



# General training in labor markets: Common value auctions with unobservable investment<sup>☆</sup>



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## ABSTRACT

This paper studies the puzzle of employer financing for the general training of workers. A parsimonious theory is developed based on asymmetric information between employers about the quantity of training. The labor market is modeled as a common value auction with an informed and an uninformed bidder. The novel feature of the game is that one of the bidders can make an unobservable investment that increases the value of the item before the auction. By randomizing the amount of training provided, an employer can create an endogenous adverse selection problem, enabling it to compress the wage structure and capture some returns from its training investment. The model generates continuous equilibrium wage and training distributions, and identical employees can receive different wage offers and training levels. A parametric example is used to illustrate how the shape of the wage distribution depends on the elasticity of production with respect to human capital.

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## 1. Introduction

Why do firms pay for the general training of employees? This paper constructs a model of common value auctions with unobservable investment in order to address this question, which has interested several generations of economists. In *Wealth and Welfare*, Pigou (1912) observed that “under a free economy. . . socially profitable expenditure by employers in the training of their workpeople. . . does not carry a corresponding private profit.” A trained worker might quit his or her current position for a higher paying job, or an employer might need to pay a higher wage in order to retain a trained worker. Hence, a firm may not capture all of the returns to an investment in general training. Some of the gains may accrue to the worker or even other firms in the labor market. Because of this sort of poaching externality, firms might underinvest in training, resulting in inefficiently low levels of human capital and labor productivity.

In *Human Capital*, Becker (1964) presented an influential analysis of training in perfectly competitive labor markets. A key assumption of this study, which is relaxed in the current paper, is the observability and contractibility of training. According to Becker (1964), training can be either specific or general. Both a worker and a firm can share the costs of and returns to specific training, which is useful only at the firm where it is received. By contrast, general training is widely applicable, augmenting the productivity of a worker in numerous firms. If the labor market is competitive, then a worker is paid a wage equal to his or her marginal product. In this case, employers cannot recover any of the returns to general training and are

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unwilling to fund the general training of employees. Ideally, a worker can finance the efficient level of training by incurring a tuition fee or accepting a wage cut.

Some evidence supports the prediction that workers must bear a large portion of training costs. For example, [Minns and Wallis \(2013\)](#) describe the premiums that apprentices in preindustrial England paid to masters before receiving instruction. Nonetheless, as [Bishop \(1996\)](#) notes when reviewing empirical work on the subject, employers often cover some of the expenses for general training. For example, [Barron et al. \(1999\)](#) find only a small impact of training on the starting wage of an employee, and [Loewenstein and Spletzer \(1999\)](#) find little difference between the wage gains from general and specific training. In addition, [Acemoglu and Pischke \(1998\)](#) argue that the monetary cost of apprenticeships in Germany is largely borne by employers, and [Autor \(2001\)](#) discusses the free provision of general training by temporary help firms in the United States. [Picchio and van Ours \(2011\)](#) observe that labor market frictions raise training investments by employers.

A considerable theoretical literature has developed in order to account for outlays by firms on the general training of employees. Several authors have suggested that adverse selection might reduce the mobility of workers between employers, thereby enabling firms to recover some returns to investments in general human capital. [Chiang and Chiang \(1990\)](#) analyze the role of asymmetric information between employers about the teachability of a worker. [Katz and Ziderman \(1990\)](#) propose that an incumbent employer might have better knowledge than outside firms about the value of training provided, and [Chang and Wang \(1996\)](#) attempt to formalize this idea. [Acemoglu and Pischke \(1998\)](#) construct a model in which the innate ability of a worker is observable to the current employer of the worker but not to outside firms. [Autor \(2001\)](#) argues that more able workers self-select into jobs that offer training, which helps employers screen workers for their ability.

Informational asymmetries are not the only sort of market imperfection that can stimulate general training by employers. [Acemoglu \(1997\)](#) demonstrates how search frictions might facilitate training investments by enabling firms to collect some of the surplus from an employment relationship. A linkage between general and specific human capital may also be relevant. [Stevens \(1994\)](#) studies skill acquisition in situations where training is a mixture of specific and general components. [Lazear \(2009\)](#) argues that each firm in the labor market uses a specific combination of general skills; so that, training is only partially transferable across employers. Finally, [Acemoglu and Pischke \(1999a\)](#) catalogue a variety of labor market institutions like labor unions, efficiency wages, minimum wages, and unemployment insurance that can enhance training investments. Overall, as [Acemoglu and Pischke \(1999b\)](#) demonstrate, firms may have an incentive to fund general training whenever the wage structure is compressed, in which case training investments raise the marginal product of a worker by more than they increase the wage rate.

The current paper endogenizes the process through which the wage structure is compressed. It models general training in labor markets by introducing pre-bidding investment into a first-price, sealed-bid auction with asymmetric information. The framework retains the essential features of a perfectly competitive labor market, except for the observability and contractibility of training. The key insight is that the opportunity for employers to train workers might in itself be a justification for employers to finance training. In particular, if the amount of training received from an incumbent employer cannot be accurately ascertained by the outside market, then firms may have an incentive to randomize the quantity of training provided, so as to endogenously generate uncertainty about an employee's productivity. By rationing training to workers in this way, an employer can create a winner's curse problem that deters other firms from offering high wages to its employees. This mechanism may lower the wage below the marginal product of a worker, enabling an employer to earn a return on its training outlays.

The basic intuition behind the model is straightforward. First, suppose that an employer spends the same positive amount on training each worker. Outside firms would rationally anticipate that each worker has received this particular amount of training and so would be willing to offer each worker a wage equal to his or her marginal product at this training level. Hence, an employer could retain a worker only by paying the worker a wage no less than his or her marginal product. This arrangement cannot be supported as an equilibrium because an employer invests in training but obtains no return on its investment.

Next, suppose that an employer never trains a worker. Outside firms would believe that each worker has no training and so would be willing to offer each worker a wage no greater than the marginal product of untrained labor. Hence, an employer could retain a worker by paying the worker a wage equal to his or her marginal product without training. This situation may not be an equilibrium outcome because an employer might have an incentive to deviate by secretly training a worker and paying the worker a wage equal to his or her marginal product without training. This deviation could enable an employer to obtain a return on its training investment equal to the difference between the marginal products of a trained and untrained worker.

Finally, suppose that an employer uses a mixed strategy such that the amount of training provided varies across workers. Outside firms would be uncertain about the training received by each worker and so could not offer each worker a wage equal to his or her marginal product. As a result, an employer could potentially employ a trained worker at a wage below his or her marginal product, thereby reaping a return on its training investment. The model in the current paper has a unique Nash equilibrium, in which an employer implements this sort of investment policy.

Although the game is simple, it generates a complex pattern of behavior. Ex ante identical employees will receive unequal amounts of training. The equilibrium distribution of training levels will have a positive density on the interval between a zero training level and the socially optimal quantity. Furthermore, an incumbent employer and the outside market will both offer the same atomless distribution of wages. An incumbent employer offers different wages to employees with different

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