

Foundations and Trends® in  
Microeconomics  
2:5 (2006)

# On-the-Job Training

Harley Frazis and Mark Loewenstein

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# **On-the-Job-Training**

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Boston – Delft

## Foundations and Trends<sup>®</sup> in Microeconomics

*Published, sold and distributed by:*

now Publishers Inc.  
PO Box 1024  
Hanover, MA 02339  
USA  
Tel. +1-781-985-4510  
www.nowpublishers.com  
sales@nowpublishers.com

*Outside North America:*

now Publishers Inc.  
PO Box 179  
2600 AD Delft  
The Netherlands  
Tel. +31-6-51115274

Library of Congress Control Number: 2006939974

The preferred citation for this publication is H. Frazis and M. A. Loewenstein, On-the-Job-Training, Foundations and Trends<sup>®</sup> in Microeconomics, vol 2, no 5, pp 363–440, 2006

*Printed on acid-free paper*

ISBN: 1-60198-002-7

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**Foundations and Trends<sup>®</sup> in  
Microeconomics**

Volume 2 Issue 5, 2006

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Foundations and Trends<sup>®</sup> in Microeconomics, 2006, Volume 2, 5 issues. ISSN paper version 1547-9846. ISSN online version 1547-9854. Also available as a combined paper and online subscription.

## On-the-Job-Training

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### Abstract

The analysis of how individuals obtain and are paid for their skills is fundamental to labor economics. The basic idea of human capital theory is that workers and firms invest in workers' skills in order to increase their productivity, much as persons invest in financial or physical assets to earn income. Workers develop many skills through formal education not tied to an employer, but an important part of their skills are learned on the job. This paper is a survey of the recent literature on on-the-job training, both theoretical and empirical.



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# 1

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## Introduction

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The analysis of how individuals obtain and are paid for their skills is fundamental to labor economics. The basic idea of human capital theory is that workers and firms invest in workers' skills in order to increase their productivity, much as persons invest in financial or physical assets to earn income. Workers develop many skills through formal education not tied to an employer, but an important part of their skills are learned on the job. This paper is a survey of the recent literature on on-the-job training, both theoretical and empirical.

While the roots of human capital theory (including the metaphor of skills as capital) go back at least to Adam Smith (1904) modern human capital theory was developed in the late 1950s by such economists as Theodore Schultz (1962), Jacob Mincer (1962), and Gary Becker (1962). For a period of some two to three decades, the theory of on-the-job training was dominated by Becker's (1962) analysis of general and specific human capital. Empirical work followed the lead of Mincer (1962, 1974), who imputed the amount of on-the-job training from wage-experience profiles.

Because data on the actual amount of on-the-job training were not available, Mincer's attempts to measure such training were indirect.

## 2 *Introduction*

In the last two decades, as datasets with information on training have become more plentiful, researchers using direct measures of training have been able to examine its effects and test human capital theory. Simultaneously, partly in response to empirical findings and partly in response to advances in the analysis of the relationship between workers and firms, theorists enriched and in some cases contradicted the Becker model. We focus on this later literature—empirical work using direct measures of training and theoretical papers inspired by findings from such empirical work.

One of the clear predictions of the Becker model is that workers will bear all the costs and reap all the returns to general training, rather than sharing costs and returns with employers. We discuss several strands of empirical results that cast doubt on this conclusion. We develop a theoretical model similar to others in the literature showing that costs and returns to general human capital may be shared if training increases mobility costs, if there are constraints on lowering wages, or if there is uncertainty about the value of training at competing employers.

Our model also allows us to analyze the choice of the amount of training, where we emphasize the influence of whether the employer can commit to training prior to employment. In addition, the model implies that firms will attempt to match low-turnover workers with training opportunities, an implication we find much empirical support for in the literature.

The development of datasets with direct measures of training has allowed researchers to examine the effects of training on wages and productivity. We examine the many potential biases in estimating training effects. Longitudinal data allow researchers to overcome many of these biases. After correcting for most forms of bias, we conclude that the weight of the evidence is that the average rate of return to formal training for the trained is quite high; one reasonable estimate is in the neighborhood of 50% for workers with the median (positive) amount of training. However, no good estimates exist for the return to training for workers on the margin of being trained, or for the marginal return to training for trained workers. Productivity returns to training are found by virtually all researchers to be higher than wage returns.

# 2

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## Measuring Training

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Much of this survey will be concerned with empirical work on training. It is helpful to begin our discussion with a brief description of how the concept “training” has been operationalized in the literature.

Employees acquire skills on the job in a variety of ways. They may be trained formally in classes, informally by supervisors or co-workers, or they may become more productive without direct training as a result of learning-by-doing. Because it is easiest to measure, most empirical work has involved formal training, but broader training measures including informal training and learning-by-doing have also been used.

Some early research on training, including Duncan and Hoffman (1979), Mincer (1988), and Brown (1989), was done using the broad training question in the Panel Study of Income Dynamics (PSID). In 1976, 1978, and 1985, the PSID asked the question “On a job like yours, how long would it take the average new person to become fully trained and qualified?” (A slightly different question was asked in 1993.) Since the question does not refer to specific training activities, it is probably best interpreted as referring to a period at the beginning of the job where the employee is trained, whether formally

#### 4 *Measuring Training*

or informally, and also increases his or her productivity through learning-by-doing.

Because it may be difficult for survey respondents to recall episodes of informal training, relatively few surveys attempt to measure it; for a detailed look at attempts to measure informal training, we refer the reader to Loewenstein and Spletzer (1999a). The Employer Opportunity Pilot Project (EOPP) survey of 1982 and the Small Business Administration (SBA) survey of 1992 attempted to measure informal training by asking establishments about the number of hours new employees spend in particular informal training activities such as receiving individualized training from line supervisors or co-workers, or watching co-workers perform the job. These questions are asked about the first three months on the job of the last person hired. (EOPP and SBA also ask a question similar to the PSID question.) As reported by Frazis *et al.* (1998), in order to minimize recall error, the 1995 Survey of Employer Provided Training (SEPT95) attempted to measure informal training by asking employees to fill out a training log while on the job.

Not surprisingly, given the difficulty of collecting informal training data, more datasets contain measures of formal training. Even in the case of formal training, differences in reference periods, samples, the definition of training, and the boundary between “education” and “training” can lead to substantial differences in the estimated incidence of formal training. Upon scrutiny, these differences can sometimes be reconciled. Examining the formal training information in EOPP, the 1979 cohort of the National Longitudinal Study of Youth (NLSY79), a January 1991 supplement to the Current Population Survey, and the National Longitudinal Survey of the High School Class of 1972, Loewenstein and Spletzer (1999a) determine that if one takes into account differences in sample populations, reference periods, and formal training definitions, the formal training responses are consistent across the data sets. Excluding formal schooling, they find the annual incidence of formal training to be about 17% and with about 45% of workers having received training while on their current job.

More recent estimates appear to be higher. Lerman *et al.* (1999) report that the annual incidence of employer-provided or -supported formal training in the 1995 National Household Education Survey

(NHES) is 27%. Similarly, the incidence of formal training in SBA is 32 percent. Analyzing the 1994–1995 International Adult Literacy Survey (IALS), O’Connell (1999) finds a still higher US incidence of education or training for career or job-related purposes by the employed of 46%.<sup>1</sup> However, this figure may well include informal training since the training question is worded quite broadly and includes “on-the-job training.”

Differences in the definition of training make comparisons across data sets especially difficult, but the results presented above suggest that formal training incidence may have risen during the 1990s. Especially striking is the fact that formal training incidence is about 18% higher in SBA than in the very similarly designed EOPP (32% vs. 14%), although this may be partly due to the fact that EOPP oversampled low wage jobs. (For further discussion of how EOPP compares with SBA, see Barron *et al.* (1997b).)

In contrast to formal training, EOPP and SBA indicate that nearly all workers receive some informal training. Not only is the incidence of informal training higher than the incidence of formal training, but informal training spells appear to last longer than formal training spells. In the SBA, workers on average receive 144 h of informal training during the first three months of employment. However, the average length of a formal training spell is only 89 h. Consequently, formal training constitutes only 13% of total training hours. In SEPT95, this figure is higher, but still only 30%. The SEPT95 includes all levels of tenure but only establishments with 50 or more employees; the SBA includes all sizes of establishments, but only covers the first three months of employment. In light of Frazis *et al.*’s finding that the formality of training increases with size and tenure, one can treat these estimates as bounds.

As reported by Bassanini *et al.* (2005), the OECD has attempted to produce internationally comparable training statistics by combining data from surveys with similar instruments in different countries: the household IALS and the establishment Continuing Vocational Training

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<sup>1</sup>Frazis *et al.* (1998) report an anomalously high figure of 70% in SEPT95; this may be due at least partly to restricting the sample to large establishments and to non-response.

Survey (CVTS). Comparing Europe and the US, Scandinavian countries appear to have particularly high amounts of formal training, Eastern Europe appears to have low amounts, and the US seems to be in the middle (see Pischke (2006) for a discussion of how comparability might be affected by varying labor market institutions across countries).

While cross-sectional data sets can be useful in examining the extent and incidence of training, panel data methods are very useful in estimating the effects of training. Thus it is not surprising that a disproportionate amount of research on on-the-job training is done using panel datasets, especially the 1979 cohort of the National Longitudinal Study of Youth (NLSY79), a relatively early longitudinal dataset with detailed questions on formal training in (almost) every wave. (Frazis and Spletzer (2005) provide a non-technical review of NLSY79 training research.) More recently, European countries have developed panel datasets with detailed training sequences, such as the European Community Household Panel (ECHP), the British Household Panel Survey (BHPS), and the German Socio-Economic Panel (GSOEP); see Arulampalam *et al.* (2004b) for an example of research using the ECHP, Arulampalam *et al.* (2004a) for the BHPS, and Pischke (2001) for the GSOEP.

How well is training measured? The only evidence on this question that we are aware of is a validation study by Barron *et al.* (1997b), who conducted a survey where they matched employers' reports of the training provided to their most recently hired worker during the first month on the job with the workers' own reports. They found a correlation between employers' and workers' reports of total hours of training of only 0.47, indicating substantial measurement error. However, they found no substantial difference in the degree of measurement error (as measured by the correlation between employers' and workers' reports) between formal and informal training. Surprisingly, there was substantial divergence between reports of the *incidence* of formal training, with only a 0.32 correlation in the reported incidence of on-site training and a 0.38 correlation for off-site training. So there is a good possibility that the effect of formal training is typically underestimated, even with informal training as an omitted variable. Later, we will discuss

the effects of measurement error on estimates of the wage return to training.

To summarize our description of the available data, we observe that relative to the early years of human capital research there is now a wealth of data on on-the-job training. Moreover, the increasing availability of training data in longitudinal datasets has greatly aided research on the effects of training. However, it is clear that there are important limitations in existing data. Most datasets only contain information on formal training, even though the small amount of data on informal training that exists indicates that most training is informal. Even the data on formal training are inconsistent across datasets and plagued by measurement error.



# 3

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## The Division of the Cost and Return to Training

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There are two distinct decisions that must be made with respect to training. First, employers and workers must decide how much training to undertake. Second, employers and workers must determine how to share the cost and return to training. Labor turnover considerations play a fundamental role in shaping these decisions. Unlike physical capital, workers cannot sell their human capital. When a worker leaves an employer, the worker's human capital goes with him. The employer loses the opportunity to derive any further benefits from it and the worker loses the opportunity to use it at the employer's workplace. Thus, the employer's and worker's willingness to invest in training will depend on the likelihood of a quit or dismissal in the future. Furthermore, as discussed below, decisions about the division of the return and cost to training between employer and worker will be heavily influenced by the consequent effects on turnover.

Becker's (1962) distinction between general and specific human capital is a key concept in thinking about the relationship between training, turnover, and the division of returns to training. Specific skills are only useful at one employer, while general skills make a worker more productive at many employers. Training that teaches a worker about an