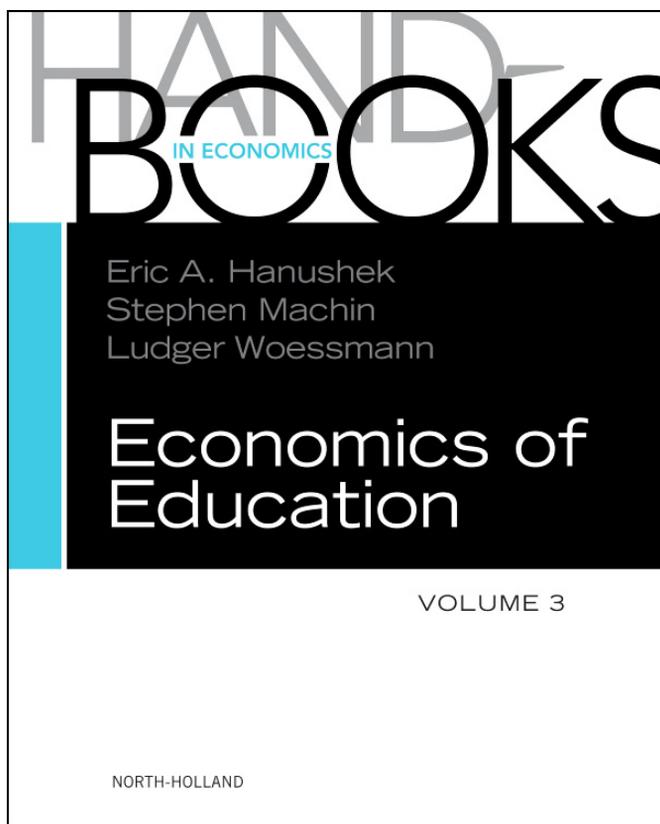


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From: Stefan C. Wolter and Paul Ryan, Apprenticeship. In Eric A. Hanushek, Stephen Machin, and Ludger Woessmann, editor: *Handbooks in Economics*, Vol. 3, The Netherlands: North-Holland, 2011, pp. 521-576.

ISBN: 978-0-444-53429-3

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CHAPTER 11

Apprenticeship

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Abstract

Apprenticeship varies greatly across countries, in terms of both quantity (numbers trained) and quality (skill content); and across sectors and occupations within countries, in terms of its provision and finance by employers. This chapter outlines recent advances in both areas. Some firms engage in apprenticeship training, others do not; some of those that do, invest in their apprentices, whereas others make a surplus on them. Despite the advances of the last two decades, there is as yet no “general theory” to explain the full range of financial attributes seen in practice within, let alone between, countries. Indeed recent theoretical efforts have focused excessively on specific circumstances in occupational labor markets, and neglected the potential sensitivity of their conclusions to changes in assumptions about labor markets, for both skilled workers and trainees. We also consider evaluations of the benefits of apprenticeship for individuals. Finally, the chapter considers the coordination mechanisms, principally employer bodies (associations, chambers) and employee representation and social partnership (trade unions, works councils, and joint regulatory bodies). Economic analysis indicates various ways in which such institutions may affect economic efficiency. Diversity of institutions across the countries with successful apprenticeship systems suggests, however, that there is no unique recipe for success.

JEL classification: I2, J3, J4, J5, J6, O5

Keywords

Apprenticeship
Training
Institutions

1. INTRODUCTION¹

Apprenticeship normally combines part-time formal education with training and experience at the workplace. As such, it involves four parties—employers, trainees, educators, and government—as potential bearers of its costs and recipients of its benefits. The conditions under which they are willing to bear those costs and can receive those benefits constitutes a fruitful area of contemporary research, both theoretical and empirical.

The issue is particularly important for employers. Full-time vocational education involves the employer and the labor market only indirectly, as agent and arena respectively for the trading of human capital after its creation. Apprenticeship, by contrast, involves both directly, as part of the creation of human capital. Following Becker, a key question is: why would any employer provide and finance training for an asset, viz. employee skills, that it does not own and for any investment in which it cannot in competitive markets extract a return?

¹ We thank the editors, the participants at the Munich conference, Simon Field, Kathrin Hoeckel, Malgorzata Kuczera, Samuel Mühlemann, Harald Pfeifer and Eric Verdier for information, comments and suggestions.

The wider benefits of apprenticeship have also attracted scientific interest. Many observers, including economists, educators, managers, and policy makers alike, view apprenticeship as superior to full-time schooling as a source of efficient skill development. Its potential benefits include: (a) the cognitive and motivational effects of integrating theory and practice in skill learning; (b) a closer correspondence between the content of skills and the requirements of actual production systems; and (c) increased youth employment rates, and better school-to-work transitions in general (Streeck (1989); Grubb (1995); Ryan (2001); Field et al. (2009)).

The evidence does not uniformly favor apprenticeship: traditional and unregulated apprenticeship often shows limited learning content and a poor integration of theory—where present in the first place—with practice. Nor does apprenticeship invariably induce superior labor market outcomes for participants. Apprenticeship is more vulnerable to fluctuations in both economic activity and the youth population than is full-time schooling. Moreover, occupation-specific training such as apprenticeship may be better suited to incremental than to radical innovation, resulting in a slower adaptation of new technology and possibly a slower growth rate (Hall and Soskice (2001); Krueger and Kumar (2004a,b)). These drawbacks have not however prevented widespread policy interest in apprenticeship in advanced economies since the 1970s (OECD (1999)).

Scientific interest in apprenticeship is promoted also by the high dispersion of training activity across sectors, occupations, and countries. A standard indicator is the share of educational enrollments at upper secondary level that involve part-time training at workplaces. Across 17 advanced economies in 2006, this indicator had a coefficient of variation of 92%, as compared to 5% for the enrollment rate in all programs, and 64% for that in full-time vocational programs. In Germany and four of its smaller neighbors, apprentices account for between one-third and two-thirds of upper-secondary enrollments; in Belgium, South Korea, and Sweden, for very few or none (OECD (2008b, tables C1.1, 2.2)). Why do countries differ so much in so potentially important an aspect of skill formation?

We define apprenticeship as programs that comprise both work-based training and formal education, in most countries at upper-secondary level, and lead to a qualification in an intermediate skill, not just to semiskilled labor.² Apprenticeship is therefore distinct from three activities for which it is often an alternative: full-time vocational education, standalone on-the-job training, and labor market programs.³ Even then, the term “apprenticeship” covers a heterogeneous reality. Definitions of apprenticeship vary from country to country and comparative data on it are limited.

² Although vocational education is present at lower-secondary level in many advanced economies, because young people at ages subject to compulsory schooling are excluded from mainstream employment, formal apprenticeship training usually starts when school-leavers attain full age. Apprenticeship training can also be part of tertiary education. We do not in principle differentiate the levels at which apprenticeship training can lead to educational credentials, because those differences are not relevant to most of the analysis.

³ We use “apprenticeship” in principle as a functional rather than a conventional term. However, we do not cover other forms of vocational preparation that functionally fall under our definition but are not conventionally labeled as such—e.g., pupilages in the English legal profession.

The outline of the chapter is as follows. The next section tracks developments in the literature on employer-provided training, given that the firm's willingness to train apprentices is the *conditio sine qua non* for an apprenticeship system. We present the diverse analyses in the training literature—some competing, some complementary—of the firm's motivation for training. Most of these theoretical developments have been prompted by one-off empirical observations, and can therefore be expected to hold only if the relevant evidence is representative of a larger set of apprenticeship situations. That is why [Section 3](#) considers recent empirical developments that refocus attention on specific issues and relativize some common views on the economics of apprenticeship. [Section 4](#) summarizes recent empirical studies on the effects of training for apprentices themselves. As there is no comprehensive microeconomic theory that might explain differences in the scale of apprenticeship across countries, [Section 5](#) discusses institutional factors, which provide the most promising analysis of those differences. The conclusions are presented in [Section 6](#).

2. FIRM BEHAVIOR IN PROVIDING AND FINANCING APPRENTICESHIP TRAINING

This section analyses the firm's behavior in offering and financing apprenticeship training. Although the training literature, and human capital theory in particular, offers no specific theory of apprenticeship training, apprenticeship has often served not just as an illustration of its predictions but also as catalyst for new theoretical developments.⁴ However, apprenticeship training, in contrast to standard “on-the-job-training,” is in most cases heavily regulated by governments and social partners, and so particular aspects of it are not considered in the mainstream training literature, in which decisions are based solely on market-based interactions between atomistic employers and employees. This section has two goals: to trace developments in the training literature⁵ over the last five decades, and to check the appropriateness of its assumptions and predictions in the context of apprenticeship.

Most of the training literature sees firms as having three options and choosing whichever promises the most profit. (1) They can either use nonskilled or skilled labor in production. If they choose skilled labor, they can either (2) train their own skilled labor, or (3) hire skilled labor on the external labor market, where skilled workers have been trained by other firms. For reasons of simplicity we assume in this section that skills can either be acquired efficiently only at the workplace or require on-the-job experience to develop full productivity, and that therefore once a firm has a demand

⁴ Examples for this include: [Lindley \(1975\)](#), introducing the distinction between a production and an investment motive for firms to provide apprentices, using data on the net cost of training in England; [Stevens \(1994a\)](#), applying her investment model of firms' training to explain the collapse in the demand for apprentices in the English engineering industry in the 1980s; and [Acemoglu and Pischke \(1999a\)](#), using the observation of [von Bardeleben et al. \(1995\)](#), that the average German firm incurs considerable net cost during the training period of apprentices to motivate their extension of the classical Becker model (see also 2.2.).

⁵ See also [Leuven \(2005\)](#) for a more extensive survey of the training literature.

for skilled labor its sole options are to offer training or to hire former apprentices that have been trained by other firms.⁶

2.1 The human capital theory framework of Becker

Human capital theory, formalized by [Becker \(1962\)](#) but contemporaneously developed by others, helps us understand the training activities of firms. It (re-)introduced the view that education and training represent investment in future productivity and not just consumption of resources. In this perspective, firm and workers alike depend on investments in human capital to increase competitiveness, profits, and pay. Although the benefits are obvious, these investments come at a cost. From the firm's point of view, investments in human capital differ from those in physical capital, in that the firm does not acquire a property right over its investments in skills, so it and its workers have to agree on the sharing of costs and benefits of those investments. Whereas investments in physical capital are strictly the company's own decision, investments in the skills of its workforce involve interaction with the employees to be trained. In the basic formulation, Becker, assuming that product and labor markets are perfectly competitive, introduced the distinction between firm-specific and general human capital to solve the question: who bears the costs of training?

General human capital is defined as all skills that are identically useful to many firms, including the training company. Firm-specific skills, in contrast, increase productivity only in the firm in which the skills were acquired. In a competitive market setting, workers always get a wage that equals their marginal productivity and thus, in the case of general human capital, workers earn the same wage wherever they work. Therefore the answer to the question "who bears the costs of general human capital investment?" is straightforward. As firms—in the absence of a contractual specification of an enforceable remedy for breach of contract—would lose all their investment were a worker to leave the training company, and because the worker is indifferent to the identity of the employer, there is no reason for any firm to finance the investment. Expenses are borne by the worker, either through an up-front payment or through a wage reduction during training. Although firms do not have an incentive to finance general human capital, workers are prepared to finance it up to the point where the marginal increase in their productivity (and wages) equals the marginal increase in their cost of training, and the amount of training provided by firms is then socially efficient, provided that no credit or liquidity constraints prevent the workers from financing the optimal amount of training.

If the training is firm-specific, the optimal financing scheme becomes more complicated, as neither the firm nor the worker has an incentive to pay its full cost. The reason is that both parties lose their entire investment in the event of a separation after

⁶ However, the role of the state as a provider of education and training, which is of little importance for induction training and simple on-the-job training, is crucial for apprenticeship training, and that also motivates our discussion of institutions (below).

training. Becker conjectured that the firm and the worker would share costs and benefits in that case. Hashimoto (1981) formalized an optimal sharing rule, based on the minimization of inefficient post-training separations. With optimal cost-sharing, the investment in specific human capital is also socially efficient.⁷

In Becker's analysis, firms invest the efficient amount in training as long as trainees are willing and able to pay for the investment, whether directly out of their pockets or by accepting lower pay during training. At least historically it was the case that in many countries apprentices had to pay an apprentice premium (fee) that potentially covered the net cost of their training. Since this practice ended, apprentice pay has typically been substantially lower than the average pay of unskilled labor, which suggests that apprentices bear at least part of total training costs, in the form of lower pay.⁸

Two features of apprenticeship increase the analytical suitability of Becker's model to the financing and provision of apprenticeship training. First, and different from adult workers, apprentices are mostly young and living with their parents, and therefore less likely to be liquidity constrained or to reject low pay in order to finance training. Also, statutory minimum wages which might otherwise prevent wages from falling sufficiently for trainees to pay for training, typically do not apply to apprentices.⁹

Second, regulation of the length of apprenticeship contracts (Malcomson et al. (2003)) can further enhance efficiency.¹⁰ Training very often involves an up-front investment for the training company, in the sense that the apprentice receives most of the training in the first phase of the apprenticeship and works productively only in the second phase. In such cases, the apprentice would have no incentive to accept low pay and stay with the training company for the second phase, if she could receive pay equal to her marginal product with another employer. Such situations are

⁷ An important outcome of human capital theory is that in competitive markets there is no market failure in the provision of training and therefore also no cause for governments to intervene in the training market. Employers provide the efficient amount of general and specific skills.

⁸ However, the observation that apprentice pay is lower than the wage of an unskilled worker does not necessarily establish that training costs are fully borne by the apprentice. Apprentices do not spend all their time at work (as a result of part-time schooling or formal training spells at the workplace) and the training company incurs expenses for trainers and materials. For the apprentice to bear all of the cost, the wage reduction would have to cover both the loss of production while the apprentice is away from work and the training expenses incurred by the company.

⁹ In some countries the minimum wage applies to all categories of worker; others have a youth-specific subminimum wage, such as the SMIC (*Salaire minimum interprofessionnelle de croissance*) rate in France for young workers and apprentices. In some theoretical models, minimum wages are the rationale for employer financed general training (e.g., Acemoglu and Pischke (2003)).

¹⁰ This need not be the case, as some employers may want contract lengths that are inefficiently long in order to profit more from their apprentices. One has to note, however, that the length of the contract cannot be arbitrarily long to allow firms to recoup their training expenses. From the perspective of the apprentice, time spent in apprenticeship generates opportunity costs and therefore if a longer training period does not increase her productivity, apprenticeship training becomes a less attractive option compared to nontraining or a full-time schooling education (see e.g., Oosterbeek and Webbink 2007). An efficient contract length therefore must correspond to the time needed to learn the relevant occupational skills. Mühlemann et al. (2007b) show that the differentiation in the length of apprenticeship training programs in Switzerland is—on average—well-adapted to learning requirements.

common. The contract therefore commits the apprentice to stay to its completion, thereby permitting the training company to recoup its training expenses. Such contracts are less frequent and more difficult to enforce in the case of standard on-the-job training. Although it would also be quite difficult for employers to sue apprentices who quit their training before completion, the difference between on-the-job-training, which is typically uncertified, and a completed apprenticeship, which provides an educational credential, makes that unnecessary: the apprentice has an incentive to complete the contract in order to obtain the educational qualification. Even apprentices who do not set a high value on the qualification may be deterred from quitting by the reputational damage and, in some cases, increased difficulty of access to regulated occupations.

According to the Becker model, when all training in an apprenticeship is general, firms should bear no net costs for the training period as a whole. At the end of training, labor turnover should be high, and former apprentices should earn the same pay whether they stay or leave. If the training is firm-specific, in whole or part, companies should finance some of the net training cost during the apprenticeship and turnover after training should be lower. Assuming that all apprentices receive the same mix of firm-specific and general skills, stayers should earn more than movers, as the latter lose all the productivity derived from firm-specific human capital. Nontraining firms should not be able to make a profit from the investments made by the training firm or its apprentices (no poaching) as they have to pay a wage equal to the marginal productivity of the hired worker.

Although the Becker model offers an elegant analysis of the training decisions of firms, two sources of concern led to its extension. First, its predictions are potentially sensitive to its rather strict assumptions, viz. a perfectly competitive market system, with no distortions and with full information. This raised the question: how would the predictions change if these assumptions were relaxed? Becker's model might still constitute an important benchmark for alternative models, and the choice among alternative models might depend on the realism of their assumptions. Second, if empirical results contradict the predictions of the Becker model, a model that conforms better to those observations might be preferred.

2.2 Extensions to the Becker model

The basic human capital model has been extended in the last three decades in response to empirical findings that contradicted the prediction that firms never pay for general training. Indeed, Becker's model was seen to fail to explain the existence of apprenticeship systems such as the German one. The skills learned in German apprenticeships, because they conform to a national curriculum and are certified by external bodies, should be transferable to many companies and are therefore more general than firm-specific in content. If so, according to the Becker model, the turnover of apprentices after training should be high and, more important, firms should not pay for the

training. However, the evidence showed that many firms incur substantial net costs over the training period as a whole and, although skills are in principle transferable, labor turnover after training, especially immediately after, is not particularly high.

2.2.1 Information asymmetries

[Katz and Ziderman \(1990\)](#) argued that there might be an information asymmetry concerning the amount and quality of training a worker receives.¹¹ If just the training firm knows how much and what type of general training a worker received, that would impose substantial information-based costs on external firms that seek to recruit its ex-trainees. The pay of the trained worker in the external market would therefore be lower than her true productivity. In such a situation the firm becomes willing to invest in general training as the informational advance over its competitors gives it bargaining power when negotiating the wage after training. All actions that help the training firm to disguise the true amount and the nature of general training it provides to its workers increase the rent that it can earn on its ex-trainees. Conversely, all measures that reveal its training reduce the informational asymmetry and thus its willingness to invest in general training. In particular, skill certification awards workers an effective property right over their general training and increases their potential mobility. But it also returns us to the Beckerian situation, in which apprentices must bear all the cost of their training. As apprenticeship training is in most countries externally certified, the model seems therefore not to explain why firms might pay for general training. [Katz and Ziderman \(1990, p. 1157\)](#) themselves noted that in their model the (West) German apprenticeship system appears anomalous, as the training is certified externally but firms bear the bulk of the training costs.

[Acemoglu and Pischke \(2000\)](#) introduced a framework in which external certification is not only compatible with firms' sharing or bearing the costs of general training but may even be a necessary condition that the predictions of the Katz and Ziderman model can be confirmed. The underlying intuition is that, whereas asymmetric information generates monopsony power for the firm over its skilled workers, and thus encourages it to invest in training, it also reduces the incentive for workers to invest in training themselves. If the effort that trainees put into their learning itself increases the effect of training on productivity, and that effort cannot be monitored by the training firm, then the firm faces a dilemma. It could, in principle, using its monopsony power, extract a rent on its training investment, but doing so reduces the incentive of trainees to exert effort and thereby reduces the value of the firm's investment. External certification can solve this dilemma as it ensures that workers receive more of the return to their general training and encourages workers to exert effort during training. It also has the advantage that it commits the training firm to provide a specific amount and quality of training, which otherwise would be legally difficult to enforce. In the model of [Dustmann and Schönberg \(2007\)](#),

¹¹ [Chang and Wang \(1996\)](#) provides formal model that borrows from Katz and Ziderman.

if firms are not able to commit to training provision because of the absence of an external regulatory framework, training activity is substantially lower, because apprentices are not willing to accept wage cuts to finance their share of the investment.

The idea that the monopsony power of training firms stems from an asymmetry in information over the content of general training is unlikely to explain fully firms' investments in general human capital in most apprenticeship systems.¹² The prospective exceptions are countries in which decisions about training and certification are company-based rather than institutionalized and external, as is largely the case in England, Italy, and Spain (Ryan (2000), Bassanini et al. (2007)) or certification requires only low attainments, leaving room for information asymmetry for the nonmandatory part of training.

When information about the ability and the productivity of skilled workers is not perfect, additional types of asymmetry can be exploited by training firms. The argument that adverse selection due to information asymmetries can generate rents on firms' investments is an application of Akerlof's (1970) "lemons" problem to labor markets. Models built on this idea assume that the ability of trainees cannot be (fully) observed in the moment of hiring. Therefore all unskilled recruits receive the same amount of training or no training at all. After training the company learns their true ability and makes a second-period wage offer that is contingent on ability and training. The training company can offer low-ability workers a wage equal to their productivity and high-ability workers the market wage. In the external market, firms observe the presence of training but not the ex-trainee's ability and so offer a wage that equals the expected ability of workers in the market. Assuming that some turnover is exogenous there will always be some high-ability workers in the market and wages will be strictly greater than the productivity of low-ability workers. Consequently, all low-ability workers have an incentive to leave the training firm and expected productivity in the market is strictly lower than the productivity of high-ability workers. Although the high-ability worker's productivity is higher than the market wage, she will not get a higher outside wage because the nontraining firms cannot observe individual ability in the market and so they always pay the market wage. Therefore by retaining high-ability workers after training, the training company can make a profit because the market wage is always less than the productivity of high-ability workers. If ability and training are complementary, so that high-ability workers profit more from training than low-ability workers, the information asymmetry automatically leads to a compressed wage structure, with reduced pay differences between untrained and trained workers (Acemoglu and Pischke 1998), which further encourages firms to investment in general training (see Section 2.2.2., below).

If firms do not know the ability of recruits, then another gain from training can be that training programs allow workers to signal their ability. These models (e.g., Autor (2001), Cappelli (2004)) also assume complementarity between training and ability. In

¹² Clark (2001) tests asymmetric information empirically, finding little evidence that German firms subsidize training to obtain (asymmetric) information about their trainees' attributes and choices.

this case, those workers who believe themselves to have high ability apply to training firms; workers who do not, apply to nontraining firms. Providing training helps the firm to access a pool of high-ability workers.¹³ During the training period the firm learns the true ability of workers and, as above, it exploits its informational advantage about worker ability, because adverse selection depresses the market wage. The high-ability workers retained by training firms have a higher productivity than the average in the external “secondhand” worker pool, but because they cannot signal that to outside employers, the training firm pays them a wage below their true productivity.

2.2.2 Compressed wage structures

[Acemoglu and Pischke \(1998, 1999a,b\)](#) addressed the same anomaly—firms bearing a large share of the costs of training for skills that are predominantly general—as in the German apprenticeship system, explaining it also in terms of imperfect competition in labor markets. Frictions in the labor market lead to a compressed wage structure that makes it profitable for firms to invest in general training.¹⁴ Wage compression denotes a situation in which pay increases with training less strongly than does productivity, creating a wedge between productivity and pay that is higher at greater levels of skill ([Acemoglu and Pischke \(1999a\)](#), p. F120).

Empirically, the ratio of pay at the highest decile to that at the lowest decile of the pay distribution differs substantially between countries. Assuming that the structure of productivity as a function of training is similar in all industrialized countries, this suggests that in some countries the wage structure is more compressed than in others; and [Bassanini and Brunello \(2008\)](#) show that firm-sponsored training is—as expected—more widespread in countries with pronounced wage compression than in other countries.

Wage compression may have several causes:

Information asymmetries. Asymmetric information between the training firm and its competitors in the labor market can cause wage compression through two channels. First, the training provider may know more about the amount of training it provides; second, it may know more about the ability of its trained workers. Either informational asymmetry leads to wage compression if ability and training are complements ([Acemoglu and Pischke \(1998\)](#)). This is plausible since more able workers are likely to benefit more from training and will therefore acquire more training.

Search costs and matching frictions. If workers must incur search costs in order to find a new employer and if frictions in matching make some employer–employee matches

¹³ Similarly workers may view the training activities of firms as a signal of workplace quality, whether or not they themselves are interested in the particular training program. [Backes-Gellner and Tuor \(2010\)](#) find that German firms that provide apprenticeship have superior recruitment outcomes for skilled blue-collar workers, because such programs signal a high-quality workplace. In such cases the employer may recoup its net costs for apprenticeship training by enjoying lower recruitment costs.

¹⁴ On the difference between absolute and relative wage compression see [Booth and Zoega \(2004\)](#).

more productive than others, the result is bilateral monopoly and a sharing of the match-specific surplus, with workers paid less than their marginal products. Although skilled workers usually have more bargaining power than unskilled workers, more skill also means higher search costs for workers; as it becomes increasingly difficult to find a good match, the bargaining power of skilled workers falls relative to that of unskilled ones, which also means wage compression.

Moreover, labor market regulations, in the form of firing costs, potentially augment search costs and matching frictions. If firing costs are negligible then in the case of a bad match firms can just lay off workers and bear the search cost for new recruits. Otherwise, firing costs add to the potential for mismatch. If firing costs are higher for skilled workers (“golden parachutes”) than for low-skilled workers this in turn means greater wage compression.

Moral hazard. Acemoglu and Pischke (1998) argue that, if the company cannot monitor perfectly the work effort of employees, it may have to pay a higher (efficiency) wage to deal with moral hazard, that is, to incentivize effort. Such a wage floor would also compresses the wage structure. However, additional frictions (e.g., mobility costs) that create a surplus (i.e., a gap between marginal product and pay) must be present for the firm to offer training in the first place. The surplus may be invariant with respect to the level of skill. When a surplus exists, the introduction of the wage floor compresses pay structure and gives the firm an incentive to incur the cost of training up to the point where pay (which equals marginal product minus the surplus) exceeds the wage floor.¹⁵

Collective bargaining. A wage floor can also result from collective bargaining, for example, if trade unions seek to ensure for their members some minimum living standard. Dustmann and Schönberg (2009) test the effects on apprentice training in Germany using movements by firms between coverage and noncoverage by collective bargaining in order to control for selection biases potentially caused by unobserved employer attributes. As in Acemoglu and Pischke (1999a), the model predicts both more compressed pay structures and more apprenticeship training in firms with bargaining coverage. The evidence is consistent with the predictions: the number of noncovered firms that provide apprenticeship, although positive, is close to zero and significantly lower than the share of training firms among covered firms.¹⁶

A further effect of the equalizing effects of unions may be that low-ability members earn more than in the nonunion sector whereas high-ability workers earn less (Hirsch and Schumacher (1998)). Wage compression again gives unionized firms an incentive to invest in general human capital. However, additional frictions, such as information asymmetries, must also be present, because otherwise nontraining firms would poach trained workers and appropriate some of the rent on their skills (Stevens (1994b)).

¹⁵ In the Becker model of general training, minimum wages reduce training when they prevent workers from paying for their training through lower pay.

¹⁶ The recent literature on skilled labor markets has ignored a further source of imperfect competition that was historically important for manual skills and remains important in the liberal professions: seller organization and market power, as exercised notably by craft trade unions and professional associations.

Interaction between firm-specific and general skills. Training is never exclusively firm-specific or entirely general, but comprises instead some mix of general and firm-specific components.¹⁷ In Becker's model, firms and workers share costs and benefits for firm-specific skills and firms pay nothing for general skills. [Acemoglu and Pischke \(1999b\)](#) argue that if firm-specific and general skills are independent, a component of specific skills simply generates economic rent for the firm but does not encourage them to invest in general skills, because that rent is independent of the amount of training in general skills.¹⁸ If, however, firm-specific and general skills are complements, either because the production of one of those types of skill is less costly when accompanied by the other, or because skills of one category are more productive in the presence of the other category, the value of firm-specific skills increases as the amount of general skills increases, and with it the surplus from specific skills and the extent of wage compression.

2.2.3 Industry- or occupation-specific monopsonies

Other deviations from Becker's assumptions that may also explain firms' investments in general training do not involve wage compression. One is that firms possess monopsony power. Even if one would assume that all skills are technically general, their specificity to an industry or an occupation makes them *de facto* specific to firms ([Bishop \(1996\)](#)). [Lazear \(2003\)](#) formalized this idea in his skills weight model.¹⁹ The fact that because of the specific combination (skills weight) of general skills turns them into *de facto* industry or occupation-specific skills, creates monopsony powers because it limits the number of firms that compete for a particular set of skills and thus increases the cost of changing jobs. Firms of course can further reduce the transferability of training in differentiating their skills requirement so as to generate market power ([Stevens \(1994b\)](#)). Occupation- or industry-specific skill requirements play an important role

¹⁷ Even if the worker learns a mix of specific and general skills, it is not clear whether the two types are learned independently of each other or as complements, or even as substitutes. [Feuer et al. \(1987\)](#), [Stevens \(1994b\)](#), and [Franz and Soskice \(1995\)](#) argue that specific and general skills are likely to be complements. If they are complements in production, the firm can hedge its investment in the general component with its investment in the specific one.

¹⁸ In [Kessler and Lüttesmann \(2006\)](#), however, the rent on specific skills depends on the level of general skills. In this case there are incentives for firms to invest in general human capital, without having specific and general skills necessarily as technical complements or substitutes in costs or output. In their bargaining model, specific and general skills are complementary from the point of view of firms because a higher share of general skills increases the firm's share of the rent on specific human capital. The authors also argue that the combination of specific and general skills might explain why bigger firms have on average higher investments (net costs) in apprenticeship training per trainee than do smaller firms: "... it is not immediate why informational asymmetries or search costs should systematically differ ... However, it seems quite plausible that firm-specific training is of considerable importance in large enterprises which are characterized by complex internal structures. ... a high relevance of specific training leads not only to low turnover rates, but goes hand in hand with a more pronounced provision of firm-sponsored general training." (ibid.: 919).

¹⁹ Applying the skills weights approach to apprenticeship, [Geel et al. \(2010\)](#) calculate a skills weight for every occupation learned in apprenticeship in Germany, and find that, the more specific the skill portfolio in an occupation compared to other occupations, the higher are the net costs that firms bear for apprenticeship in that occupation.

in apprenticeship training and create conflicts of interests between employers and workers (Smits (2007)). Those conflicts are often addressed by the state, which typically holds the right to impose a training curriculum on the training firm. In doing so, the state has to balance the interests of the workers (more transferable skills increase the lower bound on wages and increase options for external mobility) and employers (industry- or occupation-specific skills increase their market power).

There is thus a policy tradeoff between the goals of a mobile and employable workforce and of firms' willingness to provide and finance training. The importance of the definition of the curriculum in apprenticeship training and the role it plays in keeping firms in a sector interested in providing training places can be seen in extended negotiations between governments and social partners not only about curriculum content, and thereby the mix of firm-specific and general skills, but also about the number of recognized training occupations. A higher number of occupations increases the occupational specificity of training but it increases the willingness of firms to incur training costs.²⁰

Monopsony power may also be generated by the regional distribution of firms. Assuming again that skills are to some degree industry- or occupation-specific, then a high spread of the firms in a sector across regions promotes monopsony power, that is, reduces the probability that skilled workers will be poached by competitors. Conversely, economic density can increase training through the "agglomeration effect." If training produces positive spill-overs, for example, because training is a complement to innovation (Acemoglu (1997)), a greater concentration of firms in a particular region increases firms' willingness to provide and finance training. However, Harhoff and Kane (1997) and Mühlemann and Wolter (2007) show for Germany and Switzerland respectively that the higher the number of competitor firms in the same region, the lower the probability that they are active in apprenticeship training. Brunello and de Paola (2008) and Brunello and Gamberotto (2007) show similar results for general on-the-job training in the U.K. and Italy. It seems that a greater density of economic activity increases the threat of poaching more than it creates positive training spill-overs.

2.2.4 Product market competition

As well as labor market regulation and competition, competition in the product market may also influence firms' training decisions. Theoretically different outcomes may result from more product market competition. A model of Gersbach and Schmutzler (2006) concludes that if product market competition is high and product differentiation low, training incidence is lower because workers enjoy better outside options and therefore employers have less bargaining power. On the other hand, if competition is weak and the skills of trained workers are homogeneous, firms may invest in nonfirm-specific training if others do the same, to avoid competitive disadvantage or the need to

²⁰ The traditional training literature, which is more concerned about continuous education and workplace training of adults than specifically apprenticeship training, underestimates the importance of certification authority in countries with extensive apprenticeship training systems (e.g., Busemeyer (2009)).

pay higher wages in order to attract trained workers. However, other models lead to the opposite prediction: [Bassanini and Brunello \(2007\)](#) conclude that if the number of firms rises as a result of a reduction in product market regulations, the output gain from training rises, which encourages firms to invest more in training. They estimate the relationship between product market regulation and training incidence for on-the-job-training in 15 European countries and find that more product market competition significantly increases training incidence. [Goerlitz and Stiebale \(2008\)](#) with a similar approach find for Germany no relationship between product market competition and training incidence. Thus theory does not produce consistent predictions, nor is the empirical evidence conclusive concerning the effect of product market deregulation on training.

2.2.5 The “make or buy” decision

Differences in hiring and training costs may also affect the firm’s supply of training. A firm can obtain skilled workers either by hiring from the external labor market or by training apprentices internally and retaining them after training: the “make or buy” decision. A profit-maximizing firm trains apprentices only if it is cheaper than recruiting already skilled workers. If there are no economies of scale in training or recruitment and all firms have the same cost structure, then either all firms train or no firm does. But if there are diminishing returns in training and rising costs of recruitment, firms may use both sources of skill; and if firms’ cost structures differ, then some firms do more training, others more recruitment.²¹

So some firms may train apprentices because they have a low relative cost in training relative to recruitment. Cost-benefit surveys of apprenticeship in Germany (e.g., [Beicht and Walden \(2002\)](#)) and Switzerland ([Mühlemann et al. \(2007b\)](#)) find substantial differences in net training costs across companies that provide training, even in the same occupation and industry. Generalizing to all firms, [Mühlemann et al. \(2007a\)](#) show for Switzerland that differences in net training costs affect significantly the probability that a firm trains apprentices. Recruitment costs may be similarly variable across firms, encouraging some firms to train and others to recruit.

Concerning the tendency for firms to use both training and recruitment, [Blatter et al. \(2011\)](#) find evidence that the marginal cost of recruitment increases with its scale, and the higher the recruitment cost, the greater the volume of training. Among Swiss firms with positive net training costs, the estimated elasticity of training volume with respect to recruitment cost, computed at sample means, is that one standard deviation in hiring costs for skilled workers increases the number of apprentices by 2.7 standard deviations. Therefore firms invest in training partly to reduce their recruitment costs.

²¹ A third potential source of skilled labor is the upgrade training of less skilled employees, which can offer firms a more cost-effective source of skilled labor than either apprenticeship or recruitment ([Ryan et al. \(2007\)](#)).

2.2.6 Reputation—advantages on the product markets

A further incentive for firms to bear part of the costs of apprentice training may arise from reputation effects (Sadowski (1980)). Training apprentices may signal not only a high-quality workplace in the eyes of future recruits in the labor market but also, in imperfectly competitive product markets, product quality, and social commitment in the eyes of consumers, thereby increasing the firm's sales and profits. If so, the firm's net costs for the training of apprentices does not entail any corresponding reduction in profits. The argument is popular with policy makers but, apart from some firms' declarations of their motives for training, there is no scientific evidence either way on its existence or importance.

2.3 Training subsidies

As Becker emphasized, if training involves both general skills and positive net costs for the firm, and labor markets are perfectly competitive, firms do not train. The most obvious ways to stimulate firms to offer training would then be to subsidize training costs, including tax deductibility of training expenses (Bishop (1996), Stevens (1999, 2001)).²² In many countries with well-established apprenticeship systems, firms also benefit directly from more or less generous state support, as in Denmark (Albaek (2009)).²³

A handful of evaluation studies show that, while subsidies tend to increase participation in training by firms or apprentices, substantial deadweight loss is typically involved. It is difficult for governments to target subsidies on firms that would not otherwise have done any training.²⁴ Moreover, the state rarely knows with any precision firms' net training costs, and therefore the extent to which individual firms should be subsidized, if at all. Finally, if subsidies are uniformly distributed across sectors, distortions are to be expected in the labor market: sectors with low training costs expand training, even if the skills involved are not the ones most needed in the present or the future. It is unlikely that governments possess the information necessary to circumvent this problem by targeting subsidies on particular sectors.

²² Public subsidies to apprenticeship that do not involve direct support for firms normally focus on the public funding of part-time courses for apprentices in vocational schools and colleges (Ryan (2000, table 4)).

²³ Another way to subsidize apprenticeship is to direct public subsidies to the demand side, aiming at trainees who are credit and liquidity constrained, as is likely to be common when apprenticeship is aimed more at young adults than teenagers, as is the case to some extent in Denmark (e.g., Dohmann Weatherall (2009)). The subsidy to trainees reduces apprentices' pay, so that ideally the surplus of apprentices' productivity over pay covers the firm's training costs.

²⁴ Mühlemann et al. (2007a) simulated the costs of an introduction of subsidies in Switzerland and reached the conclusion that the deadweight loss would be so big that the costs for an additional training post would exceed the costs of full-time schooling. Although Rasmussen and Westergaard-Nielsen (1999) calculated subsidy costs for an additional training post in apprenticeship training in Denmark that amounted only to one sixth of the costs of full-time schooling, they concluded that the efficiency of the measure could have been greatly improved, if it would have been limited to a few industries.

2.4 Production-oriented training motivation

The extensions to the classical Becker discussed above concern the training strategy that [Lindley \(1975\)](#) labeled investment-oriented: the firm provides training, and finances it at least in part, with a view to ensuring its future skill supply. Although it is not always clear whether the firm really invests in future skilled workforce or just needs to retain its former apprentices in order to pay back the firm's training expenses.²⁵ The theoretical focus on investment-oriented training may be motivated by the fact that investing in general training makes no sense if the firm has no intention to keep the apprentice after training. In any case, theory has not accommodated evidence that is potentially inconsistent with mainstream theories of both perfect competition (Becker) and imperfect competition in skilled labor markets ([Acemoglu and Pischke \(1998\)](#), [Stevens \(1994b\)](#)).

The anomalous evidence contains three strands. Firstly, while studies of the net cost of apprenticeship to the firm during the training contract (see [Section 3.2.](#)) always reveal great heterogeneity in firms' net costs, they also show that a substantial share of firms make a net profit—that is, incur negative net costs—*during* the training period itself.²⁶ Secondly, in some apprenticeship systems, notably the Swiss one, inter-firm mobility of apprentices during the early post-training years is so high as to call into question its compatibility with an investment-oriented training motivation for firms (e.g., [Wolter and Schweri \(2002\)](#)). In Germany, the distribution of post-training retention rates by employers who train apprentices is bimodal, with peaks at 0 and 100% ([Mohrenweiser and Backes-Gellner \(2010\)](#)). The lower mode points strongly to production-oriented training. Thirdly, the industrial disputes that apprentices have occasionally conducted in pursuit of higher pay (see [Section 5](#)) could not have succeeded had their employers trained them in general skills and borne part or all of the net cost, as they are taken to do in the theories discussed above.²⁷ These three types of evidence suggest that the provision of apprenticeship by some firms has more to do with their current production costs than with their future skills supplies.

In production-oriented training, the firm provides apprenticeships because it can substitute toward apprentices for work that would otherwise be done at higher pay by unskilled or skilled workers. Even when, because of external regulation or technology, firms train for transferable skills, they may find that the value of apprentices' output (net

²⁵ [Autor \(2001\)](#) shows that firms that hire out temporary workers share the costs for general skills without having an investment strategy; although the firm does not wish to keep the ex-trainees itself, the extra skill allows it to charge higher prices to other firms that seek temporary labor.

²⁶ E.g., [Beicht et al. \(2004\)](#), [Mühlemann et al \(2007b\)](#), and [Mühlemann et al \(2010\)](#). Similarly, [Mohrenweiser and Zwick \(2009\)](#) find that in Germany a higher ratio of apprentices to employees is associated with higher (current) labor productivity and profitability (at least in the nonmanufacturing sectors), which suggests that more apprenticeship improves the firm's current performance.

²⁷ Apprenticeship was widely criticized in West Germany before the 1969 Vocational Training Act as a vehicle for cheap production labor ([Palmer \(1981\)](#)). Similar issues arose in Britain under the Youth Training Scheme in the 1980s ([Ryan \(1995\)](#)).

of the firm's direct training costs) exceeds apprentices' pay, that is, the firm's net training costs are negative. In production-oriented training, the firm offers training not because it is more profitable than recruitment as a source of skilled labor, but because it is profitable to substitute apprentices for unskilled or skilled workers in production.

Cases in which net training costs to the firm are negative may be termed exploitation, in the Robinsonian sense: apprentices' pay is less than their (net) marginal product, which, in the absence of wage regulation, is evidence of monopsony power. Were competition for apprentices, on whom the firm earns a surplus, perfect, apprentice pay would be bid up until the firm's rent was driven to zero.²⁸

While the conditions for production-oriented training have yet to be theorized, a promising direction can be suggested. Assuming a market without external regulation of training content and asymmetric information about the content of the firm's training program,—that is, the firm knows, but other employers do not know, the amount and content of the training it provides its apprentices—the firm can then increase profit, in the short term at least, by offering little training to each apprentice, at given apprentice pay. Only the firm's concern for (i) its future skill supplies and (ii) its reputation as a trainer, and thus its ability to attract trainees, potentially stand between the apprentice and low training content. Under asymmetric information the latter constraint may be weak (Katz and Ziderman (1990); Ryan (1994); Chang and Wang (1996); Malcomson et al. (2003); Stevens (2004); Smits (2007); Dustmann and Schönberg (2007)). But the threat of inadequate content (quality) provides a rationale for externally mandated training standards (see Section 5).

The firm profits more from production-oriented training when apprentice pay can be low without jeopardizing the supply of apprentice labor—as when young people have poor external alternatives, whether because of high unemployment for unskilled young workers or because of rationing of access to full-time schooling. Finally, the firm may enjoy literal monopsony power over its apprentices, as a result of fewness of employers and an absence of collective bargaining in the labor market for youth services (see Section 3).

In the limit, production-oriented training becomes production pure and simple. As long as apprentices' pay is less than their marginal product (relative to other sources of labor), the firm benefits from reducing the amount of training they receive in order to increase their output. As the amount of training given to apprentices tends to zero, they become production labor in all but name. Such “training” is analyzed with the standard theory of production with heterogeneous labor (Mohrenweiser and Zwick (2009)).

Apart from that extreme case, the firm's decisions concerning the number of trainees and the content of their training require analysis: to what extent do firms that pursue production-oriented training take on *more* trainees, as well as offering each one less training, and fire more of them after training, than do firms that invest in training?

²⁸ Under what Leuven (2005, p. 89) terms the “free entry at the start of period 1” assumption, which characterizes most mainstream models of training, the pay of apprentices is set by competitive market clearing.

Production-oriented training has connotations of cheap labor and trainee exploitation. However, it is not always to the detriment of the apprentice: when apprentices are substituted for *skilled* workers, production and learning tend to be complementary during training, to the potential advantage of the firm, the trainee, and the economy (see [Section 3](#)).

2.5 Conclusions and future research

There is as yet no comprehensive theory of the firm's behavior in relation to apprentice training. The dominant view at present is that, if the skills learned in apprenticeship are mainly general and trainee pay is not so low as to mean that apprentices bear all the costs of training, then the firms' provision of apprenticeship is—from a policy perspective—a matter of steering between the *Charybdis of regulated labor markets* and the *Scylla of a scarcity of apprenticeship posts*. Because then apparently only labor market frictions or government subsidies, which create other distortions, can incentivize firms to pay for apprenticeship training. A third policy option would be to emphasize firm-, industry- or occupation-specific skills in training, which could be expected to harm labor mobility and workers' employability. As all three options seem to be second-best solutions, this raises the fundamental question, for economist and policy maker alike, as to whether apprenticeship training entails a problematic choice between a viable firm-sponsored training system and frictionless, competitive markets with high labor mobility.²⁹

Moreover, firms may undertake training for production-oriented reasons. In the absence of external skill standards, the result are undesirable outcomes for trainees. More evidence is therefore needed if we are to understand the firm's choice of training strategy and the influence thereon of the regulatory framework.

The development of a comprehensive theory of apprenticeship training might focus on several factors: a) labor market regulation (no external training standards vs. enforced external standards); b) the skill requirements of production, given technology and job design; c) substitutability in production between trainee and other labor (skilled and unskilled); d) asymmetric information about the content of training programs; e) alternatives open to trainees (full-time education and unskilled employment); and f) monopsony power of firms over trainees, not just over skilled workers.

²⁹ See, for example, [Acemoglu and Pischke \(1999b\)](#), pp. 548–9) who note that “naturally, in practice, increased frictions will have a number of allocative costs, such as lower employment . . . [but] in any case, the implications of labor market frictions on training are worth bearing in mind when suggesting labor market reforms. For example, proposals for reducing union power and removing other regulations in the German labor market, which are on the current agenda, could have unforeseen consequences regarding the German apprenticeship system, where employers pay for the general training of their workers.” Similarly [Beckmann \(2002\)](#), p. 385) argues that “the results of this empirical investigation emphasize, among other things, the role of unions and works councils as sources of wage compression encouraging firm-sponsored training. A continuing deregulation in terms of weakening the influence of unions or works councils would probably be at the expense of the firms' willingness to pay for general skill accumulation.”

3. EMPIRICAL OBSERVATIONS ON THE SPECIFICITY OF HUMAN CAPITAL, NET COST OF APPRENTICESHIP TRAINING AND THE BUSINESS CYCLE

Two assumptions are central to the preceding extensions of Becker's analysis of the cost of work-based training: first, that the human capital provided by firms is general and second, that firms pay for it, in part at least. Were the skills involved firm-specific and firms shared the cost, or were the skills general but firms bore no cost, everything would align with the Becker model. Therefore when we observe cost-sharing by firms and trainees the possibility arises that the firm is simply bearing its share for the firm-specific component of the skills, and similarly if certain that the skills are transferable (general), that the firm has not actually made any net investment. This section reviews evidence on whether the human capital acquired by apprentices really is general, and whether training firms truly bear net cost when training apprentices.

Because economic factors are likely to influence the supply of apprentice places more strongly than that of full-time schooling, we consider also the effect of business cycles. The issue is important because if apprenticeship activity reacts strongly to the economic cycle, countries in which apprenticeship is a substantial part of upper-secondary schooling would have to identify policies that would offset the cycle, instead of relying only on markets to provide all school-leavers with training opportunities.

3.1 Firm-specific vs. general training

Although apprenticeship training in most countries is certified so as to ensure that apprentices acquire at least some transferable skills, there is always a certain degree of firm-specificity to the employer. Certification in most cases guarantees only that the minimum set of qualifications required to practice a particular occupation have been acquired. It therefore leaves room for an indefinite additional amount of firm-specific knowledge and skills. It is almost impossible to measure the specificity of skills directly,³⁰ but indirect evidence can be found in the pay loss suffered by apprentices when moving from the training company to another firm. The loss should increase with the amount of firm-specific skills: the outside firm will not pay for skills that it cannot use. If, however, the skills involved are wholly general, apprentices who move to another firm at the end of their training should earn as much as had they stayed put. So if stayers earn more than movers, the implication is that their skills are at least partly firm-specific.

However, estimating the firm-specificity of skills based on pay comparisons between movers and stayers faces two obstacles. First, even when assuming that the decision to quit is entirely exogenous, so that therefore movers and stayers do not on average differ in ability and productivity, the interpretation of the observed pay

³⁰ See however [Gathmann and Schönberg \(2010\)](#), [Geel et al. \(2010\)](#) and [Spitz-Oener \(2006\)](#).

differential is not necessarily conclusive. If movers and stayers earn the same pay, that could be because labor markets are competitive and the skills are general, or that labor markets are not competitive and, although the skills are partly firm-specific, monopsony power allows firms to hold down the pay of stayers.

Second, the assumption that the quit decision of former apprentices is exogenous is unlikely to be valid. Firms acquire information about their apprentices while training them and one of the advantages of training for the firm is the option to release the trainee after training at no cost. The firm will want to do that if the productivity of the apprentice falls short of expectation. Apprentices who select into moving should therefore earn less than those who select into staying even when their skills are purely general. Without controlling for the endogeneity of turnover after training, we cannot tell the extent to which the pay differential between movers and stayers reflects selection by unobserved individual attributes rather than firm-specificity in training.

The evidence available on the pay of stayers and movers is therefore less than conclusive. [Euwals and Winkelmann \(2004\)](#) find that stayers do not earn more than movers, which they take (assuming that all skills are transferable) as evidence that firms bear no net training costs, and that a negative selection into moving takes place.³¹ [Werwatz \(2002\)](#) on the other hand, controlling for selection effects, finds that only a minority of movers faces wage losses, but that most move into skilled jobs with higher wages, suggesting positive self-selection into moving with skills that are mostly general.³²

[Acemoglu and Pischke \(1998\)](#) analyze wage differentials between movers and stayers, focusing in particular on the quits induced among German ex-apprentices by compulsory military service. As “military quits” can be taken to be exogenous, the average ability of such movers should be lower than that of stayers, assuming that the best are retained by the training firm, but higher than that of other movers, most of whom the firm has chosen to lay off. In the evidence, both stayers and military quitters (in their subsequent employment) earn significantly more than other movers, while military quitters earn more than stayers. The authors conclude (as latter [Euwals and Winkelmann \(2004\)](#)) that, while military quitters are paid their marginal product by their new employers, training firms can extract a rent from stayers and thus recoup their investment in training. As these results are not readily reconciled with firm-specificity of skills, which should mean that military quitters do not earn more than stayers, they suggest that the skills that apprentices learn are highly general.

³¹ [Winkelmann \(1996\)](#) concluded from the smooth transitions made by apprentices and the high mobility (by five years after training) that most of the skills learned must be transferable. [Euwals and Winkelmann \(2002\)](#) interpreted their finding that the job duration of stayers was longer than that of movers, and that of stayers in big firms even longer than that of stayers in small companies, as evidence that the firms with the highest investment in (net cost of) training had a better chance of recouping their investment.

³² Positive self-selection into moving is also inferred by [Fitzenberger and Kunze \(2005\)](#).

With a quite different approach, [Dustmann and Schönberg \(2007, p.6\)](#) using data from self-assessments of the utility of skills learned in an occupation for the present occupation and demonstrate the importance of occupation specific skills. From their data they conclude that only 5% of skills are firm-specific but some 35% of the learned skills are occupation-specific; this would leave 60% of the learned skills to be completely transferable. The degree of occupation-specificity is likely to depend largely on the type of employer-provided training and results therefore certainly differ from country to country (see e.g. [Loewenstein and Spletzer, \(1998\)](#) using self-assessment data from the National Longitudinal Survey of Youth (NLSY) in the United States).

3.2 Net cost of training

Repeated observations that German firms that train apprentices incur positive net costs have stimulated the theories of training that center on labor market frictions and informational failures (see [Section 2](#)). However, cost sharing by firms and workers for work-based training is not actually straightforward to observe. Even when explicit payments are made by firms, as typically for externally provided courses of continuous training, trainees may bear part of the cost in terms of pay less than marginal product. Empirical investigations usually do not find lower pay for trainees than for comparable employees who are not in training ([Cappelli \(2004\)](#)). But trainees may still share the cost: selection into training may be positive by ability, so that trainees would otherwise earn higher pay than nontrainees. More useful evidence would require exogenous assignment to training, which is likely to be rare.

Representative cost-benefit analyses of apprenticeship training exist for just a couple of countries.³³ The most often quoted ones follow the methodology developed in Germany by the Edding Commission in the 1970s to estimate the cost to firms of apprenticeship training. More recent estimates for Germany, while not free of restrictive assumptions and potential shortcomings, have provided a key stimulus to the contemporary training literature (see [Section 2.3](#)).³⁴ They have recently acquired a Swiss counterpart, which raises the question to what extent the results for the two countries are analogous. If they are not, it may be that the net cost estimates for Germany do not represent those of other apprenticeship systems.

These cost-benefit studies obtain from a random sample of establishments detailed information about their training costs and in particular the benefits, with the productive contribution of apprentices during training as a key ingredient. Briefly, the gross cost (C) of an apprentice (i) at a training site (j) and in an apprenticeship year (t) comprises primarily the apprentice's wages (${}_a w$), the trainers' wages (${}_b w$), and the materials

³³ Cost studies of work-based training in British apprenticeship are confined to one or a few case studies (e.g., [Jones \(1986\)](#)) or to nonrandom samples of firms offering apprenticeship ([Hasluck et al. \(2008\)](#)).

³⁴ [Acemoglu and Pischke \(1999a, pp. F114–116\)](#) describe in detail the German cost-benefit analyses of [von Bardeleben et al. \(1995\)](#).

expenses (X) involved in providing the training. The number of training years is n . For simplicity there is no discounting.

$$C_{ij} = \sum_{t=1}^n \alpha w_{ijt} + {}_b w_{ijt} + X_{ijt} \quad (11.1)$$

Trainers' pay is present in the costing framework because the "dual system" does not simply involve the apprentice working part of the week and attending school the rest of the time: part of the training takes place at the worksite. It also indicates that the training differs also from simple learning by doing, in normally requiring specialist trainers, which involves additional costs.

The benefit derived by the firm from training (B) during the training period comprises the production generated by the apprentice when she or he is at work, that is, not being trained off the job or away in school. The benefit is calculated on the assumption that the productive work done by an apprentice would—in the absence of the apprentice—be performed by either skilled or unskilled workers at the wage levels usually paid them by the firm. Allowance is made for the possibility that not all of the work of apprentices is productive and that some apprentice time is spent on exercises.

The benefit is broken down into production activities that would otherwise be performed by unskilled workers (P_I) and skilled workers (P_{II}). It is assumed in the first case that the apprentice's performance has the same value as that of the average unskilled employee. In the second case the value of the apprentice's performance (relative productivity) is estimated by comparison to that of a fully skilled worker (γ). Type I production is multiplied by the wages paid to an unskilled worker (${}_u w$), while for type II the wages paid to a skilled worker in the relevant occupation (${}_p w$) are used.³⁵ As is to be expected, the proportion of type I productivity (α) varies according to the year of apprenticeship and in general declines as the apprenticeship progresses, while the share of skilled work, with higher apprentice productivity (γ), increases as the training proceeds. The precise pattern depends on the detailed organization of the firm's apprenticeship program, the training occupation, and the quality of the trainee.

$$B_{ij} = \sum_{t=1}^n \alpha_{ijt} * {}_u w_j + (1 - \alpha)_{ijt} * {}_p w_j * \gamma_{ijt} \quad (11.2)$$

The net cost of apprenticeship training (NC) to the firm is calculated by simply subtracting benefits (Equation 11.2) from costs (Equation 11.1). The costs borne by apprentices are not estimated.

³⁵ The possibility that the wages are less than marginal product for skilled employees need not influence the calculations, which are based on the opportunity cost principle. If the productive contribution of apprentices is multiplied by a salary of a skilled worker, which lies below productivity, the benefit is not underestimated, as in the case of no apprenticeship training, the firm would have to pay the same wage for a skilled worker—as long, that is, as the firm could otherwise obtain the additional services from skilled workers at the existing wage, which may be the case only in perfect competition.

The net cost of training an apprentice in the [von Bardeleben et al. \(1995\)](#) survey, quoted by [Harhoff and Kane \(1997\)](#) and [Acemoglu and Pischke \(1999a\)](#) as evidence of firms' financing of general training, ranged from 15,000 to 25,000 DM (\$7,500 to \$25,000 at 1991 exchange rates). The presence of substantial net costs was subsequently confirmed by similar surveys in 2000 and 2008 ([Beicht and Walden \(2002\)](#)). In 2000 an identical survey was carried out in Switzerland, a country whose apprenticeship system is in scale and content comparable to the German one ([Wolter and Schweri \(2002\)](#)). Data from the national surveys were subsequently merged, and net costs calculated on the same basis for each country ([Dionisius et al. \(2009\)](#)). Matching techniques were applied to calculate the net costs of training for similar firms in similar occupations. [Table 11.1](#) shows the results for an average firm training an apprentice in a three-year program.

The results are quite different for the two countries. In Switzerland, firms on average obtain a net benefit (i.e., incur a negative net cost) when training apprentices, whereas German firms typically incur a substantial net cost. In both countries, net cost varies from firm to firm, as indicated by the standard deviations. Taking the two dimensions together, in Switzerland 60% of all training firms obtain positive net benefits, while in Germany, 93% of training firms incur net costs. A complementary difference between the countries shows up in labor turnover. In Germany more apprentices remain with their training company after completion than in Switzerland: 50% and 36% of apprentices stay put for at least a year afterwards, respectively.³⁶

Three factors explain the large difference between Germany and Switzerland in the firms' net cost for apprentice training. First, the relative pay of apprentices (compared to skilled pay in the training occupation) is around twice as high in Germany as in Switzerland ([Ryan et al. \(2010\)](#)). Second, there are marked differences in the tasks

Table 11.1 Net Cost to the Firm of Training an Apprentice (3-Year Program) in Germany and Switzerland (2000, €; Standard Deviations in Parentheses)

	Gross Costs	Benefits ^a	Net Costs
Germany	46,608 (15,050.35)	24,024 (11,922.24)	22,584 (16,694.65)
Switzerland	54,393 (21,413.4)	57,132 (17,589.25)	-2,739 (24,292.89)

Note: euro/dollar exchange rate in 2000 approximately 0.9.

^aExcluding any benefits that accrue after the completion of training.

Source: [Dionisius et al. \(2009, tables 2, 4\)](#).

³⁶ In Germany's western federal states, in which estimated firms' net training cost is higher than the national average, the one-year retention rate is also higher (64%) than the national rate.

allocated to apprentices when they work in production. German apprentices spend more time doing practice exercises, Swiss ones doing productive work, and particularly doing skilled tasks. Third, although Swiss apprentices spend similar time in part-time vocational education, they are nevertheless more often present at work, as they have less vacation time, take fewer sick days, and spend less time in external and internal courses. [Table 11.2](#) shows the results of simulations in which these three parameters are changed in order to simulate Swiss training conditions for a German firm, and vice versa. First relative wages are changed to the other country average, then the same is done for days present at the workplace, and finally for task allocation (exercise vs. productive work). The three adjustments taken together more or less transform the training costs of the average German company into those of the average Swiss one, and vice versa.

In terms of net cost, an average German firm, training apprentices with relative wages, attendance days, and task allocations as in Switzerland, would face a net cost of less than €3000, whereas a Swiss company training under German conditions would have to bear a net cost of nearly €24,000. The biggest change in net cost is caused by changing task allocation, as the productive contribution of German apprentices is considerably lower than that of Swiss ones.³⁷

The next question is whether the difference in net cost between the two countries can be attributed also to differences in training standards: for example, were lower training standards in Switzerland to allow Swiss firms to provide less training to their apprentices? Training standards in the two countries cannot be compared directly.³⁸ Nevertheless, given the similarity in the two countries' training system and industry structure, the relative productivity of an apprentice in her final year provides a proxy measure of training quality. The average productivity of a final year German apprentice relative to that of a fully trained worker amounts to 68%, as compared to 75% in

Table 11.2 Mean Net Cost of Training for German and Swiss Apprenticeship Training (3-Year Programs), with and without Treatment (€, 2000)

Country	No Treatment	Relative Wages Only	Relative Wages + Attendance	Relative Wages + Attendance + Task Allocation
Germany	22,584	19,206	16,578	2,802
Switzerland	-2,739	9,231	13,053	23,754

Source: Calculations based on [Dionisius et al. \(2009\)](#), tables 2, 4).

³⁷ The low amount of productive work of German apprentices had already been noted in the German-French-comparison of [Fougère and Schwerdt \(2002\)](#).

³⁸ Some governments interested in apprenticeship training intend to measure learning outcomes directly, as do the OECD's PISA studies of the competencies of early school-leavers (e.g., [Winther and Achtenhagen \(2009\)](#)).

Switzerland (Dionisius et al. (2009)). Differences in training standards do not therefore appear to explain lower costs for firms in Switzerland.

Two questions remain, however: why do German firms incur high net costs, if Swiss firms can do the training at lower cost, and why do so many Swiss firms have net benefits in the first place? Were the training market highly competitive, one would expect that profits on training would be driven to zero.

Concerning the first question, the net cost incurred during training and the profits German companies can make after training, relying on labor market frictions, may be opposite sides of the same coin.³⁹ If the social partners agree on labor market regulations and frictions that allow firms to earn economic rent on their skilled employees, thereby earning a return on their training investments, then free entry into the training market results in higher wages of apprentices—or, as can be seen by the empirical observations, less use of apprentices in productive activities during the training period.⁴⁰

A further factor may be the greater strength of employee representation in Germany than in Switzerland. Both high relative pay and low relative productivity may result from the greater strength of trade unions and works councils in Germany. Unions and councils might favor less use of apprentices for production because they see it as the substitution of apprentices for adult members, whether skilled or unskilled workers. The issue is taken up in Section 5, below.

There is as yet no conclusive explanation for why numerous Swiss firms obtain substantial net benefits during apprentice training, but there are several entry barriers to apprenticeship training that hinder free competition. The most promising answer is that apprentices are required to undertake practical work and training in the chosen occupation and if a company does not have many skilled workers in the respective occupation, the firm would simply not have much occupation-specific work to give its apprentices, which lowers the potential benefit of training. Therefore the size of the company and the nature of its activity limit the immediate profitability of training. Wolter et al. (2006), simulating the net cost of training for nontraining firms, show that those firms differ from training firms mainly in the benefits from training apprentices (Table 11.3). The main reason for nontraining is therefore a high net cost were the firm to provide training, which in turn reflects a lack of adequate work to give to potential apprentices—which would also imply that due to the differences in the net costs of training between firms, competition for apprentices is imperfect and training firms make a profit on average.

³⁹ Mohrenweiser and Zwick (2009) analyze whether firm profits are influenced by the share of apprentices and find no impact of the share of apprentices (relative to the share of nonskilled workers) on profits. We interpret this empirical finding as proof that German firms have the possibility to reap substantial benefits from their trainees after training due to labor market rigidities that are sufficient to offset positive net-costs in the training period.

⁴⁰ “Because of the free-entry condition firms bid up workers’ wages until they make zero profits in the long-run. As firms make positive profits in the second period. . . , first period wages are higher than workers’ expected productivity,” (Dustmann and Schönberg (2009)).

Table 11.3 Gross cost, benefit, and net cost of training in Swiss firms, 2000, €

	Gross Cost	Benefit	Net Cost
Training Firms	58,295	61,276	−4,116
Nontraining Firms	72,427	31,524	28,263

Note. All values are predicted econometrically, so net costs for training firms differ somewhat from the survey-based estimates in Table 11.1.

Source: Wolter et al. (2006); converted from Swiss francs at 1€: 1.5CHF.

It is also possible that more Swiss than German firms enjoy monopsony power, not over trained workers but over youth labor, which allows them to keep apprentices wages low.⁴¹ Mühlemann et al. (2011) find that the pay of Swiss apprentices is lower, relative to that of unskilled workers, in districts with a lower density of potentially competing firms.

3.3 Production-oriented training: cheap labor?

As outlined in Section 2.4., using apprentices as substitutes for other employees because their lower pay more than compensates for their lower productivity might be termed a “cheap labor” strategy. However, two things have to be kept in mind, when interpreting the low pay of apprentices. First, apprentices do not spend all their time at the workplace and are therefore not as productive as skilled workers at least. Second, firms incur direct training costs that have to be covered, if a surplus cannot be earned after training, during training by way of a lower apprentice wage. Therefore the relative pay of apprentices does not in itself reveal whether the firm’s motivation to train is indeed the substitution of more expensive with less expensive labor. When, however, firms earn a substantial surplus on apprentices during the training contract itself, the question arises whether that indicates the exploitation of trainees. In the scientific sense that is the case: exploitation occurs by definition when an employee is paid less than her marginal product—defined for the apprentice as net of her direct training costs—whether apprentices do unskilled or skilled work. But which of the latter applies is important, both for the apprentice and for public policy. If the apprentice is underpaid for doing skilled work, concern is limited, as she is acquiring skills that she could probably not obtain through formal off-the-job training. So from the perspective of the apprentice and the public interest the “exploitation” is potentially acceptable, as it leads to greater skill and productivity in future. The same does not however apply when the tasks performed by the apprentice are unskilled. In order to judge production-oriented

⁴¹ Although there are industry guidelines and recommendations, in all but one Canton, apprentices’ wages can be set freely by the training company.

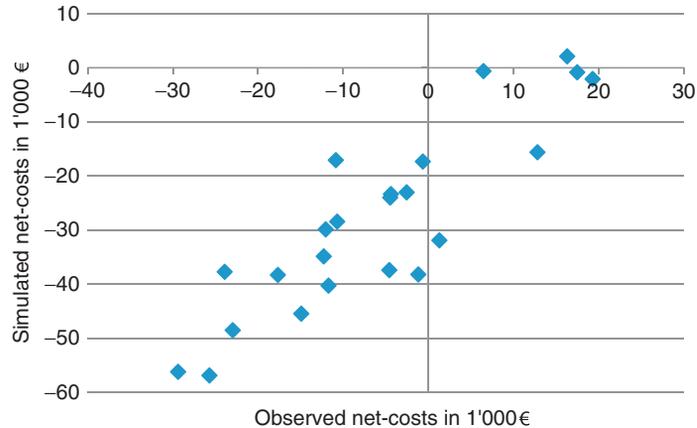


Figure 11.1 Observed and simulated net cost of apprentice training for the largest occupations, Switzerland (€) Note: $n = 2200$ firms; conversion to euros as in [Table 11.3](#). Data source: [Mühlemann et al. \(2007b\)](#).

training, one needs therefore to know whether the firm's net benefit during training is generated by using apprentices for unskilled or for skilled tasks.

Evidence can be taken from the same surveys of training costs. [Figure 11.1](#) shows the observed average net cost in the 23 largest training occupations in Switzerland. Training produces on average a net cost in six and a net benefit in the other 17 occupations. The simulation reestimates net cost on the assumption that the cost parameters (training methods, apprentice pay, and apprentice productivity in skilled and unskilled tasks) remain the same, but the contribution of apprentices to production is confined to unskilled tasks. The effect is dramatic. Were employers to confine apprentices to unskilled work only, their net training cost would fall (or the benefit would increase) by around €22,000, and in no occupation would the typical employer make any worthwhile surplus during training. The simulated change in net cost is not significantly associated with actual net cost, meaning that the observed negative net-costs are not just the result of a heavier use of apprentices in these occupations for unskilled labor.⁴² The implication is that, in Switzerland at least, production-oriented training involves a preponderance of skilled rather than unskilled work by apprentices.

These results raise the question: what deters training firms from exploiting apprentices more intensively, given the scope for firms to increase profits from all training occupations by giving apprentices more unskilled work to do? The potential reasons include externally mandated minimum training standards, to which in Switzerland as in Germany firms must adhere in order to be allowed to continue to train apprentices.

⁴² The correlation between observed net cost and the difference between simulated and observed cost caused is 0.17.

Second, firms would choose not to do it if they intend subsequently to employ their apprentices as skilled workers and if doing skilled work and learning skills are complements—though when the firm intends to release most or all its apprentices after training, this factor is secondary or absent. Thirdly, were firms to use apprentices only to maximize current production, their reputation on the training market would suffer, and they might attract only low-ability apprentices with deficient output even in unskilled work. The limitations of the second and third constraints suggests that external training standards are central to the viability of high quality in the apprentice training market (see [Section 5](#)).

3.4 Apprenticeship training and the business cycle

Economic fluctuations have two potential effects on apprenticeship activity, depending on the firm's training strategy. First, the firm's demand for skilled labor falls during an economic downturn, which may in turn cut its demand for apprentices, when apprenticeship is integral to the firm's acquisition of skilled labor ([Stevens \(1994a\)](#), [Brunello and Medio \(2001\)](#), [Brunello \(2009\)](#)). If the firm trains apprentices because that is less expensive at the margin than recruiting skilled workers, an economic downturn not only reduces the demand for skilled workers but also cuts recruitment costs, as the external supply of skilled workers rises. Both effects reduce the demand for apprentices. However, as apprenticeship programs typically last between two and four years, the economic cycle may not affect the provision of training strongly, because firms may expect economic recovery before new apprentices have finished training.

Alternatively, if the firm trains for production-oriented motives, economic fluctuations may affect the benefit of using apprentices in production. In prosperous times, when order books are long, there may be abundant work, skilled as well as unskilled, to give to apprentices. With low apprentice pay, the firm has an incentive to expand training in the short-run in order to increase production. However, [Merrilees \(1983\)](#) noted that the firm may not adjust its demand for apprentices immediately. In an economic boom, the firm might prefer to switch its trainers from training apprentices to production in order to increase output. In recession, the demand for apprentices would not fall in proportion to incoming orders because apprentices are initially not very productive (because they first need to be trained in skilled work) and therefore periods of lower economic activity could be used for training instead of work.

In sum, theoretical considerations imply that, while business cycles have potentially important effects on the supply of apprentice training by firms, there are countervailing effects that may weaken those effects.

The evidence suggests that fewer apprenticeships are offered during economic downturns and when unemployment rates are high. [Dietrich and Gerner \(2007\)](#) find in establishment-level panel data for Germany during 1993–2003 that firms' training efforts respond to short-term business expectations: a one percentage point increase

in the firm's expected business volume increases its supply of new apprenticeships by 0.35 percentage points. For the U.K., [Hart \(2005\)](#) finds that although fewer apprenticeships were offered during the Great Depression, firms seemed to lay off skilled workers more rapidly than they did apprentices. [Merrilees \(1983\)](#) found for 1963–1979 a negative relationship between new apprenticeship contracts and unemployment, and a positive one with output. For Norway, [Askilden and Nilsen \(2005\)](#) find that the supply of apprenticeships decreases with unemployment. [Rasmussen and Westergaard-Nielsen \(1999\)](#) find that firms' demand for apprentices is positively related to demand for skilled labor in Denmark.

For Switzerland, [Schweri and Müller \(2007\)](#) find a positive effect from the recent GDP growth rate on a firm's propensity to train. [Mühlemann et al. \(2009\)](#) find a significant, although also small, impact of unemployment rates and changes in the growth of cantonal income on the number of new apprenticeship contracts: across Swiss Cantons from 1988–2004, a standard deviation increase in the unemployment rate (1.9 percentage points) reduces the number of new apprenticeship contracts by around 0.6%.

The business cycle can affect not only a firm's offer of apprenticeships, but also quitting by apprentices. [Bilginsoy \(2003\)](#) finds for the United States that apprentices are more likely to leave their training program if unemployment is low, since outside options increase if the labor market is tight.

The empirical evidence shows a significant but modest impact of business cycles on the provision of apprenticeships, provided that what is involved is indeed cyclical downswing rather than structural decline. Therefore the fear that apprenticeship training is a problematic component of upper-secondary educational opportunities, because the number of training positions may show booms and busts, is exaggerated.

3.5 Conclusions and future research

The evidence, based as it is predominantly on apprenticeship training systems in German-speaking countries, suggests that given that the skills learned in apprenticeship are predominantly general, frictions in the market for skilled labor contribute importantly to the willingness of firms to offer training. They make it possible for employers to invest in general skills without facing the prospect of being unable to make a return on it after the apprenticeship contract has ended. Indeed, the same frictions require employers to bear some of the cost of training, as apprentices respond to their inability to acquire all the returns by refusing to bear all of the costs.

At the same time, some firms train apprentices not so much for their future supply of skilled labor as for their immediate usefulness in production. A minority of firms in Germany, and a majority in Switzerland, reap net benefits rather than incur net costs over the training contract as a whole.

The conditions under which firms adopt one training strategy or the other are only partly understood. The contributory factors potentially include collective bargaining and the goals of trade unions and works councils, and, in the absence of either of those constraints, employers' power in the labor market, in relation to apprentices as well as skilled workers. External training standards are also important, in limiting the scope for firms to use apprentices in production for short-term profit. Moreover, the extent to which skilled work and formal training are complementary is potentially important.

The evidence invariably shows up extensive heterogeneity among employers. A leading research question is therefore why in situations involving the same economic and regulatory framework some firms find it profitable to invest in their apprentices whereas others train apprentices but make a surplus during training, while yet others do neither—and what consequences follow for young people these different choices by employers, a topic taken up partly in the next section.

4. OUTCOMES FOR APPRENTICES

4.1 Measurement and identification issues

Determining the effects of apprenticeship training on individuals is complicated by at least four problems.

First, one has to implement the counterfactual: that is, compare outcomes for apprenticeship to those under the alternative foregone when someone takes an apprenticeship. Taking apprentices to be engaged in part-time upper secondary education, the principal potential alternatives are (i) full-time upper secondary education, general or vocational, and (ii) labor market experience, including various mixtures of employment, unemployment, and labor market programs. The issue of what constitutes the alternative for young people is of course essentially an empirical one.

Second, the allocation of young people to upper-secondary programs is unlikely to be random. For example, more talented young people may take an apprenticeship rather than enter the labor market directly, while still more talented young people may remain in full-time schooling. If “talent” represents any and all unobserved individual attributes, then, in the absence of effective statistical controls for differences therein, estimates of the effect of apprenticeship that are based on comparisons to labor market experience and to full-time schooling will be biased: upward-biased and downward-biased, respectively. A meaningful analysis therefore requires controls, whether experimental (natural or social experimentation) or statistical (econometric), for unobserved individual heterogeneity.

Thirdly, apprenticeship might be superior to other forms of learning for particular skills and occupations, but inferior for others. Therefore some occupations may be learned through apprenticeship, others through full-time education or simple labor market experience. In such situations, comparisons of outcomes by mode of learning

overlap with and are potentially biased by uncontrolled occupation-specific factors. This points empirical work toward situations in which apprenticeship and full-time education result in the same qualifications, as in many occupations, for example, in France and the Netherlands, but not in Germany and Switzerland.

Fourth, the outcomes chosen must be appropriate. Employment, unemployment, and pay are the obvious ones for economists. But apprenticeship may also induce youngsters to remain in post-compulsory education, both during and after their training programs. The benefits of any induced increase in educational attainment are captured only partly by labor market outcomes. However, where apprenticeship functions as an educational terminus, it may be educationally damaging, as if it reduces educational attainment by those who would otherwise have remained in full-time schooling (Ryan (2003)).

Finally, human capital theory is couched in terms of rates of return, which involves a comparison of discounted costs and benefits. In practice, however, given the paucity of data-sets with information on both costs and benefits, empirical studies of individual “returns” focus on gross returns (in pay and employment probability) from training, and do not estimate either costs or net returns for apprentices.

Given these difficulties, we now offer not a comprehensive survey of methods and findings in the empirical literature but rather a selection of recent papers that use innovative methods and data to analyze the effects of apprenticeship on individuals.

4.2 Some recent evidence

The papers discussed here estimate the economic effects of apprenticeship on participants using potentially informative evidence taken primarily from papers that use potentially exogenous variation arising from social or natural experiments, which have involved either changes in school laws or the failure of firms or econometric techniques to overcome selection problems.⁴³ Broader surveys of the literature prior to 2000 are provided by Ryan (1998, 2001).⁴⁴

A potential advantage of apprenticeship in comparison with full-time schooling, particularly in the context of high youth unemployment, is the smoothing of the transition from school to work (Sofer (2004)). Bonnal et al (2002) show for France that students who come through apprenticeship subsequently experience less long term unemployment as young adults than do those who go through full-time vocational schooling. Plug and Groot (1998) show for the Netherlands a similar benefit, which does not involve lower pay than for former full-time vocational students.

⁴³ We include a paper concerning the effects of vocational education instead of apprenticeship training (Oosterbeek and Webbink 2007) because of its pertinence to apprenticeship.

⁴⁴ Ryan concluded that apprenticeship is associated unevenly with economic advantages, primarily as a source of more stable employment for young male adults, but with low returns for females, and more in comparison to labor market experience than to full-time upper secondary schooling.

Some papers take into account the internal heterogeneity of apprenticeship systems. Countries with large apprenticeship systems have many training occupations with differentiated entry requirements. Selection into particular training occupations clearly depends on educational performance in compulsory schooling, but does the subsequent transition to the labor market after training depend on occupation? [Bertschy et al. \(2009\)](#) find that once the transition to training occupation is taken out, and using PISA results to control for ability, apprentices with poor educational results are not further penalized once they complete apprenticeship training.⁴⁵ They also find significant advantages in the transition to the labor market for apprentices compared to full-time vocational students.

Concerning effects on pay, selection into different educational tracks is a potential source of bias, which few studies have tried to correct—that is, when they go beyond simply treating years of education as homogenous across tracks. [Fersterer et al. \(2008\)](#) analyze the individual return to apprenticeship training in Austria using instrumental variables estimation, specifically by concentrating on apprentices whose employer failed before they had completed training. Such apprentices have a significantly higher risk of never completing their apprenticeship. The time that those apprentices spent in apprenticeship before the bankruptcy provides an instrumental variable for years of apprenticeship. The results differ little however from those produced by ordinary least squares, which does not involve any controls for selection by ability in setting the length of training for apprentices as a whole. A year of apprenticeship training is estimated to generate an increase in pay of slightly more than 5%.

By contrast, [Oosterbeek and Webbink \(2007\)](#) use a natural experiment and a difference-in-difference approach. In 1975 all vocational programs in Dutch schools were required to last four years, whereas previously one half had lasted only three years. The general education component of the curriculum was increased at the same time. The authors study the long-term returns to an extra year of basic vocational education comparing the cohorts that studied before the reform to those that came after it.⁴⁶ The reform did not affect labor market outcomes for young people, which suggests that an extra year in vocational education and work experience had similar effects—possibly because the skills learned in vocational education can readily be learned on-the-job instead.

Finally, [Malamud and Pop-Eleches \(2010\)](#) assess the effects of vocational education, including apprenticeship, in Romania, with the alternative taken to be full-time

⁴⁵ [Büchel \(2002\)](#) cautioned against this view in an analysis of different cohorts covering the time from 1948–1992. He found the same labor market entry quality for trainees with different levels of attainment in compulsory schooling only in the older cohorts.

⁴⁶ The study parallels analyses of the return to schooling that use extensions of the compulsory school leaving age ([Pischke and von Wachter \(2008\)](#)).

general education.⁴⁷ The focus is the educational reform of 1973, which prevented students from entering vocational schools or apprenticeship after only eight years of compulsory schooling, required them to receive an additional two years of general education, and shortened the duration of vocational training. A regression discontinuity approach compares the long term labor market outcomes (1992, 2002) of cohorts affected by the 1973 reform and earlier ones that had not been affected by it. Although the reform provoked the intended sharp increase in general educational attainment, the pay and family income of the pre- and post-reform cohorts did not differ significantly. The results demonstrate that increased general education did not improve labor market outcomes relative to vocational education and that graduates of vocational programs have done just as well on the labor market, even in times of rapid technological change.

4.3 Conclusions and future research

The evidence on the economic effects of apprenticeship on individuals is still too limited to draw general conclusions. The well-documented benefits of apprenticeship for the transition from school to work—once selection into different training options is taken into account—are followed by economic returns in early adulthood that in some countries are similarly favorable but that in others involve smaller pay gains and more unstable employment. In some results apprenticeship compares favorably to full-time school-based vocational programs; in others, it even beats general ones. This heterogeneity in the empirical results arises less from differences in research methods and data than from differences in the scale and content of apprenticeship itself. Consequently, results for specific countries or programs can rarely be generalized to apprenticeship training *per se*. The further empirical research that is therefore needed should a) employ convincing methods, whether econometric or experimental, to control for selectivity across programs, and b) allow for the heterogeneity of apprenticeship and thereby isolate the attributes of the variants that work for young people themselves.

5. INSTITUTIONAL FOUNDATIONS OF APPRENTICESHIP

The introduction noted the high dispersion of apprenticeship activity across countries. How might such differences be explained?

The previous two sections have discussed microeconomic theories of work-based training, and presented evidence derived primarily from single-country micro-data. That evidence is consistent with theories of imperfect competition in occupational labor markets. Such theories are less suited however to an explanation of differences

⁴⁷ The authors cannot differentiate between people having obtained a degree from full-time vocational school or apprenticeship training. Therefore vocational schools and apprenticeship training are treated as one category and compared to general schooling.

in apprenticeship across countries. Most of the factors that they highlight, including skill specificity and informational asymmetries, are technological attributes, which are not expected to vary greatly from country to country. Others, including external wage compression, might be expected to vary more, but they in turn require explanation, rather than being treated as exogenous.

The great variability of national institutions is the starting point for institutional analyses of labor markets (Freeman 2008). The roles of such institutions as employers' associations, trade unions and works councils vary greatly, with potential influence on the training-related decisions of employers and individuals.

Microeconomic and institutional explanations are often treated as alternatives, and their merits contested across academic disciplines within the social sciences. We view them as complements when it comes to explaining cross-national training patterns. Neither is plausibly sufficient for an explanation. On the one side, the institutions that might promote apprenticeship can arguably perform that task only in the presence of labor market imperfections: under perfect competition, as Becker demonstrated, employers could not finance general training at all, and collective action aimed at getting them to do so would fail. On the other side, while imperfect competition makes it possible for employers to provide and finance training in transferable skills, it does not require them to do so, and the extent to which they do varies across countries in ways that can be linked, both logically and empirically, to institutions (Ryan (2001)). This section addresses that task.

Causal inference is particularly problematic in institutional research. Four types of empirical difficulty stand out. The first concerns measurement problems. Some institutional attributes are qualitative and unmeasurable; others are measurable, but only as ordinal variables, and characterized by measurement error, missing observations, and limited validity, as the terms and their meaning vary across countries. Moreover, even simple outcomes, such as the rate of youth participation in apprenticeship, are potentially distorted by the interest of national governments in improving their country's standing in international league tables such as those compiled by the OECD. Secondly, some institutions are multidimensional, and their effects on apprenticeship may differ by subdimension. Thirdly, institutions may interact in determining outcomes, as suggested by the concept of "institutional complementarity" (Höpner (2005))—between, for example, industrial relations and corporate ownership—a factor that places additional strain on the evidence. Finally, the data are usually country-year observations, which means small sample sizes and identifying variation based more on differences between countries than on changes over time. Country-specific fixed effects can therefore distort the results. Firm conclusions are therefore elusive in institutionally-oriented research. For institutionalists, however, the importance of the issues trumps the limitations of the evidence.

The result is a literature dominated by qualitative evidence and binational comparisons. We prefer here to relate quantifiable outcomes to quantifiable institutional

attributes across a heterogeneous set of countries, and thereby to suggest potentially fruitful directions for further research. We rely in particular on a database on national institutional attributes that was compiled primarily with pay setting in mind, but which potentially applies to training as well (Visser (2009)).

As to the meaning of “institutions,” we follow contemporary practice in political economy and focus both on the organizations that sustain collective action, such as employers’ associations, trade unions, and labor market authorities, and on their relationships with each other, including collective bargaining and joint regulation. These relationships affect individual agents’ choices in market contexts—for example, the decision of employers to offer apprenticeships—which in turn renders sterile any dichotomy between markets and institutions.

5.1 Institutions and outcomes

Institutionalists typically identify several types of institution as foundations on which successful national apprenticeship systems stand. The set includes public regulation (legislation), employer organizations (employers’ associations, chambers of trade and commerce), employee organizations (trade unions, works councils), and educational organizations (vocational colleges, educational professionals). To this list we add youth and trainee organization.

A prominent theme in institutionalist accounts is efficiency: such institutions may correct training-related market failures. Such perspectives dominate personnel economics, or the “new efficiency-oriented institutionalism”, and the “varieties of capitalism” literature (Lazear (2000), Hall and Soskice (2001)). Other institutionalists prefer historical contingency and path dependence to functionalist determinism, with more scope for economically undesirable outcomes (Streeck (2005), Hall and Thelen (2009)). We avoid any dichotomy between these approaches: the potential efficiency-improving functions of the various institutions are analyzed, while potential dysfunctions and historical processes are kept in mind.

We attempt here only a preliminary empirical analysis of a potentially fruitful research field. Our analysis is confined to eight advanced economies (Table 11.4), for all of which reasonably comprehensive data on institutional attributes are readily available—which unfortunately rules out the Czech Republic, for example. We select them so as to span a wide range of both institutional attributes and intensity of operation.

Table 11.4 shows the most accessible indicator of apprenticeship’s intensity of operation: the share of educational enrollments at upper secondary level that are part-time (i.e., combined school-based and workplace-based). In Switzerland and Germany, the share of apprentices is 58% and 44% respectively; in Sweden and South Korea, zero.

This indicator of apprenticeship activity is imperfect in various ways. First, it measures the quantity but not the quality of training. Second, its coverage of apprentices is

Table 11.4 Apprenticeship Activity and Institutional Attributes, Selected Countries, 2006

	Switzerland	Germany	Netherlands	France	Ireland	U.K.	Sweden	South Korea
1. Enrollment share of part-time vocational education (%)	57.8	44.2	18.3	11.6	2.4	[1.4] ^a	0	0
2. Year of key apprenticeship legislation	1930 2003	1969	1966 1993	1971 1987	1987	[2009]	none	none
3. Employers' association membership density (%)	37	72	79	74	39	54	56	n.a.
4. Mandatory extension of collective agreements (index)	0	1	1	2	0	0	0	0
5. Union membership density (%)	19	21	22	8	35	29	75	10
6. Collective bargaining coverage (%)	48	63	82	95	n.a.	34	92	10 ^b
7. Works Council powers (index)	0	3	3	2	1	1	2	0
8. Tripartite national council present (index)	0	0	1	1	1	0	0	0
9. Joint body, national socio-economic policy (index)	2	1	2	1	2	0	2	0
10. Joint bodies, sector employment policy: (index)	1	2	2	1	0	0	2	1
11. Powers over workplace training, external body (index)	1 ^c	1	1	1	1	0	n.a.	n.a.
12. Representation of vocational teachers (index)	0	1	1	0	1	0	n.a.	n.a.

Variables

1. Enrollments in vocational upper secondary programs in which off-the-job education accounts for less than one-quarter of the curriculum as a percentage of the 15–19-year-old population
2. Year of key (enabling or codifying) statute for apprenticeship
3. Share of employees within the domain of the employer peak organization who are covered by it, 1995 or 1996
4. Mandatory extension of collective agreements to nonorganized firms. Coding: 2 extension applied regularly and to significant share of employees; 1, available, but not widely used; 0, not available
5. Union membership net of nonemployees as percentage of employees in employment
6. Employees covered by collective pay bargaining as percentage of those with the right to coverage
7. Rights of works councils: 3, codetermination of company economic policies; 2, major consultation rights over social policies, including training; 1, information rights; 0, no representation or no rights
8. Existence of tripartite national council concerned with socio-economic policy in private sector: 1, yes; 0, no
9. Formal involvement of organizations of employers and employees in determination of social and economic practices; 2, routine; 1, occasional; 0, rare or nonexistent
10. Sector-level organization of employers and unions, or joint bodies, for negotiation, dispute settlement, training and/or recruitment: 2, present throughout economy; 1, present in some sectors only; 0, absent
11. Powers over the operation of apprenticeship within the company for an external joint body, including sector-level or occupation-level committees, and German chambers: 1, any; 0, none
12. Mandatory representation of vocational teachers on joint apprenticeship committees, at national, sector or district level; 1, yes; 0, no

Notes. n.a.: not available or not applicable.

^a Learner volumes, Level 3 Advanced Apprenticeship, <19 year olds 2006/07 (England only).

^b Lower bound estimate, 2000.

^c Public (cantonal) body is responsible for quality of training at workplace, but occupational associations (*Berufsverbände*) examine apprentices (Hoeckel et al. 2008, p. 14). Sources (1) OECD (2008, table C1.1); Kuczera et al. (2009); Learning and Skills Council, Post 16 Education and Skills Tables, Statistical First Release June 2009; ONS, Principal Population Projection, 2006-based, England. (3) Traxler (2008, table II.4). (4–10) Visser (2009); Kuczera, Kis, and Wurzburg (2009); OECD (2004, table 3.3); OECD Statistics database. (2, 11, 12) Ryan (2000, table 3); Hoeckel et al. (2008); Ni Cheallaigh (1995, Annex 5).

incomplete, and in ways that may lead it to understate the dispersion of activity across countries.⁴⁸

Table 11.4 also lists 11 quantifiable institutional attributes that potentially influence the scale of apprenticeship. Five categories are covered: public law, and the representation of employers, employees, educators, and trainees themselves. The list of institutions is also less than comprehensive. Particular institutions may contain additional dimensions: for example, the influence of employers' associations potentially depends on their powers vis-à-vis their members as well as the share of the economy that they cover. A second difficulty is that training decisions may also be affected by institutions not included in Table 11.4—notably, corporate ownership and finance (Black, Gospel and Pendleton (2007)).

Moreover, no listing of individual attributes can capture complementarities between institutions. For example, the “varieties of capitalism” approach classes market economies as “liberal” or “coordinated” according to the importance of supra-market coordination by organized interest groups (Hall and Soskice (2001)). Each category is described in terms of a set of organizational attributes, including industrial relations, corporate ownership, and product market strategies, that complement each other within a wider whole. Apprenticeship is treated as a leading area of institutional complementarities, though the content of those complementarities remains controversial (Crouch et al. (2005)).

We now examine the extent to which the scale of apprenticeship is associated across countries with their institutional attributes.

5.1.1 Statutory framework

Some countries have passed laws that define apprenticeship and provide for its organization and administration (Table 11.4, row 2). The best-known example is Germany's Vocational Training Act of 1969, which extended the prior recognition and regulation of apprenticeship in small artisanal firms to larger employers in industry and the services. One of the act's central functions has been to stipulate how apprenticeship is to be organized, in that it defines the responsibilities, membership categories, and powers of the relevant multilevel bodies. The broader connotation of the 1969 Act is the devolution of public powers to bodies representing the interested parties, such

⁴⁸ The OECD's measure in principle excludes: firstly, apprentices older than 19 years, who constitute a majority of apprentices in Germany and the U.K.; secondly, apprentices in post-secondary education, whose numbers have risen rapidly in France; and thirdly, learners who are not enrolled in formal education, who are the majority of “apprentices” in the U.K. The excluded categories are large in some countries with larger systems, notably Germany and France, but not in Switzerland, where most apprentices start training after lower secondary education. On a more comprehensive measure, for the share of a population cohort that undertakes an apprenticeship at any age, Switzerland and Germany scores are much closer, at around two-thirds and three-fifths respectively (Wolter and Schweri (2002), Ryan and Unwin (2001)).

as employers' associations, conditional on their using those powers in the public interest rather than in sectional ones (Streeck et al. (1987), Deißinger 1996).

A similar approach was adopted around the same time by Germany's smaller apprenticeship-oriented neighbors and by France in 1987. The Dutch and Irish statutes, for instance, integrated traditional apprenticeship into the formal education system. The French reform made apprenticeship a recognized path to existing vocational qualifications at all levels of attainment, including post-secondary ones (Combes (1988), Ryan (2000)). In Switzerland, vocational education was exempted by law in 1930 from the general devolution to canton level of the regulation of formal schooling and has since then constituted the exceptional federal responsibility in educational matters (Bauder and Osterwalder (2008)). By contrast, until recently British apprenticeship lacked a statutory basis, and in Sweden and South Korea, in the effective absence of apprenticeship, that remains the case.

The potential functions of enabling legislation start with the mobilization of decentralized and scarce information about training needs and methods in particular occupations, sectors, and employers. Members of the officially recognized regulatory bodies have information about a wider range of circumstances than can be obtained by public administration alone. Secondly, by providing for the public definition of both training occupations and minimum training standards in those occupations, and also for the regulation by external organizations of the actual content of training at the workplace, a counterweight is installed to the threat of low quality training within the firm—a matter of particular concern when production-oriented training firms are left entirely to their own devices (see Sections 2 and 3). More broadly, to define the educational standing and contribution of apprenticeship is to point it away from narrow job training and toward vocational education, and, in most countries, general education too.

The problems potentially caused by statutory regulation include the restriction of innovation in training agency and training methods. Thus Britain's (until recently) nonstatutory, subsidy-based system has encouraged a proliferation of training providers, including commercial specialists. The potential gains are greater cost reduction and faster innovation. As the same providers have increasingly displaced public colleges, the potential losses include training standards and the educational contribution of apprenticeship, along with a low commitment by employers to apprenticeship (Dustmann and Schönberg (2007), Lewis and Ryan (2009)).

Table 11.4 suggests that the scale of apprenticeship is associated with statutory regulation, and in particular that a statutory basis may be necessary for a substantial system. The countries with mid-sized or large apprenticeship systems all have such laws, whereas those without apprenticeship—not surprisingly—lack such laws. However, as the countries with a statutory basis for apprenticeship include Ireland, which has only a small system, legislative support appears to be less than sufficient for success.

5.1.2 *Employer representation*

The viability of apprenticeship is frequently taken to require collective action by employers. Two institutional types are potentially relevant: employers' associations, at the level of the sector and the economy; and chambers of trade or commerce, organized across sectors at district or regional level.

The potential contributions of employer representation are widely recognized. Firstly, it may ensure that the content of apprenticeship—in contrast to vocational education based wholly in educational institutions—remains relevant to the skill requirements of production. Moreover, external employer representation may discourage firms from providing narrow, firm-specific training, and prompt them instead to contribute to a pool of transferable skills from which all companies benefit. Similarly, when it is employer representatives, whether from the sector or district, rather than public officials, who assess the quality of an employer's training program, the legitimacy of the assessment in the eyes of that particular employer is potentially greater.

Secondly, according to employer representatives, trust is fostered when they play an important part in the design and administration of the apprenticeship system. Individual firms are encouraged to share types of information about their skill requirements and training options that they would not otherwise willingly share with outsiders, particularly public officials. The result is a better design and functioning of the training system (Culpepper (2003)).

Thirdly, there is the threat of noncooperative outcomes in the prisoners' dilemma "game" of "train or recruit" that employers who use costly transferable skills must play: that is, under uncoordinated decisions, employers do not provide enough training, and use recruitment excessively instead. In that context, employer collectives may coordinate strategy choices around the jointly beneficial cooperative outcome, in which more firms do more training than they would if left entirely to their own devices. (This potential benefit is relevant only to employers with an investment-oriented training strategy.) Attaining the superior outcome may however require that the employers' association possess formal powers that allow it to punish any defecting employers. Those powers may be based either on compulsory membership or on extension rules, which require nonmembers to observe the terms established by the association. The contribution of employer collectives to building "dialogic capacity" and exerting peer pressure on individual employers may however be sufficient (op. cit.).

Finally, chambers of commerce, which are organized by district and across sectors, may be able to use attachment to the local community to mobilize employers to provide more training, in terms of quality as well as quantity, than they would if left purely to their own devices.

The potential dysfunctions of devolved administration by employer representatives start with the threat of rent extraction: instead of pursuing the general good, those

representatives may feather their own nests. The threat is particularly acute for employers' associations, with their sector-specific basis. Firms that compete in the same product market may find it easier to coordinate their product market strategies when they can meet legitimately to coordinate their training decisions.

A second consideration is conflict between the interests of large and small firms. To the extent that large companies favor investment-oriented training and small ones production-oriented training, and small firms dominate employers' associations, the result is higher volume and lower quality in the apprenticeship system, along with fewer opportunities for educational progression after apprenticeship (Culpepper (2007)).

Third, powers exercised by chambers of commerce over training at the workplace may mean under-informed decisions, to the extent that employers in other sectors fail to understand or share the concerns of the company providing training.

What quantitative evidence is there on the association between employer organization and apprenticeship? The answer is: unfortunately little. The indicator that is available for the largest number of countries is the coverage of the national peak employers' association. It varies considerably across countries, and it is particularly high in three of the four largest apprenticeship systems, those of Germany, France, and the Netherlands (Table 11.4, row 3).

Such an association would align with the failure of the government's attempt to develop a German-type apprenticeship in South Korea in the 1990s, which resulted partly from the absence of employer organizations capable of generating and coordinating suitable responses—a lacuna that continues to handicap public training policy (Jeong (1995); Kuczera et al. (2009)).

The apparent association between employers' associations and the scale of apprenticeship cannot however be close. In Switzerland, the country with the largest apprenticeship system, the coverage of the peak employers' association is relatively low. Sweden has no apprenticeship training but highly developed institutions of employer coordination.

The evidence is not however compelling. The coverage of the peak association may not capture well the role of employers' associations, particularly as it is at sector-occupation level rather than national level that the coordination of training decisions is potentially most important. The countries with the largest apprenticeship systems, Switzerland again excepted, devolve to sector-level employers' associations powers over the organization and administration of apprenticeship, whereas three with smaller systems (Britain, Sweden, and South Korea) do not. Second, other bodies may be able to perform the task of coordinating employers' training decisions. In Switzerland the job is done by occupational associations (*Berufsverbände*), whose presence is mandated for all apprenticeable occupations, and which are dominated in part or whole by employer representatives (Hoeckel et al. (2009, p. 16)). Finally, employers' associations often face a divergence of interests between large and small member firms. The greater

the membership share of small firms—as in Austria relative to Switzerland—the more the association becomes likely to favor production-oriented training in general, and narrowly defined training standards in particular (Culpepper 2007).

A positive association with the scale of apprenticeship is less clear for chambers of commerce. Comparative data on these bodies are particularly scarce.⁴⁹ In Germany chambers hold the power to approve an employer's training programs and to assess apprentices at the end of training. This is however a specifically German approach. In the Netherlands and Ireland, much or all of that set of tasks falls to sector-based or occupation-based bodies, who in Switzerland and England share the relevant tasks with public inspectorates (Ryan (2000); Hoeckel et al. (2009, p. 21)).

Further evidence on the role of employer organization comes from *within-country* differences in employer organization and training activity. A striking example is the electrical contracting component of British construction, in which an employers' association managed for many decades to coordinate its members' provision of apprenticeship training. At the same time, lacking direct statutory support, the employers' association could not sustain training on a scale commensurate with its members' needs, let alone those of the wider industry (Gospel and Druker (1998)).

That weakness points to statutory support, in the shape of extension rules that require nonparticipating employers to adopt decisions made by their sector's employers' association, that may contribute to the effectiveness of employer organizations. The evidence in Table 11.4 (row 4) is broadly consistent with that proposition. Three of the four countries with the largest apprenticeship systems operate extension rules in at least some parts of the economy; in the four with the smallest systems, they do not operate them anywhere. Switzerland again proves the exception.

Finally, an important role for employer organization is suggested also by the government attempts in France and the new federal states (*Länder*) in Germany in the 1990s to increase employers' provision of apprenticeship. The few regions and states in which those efforts succeeded were those in which intra-sector cooperation by employers was most successfully fostered, in particular by the devolution of public powers to their representatives, whereas in those in which public officials imposed their own decisions, failure was normal (Culpepper (2003)).

5.1.3 Employee representation: social partnership

Social partnership denotes the involvement of representatives of employees, as well as those of employers, on joint bodies that are given responsibility for some combination of strategic advice and administration in relation to the apprenticeship system. These

⁴⁹ For example, Traxler et al. (2001), studies the organization and effects of employers' associations, both sector and economy-wide, but does not touch on the organization and role of chambers.

joint bodies may operate on a simply bipartite basis, as in Denmark, or on a tripartite one, including government representatives, as in Switzerland.

The bodies that represent employees in relation to apprenticeship issues are trade unions and works councils. In Germany, trade union officials have parity of representation with employers on the joint bodies that steer and operate the apprenticeship system, ranging from the board of the Federal Vocational Training Institute (BIBB), down to the committees that the district-level chambers—which in other functions are purely employer-based bodies—set up to validate individual employers as trainers and to assess apprentices' skills. At company and workplace levels, works councils have the right to codetermine both how training regulations are implemented at the workplace and the content of employment decisions concerning training staff. They have established a plant-level training committee in most large establishments (Streeck et al. (1987); Münch (1991); Müller-Jentsch (1995, p. 71)).

In some accounts, employee representation, as part of joint regulation by employer and employee representatives, is a key requirement for the success of an apprenticeship system (Raggatt (1988), Streeck (1989)); in other accounts, it is a secondary or optional extra (Hall and Soskice (2001)).

The potential contributions of employee representation to the success of apprenticeship depend on the goals of trade unions and works councils. Theoretical generalization on that matter is difficult. A simple starting point is the assumption that employee representatives press for more and better training. To the extent that they do so, their involvement in training-related decisions increases support for those goals, compared to cases of “employer coordination only.” This is potentially important both at central level (the definition of training standards for particular occupations), which typically involves national union officials, and at workplace level (training content that exceeds minimum standards, a higher volume of training), which potentially involves works councils and workplace union representatives. Support for quality is potentially most important when the employer adopts a production-oriented training strategy; support for quantity, is when an investment-oriented strategy is involved. The former situation arises mostly in small firms, where employee representation is least extensive, and therefore least able to improve training. In the investment-oriented case, support for high training standards is less necessary, but a works council with codetermination powers may press to make the firm's apprenticeship program larger and its content less firm-specific than they would otherwise be, which may reduce market failure.

Secondly, employee representation may improve information and reduce distrust, and thereby also potentially improve apprenticeship. To the extent that works councils reduce the cost and asymmetry of information on skills-related issues between managers and employees, and increase trust between the two parties, the efficiency of apprenticeship training can improve (Rogers and Streeck (1995)). In particular, works councils, workplace training committees, and union training representatives are well-

placed to monitor the quality of training, and thereby to reassure employees and trade unions that their interests are not unduly threatened by the substitution of apprentices for adult employees (see [Section 2](#); [Ryan \(1994\)](#)).

Indirect channels may also be present. Firstly, to the extent that unions and councils press for more skill-intensive methods of production, both the employer's demand for skill and the supply of apprenticeships may be higher. Secondly, when an employer possesses monopsony power over trainees, as is sometimes the case for production-oriented training, collective bargaining can raise apprentices' pay and weaken the incentive to the employer to offer high quantity and low quality training. This constraint is potentially important when effective external training standards are absent. Finally, to the extent that trade unions succeed in strengthening employment protection law, employers seeking to screen candidates for future employment are encouraged to offer apprenticeship rather than recruit already skilled workers, both because an apprenticeship contract makes it easier to lay off individuals (i.e., when it expires, at the end of the training contract) than does an employment contract, and because it is more expensive to recruit skilled workers when layoffs are restricted by law.

Employee representation and social partnership may however have dysfunctional effects. First, trade unions may make pay a higher priority than training. When that leads to higher apprentice pay, training costs are higher and the employer's supply of training places lower—a pathology that was prominent in post-war Britain. Unions may pursue such goals for various reasons: to increase employment for adult members, to increase their bargaining power, to respond to youth discontent, or to increase recruitment ([Ryan \(1987\)](#); [Marsden and Ryan \(1991\)](#); [Ryan \(2010\)](#)).

Second, trade unions may seek to curb the supply of apprenticeships in order to generate scarcity in occupational labor markets, and thereby to raise pay for their skilled members. The strategy is encountered most frequently among occupationally based employee organizations (craft unions and professional associations). The resulting volume of training is inefficiently low.

Finally, trade unions may be reluctant to engage in political-economic exchange in the first place. Where trade unionism has a strong political or ideological component, and militancy is preferred to negotiation, the prospects for the joint regulation of work-based training may be impaired from the supply side. The difficulties of apprenticeship in South Korea may have resulted from such attributes in the labor movement, not just the weakness of employer coordination ([Jeong \(1995\)](#)).

Turning to works councils, although usually they operate under a “peace obligation” (i.e., prohibition of industrial action) and are formally excluded from pay bargaining, they may be diverted from improving training into rent acquisition (“plant egotism”), by negotiating establishment-specific advantages in pay and working conditions ([Thelen \(1991\)](#)).

Second, works councils may use their powers over training at the workplace to “protect” trainees by reducing their involvement in production during training, which raises costs to the employer and, under investment-oriented training, potentially cuts both the effectiveness of training and the supply of places.⁵⁰ Similarly, works councils have been seen in Germany to push the employer to retain after training more apprentices than it would otherwise do, thereby reducing the contribution of apprenticeship to the screening of future employees and more generally to the matching of workers and jobs in occupational labor markets [Ryan et al. \(2010\)](#).

Finally, social partnership at national level may reduce innovation in training content and methods. Training schedules have to be revised in response to technical change in products and processes; the need for agreement means more discussion and slower decision-making, particularly under the consensus requirements for decision-making. The issue remains open, however, as the cost of slower decisions may be outweighed by the benefit of better decisions.

The cross-country evidence suggests some association between indices of employee representation and apprenticeship activity ([Table 11.4](#), rows 5–11). The countries with small or nonexistent apprenticeship systems tend to score low in terms of both the background attributes of social partnership (trade union membership and collective bargaining coverage) and the foreground ones (powers of works councils at the workplace, and of joint committees at sector and national levels).

A comparison between South Korea and Ireland illustrates the relationship. Korea's weak and highly conflictual industrial relations system helped frustrate its government's German-inspired attempt to introduce apprenticeship in the 1990s ([Jeong \(1995\)](#)). By contrast, the growth of social partnership in Ireland since the mid-1980s, while originally oriented to macroeconomic management, soon embraced the reform of a traditional “time served” apprenticeship system. The success of that reform, relative to its British counterpart, is consistent with the importance of social partnership in Ireland and its near absence in Britain. An Irish-British comparison is particularly informative for involving institutional changes over time, not just institutional differences at a point in time ([Ryan \(2000\)](#); [Field and O'Dubhchair \(2001\)](#)).

Nevertheless, social partnership appears not to meet the more stringent requirements for status as necessary or sufficient for the success of apprenticeship. On the sufficiency side, Sweden scores highly on all indicators except national policy-making but has no apprenticeship. That is perhaps not surprising: as Sweden had previously opted to replace apprenticeship system by full-time vocational education, it may be a case of

⁵⁰ Any council-induced reduction of apprentice learning might conflict with the case for apprenticeship as a means of learning. If skills are better learned not only by being learned at the workplace but also by performing actual production tasks, apprentices who are less involved in productive work in order for a works council to curb substitution for skilled workers learn less. A cross-sectional study finds the greater the share of their time at the workplace that apprentices spend in productive work, the more cross-curricular skills they learn ([Bieri-Buschor et al. \(2002\)](#)).

institutional suitability combined with lack of political interest in developing apprenticeship (Crouch et al. (1999, p. 117 seq.)). One test would be whether, should the Swedish government try to recreate apprenticeship, the country's well-developed institutions of social partnership will generate success.

On the necessity side, extensive employee representation and social partnership may not be essential for large-scale apprenticeship. Switzerland lacks mandatory works councils, most Swiss employees neither belong to unions nor are covered by collective bargaining, yet the country has a large apprenticeship system. Swiss law does however give the "organizations of the world of work" (employers' associations, trade unions, and occupational associations) responsibility for the design and operation of apprenticeship (BBT (2009)). That shows up in Table 11.4 in the role of joint bodies in the formulation of social and economic policy at both national and sector levels. The Swiss case therefore both calls into question the necessity of employee representation for the success of apprenticeship and suggests that, insofar as social partnership does matter, the important attribute is training-related joint representation, not high levels of employee organization *per se*.

One potentially necessary condition must be noted. In almost all of the countries with apprenticeship systems, including Switzerland, joint bodies external to the firm possess powers over the content of training at workplaces. Those powers involve variously the specification of minimum training standards, the validation of the employer's eligibility to train apprentices, or the assessment of apprentices' learning.⁵¹ To that extent, some external regulation of workplace training appears to be a necessary ingredient of apprenticeship training. Doubt again centres on Switzerland, where the relevant powers of occupational associations are limited to the assessment of apprentice skills, and many associations are employer-dominated and, as such, do not involve strong social partnership.

5.1.4 Educational representation

Social partnership may also involve educational institutions and educators in the design and administration of apprenticeship. In Germany, representatives of vocational teachers enjoy parity of representation with employers and employees on the vocational training committees of the federal states (*Länder*), which are responsible for the vocational education (*Berufsschule*) component of apprenticeship (Streeck et al. (1987, p. 17)). The examination committees that the chambers set up for the assessment and certification of apprentice learning must contain a vocational teacher (Münch (1991)).

The potential contributions of such representation rights are all quality-related: the bolstering of the more educational components of apprentices' learning and its

⁵¹ The exception is the U.K., where the powers of the external body (Sector Skills Council) are limited to restricting eligibility for public training subsidies to firms that adhere to a training "framework," and where those external bodies are "employer led," i.e., need not involve employee representatives.

external, disinterested assessment, and of the monitoring of training content at the workplace. These contributions are potentially valuable across the board, but particularly so when employers adopt a production-oriented training strategy and have an incentive to cut corners in organizing training.

The potential dysfunctions of educational representation include the reorientation of apprenticeship toward narrowly academic goals and methods, to the detriment of apprentice motivation and learning—which undermines the case for apprenticeship as opposed to full-time vocational schooling. Vocational educators may also resist pedagogical innovations that reduce training cost without compromising quality, not just those that cut quality as well as cost. Fear of such dysfunctions may account in Germany for the lack of direct representation of vocational teachers on the Central Board and the sectoral training committees of the Federal Vocational Training Institute, responsible respectively for the overall design of the system and the specification of training regulations at occupation level (Streeck et al. (1987)).

Cross-national data on the role of vocational educators in apprenticeship systems are scanty. In the European countries with moderate or extensive apprenticeship systems, such representation is typically mandatory, whether on the national steering body, on the sector-level or district-level committees that regulate work-based training, or on both (Table 11.4, row 12). That does not however apply in either France or Britain. Its absence in Britain reflects political hostility to both social partnership and any systematic educational orientation in apprenticeship (Lewis and Ryan (2009)).

5.1.5 Apprentice organization

The final category of actor is apprentices themselves. Their role has been widely neglected. Institutionalists have paid little attention to the individual trainee. Indeed, the governance of apprenticeship usually accords no place to apprentices, beyond the indirect representation of their interests by trade unions. Nevertheless, under particular circumstances, dissatisfied apprentices have organized independently, acted collectively, and thereby affected how their training programs function.

The effects of trainee organization involve occurrence, goals, and methods. Dissatisfaction becomes more widespread, and collective action more likely, when employers adopt a production-oriented training strategy and trainee pay is low by the standards of the time and place. Even then, collective action is likely only when three conditions are met: first, external training standards are either absent or poorly enforced, so that little learned; second, the alternatives open to discontented apprentices are few and poor, for example, as a result of job scarcity or monopsony power; third, apprentices expect to face excess supply in occupational labor markets after qualifying. Career prospects are then too poor to compensate young people for low pay relative to productivity during training. Apprentices may then act collectively, and press employers either for better training or for higher pay during training.

Apprentice activism is neither commonplace nor easy to measure. In the absence of systematic cross-country data, evidence can be taken from particular times and places. Three examples stand out. The first is the strike movements conducted by apprentices in British metalworking between 1912 and 1964, mostly in pursuit of higher pay. Those actions episodically increased the relative pay of apprentices and the cost to employers of training them, and arguably contributed to the decline of apprenticeship (Ryan (2004, 2010)). The second example concerns the unofficial strikes conducted by German apprentices between 1968 and 1972, in which the primary demand was better training not higher pay, but which appear to have had little effect on either (Blanke (1972)). Thirdly, there are the strikes conducted in recent decades by teaching assistants—viewed as apprentices' functional equivalents in higher education—in some large public U.S. universities, including Wisconsin and Berkeley, in pursuit of higher pay and reduced workloads (Cohen (2000), Julius and Gumpert (2003)).

Apprentice activism that leads to more training per apprentice potentially increases efficiency, insofar as market-based training involves under-provision. When it raises apprentice pay, the effect on efficiency depends on whether low pay during training reflects monopsony power or simply a paucity of alternatives to apprenticeship (see Section 4.2.3). If the former, efficiency potentially increases, but if the latter, it falls—although a case for the change may still exist in equity.

5.2 Conclusions and future research

The evidence suggests, first, that countries with larger apprenticeship systems tend to have more elaborate institutions for the coordination of training related decisions, both market-based and nonmarket-based, than do those with smaller ones or no system at all. The principal dimensions along which institutional elaboration is observed are: statutory underpinning, employer organization, and social partnership.

Second, a functionalist analysis of those institutions indicates various ways in which they can reduce market failure and increase efficiency. Two loci are particularly important: in the presence of investment-oriented training, by increasing the quantity of training provided (number of apprentices); in the presence of production-oriented training, by improving training standards, and thus the amount of training per apprentice.

The evidence considered here is consistent with the view that such institutional attributes influence the success of apprenticeship across countries. Three reservations must however be registered. First, the evidence is too limited to “prove” the hypothesis overall, let alone determine the interactions between institutions in the setting of outcomes. Second, some potential institutional effects, including those of corporate ownership and finance, have not been covered here. Third, it appears unlikely that, even confining attention to the institutional attributes that have been considered, any combination is either necessary or sufficient for the success of apprenticeship. Concerning necessity, the successful countries include Switzerland, whose “liberal

corporatism” involves weaker roles for employee representation and social partnership than do the neighboring countries with comparably large apprenticeship systems (Fluder and Hotz-Hart (1998)). Concerning sufficiency, high levels of coordination in Sweden have only recently led to attempts to create an apprenticeship system in place of the one abandoned decades ago.

The evidence has a bearing on the efforts of governments to develop apprenticeship in many countries, including France, Ireland, the U.K., and South Korea, which had previously either no apprenticeship system or only a traditional or moribund one. The evidence suggests that neither of the polar positions that are sometimes taken in discussions of such policies—“no need for serious institutional development” and “no prospect for policy borrowing, given institutional stasis”—is valid. Countries that lack institutions for employer coordination and social partnership do indeed face serious difficulties, whether in expanding high-quality work-based training without institutional support, or in developing suitable institutional support in the first place—as notably in South Korea. But the institutional obstacles are less than absolute. Ireland and France have both expanded apprenticeship and increased its quality with less powerful—albeit nontrivial—support from employer coordination and social partnership.

Promising directions for future research include improved measurement of institutional attributes, leading to the inclusion of more countries and more detailed institutional attributes, at sectoral and regional as well as national levels. It may then become possible to identify more clearly the roles of and complementarities between institutions in the operation of apprenticeship, and to analyze institutional change more effectively (Thelen (2009)).

6. CONCLUSIONS

Apprenticeship varies greatly across countries, in terms of both quantity (numbers trained) and quality (skill content); and across sectors and occupations within countries, in terms of its provision and finance by employers. Therefore it is not easy to explain the heterogeneity of apprenticeship. Despite the theoretical advances of the last two decades, as yet no general theory explains the full range of financial attributes observed, even ignoring cross-national heterogeneity. Indeed recent theoretical efforts have focused to a greater extent than is widely recognized on specific circumstances in occupational labor markets, and the potential sensitivity of the conclusions to changes in assumptions about trainee labor markets is not widely recognized. The economics of information and imperfect (monopsonistic) competition potentially explains why many employers invest substantial amounts in transferable (“general”) skills, despite the poaching externality. But empirical observations show not only a large degree of heterogeneity in the training costs that firms share but also that many firms reap net benefits even during the training of apprentices.

This can be partly explained by the phenomenon of production-oriented training, in which employers earn a surplus during training, release many trainees at the end of the training contract, and, in the absence of external training standards, use apprentices as cheap labor. However, production-oriented training is less well-understood than investment-oriented training and more research is needed to understand why in some cases production-oriented training leads to a qualitative collapse of the training market and why in others it operates alongside a high-skill, high volume training market.

Microeconomic models of market choices by firms and young people require institutional elaboration in order to effectively address cross-national differences in apprenticeship, partly because informational failure and skill specificity are not expected to vary greatly, and partly because institutional attributes do vary considerably, across countries. Successful apprenticeship systems involve nonmarket coordination mechanisms, comprising principally employer bodies (associations, chambers) and also social partnership, drawing upon employee representatives (trade unions, works councils) and educators. Economic analysis indicates various ways in which such institutions may reduce market failure and increase efficiency. Countries with successful apprenticeship systems do however differ among themselves in terms of institutional content, particularly the importance of social partnership. The relevant institutions may also produce economically dysfunctional effects. Path dependence in institutional development may hamper the scope for suitable institutional development. This means research is needed into institutional development and the interplay of institutions, to fully understand under what circumstances and in what combinations institutions improve outcomes for young people, employers, and the economy as a whole.

Many questions await conclusive answers, including: does apprenticeship increase educational participation and attainment, as it should do if it improves motivation and cognition in vocational education, and if it provides improved job prospects to young people? This is suggested by the positive cross-country association between overall educational participation and the enrollment share of apprentices. The association is not strong, as many nonapprenticeship countries have high enrollments (Sweden, Belgium), but the lowest enrollment rates are in countries with little or no apprenticeship (U.S.) or little or no educational content in apprenticeship (U.K.). The association is in any case at most suggestive, given potential distortion by national fixed effects.

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