <12yrs	.099	.268	.095	.173
Education 12 yrs	.289	.319	.277	.310
Education 13-15	.271	.181	.289	.221
Education 16 yrs	.138	.102	.166	.104
Education >=17 yrs	.200	.127	.170	.189
Black	.189	.308	.181	.244
South residence	.368	.489	.360	.425
Years work experience	12.8	13.6	13.1	12.9
Years job tenure	5.1	5.4	5.3	5.1
Weeks unemployed 1980	7.8	10.2	7.7	9.0
Weeks worked 1980	47.8	47.1	47.1	48.1
Annual salary 1980 $	16,440	12,530	18,007	13,767
Weekly wage 1980 $	391	318	423	338
Weekly wage 1980 $				
Education <12yrs	269	259	278	260
Education 12 yrs	360	288	394	308
Education 13-15	374	386	398	355
Education 16 yrs	436	370	464	378
Education >=17 yrs	486	390	541	421

Educational Attainment

The effects of educational attainment on the probability of training are captured by indicator variables for each of five levels of educational attainment–less than 12, 12 (the omitted category), 13-15, 16, and greater than 17 years of school. These effects are reported in panel A of Tables 3.1 and 3.2 for the CPS and NLS samples, respectively.

Years of formal schooling emerges as one of the most important determinants of postschool training investments. Like the tabulations reported earlier, both sources of training are strongly complementary: compared to high school graduates (the omitted group), the probability of getting most kinds of training rises with education to a peak at 16 years or less of schooling. However, the likelihood of additional training from regular school sources rises continuously with level of schooling completed. Qualitatively, these results are quite similar for men and women in the CPS, and between them and the three NLS samples. One direct implication of this strong positive association is that those with limited formal schooling also face limited

training opportunities in the workplace, and lower future productivity, income growth and employment stability as well (see below, Labor Market Effects of Training).

Increases in schooling attainment have quantitatively different effects on training likelihood among men and women, varying by training source. Compared to men, higher schooling among CPS women is typically associated with smaller increases in the probability of training from all sources, except for additional training from regular school. For example, relative to high school graduates, female college graduates in the CPS are 37 percent more likely to get company training as compared to 48 percent for their male counterparts. In the NLS sample of career women, training from "other" sources is the only statistically important source across educational groups, the one exception being a higher likelihood of company training among those with some college education (13-15 years of schooling). Training from these other sources appears to be primarily professional and technical in nature (see Table A.5).

A comparison of NLS young men and NLS mature men also points to important life-cycle training patterns among various educational groups. The likelihood of company training is significantly higher for more educated young men in the NLS, differences not apparent among the older NLS sample. This pattern of training in the early work career is consistent with observed wage profile differences among schooling groups reported in the earnings literature in which the more educated experience higher relative rates of wage growth (Mincer, 1974). However, mature college graduates in the NLS are more likely to get training from business and technical schools and from miscellaneous other sources relative to their younger counterparts.

TABLE 3.1
SCHOOLING AND TECHNICAL CHANGE: CPS MEN AND WOMEN

	CPS MEN				CPS WOMEN			
A. EDUCATIONAL ATTAINMENT	Regular Schools	Company Training	OJT	Other Sources	Regular Schools	Company Training	OJT	Other Sources
<12 years	-.514 **	-.483 **	-.076 *	-.392 **	-.457 **	-.414 **	-.095 *	-.568 **
13-15 years	.464 **	.229 **	.102 **	.317 **	.543 **	.242 **	.081 **	.103 *
16 years	.618 **	.478 **	.116 **	.552 **	.670 **	.373 **	.099 **	.410 **
17+ years	1.044 **	.308 **	-.051	.832 **	1.288 **	.301 **	-.116 *	.265 **
B. TECHNICAL CHANGE* (EDUCATIONAL ATTAINMENT)								
<12 years	-4.135	1.925	-1.200	2.822	-41.748 **	-23.692 **	2.337	-46.897 **
12 years	-9.999 **	0.408	5.525 **	-9.097 **	-28.146 **	-14.787 **	-2.191	-23.260 **
13-15 years	-11.506 **	2.878	-.809	-0.306	-15.350 **	-5.505	-2.988	-13.579 **
16 years	-11.356 **	3.561	-.561	-3.261	-21.970 **	0.091	2.282	4.687
17+ years	-14.588 **	15.322 **	6.632	-8.307	-37.254 **	18.435 **	7.627	-27.000

SOURCE: January 1983, CPS
** significant, from zero, at 5 percent level.
* significant, from zero, at 10 percent level.

Industry Rates of Technical Change

Earlier, in the Overview, we postulated that industries experiencing rapid technical change are more likely to require specific skills acquired from in-house company training rather than the general kinds of skills provided by outside training institutions--such as business, and vocational and technical schools. We also described the "allocative efficiency of schooling" hypothesis that workers with more education are better able to evaluate new information critically, and therefore respond more readily to technological change (Welch, 1970). Suggestive, but inconclusive, evidence was found for both hypotheses. Here, we test these hypotheses more rigorously in the probit model by including interaction terms between the Gollop and Jorgenson (1980) technical change indices and schooling attainment.

Panel B of Tables 3.1 and 3.2 reports the partial effects of technical change on training by source for the CPS and NLS samples, respectively. A strikingly similar pattern of technical change effects is found in all five samples of men and women in the CPS and NLS. Company training to improve skills is significantly more prevalent for the most highly educated--post graduates among CPS males and NLS mature men, and 16 or more years of schooling among NLS youth--in high tech industries. With variations, the result holds as well for female workers. In high tech industries, CPS women with 17 or more years of schooling are more likely to get company training, a pattern of training repeated among NLS career women with a college education or more. The less educated are also less likely to get company training in high tech industries, a result that is particularly significant among CPS men and women but not in the NLS samples.

Less formal kinds of company training (OJT) to upgrade skills in the CPS are not related to the rate of technical change. Only male high school graduates are significantly more likely to get informal OJT in high tech industries; no systematic pattern of informal OJT is found for other schooling groups or for women. This result was surprising. One might have expected relatively more informal training in a technologically changing environment, and more structured formal training programs to teach well-understood older production technologies. It would appear that informal training on the job is poorly recalled and reported. This appears less true, however, when informal training is perceived by the respondent as being important to getting the current job. The probability of reporting entry-level OJT increases with education in high tech jobs for both CPS men and women, especially for the most educated (see Tables A.1 and A.2).

In marked contrast, training taken from sources other than the employer (essentially general training) is significantly reduced in high tech industries. In both male and female CPS samples, almost all technical change-schooling interactions for regular school training are significantly negative, as are the preponderance of interactions for training from other outside sources. Similarly, in the NLS the likelihood of training from business and technical schools or "other" sources is generally diminished in high-tech jobs, with the more educated being less likely to get such training. The likelihood of receiving training from regular school sources among NLS young men (not reported in Table 3.2) is also reduced in jobs characterized by higher rates of technical change. Finally, Tables A.1 and A.2 also suggest that transferability of skills from most sources is diminished in high- tech industries--both CPS men and women are less likely to report that company training and OJT (presumably from previous jobs) were important to getting their current job; only among post graduates was previous OJT important.

Together, these results provide important insights into the skill requirements associated with technical change. They demonstrate two points: first, high tech industries rely significantly more on training from in-house sources than on outside training, possibly because skills specific to new technologies are not readily available outside the firm; and second, company training is especially prevalent among the most highly educated workers in high tech firms, and least among the less educated. These findings combine to lend strong empirical support for both the technology-specific skills model of Tan (1980; 1986) and the "allocative efficiency of schooling" hypothesis (Welch, 1970).

One final insight into the relationship between technical change and skills may be gleaned from NLS information on types of training. In high tech industries, the greater emphasis on training from in-house sources appears to be manifested largely in increased managerial training but not, as Tables A.3 through A.5 make clear, in professional, technical, or semi-skilled types of training. In fact, high tech industries appear to provide both less semi-skilled training for youth, and less professional and technical training for all three NLS

TABLE 3.2
SCHOOLING AND TECHNICAL CHANGE: NLS SAMPLES

	YOUNG MEN			MATURE MEN			CAREER WOMEN		
A. EDUCATIONAL ATTAINMENT	Company Training	Bus/Tech Schools	Other Sources	Company Training	Bus/Tech. Schools	Other Sources	Company Training	Bus/Tech Schools	Other Sources
<12 years	-.437 **	-.522 **	-.385 **	-.331 **	-.154	-.285 **	-.232	.418	-.270 **
13-15 years	.301 **	.047	.186 **	.190 **	.177	.279 **	.236 *	.248	.376 **
16 years	.454 **	-.229 **	.203 **	.106	.547 **	.401 **	.058	.312	.893 **
17+ years	.261 **	-.066	.360 **	.076	047	.625 **	-.067	-.224	1.105 **
B. TECHNICAL CHANGE* (EDUCATIONAL ATTAINMENT)									
<12 years	4.250	18.005 **	7.035	0.767	6.104	0.554	-15.968	-14.184	-15.084 **
12 years	1.250	-4.796 *	-5.062 *	-5.976	8.708	-3.273	-26.475 **	32.934 **	-17.349 **
13-15 years	0.283	-3.219	-7.542 **	-1.232	-6.039	-17.600 **	12.051	11.019	-11.984
16 years	9.866 **	-6.554	-8.612 *	-4.346	-17.591	-15.266 **	60.916 **	-0.144	-27.543
17+ years	16.877 **	0.302	-13.356 **	32.111 **	-16.564	-5.786	80.704 **	-66.865	-97.568

SOURCE: NLS Young Men, NLS Mature Men, NLS Women
** significant, from zero, at 5 percent level.
* significant, from zero, at 10 percent level.

groups. This naturally raises the question of whether high tech firms can continue to sustain high productivity growth without parallel human investments in the technical skills of their professional, technical and manual workers. Plausibly, these workers may be getting informal learning on the job through working with new technologies. No empirical support for this view could be found, at least not in the CPS informal OJT data.

Labor Market Experience

Two measures of labor market experience are included: years of tenure on the current job and years of potential labor market experience. Potential labor market experience is computed as age minus years of schooling minus 5. As is widely known, this experience measure is an especially poor measure of actual work experience for women who exit and enter the labor force more frequently than do males. For the youth samples in the NLS and CPS, an indicator variable for work experience less than five years is included to control for differences between new labor market entrants and more experienced workers not accounted for by the other labor market variables.

TABLE 3.3
THE EFFECTS OF LABOR MARKET EXPERIENCE ON TRAINING

Sample/ Years of Experience	Company Training	OJT	Bus/Tech. Schools	Regular Schools	Other Sources
CPS MEN					
Work Experience	-.008 **	-.010 **	n.a.	-.002	.002
Job Tenure	.034 **	.011 **	n.a.	.034 **	.026 **
First 5 yrs	-.132 **	.016	n.a.	.100 **	-.094 *
CPS WOMEN					
Work Experience	-.004	-.008 **	n.a.	-.006 **	-.003
Job Tenure	.032 **	.012 **	n.a.	.046 **	.025 **
First 5 yrs	-.110 **	-.081 *	n.a.	-.100 *	-.181 **
NLS YOUNG MEN[1]					
Work Experience	.009 **	n.a.	-.018 **	-.008	.023
First 5 yrs	.002	n.a.	.023	.039	-.045
NLS MEN					
Work Experience	-.016 **	n.a.	-.027 **	n.a.	-.025 **
Job Tenure	.024 *	n.a.	-.015 **	n.a	-.007 **
NLS CAREER WOMEN					
Work Experience	-.029 **	n.a.	-.042	n.a.	.008
Job Tenure	.024 **	n.a.	.002	n.a.	-.005

[1] Job tenure excluded because of errors in the imputed job tenure variable. See text.

The training effects of these labor market variables are reported on Table 3.3. Consistent with the life-cycle patterns of training predicted by human capital theory (Ben-Porath, 1967; Mincer, 1974), the likelihood of training is low in the first five years in the labor market, coinciding with an initial period of job search. In the absence of job attachment (holding constant job tenure), this likelihood of training continues to fall over time with years of potential experience, but at a lower pace.

The likelihood of most kinds of training, however, rises with time on the current job. For CPS men and women, the accumulation of job tenure is associated with increased training from in-house sources (both formal and informal OJT), as well as training from schools and other sources. Similar results for company training are seen in the NLS mature men and women samples. For NLS young men, no job tenure effects are reported because the imputed tenure variable (in many years respondents were not asked job tenure directly) was found to be quite deficient. Job tenure for NLS mature men is associated with less training from outside sources, possibly because of reduced incentives to acquire further general skills this late in their work career (by 1980, many mature men are already in their 60s).

Race

How likely are non-whites to get training as compared to whites? The question is addressed in a limited way by including an indicator variable for non-whites in each probit model. Table 3.4 summarizes the net effects of race on the likelihood of training in the five surveys, holding everything else constant. Non-white males are significantly less likely to get most kinds of postschool training as compared to white males, even after controlling for a comprehensive set of observable worker attributes, labor market experience, and job characteristics. This result is especially striking, and statistically significant, for company training, regular schools, and "other" training sources. Interestingly, race differences in training probability is quantitatively less pronounced among young men than among mature men in the NLS or, for that matter, males of all ages in the CPS. Race differences, however, are less apparent among females. Among CPS women, non-whites get significantly less company training but the race differential is smaller than that for CPS men, or for NLS youth. Among NLS career women, race is not an important factor in training. In fact, non-white women are more likely to get more training from all sources, though only training from "other" sources is statistically significant at the 5 percent level.

TABLE 3.4
EFFECTS OF RACE ON TRAINING BY SOURCE

NON-WHITES	Company Training	OJT	Bus/Tech. Schools	Regular Schools	Other Sources
CPS MEN[1]	-.250 **	-.012	n.a.	-.192 **	-.226**
CPS WOMEN[1]	-.142 **	.017	n.a.	-.200 **	-.270**
NLS YOUNG MEN	-.168 **	n.a.	.041	-.046	-.136**
NLS MEN	-.223 **	n.a.	.054	n.a.	-.029
NLS CAREER WOMEN	.155	n.a.	.250	n.a.	.138 *

[1] CPS training refers to training to upgrade or improve job skills in the current job

These results should be of interest to researchers seeking to better understand race differences in earnings. Numerous studies have documented the existence of earnings differentials among white and non-white males, and the absence of similar differences among females (for example, see, Smith 1984). The differences in training propensity of non- white males and females relative to whites highlighted by these results suggest a possible explanation for these empirical regularities. Future research might also profitably explore race differences in patterns of training (both sources and types) by education revealed in Section II, above.

Union Membership

A union membership variable is included to examine the effects of unionization on training. Mincer's research (1983) suggests that unions have a negative impact on training, a result he attributes primarily to rigid seniority rules in union jobs regarding promotion, training, and wages. Incentives for workers to invest in general (but not necessarily specific) training are reduced because of greater job security and a weaker link between training and earnings in union jobs.

Table 3.5 reports the partial effects of union membership on the likelihood of training by source. With few exceptions, union membership in the NLS samples is associated with a lower likelihood of training from most sources, including company programs that might be considered to have a large firm-specific training component. This result also holds when training types are considered (see Tables A.3 through A.5). In the CPS, company training and informal OJT to improve skills is also lower in union jobs, but these are marginally significant only for men. Among both CPS men and women, union membership is associated with a greater likelihood of training from regular school sources, a result which runs counter to the prediction that incentives for general training are reduced in union jobs. Finally, union members (both males and females) are more likely to say that entry-level company training was important to get the current job, but less likely to report taking company training to improve skills subsequently. This time path of training, resembling other results reported by Mincer (1974), may reflect selectivity in hiring by union firms, as well as the concentration of company training at the entry-level in union firms.

TABLE 3.5
UNION MEMBERSHIP AND PROBABILITY OF TRAINING

SAMPLE	Company Training	OJT	Bus/Tech Schools	Regular Schools	Other Sources
NLS YOUNG MEN	-.064	n.a.	-.125 *	.007	-.049
NLS MEN	-.589 **	n.a.	-.178	n.a.	-.239
NLS CAREER WOMEN	.044	n.a.	-.014	n.a.	-.170
CPS MALES					
Get Job	.235 **	-.061	n.a.	n.a.	-.041
Improve Skills	-.090 *	-.022	n.a.	.151 **	-.243**
CPS FEMALES					
Get Job	.030	-.110 **	n.a.	n.a.	.012
Improve Skills	-.053	.095	n.a.	.344 **	-.175*

Labor Market Conditions

The effects of labor market conditions on training probability are measured in several ways: the national unemployment rate (NUR), and state indices of labor market conditions developed by Lillard (1985). These are the cyclic sensitivity of the state to national unemployment cycles (denoted RHAT) and the state's long-run level unemployment relative to the nation (denoted SHAT).

Ideally, we would consider the separate effects of both cross sectional and local time series labor market conditions, but data limitations restrict what can be done. The CPS identifies state of residence, but not the timing of training (to improve skills) taken over a variable length of time determined by current job tenure. We control for state indices of unemployment measured at the time of entry into the current job. NLS training variables refer to a well defined period of time, but the survey does not identify state of residence. Therefore, we use NUR as an aggregate measure of labor market conditions. These labor market indices are not directly comparable: the state indices capture the effects of severity and persistence of adverse local conditions; the national unemployment rate, the contemporaneous effects of changing macroeconomic conditions.

The impact of local and national economic conditions on the likelihood of training is reported on Table 3.6. Among NLS young men, no statistically significant effects of adverse economic conditions on training are found.[6] For mature men and career women, periods of high national unemployment are associated with a greater likelihood of training from company sources, much of which appears to be

[6] In pooled one-year interval estimates, which covers a younger NLS sample, periods of high unemployment are associated with an increased likelihood of regular school training. Apparently, young men are more likely to return to school when times are bad.

professional and technical in nature (see Tables A.4 and A.5). This suggests that employers are more likely to retrain older workers (both male and female) during periods of slack economic activity when their time opportunity cost is low. Possibly because employers have invested little specific training in their younger workers, they are less likely to provide them with company training in adverse times or, for that matter, to retain them.

TABLE 3.6
EFFECTS OF ECONOMIC CONDITIONS ON TRAINING BY SOURCE

UNEMPLOYMENT VARIABLE	Company Training	OJT	Bus/tech Schools	Regular Schools	Other Sources
NLS YOUNG MEN					
NUR	-.002	n.a.	.011	.021	.007
NLS MEN					
NUR	.014 **	n.a.	.014	n.a.	.013 **
NLS CAREER WOMEN					
NUR	.111 *	n.a.	.040	n.a.	-.083**
CPS MALES					
SHAT	-2.615	-5.977 **	n.a.	-1.104	-4.001
RHAT	-.234 **	-.136 **	n.a.	.089 *	-.083
CPS FEMALES					
SHAT	.629	-9.384 **	n.a.	2.033	-4.183
RHAT	-.199 **	-.089 **	n.a.	-.003	-.067

NOTE: See text for a definition of SHAT, RHAT, and NUR.

In the CPS, on the other hand, the likelihood of training is depressed in local labor markets characterized by persistently high unemployment rates or greater cyclical volatility relative to the nation as a whole. These effects are generally significant only for training from in-house sources, informal OJT in particular, but never for training taken outside the current firm. These results are what one might expect if employment in states with high values of SHAT and RHAT is concentrated in declining industries, or in firms with cyclically sensitive product demand. If layoff rates are high as a consequence, both employers and workers have few incentives to either provide or take company training in job-specific skills since the probability of recouping such training costs is low.

THE LABOR MARKET EFFECTS OF TRAINING

Thus far, we have painted a broad picture of the overall patterns and determinants of training. We now turn to the effects of training on earnings, earnings growth, and employment stability. In particular, we are interested in identifying the sources and types of training that are importantly related to these labor market

outcomes. Selected results from Lillard and Tan (1986) are reported for CPS men, and NLS young men for whom relatively complete training histories are available.

One potential limitation of the findings reported here is our treatment of training as being predetermined. We are critically aware that the decision to take or to be given training may be endogenous and thus subject to selectivity problems (see Lillard & Kumbhakar, 1986). The primary difficulty is the econometric treatment of occurrences of multiple training sources and types, and their timing, especially given the panel nature of the NLS young men survey. Work is currently underway to model these issues econometrically. With this caveat, the results are nonetheless useful in documenting dynamic patterns of effects to be addressed in future research.

We begin with the effects of training on earnings of CPS men, followed by the earnings of NLS young men which include dynamic training effects treat as exogenous. This is followed, again for the NLS sample, by a discussion of the impact of different sources and types of training on the likelihood of unemployment.

The Earnings Effects Of Training--1983 CPS

Two specifications of a wage model were used to study the effects of training on earnings in the CPS. The first is the conventional wage model typically estimated in the human capital literature where the logarithm of annual earnings is related to educational attainment, potential work experience, job tenure, and controls for a variety of demographic and locational variables and job and local labor market characteristics. The second specification adds indicator variables for reported training. Table 4.1 reports the results of these wage models estimated by OLS (ordinary least squares regression methods).[7]

[7] The analysis of training outcomes was based on earnings and weeks worked over the previous year reported in the March 1983 CPS. This information was obtained by merging the January and March 1983 CPS surveys. The sample was restricted to males who report positive earnings and weeks worked the previous year. The self-employed, those currently unemployed during the survey week (they are included in the subsequent analysis of unemployment as a training outcome), and those with such low earnings (weekly wages less than $10) that their earnings are presumed to be incorrectly recorded, are excluded from analysis. The resulting sample contained 11,202 observations.

TABLE 4.1
THE EARNINGS AND TRAINING EQUATIONS FOR CPS MEN

Variable	Model Specification (1)	(2)	(3)
Constant	7.598 (.062)	7.871 (0.065)	7.858 (0.067)
Years of schooling	0.111 *** (0.003)	0.083 *** (0.003)	0.079 *** (0.004)
Nonwhite	-0.239 *** (0.026)	-0.219 *** (0.026)	-0.200 *** (0.025)
South region	-0.022 (0.021)	-0.023 (0.021)	-0.010 (0.021)
North East region	-0.142 *** (0.025)	-0.133 *** (0.024)	-0.117 *** (0.024)
North Central region	-0.091 *** (0.022)	-0.086 *** (0.021)	-0.077 *** (0.021)
SHAT (long-run state unemployment rate)	-0.138 (1.571)	0.375 (1.550)	0.766 (0.534)
RHAT (cyclical sensitivity of state unemployment)	0.126 *** (0.029)	0.138 *** (0.029)	0.127 *** (0.028)
Union member	0.160 *** (0.026)	0.184 *** (0.026)	0.181 *** (0.025)
Union missing	-0.003 (0.019)	0.008 (0.016)	0.006 (0.015)
First 5 years of work	-0.458 *** (0.021)	-0.457 *** (0.020)	-0.436 *** (0.020)
Prior work experience	0.007 *** (0.001)	0.007 *** (0.001)	0.006 *** (0.001)
Years of job tenure	0.152 *** (0.004)	0.144 *** (0.004)	0.142 *** (0.004)
Tenure squared	-0.005 *** (0.0002)	-0.005 *** (0.000)	-0.005 *** (0.0002)
Technological change interaction			

TABLE 4.1—continued

Variable	Model Specification (1)	(2)	(3)
Schooling 12 years	3.635 *** (1.088)	4.363 *** (1.074)	4.746 *** (1.063)
Schooling 13-15 years	2.352 * (1.469)	3.035 ** (1.451)	3.131 ** (1.439)
Schooling 16 years	6.883 *** (1.808)	6.411 *** (1.784)	6.364 *** (1.767)
Schooling 17+ years	9.161 *** (2.332)	8.808 *** (2.304)	8.164 *** (2.281)
Training to improve skills			
Regular school		0.021 (0.024)	0.014 (0.024)
Company		0.270 *** (0.021)	0.224 *** (0.021)
On-the-Job		0.056 *** (0.020)	0.044 ** (0.020)
Other		0.135 *** (0.035)	0.112 *** (0.035)
Training to get job			
Regular school * years of schooling		0.014 *** (0.001)	0.021 *** (0.008)
Regular school			-0.099 (0.123)
Company			0.176 *** (0.023)
On-the-Job			0.198 *** (0.016)
Other			-0.012 (0.027)
R-square	.362	.380	.3934

Source: 1983 CPS.
Note: Standard errors in parenthesis.
* Significant, from zero, at 10 percent level.

Column one of Table 4.1 presents the estimates for the first model specification. The results are broadly similar to those reported elsewhere in the literature and will only be summarized briefly here. The returns to schooling are on the order of about 11 percent. The effect of experience prior to joining the firm of current employment, while significantly positive, is small (0.7 percent) compared to that of job tenure (which has a linear effect of about 15 percent). The control for low work experience is significantly negative, indicating that a worker's earnings profile rises quite steeply in the first five years after entry into the labor market. Non-whites, those living outside the western United States (the omitted region), and those working in non-unionized firms receive lower earnings.

The results also indicate that the returns to schooling are higher if the individual worked in a high technology industry, as is indicated by the positive interactions between schooling categories and the measure of industry rates of technical change. The parameters of these interactions are larger and more statistically significant for the higher schooling categories--note that the TFP effects are two to three times larger for those with advanced degrees than for high school graduates. This result is consistent with (and explains) the earlier finding that employers in high tech industries are more likely to give their highly educated workers more company training. Because these workers are better adept at responding to technical change (Welch, 1970), their returns to education and training are higher in rapidly innovating industries (Tan, 1980).

The results of the second model specification suggest that several reported measures of training are associated with higher earnings. In column two, which includes training to improve job skills, company training has the largest effect on earnings (27 percent), followed by training from "other" sources (13 percent). Oddly, informal on-the-job training has only a small (though still significant) earnings effect of about 5 percent. The effect of regular school training is statistically insignificant, but schooling returns are higher if the individual reported that training from this source was important to getting the current job. The coefficient of the interaction between these two variables varies between 1.5 and 2.0 percent, or about one-sixth to one-quarter the estimated returns to schooling.

Including measures of training to get the current job (column three) reduces the estimated effects of training to improve skills, but only marginally. Several sources of training to get the current job proved important: company training and OJT from previous jobs had a statistically significant effect on earnings in the current job. It appears that many respondents accurately perceive that some of their prior skills are transferable to other jobs. At least for these individuals, the results indicate that previous company training and informal OJT are quite portable: their effects on earnings in the current job (between 17 and 20 percent) are not too different from returns to company training on the current job.

The CPS results, while informative, are nonetheless limited by the cross sectional nature of the data and the training questions asked. The reporting of only two training "events" in the CPS (when our earlier results indicate that multiple training events are common), and the lack of information on when training to improve skills was taken, limit our ability to estimate appropriately the effects of training on earnings. In particular, we are unable to identify the time path of these effects on earnings. Do the earnings effects of training persist or are they dissipated over time? Are there variations in these effects among the different kinds of training?

The Effects of Training--NLS Young Men

The panel nature of the NLS young men allows us to address some of these questions, in particular, the dynamic pattern of training effects on earnings as well as the likelihood of unemployment. To begin, consider extensions of a standard specification of the earnings equation to include the effects of training (extensions to consider the probability of unemployment are straightforward). Earnings in the current period may be affected by training in a number of ways, both current and past. First, training in the current period may actually reduce earnings through reduced productivity during learning if training occurs on the job or requires leaving the job, as in the case of going to school or training classes. Second, the occurrence of current and past training events may shift the earnings function up by some proportion. For simplicity, assume that each occurrence of training enhances earnings by the same amount, though each source of training may have a different effect on earnings. Third, the occurrence of training may alter wage or earnings

growth. In this case, the effect of a training event will depend on how long ago it occurred, since at that point in the past the growth path was changed. Again, each source of training may have a different effect.

In accordance with these notions, the earnings (unemployment) models may be augmented to include dynamic training effects: (1) whether training was taken since the previous interview, termed "current"; (2) the sum of all training events taken since 1967 or whenever the individual first began work as a major activity, termed "events"; and (3) the duration of time between training taken and the current period, accumulated over all training events, termed "duration." These three measures provide a parsimonious way of characterizing the effects of multiple episodes of training on earnings in the current period, and on the likelihood of unemployment.

Model estimates are reported on Table 4.2. The first set of results are for log-earnings estimated on a pooled sample from the following years: 1969, 1973, 1975, 1978 and 1980. These survey years were selected because (relatively) clean data were available on both wage and salary income and weeks worked in the past year. The model relates the logarithm of annual earnings to the three training measures, controlling for personal and firm attributes, location, labor market conditions, and year indicator variables. The second set of results, estimated by probit regression, are for the likelihood of experiencing a spell of unemployment. The sample included the 1969 and 1980 surveys in which respondents were asked directly about weeks unemployed in the previous year (estimates for weeks unemployed are not reported here). Separate earnings and unemployment models were also estimated by source and type of training, and the most important results summarized on Table 4.3.

The most important determinants of earnings are reported in column one of Table 4.2. Many of the results are familiar, and require no further elaboration. One non-standard result--the interaction of schooling and measures of technical change--merits passing mention before we turn to the training effects. Echoing the earlier findings of industry TFP growth as a training determinant, earnings rise with level of schooling completed, especially for the most educated individuals with college or advanced degrees in industries experiencing rapid technical change. The presence of these earnings effects, even after controlling for training, may point to increased investments in informal learning in high tech jobs not captured by our controls for formal training; alternatively, they may reflect selectivity in the employment of more able personnel in high tech jobs.

The summary training variables have the postulated effects on earnings. Training taken in the current period is associated with an initial (and one-time) drop in earnings of 2.4 percent. In every subsequent year, however, training has two effects on earnings: an 11.9 percent increase in earnings level (the coefficient of the cumulated training variable), and a 1.1 percent decline with each year since training (the duration coefficient). Thus, the net effect of training is an increase of 9.5 percent (11.9 - 2.4) in the first year, 10.8 percent (11.9 - 1.1) in the second year, declining to zero by the eleventh year after training.

Panel A of Table 4.3 reports earnings effects separately by source and type of training. Company training has the largest effect on earnings (17 percent), followed by training from business and vocational schools (11 percent), and over 8 percent from regular schools and other miscellaneous sources. Furthermore, company training is characterized by almost no decline in current period earnings, as compared to a 10 percent fall for training from business and vocational schools, and 4 percent for training from to regular schools. This may simply reflect earnings foregone in diverting work time to attending school. However, these findings persist even when we control for weeks worked in the past year. One interpretation, consistent with human capital theory, is that employees pay for externally provided sources of general training through lower weekly wages, and that firm-specific training costs from company sources are borne primarily by employers. Finally, because of the points noted above, we calculate that the positive earnings effects of company training persist for 13 years, as compared to between 8 and 10 years for the other sources of training.

Similar dynamic patterns of effects are found by type of training. Training in the current period has negligible effects on earnings for managerial, professional and technical training, and somewhat larger negative effects on semi-skilled manual training. The initial effects of the former types of training are larger (14-16 percent) as compared to 9.5 percent for semi-skilled training. However, because the rate of decay of semi-skilled training is lower, the earnings effects of this type of training persists over a longer period (15

TABLE 4.3
EFFECTS OF TRAINING ON ANNUAL EARNINGS AND PROBABILITY OF UNEMPLOYMENT BY SOURCE AND TYPE OF TRAINING: NLS MEN (1)

Training Variables	SOURCE OF TRAINING				TYPE OF TRAINING			
	Regular School	Bus/Tech. School	Company Training	Other Sources	Managerial	Professional Technical	Semi-Skilled	Other Types
A. ANNUAL EARNINGS								
Current	-.046	-.109 **	.000	-.008	.016	-.011	-.061 *	-.025
Events	.082 **	.119 **	.169 **	.088 **	.166 **	.142 **	.096 **	.101 **
Duration	-.010 **	-.013 **	-.013 **	-.009 **	-.014 **	-.013 **	-.007 **	-.015 **
Persistence of effects	8 years	9 years	13 years	10 years	12 years	11 years	15 years	7 years
B. PROBABILITY OF UNEMPLOYMENT								
Current	-.203	-.056	.256 *	.412 **	-.133	.266	.305 **	.252 *
Events	-.128	.071	-.332 **	-.357 **	-.120	-.459 **	-.159 *	-.224 **
Duration	.018	-.011	.026 *	.029 **	.001	.039 **	.013	.021
Persistence	(2)	(2)	13 years	12 years	(2)	12 years	12 years	10 years

(1) Coefficients taken from model specifications similar to (1) and (2) in table 4.2, but including training measures for each training source and type.

(2) Duration not calculated because of lack of statistical significance.

years) as compared to 12 and 11 years for managerial and professional-technical training types, respectively. The earnings effects of other types of training are more short-lived, lasting no more than 7 years.

Probit estimates of the determinants of unemployment propensity are reported in the second column of Table 4.2. Many results resemble those reported by other research on the determinants of unemployment: a lower likelihood of unemployment for the more educated, for whites as compared to other racial groups, and for those with long job tenure (Mincer & Jovanovic, 1981). It is noteworthy that no relationship between technical change and the likelihood of unemployment is found. Unlike the previous results for earnings, the interactions between technical change and schooling are not statistically significant except for the negative interaction for high school graduates. That is to say, a higher industry rate of technical change in the current or last job is not associated with a greater incidence of unemployment. Thus, no support is found for concerns about potential labor displacement effects of technical change, at least not for this sample of youth.

The effects of training on the probability of unemployment are a mirror image of training effects on annual earnings (see Table 4.2). On net, training is associated with a lower likelihood of experiencing a spell of unemployment (.198-.240) in the current period. The results also suggest that accumulation of training over the early work career results in a reduction of the likelihood of future unemployment. As before, the period over which training effects attenuate can be calculated from the parameters of the cumulated training and training duration variables, i.e. -0.240/0.019, or about 12 years on average.

As shown in Panel B of Table 4.3, the unemployment effects of training also vary systematically by source and type of training. Among the different training sources, training from company programs has the most enduring effects on reducing the likelihood of unemployment (13 years), followed closely by training from miscellaneous "other" sources (12 years). In contrast, the effects of training from regular schools and from business and vocational schools are never statistically significant. Since company training is likely to be largely firm- specific in nature, and training from outside schools completely general, we interpret these findings as strong, direct support for the hypothesis that firm-specific training inhibits job separations (into unemployment). The labor turnover literature has typically relied on job tenure as a proxy for firm-specific training to test this hypothesis. Among types of training, professional and technical training inhibits unemployment the most, followed by semi-skilled manual training. Managerial training did not have a statistically significant effect on unemployment.

SUMMARY AND IMPLICATIONS

This paper sought to address the broad question--who gets postschool training, how much, what kinds, and why. Self-reported training measures in the CPS and several NLS cohorts were used to characterize the distributions of different kinds of training among major demographic groups, across industries and occupations. Model estimates, taken from Lillard and Tan (1986), were also reported to highlight the most important determinants of training, and their effects on earnings and unemployment. We conclude the paper by summarizing the main findings, highlighting questions they raise, and discussing areas where future research will be most useful in guiding training policy.

Only the more formal kinds of training tend to be reported in the different surveys, but then appear to be reported quite consistently. In fact, the results from using these training measures are remarkably consistent across different surveys, despite the different types of information covered, the different time intervals that they reflect, and the different groups of workers that they include. What they reveal about postschool training deserves special emphasis. On the most general level, they suggest that highly aggregated descriptions of training miss important differences among various sources and types of training, their determinants, and their consequences for earnings and employment. There is not one kind of training, but various kinds for different purposes. Some of these kinds of training are relevant in the context of technical change, some are not. Some actively complement formal schooling, and some do not. The incidence (and frequency) of training by source varies across different groups of workers, industries, and occupations. Each kind of training also has different effects on earnings and on the likelihood of unemployment, and some effects persist longer than others.

TABLE 4.2
EFFECTS OF ANY TRAINING ON ANNUAL EARNINGS AND PROBABILITY OF UNEMPLOYMENT OF NLS YOUNG MEN

Explanatory Variables	Log Annual Earnings (OLS) Coef.	Std. Error	Probability of Unemployment (Probit) Coef.	Std. Error
Constant	8.708	(.047)	-1.097	(.102)
Schooling Attainment				
< 12 years	-.159	(.019)	.137	(.066)
13-15 years	.077	(.016)	-.097	(.058)
16 years	.273	(.020)	-.479	(.089)
17+ years	.369	(.019)	-.581	(.079)
Technical Change*S				
< 12 years	-2.092	(1.153)	-1.264	(4.186)
12 years	-.390	(.836)	-6.065	(3.142)
13-15 years	.399	(1.015)	-4.920	(4.052)
16 years	6.352	(1.468)	1.720	(7.943)
17 years	8.277	(1.541)	-10.145	(7.238)
Non-white	-.230	(.014)	.318	(.051)
Work experience	.100	(.006)	-.002	(.006)
Dummy 1st 5 years	.006	(.024)	.148	(.068)
Job tenure	.092	(.004)	-.116	(.006)
Unemployment rate	-.002	(.003)	.099	(.018)
ANY TRAINING				
Current	-.024	(.019)	.198	(.082)
Events	.119	(.012)	-.240	(.056)
Duration	-.011	(.002)	.019	(.007)

SOURCE: NLS Young Men. Earnings model pools samples from 1969, 1973, 1975, 1978 and 1980. Probit model uses 1969 and 1980 samples only.

NOTE: Absolute value of standard errors in parentheses.

In the Overview, the gross data revealed several aggregate differences across various groups in the amounts and kinds of training received. Both young men and career women in the NLS get more training than mature men, but women receive proportionately less company training than either of the other two male cohorts. Though not directly comparable (because of the nature of the training questions), roughly equal proportions of employed men and women in the CPS report getting entry-level training and training to improve skills; however, training in the two groups come from different sources, with men relying more on company and informal OJT, and women relying more on training from regular schools and other sources. Data tabulations also indicated the presence of systematic training differences varying by industry total factor productivity (TFP) growth. In the CPS, the proportion of workers reporting training from in-house sources (both formal and informal) rises with TFP. Similar patterns of in-house training in high tech industries are also found in the NLS young men survey, especially among the more educated youth. Furthermore, educated young men in high tech industries are not only more likely to receive company training, but also report multiple events from this training source.

In the Determinants of Training, we sought to explain these observed differences through analyses of the determinants of training. Probit models relating training (by source and by type) to a comprehensive set of covariates were estimated. This analysis confirmed the importance of formal schooling as a determinant of postschool training for both men and women. The likelihood of getting most kinds of training rises with the level of educational attainment (except for the most highly educated), suggesting that both sources of "training" are strongly complementary. Compared to men, however, increased schooling among women is associated with a smaller rise in company training and a larger increase in other training sources. These male-female differences have important labor market implications, given the quantitatively larger impact of company training on earnings growth and the likelihood of unemployment.

A systematic pattern of skill requirements accompanying technical change was found throughout the surveys. As the rate of technological change rises, the probability of getting managerial training and training from in-house sources such as company programs or informal on-the-job training (OJT) also increases, especially for those with more education. In contrast, the likelihood of getting professional, technical, and semi-skilled manual training, or training from external sources such as business, technical, and traditional schools falls with the industry rate of technical change. These results suggest that rapid technical change leads to increased reliance on in-house training, possibly because technology-specific skills are not readily available elsewhere, and to greater demand for highly skilled and educated employees who may be better adept at working with, and modifying, new technologies. Technical change also appears to make skills less transferable across jobs. We found that prior work skills are less likely to be reported as important to getting new jobs in high tech industries. The exception are postgraduates for whom previous informal on-the-job training is important. Their OJT may embody many non-codified kinds of technical and managerial skills not taught in traditional schools but important, nonetheless, for technological progress in new jobs.

The probability of getting training is affected by economic conditions, but in ways that differ depending upon how unemployment is measured. In the CPS, where state is identified, the probability of getting most kinds of training is depressed in local labor markets characterized by persistently high unemployment rates or greater cyclical volatility relative to the nation as a whole. Possibly because layoffs are more common is such states, employers and workers have few incentives to provide or get training, since the likelihood of recouping training costs is low. In the NLS, using time-series data, periods of high national unemployment are associated with a greater likelihood of training from company sources for career women and mature men but not for youth. One possible interpretation is that employers retrain older workers (who have firm-specific skills) during periods of slack economic activity when the opportunity cost of their time is low. Youth, who are more likely to be laid off in such times, apparently return to school for additional training.

Training might be expected to vary over the life-cycle, and it does. The likelihood of getting most kinds of training is low in the first five years in the labor market, coinciding with an initial period of job search. In the absence of job attachment, this likelihood continues to fall over time but at a lower pace; however, the likelihood of training rises with time on the job. The implication of these results is that those who work intermittently or change jobs frequently receive less training over the life-cycle. This is borne out by striking differences in training received by career women, and by women with low labor force attachment.

It is also consistent with, and may explain, recent findings that initial wage gains received by job changers are overtaken, in the long run, by higher wage growth of stayers (Mincer, 1988).

We found important race differences in training even after controlling for a wide variety of observable worker attributes. Non-white males are significantly less likely to get most kinds of post- school training, differences which are not apparent among females. In the NLS, non-white females actually tended to report more training, though the differences were generally not statistically significant. These findings offer one possible explanation for observed earnings differentials among white and non-white males, and the absence of race differences among females noted in the literature.

Section IV looked at the effects of training on subsequent labor market outcomes for the male samples in the CPS and the NLS Young Men sample. A limitation of these analyses was our treatment of training as being predetermined--if selectivity in training is important, many of the reported results are potentially subject to some biases.

We found large differences in the effects of training on earnings growth and unemployment, depending upon the source or type of training. Many of these results are consistent with, and may explain, the determinants of training found earlier to be important. For example, earnings were observed to rise with the level of schooling completed in industries experiencing rapid technical change, especially for the highly educated individuals with college or post graduate degrees. Earlier, we had hypothesized that more educated workers are better adept at responding to technical change, and therefore are given more technology-specific training in high tech firms. Supporting evidence for this hypothesis was found in the greater likelihood of in-house training among these workers in high tech firms and here, in their higher productivity as reflected in their earnings.

A dynamic pattern of training effects on earnings and unemployment was found, varying by sources and types of training. Among the different sources of training, company training has the greatest quantitative effect on increasing earnings, persisting for over 13 years. The effects of training from other sources are much smaller and persist for a shorter period of time. When types of training are considered, managerial training increases earnings the most, but its effects are less enduring than the effects of semi-skilled manual training. On the other hand, the effects of training on reducing the likelihood of unemployment mirror the earnings-augmenting effect of training. On average, getting training is associated with a decline in the likelihood of unemployment, which lasts about 12 years. Of all the sources of training, company training is the most enduring (about 13 years), while the effects of regular school training disappear within 7 years. Variations in these effects are also found across training types.

Finally, unlike the previous result for earnings, no relationship was found between the industry rate of technical change in the current (or last) job and the probability of experiencing an unemployment spell. On the contrary, for the sample of male youth studied, a higher rate of technical change is typically associated with a lower probability of unemployment (this relationship was significant for high school graduates). At least for this group of youth, the results suggest that concern over the labor displacement effects of technical change may be misplaced. Whether or not this finding holds for other groups is a subject for future research.

In this paper, we have developed rough estimates of the amounts of training received by different groups in the population, and taken an important first step in identifying the major determinants of training and its effects on labor market outcomes. On the basis of this research, we conclude that currently available data on job training, while far from perfect, are capable of yielding important insights into a number of labor market issues. Using these data, future research might profitably consider:

- *The complementarity between formal schooling and training.* Our use of the years of schooling attainment variable is not particularly revealing about this complementarity. Is it screening or is it the content of education that really matters?

- *Technical change, schooling, and skill requirements.* These estimated relationships were among the most significant found. Research is needed to further investigate the impact of technical change on unemployment, retraining of older workers, and skill transferability across jobs. What are the training needs (skill shortages) of different industries, and can

policies be developed to encourage greater investments by employers and other providers in skills required for technical change?

- *Black-white wage differentials.* Important race differences in training propensity were found for males but not for females. How much of the black-white wage differentials reported in the literature (Smith, 1984) can be attributed to training? To what extent has increased training contributed to the observed narrowing of the earnings gap between ethnic groups, and between white and non-white women?

- *Job training and female labor force attachment.* Skill obsolescence is an important issue for women who withdraw from the labor force (McDowell, 1982). What kinds of training or retraining would facilitate their reentry into the labor market?

- *Minimum wage legislation and youth training.* Research has indicated that Federal minimum wage legislation may have reduced on-the-job training of younger workers (Mincer 1984; Hashimoto, 1981). At least for the NLS Young Men sample, increases in the level and coverage of minimum wages in the 1970s offer opportunities for further exploration of this topic.

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APPENDICES

Table A.1

DETERMINANTS OF TRAINING TO GET CURRENT JOB AND IMPROVE SKILLS

CPS MEN

Variable	Training to Get Current Job: Company	Training to Get Current Job: OJT	Training to Get Current Job: Other	Training to Improve Job Skills: Company	Training to Improve Job Skills: OJT	Training to Improve Job Skills: Other
Constant	-0.722 *** (0.089)	-0.167 ** (0.074)	-1.052 *** (0.099)	-0.969 *** (0.071)	-0.863 *** (0.067)	-2.193 *** (0.113)
SCHLT12	-0.447 *** (0.053)	-0.239 *** (0.037)	0.304 *** (0.053)	-0.438 *** (0.059)	-0.076 * (0.046)	-0.392 *** (0.090)
SCH1315	0.186 *** (0.038)	0.143 *** (0.032)	0.105 ** (0.041)	0.229 *** (0.040)	0.102 *** (0.038)	0.317 *** (0.059)
SCH16	0.245 *** (0.044)	0.134 *** (0.037)	-0.120 ** (0.052)	0.478 *** (0.043)	0.116 *** (0.043)	0.552 *** (0.062)
SCH17P	-0.095 * (0.049)	-0.123 *** (0.038)	-0.291 *** (0.058)	0.308 *** (0.045)	-0.051 (0.046)	0.832 (0.057)
TCHLT12	-5.106 (4.469)	-4.213 (2.695)	-9.854 *** (3.798)	1.925 (4.539)	-1.200 (3.131)	2.822 (7.712)
TCH12	-4.980 ** (1.955)	-7.058 *** (1.725)	-3.202 (2.347)	0.408 (2.323)	5.525 *** (2.124)	-9.097 ** (3.800)
TCH1315	-5.512 ** (2.738)	-2.596 (2.337)	-7.850 ** (3.124)	2.878 (2.736)	-0.809 (2.823)	-0.306 (4.151)
TCH16	-6.472 ** (2.981)	0.520 (2.874)	3.005 (4.067)	3.561 (2.984)	-0.561 (3.358)	-3.261 (4.311)
TCH17P	-0.311 (4.894)	14.338 *** (3.622)	-2.083 (5.734)	15.322 *** (3.951)	6.632 (4.487)	-8.307 (5.411)
NONWHT	-0.103 ** (0.053)	-0.266 *** (0.041)	-0.203 *** (0.062)	-0.250 *** (0.056)	-0.012 (0.048)	-0.226 *** (0.085)
SOUTH	-0.041 (0.041)	-0.171 *** (0.033)	-0.118 *** (0.045)	-0.018 (0.042)	-0.074 * (0.039)	0.021 (0.058)
NE	-0.149 *** (0.048)	-0.181 *** (0.038)	-0.180 *** (0.055)	-0.127 ** (0.049)	-0.123 *** (0.047)	0.019 (0.066)
NC	-0.047 (0.042)	-0.180 *** (0.034)	-0.090 ** (0.045)	-0.054 (0.042)	-0.072 * (0.040)	0.182 *** (0.056)
UNION	0.235 *** (0.050)	-0.061 (0.044)	-0.041 (0.062)	-0.090 * (0.053)	-0.022 (0.050)	-0.245 *** (0.088)
E1ST5	-0.153 *** (0.041)	-0.290 *** (0.033)	-0.236 *** (0.046)	-0.132 *** (0.041)	0.016 (0.039)	-0.094 * (0.056)
POTEXP	0.000 (0.002)	0.001 (0.001)	0.003 (0.002)	-0.008 *** (0.002)	-0.010 *** (0.002)	0.002 (0.003)
TENURE				0.034 *** (0.003)	0.011 *** (0.002)	0.026 *** (0.003)
SELFEMP	-0.108 ** (0.049)	0.108 *** (0.038)	0.238 *** (0.047)	-0.296 *** (0.052)	-0.288 *** (0.050)	0.[illegible]208 *** (0.[illegible]56)
SHAT	3.417 (2.567)	-1.039 (2.067)	-3.249 (2.599)	-2.615 (2.488)	-5.977 ** (2.447)	-4.001 (3.352)
RHAT	0.030 (0.042)	-0.022 (0.034)	-0.147 *** (0.047)	-0.234 *** (0.042)	-0.136 *** (0.039)	-0.083 (0.059)
NUR	-0.055 *** (0.008)	-0.011 * (0.006)	-0.008 (0.009)			

* Significant, from zero, at 10 percent level.
** Significant, from zero, at 5 percent level.

Table A.2
DETERMINANTS OF TRAINING TO GET CURRENT JOB AND IMPROVE SKILLS

CPS WOMEN

Variable	Training to Get Current Job			Training to Improve Job Skills		
	Company	OJT	Other	Company	OJT	Other
CONSTANT	-1.114 ••• (0.110)	-0.447 ••• (0.080)	-2.075 ••• (0.160)	-1.086 ••• (0.080)	-0.961 ••• (0.073)	-1.698 ••• (0.105)
SCHLT12	-0.228 ••• (0.070)	-0.287 ••• (0.048)	-0.092 (0.096)	-0.414 ••• (0.076)	-0.095 • (0.055)	-0.568 ••• (0.129)
SCH1315	0.119 ••• (0.043)	0.131 ••• (0.032)	0.236 ••• (0.062)	0.242 ••• (0.041)	0.081 •• (0.037)	0.103 • (0.056)
SCH16	0.055 (0.057)	0.057 (0.042)	0.252 ••• (0.078)	0.373 ••• (0.051)	0.099 •• (0.047)	0.410 ••• (0.063)
SCH17P	-0.119 (0.074)	-0.020 (0.051)	0.174 • (0.096)	0.301 ••• (0.061)	-0.116 • (0.062)	0.265 ••• (0.098)
TCHLT12	-24.843 ••• (6.595)	6.782 • (3.853)	-3.786 (8.168)	-23.692 ••• (8.936)	2.337 (4.620)	-46.897 •• (20.172)
TCH12	-16.008 ••• (3.140)	-3.469 • (2.055)	-4.424 (4.149)	-14.787 ••• (2.824)	-2.191 (2.487)	-23.260 ••• (4.239)
TCH1315	-9.553 •• (3.875)	-5.639 • (3.132)	-0.331 (5.649)	-5.505 (3.628)	-2.988 (3.036)	-13.579 •• (4.838)
TCH16	6.569 (5.558)	6.514 (4.920)	7.717 (8.901)	0.091 (4.900)	2.282 (5.283)	4.687 (6.625)
TCH17P	-4.699 (10.039)	25.745 ••• (7.046)	13.223 (11.348)	18.435 •• (8.170)	7.627 (9.927)	-27.000 (18.085)
NONWHT	-0.088 (0.058)	-0.076 • (0.040)	-0.080 (0.084)	-0.142 ••• (0.054)	0.017 (0.045)	-0.270 ••• (0.081)
SOUTH	0.007 (0.050)	-0.189 ••• (0.036)	-0.048 (0.070)	-0.073 (0.046)	-0.076 • (0.041)	-0.173 ••• (0.062)
NE	-0.156 ••• (0.058)	-0.190 ••• (0.042)	0.099 (0.083)	-0.176 ••• (0.056)	-0.073 (0.050)	-0.300 ••• (0.072)
NC	-0.102 •• (0.052)	-0.166 ••• (0.037)	-0.105 (0.075)	-0.217 ••• (0.048)	-0.047 (0.043)	-0.019 (0.058)
UNION	0.030 (0.075)	-0.110 •• (0.054)	0.012 (0.113)	-0.053 (0.068)	0.095 (0.060)	-0.175 • (0.100)
E1ST5	-0.122 •• (0.053)	-0.235 ••• (0.038)	-0.074 (0.081)	-0.110 •• (0.030)	-0.081 • (0.044)	-0.181 ••• (0.064)
SOTEXP	-0.007 ••• (0.002)	-0.000 (0.000)	0.006 • (0.003)	-0.004 (0.002)	-0.008 ••• (0.002)	-0.003 (0.003)
TENURE				0.032 ••• (0.003)	0.012 ••• (0.003)	0.025 ••• (0.004)
SELFEMP	0.225 ••• (0.070)	-0.091 (0.056)	0.420 ••• (0.081)	-0.176 •• (0.073)	-0.212 ••• (0.069)	0.295 ••• (0.075)
SHAT	3.533 (3.054)	-3.773 • (2.235)	-6.226 (4.045)	-0.629 (2.746)	-9.384 ••• (2.659)	-4.183 (3.675)
RHAT	0.114 •• (0.050)	-0.018 (0.037)	-0.324 ••• (0.066)	-0.199 ••• (0.048)	-2.089 •• (0.043)	-0.067 (0.059)
NUR	-0.027 •• (0.010)	0.010 (0.007)	0.020 (0.013)			

• Significant, from zero, at 10 percent level.
•• Significant, from zero, at 5 percent level.
••• Significant, from zero at 1 percent level.

Table A.3
DETERMINANTS OF TRAINING FOR NLS YOUNG MEN, BY SOURCE AND TYPE

	Source of Training			Type of Training			
Variable	Company	Business/ Technical	Other	Managerial	Professional/ Technical	Semiskilled	Other
CONSTANT	-1.410 ••• (0.104)	-1.468 ••• (0.210)	-1.323 ••• (0.107)	-2.059 ••• (0.157)	-1.470••• (0.103)	-1.132 ••• (0.114)	-1.199••• (0.121)
SCHLT12	-0.437 ••• (0.068)	-0.522 ••• (0.084)	-0.385 ••• (0.068)	-0.449 ••• (0.122)	-0.697 ••• (0.095)	-0.451 ••• (0.064)	-0.245 ••• (0.069)
SCH1315	0.301 ••• (0.046)	0.047 (0.054)	0.186 ••• (0.047)	0.344 ••• (0.069)	0.380 ••• (0.049)	-0.114 •• (0.047)	0.272••• (0.050)
SCH16	0.454 ••• (0.054)	-0.229 ••• (0.072)	0.203 ••• (0.057)	0.620 ••• (0.076)	0.705 ••• (0.054)	-0.776 ••• (0.077)	0.237 ••• (0.061)
SCH17P	0.261 ••• (0.054)	-0.066 (0.062)	0.360 ••• (0.052)	0.501 ••• (0.074)	0.952 ••• (0.051)	-1.047 ••• (0.085)	0.211 ••• (0.059)
TCHLT12	4.250 (4.621)	18.005 ••• (5.364)	7.035 (5.431)	9.938 (10.018)	9.914 (7.361)	15.638 ••• (4.486)	-3.021 (4.267)
TCH12	1.250 (2.465)	-4.796 • (2.715)	-5.062 • (2.620)	-1.498 (4.524)	-2.545 (2.699)	-4.675 •• (2.221)	-0.987 (2.843)
TCH1315	0.283 (2.583)	-3.211 (3.124)	-7.542 •• (2.956)	5.064 (3.709)	-3.153 (2.746)	-9.867 ••• (2.909)	-1.972 (2.807)
TCH16	9.866 ••• (3.351)	-6.554 (4.820)	-8.612 • (4.624)	10.435 •• (4.931)	-6.851 •• (3.353)	4.132 (4.850)	-0.867 (4.424)
TCH17P	16.877 ••• (3.462)	0.302 (4.550)	-13.354 ••• (4.305)	20.738 ••• (4.235)	-10.974 ••• (3.428)	-0.018 (6.630)	-4.315 (4.121)
NONWHT	-0.168 ••• (0.044)	0.041 (0.051)	-0.136 ••• (0.046)	-0.218 ••• (0.068)	-0.120 ••• (0.046)	0.037 (0.046)	-0.176 ••• (0.048)
SOUTH	-0.002 (0.034)	-0.003 (0.043)	-0.049 (0.036)	-0.012 (0.046)	-0.051 (0.035)	-0.052 (0.040)	-0.014 (0.037)
UNION	-0.064 (0.056)	-0.125 • (0.071)	-0.049 (0.058)	-0.224 ••• (0.085)	-0.120 •• (0.061)	0.030 (0.059)	-0.030 (0.061)
POTEXP	0.006 •• (0.004)	-0.018 ••• (0.005)	-0.005 (0.004)	-0.013 (0.077)	-0.003 (0.005)	-0.019 ••• (0.005)	-0.000 (0.005)
E1ST5	0.002 (0.055)	0.023 (0.067)	-0.045 (0.056)	0.021 ••• (0.006)	0.021 (0.054)	0.067 (0.064)	-0.003 (0.059)
CHGJOB	-0.184 ••• (0.037)	0.155 ••• (0.044)	0.023 (0.037)	-0.196 ••• (0.051)	-0.022 (0.037)	0.029 (0.042)	-0.020 (0.039)
SCHWK	0.089 •• (0.039)	0.056 (0.050)	-0.048 (0.040)	-0.013 (0.017)	0.021 (0.040)	0.062 (0.044)	0.071 • (0.042)
SCHWKT	-0.044 (0.060)	0.139 •• (0.068)	0.141 •• (0.058)	0.072 (0.056)	0.155 ••• (0.055)	0.115 • (0.068)	0.057 (0.062)
NUR	-0.002 (0.012)	0.011 (0.013)	0.007 (0.012)	0.042 (0.081)	0.015 (0.010)	0.010 (0.013)	0.007 (0.013)

SOURCE: NLS Young Men, 2-year intervals.
NOTE: Standard errors of probit specifications in parentheses.
• Significant, from zero, at 10 percent level.
•• Significant, from zero, at 5 percent level.

Table A.4
DETERMINANTS OF TRAINING FOR NLS MATURE MEN, BY SOURCE AND TYPE

	Source of Training			Type of Training		
Variable	Company	Business Technical	Other	Manager	Professional/ Technical	Other
CONSTANT	0.599 •• (0.260)	-1.499 ••• (0.497)	-0.229 (0.229)	-1.371 ••• (0.512)	-0.595 •• (0.262)	-0.884 ••• (0.301)
SCHLT12	-0.331 ••• (0.070)	-0.154 (0.172)	-0.285 ••• (0.056)	-0.363 ••• (0.091)	-0.409 ••• (0.070)	-0.289 ••• (0.076)
SCH1315	0.190 •• (0.079)	0.177 (0.191)	0.279 ••• (0.069)	0.136 (0.100)	0.373 ••• (0.078)	0.174 • (0.090)
SCH16	0.106 (0.113)	0.547 ••• (0.191)	0.401 ••• (0.087)	0.242 • (0.125)	0.565 ••• (0.094)	0.057 (0.127)
SCH17P	-0.076 (0.108)	0.047 (0.285)	0.625 ••• (0.079)	0.038 (0.126)	0.808 ••• (0.086)	-0.088 (0.126)
TCHLT12	0.767 (3.720)	6.104 (11.073)	-0.554 (2.941)	6.618 (4.901)	-6.983 (5.385)	-4.835 (3.877)
TCH12	-5.976 (4.752)	8.708 (9.873)	-3.273 (4.136)	-1.184 (5.989)	-11.809 •• (4.931)	-5.161 (5.592)
TCH1315	-1.232 (4.967)	-6.039 (11.804)	-17.600 (5.263)	-3.662 (8.69.)	-11.630 •• (4.544)	-20.667 •• (9.378)
TCH16	-4.346 (8.660)	-17.591 (24.302)	-15.266 •• (7.075)	-3.528 (11.015)	-16.202 •• (6.962)	-6.894 (10.507)
TCH17P	32.111 ••• (7.226)	-16.564 (25.753)	-5.786 (6.792)	34.462 ••• (8.138)	-11.501 (7.520)	9.319 (10.053)
NONWHT	-0.223 ••• (0.059)	0.054 (0.183)	-0.029 (0.052)	-0.177 •• (0.087)	-0.181 •• (0.073)	0.022 (0.073)
SOUTH	-0.031 (0.055)	-0.007 (0.147)	0.036 (0.045)	0.069 (0.065)	0.044 (0.053)	-0.094 (0.066)
UNION	-0.589 ••• (0.168)	-0.178 (0.195)	-0.239 (0.160)	0.216 (0.431)	-0.367 •• (0.173)	-0.506 •• (0.208)
POTEXP	-0.016 ••• (0.005)	-0.027 •• (0.013)	-0.025 ••• (0.004)	-0.028 ••• (0.007)	-0.021 ••• (0.005)	-0.013 •• (0.006)
NUR	0.014 ••• (0.005)	0.014 (0.015)	0.013 ••• (0.004)	0.008 (0.006)	0.023 ••• (0.005)	-0.001 (0.006)
TENURE	0.004 • (0.002)	-0.015 ••• (0.006)	-0.007 ••• (0.002)	0.007 •• (0.003)	-0.005 •• (0.002)	-0.006 ••• (0.002)

SOURCE: NLS Mature Men, 2-year intervals.
NOTES: Standard errors of probit specification in parentheses.
• Significant, from zero, at 10 percent level.
•• Significant, from zero, at 5 percent level.
••• Significant, from zero, at 1 percent level.

Table A.5
DETERMINANTS OF TRAINING FOR NLS CAREER WOMEN, BY SOURCE AND TYPE

	Source of Training			Type of Training			
Variable	Company	Business/ Technical	Other	Managerial	Professional/ Technical	Clerical	Other
CONSTANT	-1.794 (0.354)	-1.974 (0.701)	-0.921 (0.213)	-2.423 (0.509)	-1.628 (0.276)	-1.181 (0.374)	-1.428 ••• (0.272)
SCHLT12	-0.232 (0.179)	0.418 (0.378)	-0.270 •• (0.106)	-2.510 (258.02)	-0.233 (0.167)	-0.628 ••• (0.205)	-0.052 (0.135)
SCH1315	0.236 • (0.135)	0.248 (0.369)	0.376 ••• (0.091)	0.086 (0.188)	0.654 ••• (0.110)	-0.186 (0.151)	0.238 • (0.125)
SCH16	0.058 (0.209)	0.312 (0.622)	0.893 ••• (0.140)	0.211 (0.273)	1.053 ••• (0.156)	-0.383 (0.383)	0.595••• (0.173)
SCH17P	-0.067 (0.245)	-0.224 (7.612)	1.105 ••• (0.265)	0.631 •• (0.252)	1.227 ••• (0.231)	-0.973 (1.400)	-0.693 (1.261)
TCHLT12	-15.968 (12.218)	-14.184 (34.298)	-16.084 •• (7.314)	-4.090 (231.742)	-31.436 •• (15.366)	-2.038 (17.723)	-10.864 (8.241)
TCH12	-26.475 •• (10.210)	32.934•• (15.941)	-17.349••• (5.726)	-52.363••• (14.528)	-30.165 ••• (8.128)	1.921 (7.677)	-19.201 • (9.976)
TCH1315	12.051 (11.649)	11.019 (57.907)	-11.984 (8.478)	28.358 • (17.170)	-5.956 (9.096)	5.806 (14.017)	-9.776 (12.378)
TCH16	60.916 •• (30.968)	-0.144 (117.136)	-27.543 (21.719)	76.039 (56.766)	-19.942 (21.828)	-0.569 (92.703)	12.956 (28.447)
TCH17P	80.704 ••• (26.109)	-66.865 (682.919)	-97.568 • (55.354)	175.313 ••• (14.685)	-51.023 (43.448)	103.240 (81.936)	-332.356 (278.987)
NONWHT	0.155 (0.132)	0.250 (0.347)	0.138 • (0.080)	0.205 (0.191)	-0.024 (0.107)	-0.040 (0.147)	0.394 ••• (0.102)
SOUTH	-0.059 (0.115)	0.197 (0.253)	-0.075 (0.078)	-0.215 (0.171)	-0.183 • (0.101)	-0.001 (0.124)	0.095 (0.102)
UNION	0.044 (0.213)	-0.014 (0.593)	-0.170 (0.135)	0.299 (0.26.)	0.086 (0.149)	-0.206 (0.273)	-0.498 •• (0.223)
POTEXP	-0.029 •• (0.013)	-0.042 (0.033)	0.008 (0.008)	0.060 ••• (0.021)	-0.028 ••• (0.010)	-0.008 (0.013)	0.013 (0.011)
TENURE	0.024 •• (0.009)	0.002 (0.016)	-0.005 (0.006)	-0.006 (0.014)	-0.001 (0.007)	0.001 (0.010)	0.007 (0.007)
NUR	0.111 • (0.058)	0.040 (0.154)	-0.083 •• (0.035)	0.231 ••• (0.088)	0.148 ••• (0.045)	-0.069 (0.061)	-0.163 ••• (0.047)

SOURCE: NLS Mature Women, 1-year intervals.
NOTES: Standard errors of probit specification in parentheses.
• Significant, from zero, at 10 percent.
•• Significant, from zero, at 5 percent.
••• Significant, from zero, at 1 percent.