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A Needs Analysis of Training Data: What Do We Want, What Do We Have, Can We Ever Get It?

Lisa M. Lynch

12.1 Introduction

The marked acceleration of changes in the nature of work over the past two decades has generated a growing interest in the process of skill accumulation. In the past, most human capital research focused on skills acquired in schools and the impact of formal education on earnings. However, issues such as the impact of trade and technology on incumbent and dislocated workers, welfare reform, and the transition from school to work have created the need for a better understanding of how workers cope with changing skill demands once they leave the formal education system. In spite of this demand for information, the supply is quite limited. For example, policymakers are faced with the challenge of reforming the welfare system with little or no documentation of the skills gap of welfare recipients and no system in place to monitor the role of training in facilitating the transition from welfare to work. Businesses that choose between “making or buying” skills have relatively little information on the impact of different training programs on productivity. Incumbent and dislocated workers who find their jobs dramatically redefined by new technology do not always know how to determine the best source of training for their new skill needs.

Although there has been a great deal written about the measurement issues associated with formal education, there has been relatively little analysis of the existing sources of postschool training. While progress has been made in recent years to improve the quantity and quality of information available on private sector training, current data sources are quite primitive when contrasted

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with data on education. For example, there is no annual time series of expenditures on postschool training similar to what we have on annual expenditures for education. We have no aggregate measure of the stock of postschool training in the economy that parallels the information we have on the average educational attainment of workers by demographic group. While much of the recent empirical work on the returns to education has focused on the role of the quality of education, this issue has barely begun to be addressed in the training arena. Therefore, this chapter tries to summarize what training information we would like to have, what information we have at the moment, and whether we can ever get all the information we actually need.

12.2 What Do We Want?

Substantial investments in human capital are made every year in the United States. For example, during the period 1990–91 more than \$248 billion was spent by federal, state, and local governments on public and private K–12 education and \$166 billion was spent on public and private higher education (Department of Education 1993). Unfortunately, estimates of the expenditures on postschool training are harder to come by, and the few estimates that do exist differ greatly. For example, Carnevale, Gainer, and Villet (1990) estimated that in the 1980s more than \$30 billion was spent annually on firm-provided training in the United States. At the same time Ann Bartel (1989) estimated that \$55 billion was spent on firm-provided training in 1987, and Jacob Mincer, using Panel Study of Income Dynamics data from 1976 and interpolating to 1987, estimated that \$148 billion was spent on formal private sector training. Including informal training expenditures in Mincer's calculations would boost his estimate to \$296 billion in 1987. More recently, the American Society of Training and Development reported that in 1995 businesses spent \$55 billion on training.

So depending on which estimate we believe, we can conclude that real training expenditures have risen or fallen over the past 10 years, while per capita training expenditures seem to have decreased. The main reason for this variance of estimates is that there is no longitudinal database of firms and their training expenditures. Even if there were such a database, there is no agreed upon accounting method by which to calculate training expenditures. Companies are not required to separately report in a common fashion direct training expenditures and would never report the largest indirect cost—wages and salaries of trainees. Until we resolve the rather serious measurement issues associated with these types of training expenditures, we will not be able to determine which of the current estimates of training expenditures is most accurate.

The measurement discussion on postschool training investments, however, is not just about how to come up with a better estimate of the amount spent on training. Much of the current interest in firm-provided training has been driven by the perception that the current system of education and training does not

Table 12.1 Literacy Skills of U.S. Young Adults Aged 21–25, 1985

Education	Prose Literacy ^a	Document Literacy ^b	Quantitative Literacy ^c
High school dropout	24.1	18.8	20.6
High school graduate	45.1	46.2	45.2
Some postsecondary	67.0	68.0	66.8
College graduate	84.3	85.6	84.2

Source: Department of Education (1989).

^aPercentage able to locate information in a newspaper or almanac.

^bPercentage able to follow directions to travel from one location to another using a map.

^cPercentage able to enter deposits and checks and balance a checkbook.

seem to be working as well as it once did. Some have argued that over the past 20 years educational quality has declined in the United States and, consequently, new entrants are not as well prepared as they were in the past to meet employer skill needs. As a result, employers find that they have to “top up” the skills of new entrants.

Some evidence on the degree of topping up is presented in table 12.1 using data from a literacy survey of young adults in 1985 conducted by the Department of Education. The percentage of young adult high school graduates or dropouts who were able to perform relatively straightforward tasks such as locating information in a newspaper or balancing a checkbook is quite low (20 to 25 percent of high school dropouts and only 45 percent of high school graduates). Almost as disturbing are the 15 percent of college graduates who are unable to complete these tasks.

While many of us may have some sympathy with the difficulties of balancing a checkbook, the empirical evidence on the rising wage gap (for a recent survey of this literature, see Freeman and Katz 1994) suggests a dramatic change in the demand for those workers without a college degree relative to those who have completed college. For those with a high school degree, the old system of “learning by doing” does not seem to be as efficient a way to develop their human capital as it once was. Employers are looking for workers who have broad and deep general education to be able to adjust to the changing skill requirements associated with changing technology and workplace practices such as job rotation and cross-training. Skills such as team work, problem solving, communication, and quality control do not seem to be easy to learn informally on the job. It would be useful to have a longitudinal survey of firms and their employment practices to capture this shift from informal learning by doing to more formal skill development. Unfortunately, we do not have any time-series information on the incidence, content, or delivery of training of a sample of representative firms to document this phenomenon.

Currently, the only source of information on some of the changes in the use of formal and informal training is the supplements to the Current Population

Table 12.2 Percentage of Workers Receiving Training on the Job

Type of Worker	Formal On-the-Job Training		Informal On-the-Job Training	
	1983	1991	1983	1991
All	12.0	16.8	15.2	16.2
Men	13.8	18.3	15.5	15.9
Women	9.9	15.0	14.7	15.9
Age				
16-19	1.9	2.8	13.6	13.3
20-24	7.7	9.9	15.2	15.0
25-34	14.0	17.5	16.3	16.4
35-44	15.4	20.9	16.0	18.0
45-54	13.8	20.1	15.0	16.7
55+	9.3	13.8	12.3	13.8
Education				
Dropout	3.8	5.2	11.7	10.8
High school	10.5	13.9	15.9	15.6
Some college	15.1	20.4	17.2	18.9
College	20.5	26.1	16.7	18.7
College+	16.7	23.4	12.6	16.8

Source: January 1983 and January 1991 Current Population Survey from Bowers and Swaim (1994).

Survey in 1983 and 1991 that collected information on the percentage of workers ever receiving formal or informal training in their current employment. Table 12.2 shows that the incidence of formal training has risen between 1983 and 1991 from 12 percent to almost 17 percent of workers. The rise has been especially sharp for workers aged 45-54 and those with more than a high school education. Therefore, a second training data need is to find a way to better document the changing pattern of formal and informal training over time.

The apparent switch from informal to formal on-the-job training is not sufficient to explain the current interest of many policymakers in identifying ways to augment firm-provided training. There is concern that while skill needs have changed and a greater premium is being paid for those with more education and skills, the marketplace is not delivering a sufficient supply of more skilled workers. In other words, as discussed in Bishop (1994) and Lynch (1994), there is a potential market failure in the provision of more general training. Possible reasons for a market failure in the provision of more general training include higher training costs for smaller firms than for larger firms, capital market imperfections, and other institutional barriers. This means that when measuring training we need to also capture training that is not occurring and why this investment is not being made. The reason may be that some firms are concerned about raiding by other firms of their trained workers or that employee

turnover is high. In both cases, the firm may not be able to fully capture its training investment.

But improving the measurement of the incidence and types of training that workers are receiving is not our only training data need. The continuing debate on rising wage inequality and competitiveness requires an increased understanding of the role training plays for wage determination and firm competitiveness. During the 1960s and 1970s, empirical studies on the impact of postschool training on wages that built on the fundamental contributions of Becker (1962, 1964) and Mincer (1974) had to infer this impact by what the wage profile looked like over an individual's work experience. This was necessary because while we had relatively good information on workers' wages and tenures with firms, we had little information on postschool training investments. Apart from the fact that this was not a terrific way to test human capital theory, there were other theories developed in the 1970s and 1980s that generated upward-sloping wage profiles that had little to do with human capital investment. Fortunately, during the 1980s, researchers were able to use an increasing supply of microbased databases that included information on the incidence of both education and firm-provided training. As a result, we are finally able to begin examining both the returns to investments in education and the varying impact of different types of postschool training on wages of workers.

The impact of training on wages is not the only outcome of interest to policymakers. Much of the current debate on training was originally motivated by the perception that U.S. workers' skills lagged behind those of workers in other countries. This skills gap in turn may be partly responsible for a decline in the competitiveness of U.S. firms, especially in manufacturing. Some recent data collection efforts on training have included attempts to measure its impact on the productivity of firms, as well as its impact on wages, by doing surveys of establishments that include questions on their training practices and outcomes.

In sum, better training data are needed to document how much is currently invested in postschool training and how the nature of this training has switched from informal to formal. Measuring the incidence of training and expenditures on training is only a very small part of the measurement needs. However, much of the current policy debate is motivated by who is not getting training rather than who is. Therefore, documentation is needed on who are the individuals (firms) receiving (providing) training and what are possible barriers to the provision or receipt of training. In order to understand the changes in training over time, one also needs to understand the possible sources of the increased demand for training—declining school quality, increasing international competition, changing technology, and changing work organization. Therefore, measuring the incidence of training within a firm or for workers without seeing how they are also affected by these external factors provides a limited picture. Finally, much of the current policy debate is about how training can affect

wages of workers and productivity of firms. This suggests that measuring the impact of training on wages and productivity is at least as important as measuring its incidence.

The rest of this chapter summarizes what is currently available on post-school training investments and highlights the ability of these data to provide insights into the outcomes of training. The paper discusses the current measurement needs for training data and outlines issues associated with closing the gap between current data sources on training and our needs.

12.3 Sources of Training Data

The following summarizes the current information on training contained in a variety of household, employer, and matched employer-employee surveys in the United States. In addition, representative studies using data from these surveys are summarized in table 12.3. Since the general characteristics of most of the household surveys listed here have already been summarized by Manser (chap. 1 in this volume), I only discuss the specific training questions asked in each of the surveys. In particular, I summarize whether the survey can be used to distinguish between informal and formal training, whether it includes duration measures, whether the content of the training program be determined, and whether the timing of training spells can be identified. The description of the establishments surveys details differences in target respondent, response rates, types of training questions collected, and other data that the training questions can be matched with. Finally, the description of matched employer-employee surveys describes alternative strategies for generating this type of matched information.

12.3.1 Household-Based Surveys

In general, all of the following surveys allow one to estimate the impact of postschool training on the wages of workers controlling for a wealth of demographic characteristics including education, race, gender, and work experience. There is usually little information on firm characteristics in these surveys other than industry and, occasionally, firm size. As a result, none of these surveys can be used to examine how training affects productivity or how training is linked to other firm practices.

Current Population Survey (CPS), 1983 and 1991. Although this is not a longitudinal survey, the CPS is currently the best source of information on how the incidence of training has changed over the past 10 years for the workforce as a whole. Training questions were asked in just two years—1983 and 1991, when a training supplement was added to the January CPS (for studies using these data, see Carey 1985; Pergamit and Shack-Marquez 1987; Lillard and Tan 1986; Bowers and Swaim 1994; Hollenbeck and Wilkie 1985). A variety of questions on training are asked, such as “What training was needed to get the current or last job, and what training was needed to improve skills on the cur-

Table 12.3 Data Sources for Private Sector Training

Survey	Representative Studies Using Data
<i>Household</i>	
Current Population Survey (CPS) 1983 and 1991	Carey 1985; Pergamit and Shack-Marquez 1987; Lillard and Tan 1986; Bowers and Swaim 1994; Hollenbeck and Wilkie 1985
Employment Opportunities Pilot Project (EOPP) individual survey, 1979–80	
High School and Beyond (HS&B), 1986	
Panel Study of Income Dynamics (PSID), 1976–80	Duncan and Hoffman 1978; Brown 1989; Lillard and Tan 1986
National Longitudinal Survey (NLS) young men and women cohorts	Lillard and Tan 1986
National Longitudinal Survey of Youth (NLSY)	Lynch 1992b; Veum 1994; Loewenstein and Spletzer 1994
National Longitudinal Study of the Class of 1972 (NLS72)	Lillard and Tan 1986; Altonji and Spletzer 1991
Survey of Income Participation and Program (SIPP), 1984, 1986, and 1987	
<i>Employer based</i>	
Bartel (1983 and 1986 data)	Bartel 1992
Columbia human resource management survey, 1985	Bartel 1989
Department of Labor training surveys, 1993 and 1995	
EOPP–National Center for Research in Vocational Education (NCRVE), 1982	Barron, Black, and Lowenstein 1987, 1989; Bishop 1994
Educational Quality of the Workforce (EQW) National Employers' Survey (NES), 1994	
National Federation of Independent Business (NFIB), 1987	Bishop 1994
<i>Training Magazine</i>	
Small Business Administration (SBA), 1992	October issues Barron, Berger, and Black 1997
Spencer Foundation, 1992	Osterman 1995
Southport Institute	Bassi 1994
<i>Matched employer-employee surveys</i>	
BLS White Collar Pay Survey (WCP), 1989 and 1990	Bronars and Famulari, chap. 13 in this volume
National Organization Survey (NOS) Upjohn, 1993	Knoke and Kalleberg 1994 Barron, Berger, and Black 1994

rent job?" It is possible to distinguish between formal and informal training and between training received on the current job and training received prior to the current job. Information on the duration of training spells is not available, and there may have been some underreporting of the incidence of training if workers only reported training spells that were associated with changing jobs or obtaining a promotion. It is not possible to determine the timing of the training spells.

Panel Study of Income Dynamics (PSID), 1976–80. The training data available in the PSID cannot be classified into formal or informal training, or on-site or off-site training. This is because the question the PSID asked—“On a job like yours how long does it take the average person to become fully qualified?”—does not reveal where the training occurred or the nature of the training. Duration of training spells can be calculated with this question, but unfortunately the question refers to the average person not the actual respondent (for studies using these data, see Duncan and Hoffman 1978; Brown 1989; Lillard and Tan, 1986). It is also not possible to determine the timing or intensity of the training with this question. There is even the possibility that some respondents may refer to training that took place before employment with the current employer. The primary advantage of this question is that it is more likely to pick up both formal and informal training. There is a second question that could be used to capture the degree of portability of training. This question is: “Are you learning skills on the current job which could lead to a better job or promotion?” This survey can be used to examine how the incidence of training and its impact varied over certain periods of time for the workforce as a whole. Nachum Sicherman (1990) has done an interesting study on the training questions in the PSID in which he compares training measures in the PSID with those listed in the *Dictionary of Occupational Titles (DOT)*. The DOT data are not self-reports. Rather, they are obtained by detailed site visits of jobs. Sicherman (1990) finds that the PSID appears to underreport training duration when compared to what is listed in DOT for the same occupation.

Survey of Income and Program Participation (SIPP), 1984 (wave 3), 1986 (wave 2), and 1987 (wave 2). All workers in the household aged 22–65 who reported earnings are asked, “Has . . . ever received training designed to help find a job, improve job skills, or learn a new job?” But the questions—for example, firms, schools, or government. The incidence measure on this training variable is much lower than the incidence measure from the CPS 1983 and 1991 training supplements. Zemsky and Shapiro (1994) have suggested that one reason why the incidence rate is lower in the SIPP than in the CPS is that these questions follow a sequence of questions probing about difficulties in the labor market. Training therefore is asked in the context of labor market difficulties, not general labor market experience.

Employment Opportunities Pilot Project (EOPP) individual survey. This Department of Labor survey administered in 1980 targeted workers employed in low-wage labor markets. Therefore, it is not representative of the labor force, and it is not a longitudinal survey. It does have detailed training questions such as “Describe up to four training events occurring between 1/1/79 and the interview date in 1980.”

National Longitudinal Survey (NLS) young men, young women, and older men cohorts. These cohort surveys include training questions that can be matched with employment and wage histories of respondents (for a comprehensive study using data from various NLS cohorts, see Lillard and Tan 1986). Questions on training include “Do you receive or use additional training (other than schooling training) on your job?” and “What was the longest type of training you have had since the last interview?” Therefore, there is some information on timing, duration, and content of training programs. A primary disadvantage of these questions is that they are specific to a particular age cohort. In addition, it is not possible to distinguish between formal and informal training, and some previously acquired training could be captured as current training given the wording of the question.

National Longitudinal Survey of Youth (NLSY). Currently, the NLSY represents the most detailed individual survey on training available in the United States (see studies that use data from this longitudinal survey by Lynch 1992b; Veum 1994; Loewenstein and Spletzer 1994). From 1979–86 the following are some of the training questions asked of all respondents: “In addition to your schooling, military and government sponsored training programs, did you receive any other types of training for more than one month?” and “Which of the following categories best describes where you received this training?” (up to three spells per interview). Cost information has been collected periodically, and intensity of training (hours) and starting and ending month of training spells are collected so that it is possible to determine source, timing, intensity, and duration of training. Specifically, it is possible to distinguish between on-the-job training and off-the-job training.

These data can be linked to detailed weekly employment histories so that researchers can observe the impact of current completed or interrupted training on wages and labor mobility as well as the impact of past training spells on current labor market outcomes. From 1988 onward there was no restriction on the duration of the training spell. This appears to have greatly increased the incidence of reported on-the-job training spells that are usually less than one month in duration. In 1993, questions on informal training were added (see Loewenstein and Spletzer 1994) so that both formal and informal training spells can now be distinguished. While the 1993 survey provides informal training information, inadvertently not all workers were asked about informal training. This error will be corrected in the 1996 survey. The primary weakness of this survey is that the training information is specific to a particular cohort. However, since a great deal of human capital accumulation occurs early in a career, this is a cohort of importance for national trends in postschool training investments.

National Longitudinal Study of the Class of 1972 (NLS72). In the 1986 survey, a series of questions about employer-provided training were asked relative to

respondents' current jobs (for a discussion of this survey, see Altonji and Spletzer 1991). Training information is gathered on formal on-site training, off-site training, and informal training. In addition, there is information on the duration (number of hours) of the training spells.

High School and Beyond (HS&B), 1986. This data set has a similar survey design to the NLS72. This survey was targeted at high school seniors and sophomores in 1980. The questions mimic the questions in NLS72.

12.3.2 Employer-Based Surveys

The following summarizes training data available in employer-based surveys. More specifically, I outline how representative each survey's sample is of establishments nationally, the type of survey instrument used (telephone or mailed), response rates to the survey, and the nature of the training measures (including cost estimates, incidence of training by occupational category, content of training, and duration or intensity measures). The following also identifies whether the data can be used to examine the impact of training on wages or productivity. A common dilemma faced in all of these surveys is identifying the target workers that the training questions will refer to. It is time consuming and expensive to ask detailed training questions about every type of worker in an establishment. Therefore, in order to get employers to provide higher quality data on employee training, many of the following surveys have opted to identify certain types of employees for whom to ask about specific training incidents rather than asking about all training spells for all employees in the establishment. This strategy is followed in the hope that it will improve the quality of the training data, but it clearly weakens the representativeness of the training data for the workforce as a whole.

Columbia human resource management (HRM) survey, 1985. This is a 1985 mailed national survey of establishments done by the Human Resource Management group at Columbia's Business School (see Bartel 1989). Data are obtained on approximately 600 establishments, but unfortunately the survey had only a 6 percent response rate. The survey includes comprehensive questions on HRM practices beyond training so that it is possible to see how training is combined with other HRM practices of the firm. Expenditures on training and incidence of training by occupation class are available in this survey. The data can also be linked to Compustat to obtain information on productivity and financial performance. However, for multiple establishments, the Compustat data refer to lines of business rather than to specific establishments. This clearly limits the productivity analysis. The very low response rate has limited the analysis of this survey.

Department of Labor training surveys, 1993 and 1995. The Department of Labor has conducted two recent surveys of employers and their training activities.

The first (DOL93) was a mailed questionnaire sent to approximately 8,000 establishments (70 percent response rate) surveying their formal training practices during 1993. No information on any dimension of informal training was gathered in this survey. Limited information on other HRM practices was collected in this survey, but wage and productivity measures were not collected. This survey can be used to determine the incidence of formal training across establishment size and industry, and there are detailed questions on the types of training provided—for example, occupational health and safety, orientation, and formal job skills training. The incidence of formal training by seven occupational groupings is also available, but it is not possible to determine how many workers actually received training during the reference period, 1993. This is because the respondents are only asked to check off whether they had any employees in that occupational category and, if yes, whether anyone got training. There are no duration measures, and it is not possible to use this survey to estimate the percentage of annual payroll devoted to training expenditures.

In 1996 the BLS released a second study on employer-provided training (DOL95) using information collected in a survey conducted by the BLS of establishments with 50 or more workers on their training activities from May through October 1995. This survey focused on the intensity of training efforts of firms. It also included some questions on direct costs of training but did not solicit information on the wage and salary value of time employees spent in training or other training costs such as equipment, space, or travel. Therefore, it is not possible to calculate total expenditures on training from this survey alone.

EOPP—National Center for Research in Vocational Education (NCRVE) employer survey, 1982. The second wave of the EOPP survey included a telephone survey in 1982 of employers that asked a series of questions about workers hired prior to August 1981. The survey included 3,411 establishments and had a response rate of 62 percent (for applications of this survey, see Barron, Black, and Loewenstein 1987, 1989; Bishop 1994). The survey also included retrospective information on 659 establishments about training and productivity of two recent hires. The training questions refer to training activities that occurred in the first three months of a new hire's tenure with the firm. Training is divided into formal and informal training, with data collected on the duration and intensity of training, starting wages, starting productivity, current wages, and current productivity. The survey includes a productivity measure where employers are asked to rate the productivity of the most recent hire at the start of their job and currently on a scale from 0 to 100 (where 100 equals the maximum productivity rating any employee in a defined position could attain).

This is not a nationally representative sample of employers, and the questions refer to the most recent new hires and not all incumbent workers in the establishment. Because the questionnaire refers to a specific newly hired em-

ployee, it is possible to ask for worker-specific information on race, gender, tenure on the job, relevant work experience, and wages. Therefore, even though this is not a “matched employer-employee” survey, employee-specific information can be determined. However, by focusing just on newly hired employees, the survey oversamples workers in high-turnover jobs. A priori we would expect that these jobs would have less training attached to them.

Educational Quality of the Workforce (EQW) National Employers' Survey (NES), 1994. This is a recently completed 1994 telephone interview of more than 3,200 private for-profit nonagricultural establishments in manufacturing and nonmanufacturing with 20 employees or more (73 percent overall response rate; for the questionnaire and a brief summary of the survey objectives and background, see Lynch and Zemsky 1994). The sample frame is the Census Bureau Standard Statistical Establishment List database. This nationally representative survey is designed so that the 1,700 manufacturing establishments can be matched with the Census Bureau's Annual Survey of Manufactures to obtain longitudinal data on output, materials, capital stock, and employment. A follow-up survey is planned that would contact approximately 20 workers per establishment in 500 of the manufacturing establishments for more detailed information on their current and past employment and training experience.

The survey is designed to elicit information on both formal and informal training, including the number of workers receiving training in 1993, how that number has changed relative to three years earlier, the hours and duration of training, the incidence of training by occupational category, and the content of the training. Future training needs are also measured, as is the percentage of total annual labor costs spent on training. Additional financial information on recent technological investments and other capital improvements, sales, competitive product strategy, age of the capital stock, and R&D has been collected so that determinants of productivity can be analyzed. Information on human resource practices, including employee involvement in decision making, the structure of compensation (including average wages by occupational category), recruitment and selection, and average educational level by occupational category, allow this survey to examine how training is linked to other HRM strategies. For example, this survey will allow researchers to distinguish between firms that train workers and firms that recruit already skilled employees. In addition, the survey can be used to see how training is bundled with other HRM practices and what its impact is on both wages and productivity in establishments.

National Federation of Independent Business (NFIB) survey, 1987. This was a mailed questionnaire in 1987 with 2,599 responses (approximately 25 percent response rate) of employers that were members of the NFIB and that hired someone in the past three years (for a complete discussion of the survey design,

see Bishop 1994). This survey focused on the hiring and training of workers in the job in the firm that had the highest employee turnover. The survey design is similar to the EOPP survey except that questions concerning formal and informal training were merged into a single question: "How many hours did you or an employee spend training or closely supervising employee A or B?" An additional question is asked about informal training: "How many additional hours (beyond training and close supervision) did A/B spend learning the job by watching others rather than doing it?" The productivity measure used in this survey is similar to that in the EOPP survey. Since information is also gathered on starting and current wages of recent hires, it is also possible to estimate the impact of training on wages for recent hires in high-turnover positions.

Small Business Administration (SBA) survey, 1992. This is a 1992 telephone interview of 1,288 establishments (50 percent response rate; for a complete discussion of this survey, see Barron, Berger, and Black 1997). The sampling frame comes from Survey Sampling of Fairfield, Connecticut, and their Comprehensive Database. The survey is constructed to mimic much of the EOPP survey design, but in this survey it is possible to distinguish between on-site and off-site formal training, which was not possible in the EOPP survey. As in the EOPP, the training questions only refer to the last hired permanent employee. This is a nationally representative sample, but establishments in agriculture, forestry, fisheries, and public administration were excluded. One weakness of this and the EOPP survey is that both data sets truncate the training duration measures at three months. This may be a serious issue since there are a significant number of employees who report training spells of at least 12 weeks in duration.

Spencer Foundation employer survey, 1992. This is a telephone interview conducted in 1992 of 875 establishments with 50 or more employees (65.5 percent response rate; for a description of this survey and its training question, see Osterman 1995). Formal training information is gathered with reference to "core" employees only. This group is defined as the largest group of nonmanagerial workers directly involved in making the product or in providing the service at the location. This survey includes detailed information on a broad array of HRM practices but has no productivity measures. The focus on core employees appears to underrepresent employees who are women and minorities.

Training Magazine survey. This is a mailed survey of members of the American Society for Training and Development begun in 1981. Response rates vary around 15 percent. Over the years the sampling frame has changed, and it now refers to establishments with more than 100 employees. Because of changes in the year-to-year sampling frame, it is not appropriate to link survey years to obtain time-series information on the incidence of training. It is also likely that

the survey oversamples corporate headquarters relative to actual production facilities. Training expenditure data and distribution of training by industry and occupation are available in this survey, but it is not possible to link these data to wage or productivity information.

As in the household-based surveys, it is difficult to compare training measures across any of these surveys. For employer-based surveys the difficulties in comparability are mainly due to the fact that each survey refers to a very different set of workers. However, given survey design, it is possible to make some comparison between the SBA, NFIB, and EOPP surveys on the one hand, and the Department of Labor and EQW surveys on the other. The SBA, NFIB, and EOPP surveys are especially good for identifying the training experience of new hires into a firm, and the Department of Labor and EQW surveys give a broader overview of the incidence and types of training across firms of varying sizes and industries.

12.3.3 Matched Employer-Employee Surveys

One way to resolve the problem of getting employers to provide high-quality data on the employment experience of different types of workers in the establishment is to do matched employer-employee surveys. In the employer survey, information on training, workplace practices, average wages, and productivity could be obtained by broad occupational categories, and then more detailed information on specific employee experiences in the establishment could be obtained with a simultaneous survey of employees. The quality of the data in this type of survey could be further enhanced if employers were willing to provide administrative records on employment and wages of employees. The matched survey would allow researchers and policymakers to see how diffuse reported workplace practices such as training and employee participation in decision making actually are in the workplace.

While this type of survey seems to be the ideal, there are some drawbacks. First, there may be substantial variation between the perceptions of employers and employees of the exact same practices. For example, a supervisor's close supervision of an employee may be regarded by the firm as employee training, while the worker may report it not as training but as monitoring. If the establishment is the frame of reference, when an employee leaves the establishment we lose information on what happens to this individual. If instead the worker is the frame of reference and we follow him or her through various employers, we may not be able to obtain sufficient information on the variation of the employment experience of other employees within the establishment. In addition, if the employee leaves the establishment, we lose the establishment from the survey. The following briefly describes some new surveys that have tried to match employees with employers.

BLS White Collar Pay Survey (WCP), 1989 and 1990. In 1989 and 1990, 354 establishments were asked by the Department of Labor about the demographic

characteristics of a random sample of their white-collar employees. Three hundred establishments provided some information on more than 1,700 workers; however, after deleting cases with missing data the final sample only includes 601 full-time white-collar employees in 124 establishments. See Bronars and Famulari (chap. 13 in this volume) for a more complete description of this survey and its findings.

National Organization Survey (NOS). The sample frame was the 1991 General Social Survey of 1,517 respondents (see Knoke and Kalleberg 1994 for a detailed discussion of this survey and the June 1994 issue of *American Behavioral Scientist*). Each respondent was asked to identify his or her employer, and a telephone interview was attempted with the employer (1,427 establishments). Interviews were completed in establishments for 727 respondents, representing approximately a 50 percent response rate. The employer's survey included information on training, employment, fringe benefits, earnings, recruitment practices, and a subjective measure of productivity (a scale from 1 to 4 on whether current performance in producing the main product is better or worse than one year ago and three years ago).

Upjohn survey, 1993. This is a telephone survey of 305 establishments and their employees (20 percent response rate) conducted in spring 1993 (see Barron, Berger, and Black 1994 for a complete description of this survey). The sampling frame strategy is similar to the SBA survey and excludes establishments in agriculture, forestry, fisheries, and public administration. The survey is restricted to establishments with 100 or more employees that had hired someone in the past 10 days or expected to hire shortly. Training questions refer to training that occurred during the first month on the job and are based on the EOPP and SBA surveys. Productivity is a subjective measure of the new hire's productivity relative to a fully trained worker. In an attempt to improve the recall ability of employers and employees, the respondents (employers and employees) were contacted once after two weeks of employment and a second time after four weeks of employment. This is a unique feature in matched employee-employer surveys and something that hopefully will be repeated in future surveys.

DOL95 employer-employee training survey. As part of the BLS 1995 employer training survey, a matched employee survey was conducted in tandem of two employees in each of the businesses surveyed. There was a questionnaire that focused on demographic characteristics and a training log that collected detailed information on all training and learning activities the employee participated in over a 10-day period. The response rate for the employee survey was 35.3 percent. From this matched employer-employee survey the BLS concluded that an estimated total of \$37 billion was spent on the indirect wage and salary costs of training during May–October 1995. Of this amount \$13

billion, or 35 percent, was for formal training and the remaining \$24 billion, or 65 percent, for informal training. The estimates in the BLS matched survey for indirect training costs are higher than those used by the American Society for Training and Development when it reported that employers spent \$55 billion in 1995 on formal training.

The bottom line is that there have been very few matched employer-employee surveys. They are very expensive, response rates can be low, and there are large confidentiality issues for both respondents. Even drawing the sampling frame is difficult because it is not always clear whether one would want to start with a representative survey of employees or of employers.

12.4 The Training Gap: What Is It and How Could We Close It?

Table 12.4 summarizes how one can use the various surveys described above for analysis of training incidence and its impact on outcomes such as wages and productivity. As documented in several recent papers (Lynch 1992c; Zemsky and Shapiro 1994; Barron et al. 1997; Loewenstein and Spletzer 1994; Sicherman 1990) there is no consensus on the estimates of the incidence of formal and informal training across surveys, especially household-based surveys. This appears to be due to the questions used, who the questions refer to, the nature of the survey instrument, and when in the business cycle the surveys were done. As Zemsky and Shapiro (1994), Barron et al. (1997), and Loewenstein and Spletzer (1994) discuss, it does not seem possible to reconcile the different estimates on the incidence of training. Therefore, measuring the incidence of formal and informal training represents one gap in our training data.

In addition to the inconsistencies across surveys in how postschool training is defined, there is relatively limited work on the impact of training on productivity. Even though table 12.4 lists several studies that have examined the impact of training on productivity, most of these surveys use a subjective measure of productivity (e.g., "How has your productivity changed over the last year" on a scale of 1 to 4), rather than output divided by employment, total factor productivity, or value added. If output or sales are used, they are often data from the firm and not the establishment (e.g., the Columbia survey). The main problem with subjective measures of productivity is that these measures are not comparable across firms or even within firms over time. They also do not allow one to estimate rates of return to training versus other human resource practices. So far, only the EQW-NES will allow us to begin to look at the impact of training on more objective measures of productivity.

The recent Department of Labor surveys of establishments and their training practices highlight another gap in the collection of information on training. The Department of Labor training survey done by the BLS found that more than 70 percent of establishments in the United States offer some type of for-

Table 12.4 Where to Go for Information on Training and Outcomes of Training

Formal Training	Informal Training	Wages and Growth	Productivity	Changes Over Time
<i>Household Surveys</i>				
CPS	CPS	CPS		CPS
EOPP ^a	EOPP ^a	EOPP ^a		
HS&B	HS&B	HS&B		
	NLS	NLS		NLS
NLSY	NLSY	NLSY		NLSY
NLS72	NLS72	NLS72		
	PSID	PSID		
	SIPP	SIPP		
<i>Employer Surveys</i>				
Columbia		Columbia	Columbia	
DOL93	DOL95			
EOPP ^b	EOPP ^b	EOPP ^b	EOPP ^b	
EQW-NES	EQW-NES	EQW-NES	EQW-NES	EQW-NES
	NFIB	NFIB	NFIB	
SBA	SBA	SBA	SBA	
Spencer				
<i>Matched Employer-Employee Surveys</i>				
BLS-WCP		BLS-WCP		
NOS		NOS	NOS	
Upjohn	Upjohn	Upjohn	Upjohn	
DOL95	DOL95			

^aIndividual survey.^bEmployer survey.

mal training. Fifty percent of establishments offered formal skills training, while the remaining establishments offered formal training in programs such as new hire orientation and occupational health and safety. At the same time, as shown in table 12.2, only 16 percent of workers in 1991 said they had ever received any type of training from their current employer. So we are left with an apparent paradox: most firms state that they are offering training while few workers seem to be getting it! A possible solution may be that while most firms offer training, only a small percentage of their workers actually receive it. Therefore, this paradox may be resolved with better matched information on firms and their employees.

Surveys that focus on identifying which firms are training and what is happening to their employees' wages and productivity may be problematic if they measure training at one point in time. From human capital theory we would expect workers' wages to be lower during periods of more general training as they share costs of training with their employers. Therefore, looking at a firm at a point in time and observing that those firms that are training have workers with lower wages than those firms that do not train, does not mean that the returns to training are low for workers. What is required instead are measure-

ments of how training has changed over time and the corresponding changes in wages. At the same time, firms that train most heavily may also be the firms with lower productivity. Bartel (1992) shows that what training programs deliver in terms of productivity gains is often not seen until two or three years later. Training and productivity are potentially endogenous. This gap in the dynamics of training and productivity could be addressed with longitudinal data on training and productivity. Longitudinal information on training and productivity would also allow us to examine the depreciation of human capital investments.

In sum, the current training gap includes discrepancies in the measurement of formal and informal training, who provides the training, what training costs, how training investments vary over tenure within a firm and work experience in general, how training varies with demographic characteristics, what impact training has on establishment productivity, what are the dynamics of training investments and their impact on wages, wage growth, productivity and productivity growth, and what are the linkages between training and other HRM practices such as recruitment and selection, compensation, new technology, and changing work organization.

Much of the current training gap could be narrowed by the creation of a large, nationally representative, longitudinal matched employer-employee survey. This would allow us to see who gets training and when and then to observe the impact of this training on wages and productivity. This survey should be longitudinal so that we can see how firms vary their training practices over time in the face of changing product demand, technology, and work organization. Finally, the data should be collected in such a way that we are able to measure the skills workers bring to firms from previous employers, previous training spells, and education. Only by collecting information on preexisting skills can we hope to distinguish between firms that decide to hire relatively unskilled workers and train them and firms that hire already trained employees. By collecting information on both workers and firms we could observe the relative contribution of worker characteristics versus firm management practices and product market conditions on outcomes of interest. In addition, in order to understand the forces that drive the training needs of a business and the bundling of training with other workplace practices, the survey needs to go beyond just measuring different types of training in the workplace. It should document the menu of establishment practices to identify which practices or combinations of practices best improve the standard of living of workers and the productivity of firms.

One problem, however, in designing this type of longitudinal survey is selecting the optimal way to generate the sample. Many of the employer-based surveys described in section 12.3 relied on databases such as the Yellow Pages, Dun and Bradstreet, or other firm databases collected by opinion research firms. These listings tend to overrepresent corporate headquarters and are updated with varying frequency. This can lead to a bias in underrepresenting

newly created establishments. The most comprehensive and up-to-date sampling frames for establishments currently reside in the Census Bureau and BLS. The ability of government agencies such as the Census Bureau and the BLS to gather data from establishments, especially on sensitive items such as profitability and productivity, has been shown to be quite high (see the reported response rates to the BLS and EQW training surveys). Unfortunately, due to confidentiality requirements, using establishment data from either the BLS or the Census Bureau generally restricts researchers' access to the data.

There is also a marked difference between a sample that is representative of establishments and one that is representative of establishments where workers are employed. More than 50 percent of all establishments in the United States employ fewer than 5 workers, while almost 50 percent of all workers are employed in establishments with 100 employees or more. Yet establishments with 100 employees or more represent less than 3 percent of all establishments. The researchers involved with the NOS chose to use a representative household survey to obtain their matched sample of employers. Unfortunately, there are very few firms for which there is more than one respondent working in an establishment to match individual data with firm characteristics. The Upjohn survey pursued an alternative strategy and contacted firms first and then workers in the firm. Due to budgetary constraints the Upjohn survey focused on new hires, which means that we are not able to determine what kind of training incumbent workers received.

So the researcher is left in a quandary over whether to go for more employees in fewer firms or to sample a few workers in a broader array of firms. The first strategy makes it difficult to infer what is happening to firms in general, and the second strategy means that we will have less information about variation in the employment experiences of similar individuals within and between firms. Even if we had a longitudinal survey of establishments, we would miss information on previous employment experience or postemployment experience of workers passing through the firm. Some of these issues might be resolved by pooling resources across government agencies such as the BLS, Department of Education, and Census Bureau and the greater use of administrative matches (e.g., Abowd and Kramarz, chap. 10; Troske, chap. 11 in this volume).

12.5 Conclusions

We are not alone in our problems with measuring training. A recent survey by the Organization for Economic Cooperation and Development (1991) on private sector training across member countries highlights the difficulty in coming up with measures within a country that could also be used for cross-country comparisons. The 1980s and early 1990s have seen an explosion of studies aimed at gathering more information on training and its impact on productivity and wages. Unfortunately, the studies on training's relationship with

productivity are few. Most of the few studies that measure productivity use subjective measures or refer only to the productivity of recently hired employees—for example, the NFIB, SBA, and Upjohn surveys.

Currently we do not have in the United States a longitudinal database of individuals and firms and their training experiences and outcomes. This lack of matched employer-employee data is especially problematic in the study of training since there are two agents that are involved in the training investment—workers and firms. Obtaining data on just one of these two agents does not provide sufficient information on the incidence, constraints, and outcomes of training investments.

Response rates of employer-based surveys suggest that having a government agency collect information, especially on sensitive data such as profitability and actual measures of productivity or value added, would enhance data response quality. No matter who eventually fields a matched employer-employee survey, we should keep in mind that the current policy debate on training is motivated by two concerns—how to maintain and improve the standard of living of workers and how to improve the productivity and competitiveness of U.S. firms. Therefore, collecting information on training needs to go beyond just measuring its incidence.

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Comment John M. Barron

In the past 15 years, there have been numerous surveys that contained questions aimed at directly measuring the extent of on-the-job training. An important contribution of Lynch's paper is to highlight the key differences across these various surveys with respect to the measurement of on-the-job training. As such, it is of great value to researchers interested in the extent and effects of on-the-job training.

Lynch's review of available data sets on on-the-job training indicates that training measures have at least four potential dimensions:

1. The distinction between formal versus informal training. Data sets such as the 1982 EOPP and the 1992 SBA define formal training as training that involves self-paced learning programs or classes designed by specially trained personnel. Informal training is defined as the time spent by management and supervisors away from other activities giving employees informal individualized training or extra supervision, time spent by coworkers who were not supervisors away from their normal work giving individualized training or extra supervision, and time spent by the employee observing coworkers in order to learn skills required for the position.

2. The distinction between the incidence, intensity, and the duration of training. Some surveys measure only whether training has been given (e.g., the 1991 CPS). Some include a measure of the intensity of training such as the number of hours each week devoted to training during the first three months of employment (e.g., the 1993 Upjohn). Others measure only the duration of training for

a particular position in terms of number of weeks or months until a worker is fully trained (e.g., the NLSY).

3. *The distinction between the training of new workers and ongoing training.* Some surveys, for instance, the 1982 EOPP and the 1992 SBA, focus on the training of new hires, as such data provide a natural test for on-the-job training theories. Other surveys encompass all employees (e.g., DOL) and thus de facto focus on measuring the extent of training involved in maintaining or upgrading the capabilities of existing employees.

4. *The distinction between employer-based and employee-based surveys to generate training measures.* Surveys such as the 1991 CPS are worker based, while others such as the 1982 EOPP ask the employer to provide measures of various training activities. The recent 1993 Upjohn survey asks both employers and employees; a planned follow-up employee survey to the 1994 EQW employer-based survey and a proposed Department of Labor survey may also provide matched data from employers and employees.

Given the above four dimensions to training measures, it follows that the ideal survey would capture all four. That is, the ideal survey would contain questions concerning both informal and formal training activity; have questions that measured the incidence, intensity, and duration of each type of training; ask training questions for a sample that includes a sufficient number of new hires; and ask training questions of both the employer and the employee (generate a "matched" data set). In addition, the survey would obtain information on how the initial matching of a worker to a position at a firm occurs (e.g., employer and employee prior search activities), the wages and other key contractual provisions of the employment relationship, relevant characteristics of employees (e.g., past education, experience, age, and gender), relevant characteristics of the employer (e.g., size of establishment, the capital-labor ratio, and financial statistics), and changes in the employment relationship that follow the initial training, including the experience of worker at subsequent employers.

As Lynch's paper makes clear, such an ideal survey does not currently exist. But by indicating precisely what is missing from each of the available surveys, Lynch provides the necessary information for future surveys to be constructed that fill in the missing pieces with respect to the measurement of on-the-job training. Lynch suggests that one focus of future surveys should be time-series data to document a possible movement away from informal toward formal training. Such a movement clearly has important policy implications given the substantial role that government might play in providing formal training programs. However, Lynch's paper contains at least two other important messages. First, in order to test on-the-job theories against alternative theories arising from learning and job-matching models (e.g., Jovanovic 1979) or incentive-

based compensation models (e.g., Lazear 1981), future surveys would be well advised to adopt sampling procedures that focus on obtaining information concerning the training of new hires. Second, future surveys should not neglect, and in fact should emphasize, the measurement of informal training.

One might argue that a focus on informal training seems misplaced given the growing importance of formal training. Lynch cites an increase from 12 to 17 percent in the incidence of formal training across all worker indicated by a comparison of the CPS surveys of 1983 and 1991. A comparison of employers' responses to the 1982 EOPP survey with their answers to similar questions in the 1992 SBA survey indicates an even more dramatic increase, with the incidence of formal training rising from 15 percent to close to 30 percent of new hires. Note that these results hold even adjusting for the fact that the EOPP sample is weighted toward smaller employers. However, formal training still is not widespread among workers. In contrast, virtually all new employees received some informal training. Further, the extent of informal training is substantial, and has increased as well during this period. In addition, both the 1982 EOPP employer survey and 1992 SBA employer survey indicate that a new worker spends close to one-fourth of her time in various informal training activities during the first three months of employment, versus less than one-twentieth of her time in formal training activities.

One might instead object to a survey that focuses on informal training by claiming that measures of informal training are inherently less precise than those of formal training. However, if the extent of training is to be used as a basis for deciding government subsidies to particular employers or employees, then it is important not to neglect survey measures of the type of training—informal—that employers appear to favor. In addition, preliminary work by Barron, Berger, and Black (1997b) that uses the 1993 Upjohn matched employer-employee survey suggests that aggregate measures of informal training may not be less precise than measures of formal training.

In sum, new surveys on training measures should not adopt the DOL training survey strategy of asking a random sample of workers only questions about formal training. Of value instead are surveys that focus on measuring both formal and informal training and surveys that focus on sampling new hires, for here the predictions of on-the-job training theories can be clearly tested. In this regard, one important puzzle to resolve is the issue of who initially pays for on-the-job training, especially if the government is to be involved in subsidizing such training. Preliminary work by Barron, Berger, and Black (in press) based primarily on the 1992 SBA survey raises the possibility that most training costs are initially borne by the employer.

Lynch is quite right that future training surveys should also consider a matched survey, as there is evidence that each side of the employment agreement can provide useful information. For instance, there is evidence that some activities identified by employers as periods of training are perceived by workers as periods of monitoring instead. Employers can provide key informa-

tion concerning the matching of workers and positions, such as the extent of employer search to fill the position. Barron, Berger, and Black (1997a) document that employers search more when filling high-training positions, suggesting that part of the return to training may reflect differences in the quality of the employment match. On the other hand, workers can provide more complete information on such activities as their prior job search and prior on-the-job training.

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