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THE PROVISION AND EFFECTS OF COMPANY TRAINING

A brief review of the literature

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ABSTRACT: This non-technical paper attempts to explore our current state-of-knowledge on the economic benefits arising from company-provided training. More precisely, it reviews the empirical training literature in the search for answers to the following policy-relevant questions: What kind of training do companies provide? Who is trained, to what extent, and for which reasons? Do the trained employees experience an earnings advantage over the non-trained? Do training enhance employability, job mobility and promotion? Does the company benefit from its training investments in terms of improved productivity, competitiveness and profitability? Does the economy, and the society at large, benefit from companies' efforts to develop the skills of their labour? The review can be described as a scratch on the surface, with the emphasis being on some of the most recent empirical research on the training provided by companies and the economic implications of these activities for the employees, the company and the society.

Despite a growing interest in investigating the incidence, determinants and impacts of company-provided training, evidently inspired by better data and more sophisticated techniques, our current knowledge on the role and importance of the huge amounts of money that companies annually invest in the human capital of their employees is still quite limited, often involving contradictory findings. Consequently, great cautiousness is needed in drawing policy implications concerning the crucial questions of inequality of access to company training, on the one hand, and training market failures, on the other.

KEY WORDS: companies, provision of training, effect of training

JEL: J24, J31, M53

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TIIVISTELMÄ: Tämän ei-teknisen katsauksen tavoitteena on hahmottaa tämän hetken tietämystämme yritysten tarjoaman koulutuksen taloudellisista hyödyistä. Alan empiirisestä kirjallisuudesta etsimme vastauksia seuraaviin koulutus- ja talouspoliittisesti keskeisiin kysymyksiin: Minkä tyyppistä koulutusta yritykset tarjoavat työntekijöilleen? Keitä yritys kouluttaa, missä määrin, ja mistä syistä? Hyötyvätkö työntekijät saamastaan koulutuksesta korkeamman palkan muodossa ei-koulutettuihin kollegoihinsa verrattuna? Edistääkö työnantajien tarjoama koulutus yksilöiden työllistymistä, liikkuvuutta ja urakehitystä? Ovatko koulutusinvestoinnit hyödyllisiä yritysten tuottavuuden, kilpailukyvyn ja kannattavuuden kannalta? Hyötyykö yhteiskunta yritysten pyrkimyksistä kehittää henkilökuntansa osaamista? Vastauksia näihin kysymyksiin etsittäessä, pääpaino kohdistuu viime vuosina julkaistuihin tutkimuksiin yritysten tarjoamasta koulutuksesta sekä sen yksilöille, yrityksille sekä yhteiskunnalle tuottamasta taloudellisesta hyödystä.

Yritysten tarjoaman koulutuksen vaikuttavuuden tutkimuksen suosio on kasvanut merkittävästi viimeisten kymmenen vuoden aikana. Osittain tähän ovat vaikuttaneet käytettävissä olevien aineistojen määrän ja laadun paraneminen sekä sofistikoitumpien tilastomenetelmien kehittyminen. Silti joutuu toteamaan, että nykyinen, teoreettiseen ja empiiriseen tutkimukseen pohjautuva tietämuksemme yritysten vuosittain henkilökuntaansa investoimien resurssien taloudellisesta merkityksestä on edelleen yllättävänkin vähäistä. Kokonaiskuvan hahmottamista hankaloittavat myös osittain ristiriitaiset tulokset. Nykyinen tietämuksemme antaa pohjan vain hyvin varovaisille politiikkasuosituksille. Tämä koskee sekä työnantajien tarjoaman koulutuksen jakautumisen että sen laajuuden vaikuttamiseen tähtäviä julkisen vallan interventioita.

AVAINSANOJA: henkilöstökoulutus, tarjonta, vaikuttavuus, yritys

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“...the traditional schooling system is not an option that many incumbent workers or firms use when facing the need to upgrade their skills. As a result, the provision (or nonprovision) of employer-provided training is a key factor determining how much and what kind of skill upgrading occurs within firms and across workers.”

– Lynch and Black (1998, p. 65)

1. Introduction

This paper attempts to explore our current state-of-knowledge on the economic benefits arising from company-provided training. More precisely, it reviews the empirical literature in this particular field in the search for answers to the following policy-relevant questions: What kind of training do companies provide? Who is trained, to what extent, and for which reasons? Do the trained employees experience an earnings advantage over the non-trained? Do training enhance employability, job mobility and promotion? Does the company benefit from its training investments in terms of improved productivity, competitiveness and profitability? Does the economy and society at large benefit from companies' efforts to develop the skills of their labour?

This non-technical review is far from being comprehensive. It may rather be described as a scratch on the surface, with the emphasis being on some of the most recent empirical research on the training provided by companies and the economic implications of these activities for the employees, the company and the society.¹ Moreover, since the primary focus is on empirical evidence, theoretical and methodological aspects are mostly only touched upon.

Although the review focuses on company training, it nevertheless overlooks the existing literature on apprenticeship training systems and their impacts. Moreover, the review does not provide descriptive cross-country statistics on company training, as such information is extensively surveyed by e.g. Nestler and Kailis (2002a,b,c,d,e) and OECD (1994, 1999, 2003).

A first decision that the company has to take is not necessarily concerned with whom to train. Rather the company needs to start by considering whether to buy the new skills in the labour market by hiring properly skilled labour, or whether it is preferable to acquire the new skills by training the company's present staff. In case the company decides to invest in its current personnel, then it is faced with a multitude of highly interrelated questions: Who are to be trained? What kind of training is needed? How extensive is the training to be? Is there an obvious risk of employees being hired away by competitors once trained? Of these questions, the empirical literature has paid considerable attention to trying to unravel which personal and company characteristics influence most strongly an employee's probability of participating in employer-provided training (the incidence of training). Considerably less is known about the determinants of the extent of the training (the intensity of training). Moreover, most of the existing evidence concerns formal company training. Our current knowledge about the incidence, intensity and effects of informal company training is scarce and scattered. Hence, the empirical evidence referred to in this brief overview relates to more formal modes of company training, unless indicated otherwise.

¹ For comprehensive reviews of previous evidence, see e.g. Lynch (1994a,b), Ashenfelter and Lalonde (1996), Booth and Snower (1996), Bishop (1997), and of more recent evidence, Asplund and Pereira (1999), Blundell et al. (1999) and Ok and Tergeist (2003). Noteworthy is also the critical contribution by Ashton and Green (1996).

An important question in itself is what is actually meant by formal versus informal company training. One thing is clear, though: there is a multitude of concepts and definitions in use in the empirical literature. This definitional confusion also extends to the traditional division of company training into general and specific training, a topic that has received considerable attention in recent years.

After the training investment has been undertaken, the focus logically turns to the effects of the training. As will become evident, there is so far rather limited knowledge on the impacts of training on the trained employees and their non-trained colleagues, on the performance of the training company, and, in the last resort, on social welfare. Moreover, a vast majority of the existing evidence concerns the UK or the USA.

2. Formal versus informal company training

The empirical evidence referred to in this review concerns primarily company-provided formal training. Corresponding evidence on informal training is scarce, and mostly lacking. A major reason for this is that the existing micro data contain minor, if any, information on informal training. Another crucial factor adding to the difficulty of comparing the effects of formal versus informal training is the definition of the two concepts. One common way of distinguishing between formal and informal company-provided training is to depart from the location of the training; that is, to base the division on whether the training is provided ‘off-the-job’ or ‘on-the-job’. Another frequently used alternative is to depart from the formality versus informality of the provided training irrespective of its location. Obviously these aspects offer at least part of an explanation of why the literature contains so few, and often contradictory, results on the provision and effects of informal training.

A cautious generalisation of the formal versus informal training results would be that there is a positive private return for individuals to gain from off-the-job training, at least (cf. Dolton 2004). Results for US youths suggest that on-the-job training has a significant effect on wages only if provided by the youngster’s present employer (Lynch 1992). This is interpreted as on-the-job training being quite specific to the training company and, consequently, mostly lost when changing the employer. When comparing youth training in Australia, the UK and the USA, Tan et al. (1992), in contrast, found that in all three countries, training provided within the company offered larger returns than off-the-job training, that is, training provided outside the company. Recent evidence for Germany, reported by Kuckulenz and Zwick (2003), indicates that participation in ‘external’ training has a significantly positive effect on wages, while the wage return on participation in ‘internal’ training is insignificant. These findings are in line with those reported by e.g. Barron et al. (1997) for the impact of ‘off-site’ versus ‘on-site’ company training on starting wages in the USA.

When it comes to productivity effects, the existing evidence points to significantly positive productivity effects of external or general training, but negligible effects of internal or specific training. Empirical evidence pointing in these directions has been obtained by Dearden et al. (2000) for the UK, Barrett and O’Connell (2001) for Ireland and Zwick (2002) for Germany. It is hypothesised that this finding may be due to more formal company training having a more lasting impact on productivity.

These few examples highlight the conspicuous variability in the definitions of formal versus informal training. A further complication is the concomitant use of other similar terms, not least those of general versus specific training and off-the-job versus on-the-job training. The conceptual confusion is further increased by the fact that often on-the-job training

is also used to cover both general and specific training. There is an obvious need of clarifying how to correctly label the different modes of company training.

3. General versus specific company training

The theoretical literature on training departs from the pioneering contributions by Becker (1964) and Mincer (1974), who draw a basic line between general and firm-specific training. While the employees need to pay themselves for their general training, companies are willing to share with their employees both the costs and the benefits arising from investments in firm-specific training. When the sharing rule is optimal, also the firm-specific investments of the two parties are optimal while, at the same time, the risks of human capital losses due to quits or layoffs are reduced (Hashimoto 1981).

The evidence of recent years, however, does not lend support for this traditional theoretical view. Instead, a growing number of studies suggest that companies provide their employees with even considerable amounts of general training, and also pay for this training. Using US data on youths, Loewenstein and Spletzer (1998, 1999) find that employers pay for nearly all off-the-job company training, of which a large portion appears to be essentially general. Also International Adult Literacy Survey (IALS) data indicates that company training received off-the-job imparts mainly general skills but is, nevertheless, to most part paid by the employer (OECD 2003). Likewise, European Community Household Panel (ECHP) data reveal that European employers tend to pay also for training that can be considered to generate more general skills (Booth and Bryan 2002).

A rapidly expanding theoretical literature attempts to identify the conditions under which companies are willing to sponsor also general training, while empirical evidence in support of the predictions derived from these theoretical models is only emerging. Below a few recent contributions are referred to, all of which contain, by and large, reviews of the previous literature in the field of employer-supported general training.² But before turning to these studies, it may be noted in this context that, apart from the characterisation of general versus specific training, also the relevance of distinguishing between general and specific company training has been put into question. More specifically, Lazear (2003) argues that there is no firm-specific training. Instead all skills can be seen to be essentially general in the sense that they are used by other companies as well. It is only the composition of the skills in a company and the weights that this particular company attaches to each skill that generates the specificity. He also provides empirical evidence in support of this ‘skill-weights’ view of his.³

Acemoglu and Pischke (1998) develop a theoretical model that departs from the assumption of the current employer having superior information about the abilities of its employees and, consequently, ex-post informational monopsony power relative to other potential employers.⁴ Their adverse selection based model results in multiple equilibria where, at the one extreme, the employer provides and pays for considerable amounts of general training due to a low quitting rate. At the other extreme, quits are endogenously high and, accordingly, the company’s monopsony power is low as is also its willingness to train. Moreover, their predictions of there being adverse selection among those receiving company-provided training, as well as of com-

² Also see e.g. Barron et al. (1999) as well as Booth and Bryan (2002).

³ For other relevant theoretical contributions on general versus specific investments in company training, see e.g. Oosterbeek et al. (2001) and Kessler and Lülfsmann (2002).

⁴ Previous theoretical work relies on the assumption of asymmetric information about the amount of the training investment (e.g. Katz and Ziderman 1990; Chang and Wang 1996).

panies having monopsony power over those who stay, receive support from comparisons of the wages of German large-company apprentices differing in their quitting behaviour.

Building on the imperfect information argument, Booth and Zoega (2000) put forth a further rationale for companies to invest in the general skills of their workforce. In particular, they argue that if the productivity of an employee depends on the quality of his or her colleagues, then this particular ability of the company to stimulate the productivity of its employees beyond what they could perform elsewhere will provide the company with some monopsony power in the labour market. When enjoying such monopsony power, the company is willing to invest also in general training of its workforce. This monopsony power is shown to be increasing in the average quality of the company's labour as measured by its capacity to undertake complex working tasks, implying that the company's incentives to invest in training that is general to the industry increase with its task complexity. Hence, the more stimulating the working environment is, the more sophisticated are the working tasks undertaken, the stronger is the employee's loyalty to the present employer, and the higher are the employer's profits, since the marginal effect of the training investment on productivity exceeds that on wages. In other words, the company benefits more from the investment than the trained employee.

Booth and Zoega (2000) note that their model receives support by empirical findings for the USA. They hereby refer to results by Lynch and Black (1998), showing that the incidence of computer skills and teamwork training in US establishments is positively associated with the average educational level of the establishment, as well as with its use of high-performance work practices. The Lynch–Black study is interesting also in that these more general types of training programmes are found to be more likely in large establishments and in establishments with low employee turnover, results that are much in line with those obtained by Acemoglu and Pischke (1998) concerning apprenticeship programmes in large German companies.

Gersbach and Schmutzler (2003), in contrast, deviate entirely from the asymmetric information condition and rely, instead, on the requirement of imperfect product market competition as a generator of company-sponsored general training in an economy with endogenous turnover. Since the most important conditions of their model relate to the training technology and the toughness of product market competition, multiple equilibria may, however, emerge also in this framework. In particular, the authors hypothesise that the probability of general training in an industry increases if the concentration is high (or competition sufficiently soft), the returns to training decrease fast enough for labour turnover to be avoided, and product differentiation is sufficiently strong. Because of the existence of multiple equilibria, government intervention may be socially desirable, they conclude.

Apart from the above asymmetric information rationale, mainly linked to young people, Acemoglu and Pischke (1999a, 1999b) develop also another line of reasoning for companies to invest also in the more general skills of their employees. In particular, they explore the bilateral monopoly situation in wage determination that is likely to arise due to labour market frictions such as transaction costs, and imperfect information on ability and/or effort. This bargaining will compress the wage structure relative to productivity and, thus, induces the company to pay also for skills that are portable across employers. The lower the wages of the employees compared to their productivity and the slower the increase in wages compared to that in productivity, the higher are the incentives of companies to invest in and also pay for the general training of their employees. Similar situations, leading to more company-sponsored investments in general training also of low-wage employees, are shown to arise from various labour market institutions, especially minimum wages and trade unions.

Acemoglu and Pischke (1999a, 1999b) provide a comprehensive review of the relevant empirical literature, especially for Germany and the USA, in search for evidence in support of the predictions of their non-competitive theoretical model. Moreover, in a separate paper (2003), they analyse empirically the impact of state and federal increases in the minimum wage in the USA between 1987 and 1992 on the company-sponsored training of low-wage employees. Their results suggest that the employees that were affected by the minimum wage increase received the same or even slightly more training. Since Acemoglu and Pischke (2003) obtain no support for minimum wages reducing company-sponsored training, they conclude that this finding may provide part of an explanation for European countries with a variety of legal and union-imposed wage floors to tend to have more well-trained workforces than the USA. However, one shortcoming of the analysis, also noted by the authors, is that it focuses on formal training, whereas informal training might be much more important in low-wage jobs. Moreover, a closer look at other recent evidence on the impact of minimum wages on training incidence reveals that the available evidence is highly contradictory⁵, which Bassanini and Brunello (2003) hypothesise to be due to difficulties related to a proper definition of the treatment versus control groups as well as of the time horizon. Cross-country differences in the degree of labour market imperfections are also seen to add to the ambiguity of existing results.

In a similar vein, Booth et al. (2003) find for a panel of British full-time males that trade unions enhance both the incidence and the intensity of general training of union-covered compared to non-union-covered employees. On the other hand, they also note that their data is biased towards more formal training, and that informal training may affect non-union employees differently from unionised employees. A more adequate coverage of company-sponsored training might, accordingly, weaken the advantageous position found for unionised relative to non-unionised employees.

An alternative test of the Acemoglu–Pischke hypothesis that wage compression encourages employer provision and sponsoring of general training is proposed and undertaken by Bassanini and Brunello (2003). More specifically, they suggest employees to be partitioned into relatively homogenous clusters, for which the training incidence and the training wage premium are calculated. Based on training data from the 1996 wave of the ECHP for seven countries, restricted to male employees aged 30 to 60 and working full-time in the non-agricultural private sector, they find the correlation between training incidence and training wage premiums to be significantly negative, although rather small in size. In other words, their results lend support to the hypothesis of higher wage compression inducing employers to provide and pay for general training.

In view of the above, it may finally be noted that in an extension of the Acemoglu and Pischke (1999a, 1999b) approach, Booth and Zoega (2001) show that wage compression does not constitute a necessary condition for companies to provide general training. More specifically, they argue that companies can gain from sponsoring general training to their employees also in the absence of (relative) wage compression, as measured by the ratio of productivity to wages, as long as the gains in wages are below the gains in productivity. Although not being a necessary condition, wage compression induced by labour market institutions may, nevertheless, make companies more willing to pay also for general training, thus raising the overall level of company-sponsored general training. The major point made by Booth and Zoega (2001) builds on Acemoglu and Pischke (1999a, 1999b) using a definition of wage compression that differs from what is commonly understood by wage

⁵ See e.g. Arulampalan et al. (2004a) for the UK; Grossberg and Sicilian (1999) and Neumark and Wascher (2001) for the USA.

compression. In particular, to distinguish it from ‘normal’ (relative) wage compression Booth and Zoega (2001) choose to call the wage compression of Acemoglu and Pischke (1999a, 1999b) ‘absolute wage compression’, since it requires the marginal effect of training on productivity to exceed that on productivity – in absolute terms. And in contrast to relative wage compression, absolute wage compression does constitute a necessary condition for company-sponsored general training. A similar point is made by Brunello and Medio (2001), who develop a simple search equilibrium model in an attempt to explain the stylised differences in education and workplace training prevailing between Germany, Japan and the USA.

All in all, the predictions of the standard theory seem to be at odds with reality. As indicated above, a number of recent empirical analyses lend support for the hypotheses that labour market imperfections restricting the mobility of workers in combination with possibilities for employers to earn rents on their trained employees make companies willing to invest also in more general skills of their workforce. The existing empirical evidence stating that companies do – and should – provide and pay also for general training might be interpreted as lending support for the hypothesis put forth by Acemoglu and Pischke (1999a) that due to more compressed wages, European companies seem to be more willing to bear the costs for general training than are US companies.

Still another dimension of crucial relevance in the general-versus-specific-training context is the relative situation of the low skilled. If the employer is reluctant to providing training in general skills, or if the low skilled tend to enter disproportionately workplaces and/or industries characterised by a low incidence of employer-provided general training, then they face an obvious risk of ending up in a vicious circle of low human capital. In other words, these low-skilled people are likely to have small chances of upgrading their basic skills on the job. This, in turn, lowers their possibilities to participate in more sophisticated general training as well as in company-specific training. Some evidence in support of these contentions are provided by Lynch and Black (1998) based on data for US establishments, and by Arulampalan et al. (2003a) based on ECHP data for both men and women in four EU countries – Austria, Britain, Finland and France.⁶

4. Incidence and intensity of company training⁷

A widely established contention, supported by aggregate statistics, is that the probability of receiving employer-provided training increases substantially with the individual’s educational attainment. This positive association between the acquired formal education and subsequent training has received strong support also in empirical analyses based on individual-level as well as employer-level data. Moreover, a recent study of ten EU countries (Arulampalan et al. 2003a) shows that this complementarity between training and education holds for both men and women. The strong positive association between education and training inclines Bartel and Sicherman (1995) to argue that one way of dampening it would

⁶ The Netherlands stands out as a conspicuous exception in the sense that, here, the lowest paid are found to be more likely to receive training than the higher paid. Also see Arulampalan et al. (2003b) as well as Asplund and Salverda (2004).

⁷ Apart from the studies mentioned explicitly in this section on the incidence and intensity of company training, further evidence on the issues touched upon can be found in, among others, the following contributions: Blundell et al. (1996), Barron et al. (1997), Pannenberg (1997), Arulampalam and Booth (1998), Lynch and Black (1998), Goux and Maurin (2000), Brunello (2001), Pischke (2001), and Kuckulenz and Zwick (2003).

be to make the process of learning new skills simpler, since this could increase the value of time spent in training relatively more for the less educated.

Oosterbeek (1998), on the other hand, argues that the positive correlation between formal education and company training is simply due to omitted ability and self-selection problems in the analyses; better educated individuals reap a higher return on their investments in training and have, as a consequence, a stronger preference for training than less educated individuals. His results point to no significant correlation between education and training on the employers' side. In other words, for the company it is irrelevant whether it trains its more or less educated employees. Similar findings are reported by the OECD (2003) in the sense that the lower incidence and intensity of company training of less educated employees as compared to their more educated counterparts are found to be demand-driven rather than supply-driven. More specifically, while the supply of training (by employers) shows no variation with the educational level of employees, the less educated reveal a much lower demand for training than the higher educated.

A characteristic closely related to the individuals' formal education is their occupational and/or hierarchical status. A broad-based generalisation of the existing evidence is that both the incidence and the intensity of company-sponsored formal training vary considerably across occupations, and typically increase when moving up the hierarchical ladder.⁸ The empirical evidence offers few, if any, explanations for these differences. One potential reason is that the training needs are highly different in different occupations and at different hierarchical levels. Alternatively, the need to supplement the skills learned in school may differ across occupations and hierarchical levels, a reasoning that might also apply to industries.

There is, however, also empirical evidence that contrasts sharply with these contentions. Using data on young males in US manufacturing industries, Bartel and Sicherman (1998) found no occupational differences in training incidence across production workers employed in manufacturing industries with very low levels of technological change. At higher levels of technological change, on the other hand, craftsmen were found to receive significantly more formal training than other production workers. Among non-production workers, in contrast, clerical and unskilled workers received least training in industries at low levels of technological change, but most training in industries characterised by high rates of technological change. Since the category of clerical workers covers occupations heavily affected by the introduction of computers, these findings might be interpreted as providing indirect evidence on companies experiencing rapid technological change paying also for investments in more general skills of their workforce, including the low skilled. The OECD (2003), in contrast, reports employers' supply of training to fall short of employees' demand in the case of, among others, employees in low-skilled occupations and employees with low literacy. It is not, however, discussed in the report how this outcome links to the aforementioned finding of the disfavouring by employers not extending to the low educated.

Since men and women are typically investigated separately when it comes to training, there is notably more information on gender differences in training participation rates than on gender as a determinant of the incidence and intensity of training. Thus the OECD (2003) finds no significant differences in training participation rates between male and female employees.⁹ A similar finding is reported by Arulampalan et al. (2003a) for six out of the

⁸ See e.g. Pischke (2001) for Germany for just one example.

⁹ There is a clear gender gap in the intensity of training, though.

ten EU countries analysed based on ECHP data. For four of the countries, women were found to be more likely than men to undertake training.

When explicitly exploring the determinants of participation in training the outcome often looks quite different, however. When decomposing the training probabilities of men and women, Arulampalan et al. (2003a) note that similarity in the overall training incidence across the two sexes commonly hides opposing effects of characteristics and returns to these characteristics. The actually observed gender gaps in training probabilities, in turn, are variably due to different characteristics across men and women, on the one hand, and to differing returns to similar characteristics, on the other hand.

The Arulampalan et al. (2003a) study reveals, in effect, several interesting training similarities and dissimilarities between European men and women aged 25 to 54 in non-agricultural employment. First, there seems to be a strong negative correlation between the probability of receiving formal work-related training for men, but not for women. The authors interpret this result as evidence of women having a higher probability of experiencing life-long learning over their working cycle. Second, fixed-term employment contracts tend to induce a lower training probability for men in five of the ten EU countries under study, but for women only in two of the countries. The authors draw attention especially to the results for Finland, which point to a significantly negative association between fixed-term contracts and training for both men and women. Moreover, a significantly negative relation is also obtained between part-time work and training, although only for Finnish men, not for Finnish women.¹⁰ In Finland, therefore, there are clear signs of a mechanism at work that may affect the country's human capital acquisition, the authors argue. Third, both men and women are, on average, more likely to receive training if employed in the public sector. Fourth, as noted above, the positive correlation between training and education is strong for both genders across Europe.

Other recent studies indicate, for instance, that being a woman in the German labour market means a significantly lower probability of receiving company training and, if participating, the length of training is likely to be significantly shorter than for men (Pischke 2001). Oosterbeek (1998) argues that the observed preference of men might well be explained by women's higher probability of career interruptions, which makes training investments in women more risky from the company's point-of-view. Lynch and Black (1998), on the other hand, argue that the documented gender differences may be largely driven by the analyses overlooking the fact that the gender composition is likely to vary with the characteristics of the employer. They find, for instance, that the larger the proportion of female employees in US manufacturing establishments, the greater is the proportion of employees trained.

Union-covered employees are found to have both a higher incidence and a higher intensity of (general) training compared to their non-union counterparts (e.g. Booth et al. 2003). In other words, unionised employees have, on average, a higher probability of being trained, and to also receive more training than their non-unionised colleagues.

Larger companies are much more likely to provide their employees with formal training than are smaller companies. Also the extent of training tends to be positively related to the size of the employer. Several potential explanations for this divergence in training provision between differently sized employers have been put forth in the literature, but none of

¹⁰ In a majority of the investigated EU countries, part-timers and full-timers are found to be as likely to start training.

them has been subject to rigorous empirical tests. Among these explanations are higher training-related fixed costs in smaller companies, and more concern among smaller employers about trained employees being hired away by competitors. However, opposite results have been reported as well. When distinguishing between manufacturing and non-manufacturing US establishments, Lynch and Black (1998) obtain an inverse relationship between employer size and the proportion of employees being trained; that is, smaller employers engaged in the non-manufacturing sector are likely to train a greater proportion of their workforce than are larger employers.

Substantial differences in the provision of formal training programmes are also evident across industries. Here, a conspicuous feature is the markedly lower incidence of company-provided training in low-skill/low-pay industries in manufacturing (e.g. textiles) and services (e.g. wholesale and retail trade, hotels and restaurants) also after controlling for a broad set of personal and employer characteristics.¹¹

Few studies have been able to cover other characteristics of the employers. For US companies and establishments there is some evidence on the adoption of high-performance work systems as well as the degree of capital intensity exerting a positive influence on the existence of formal training programmes. Large investments in physical capital and R&D, as well as adoption of new forms of work organisation also tend to induce higher percentages of employees being given formal training.¹²

Furthermore, despite the theoretically asserted crucial association between technological progress and training, few studies have explored this link empirically. Empirical research on this issue is all the more important, as no clear prediction on the sign of the relationship between technological change and investments in training can be derived from economic theory.¹³ According to the study by Bartel and Sicherman (1998) using US data on young males employed in manufacturing, production workers in manufacturing industries with a high rate of technological change are more likely to receive formal company training than their colleagues employed in manufacturing industries characterised by low levels of technological change.¹⁴ The corresponding results for non-production young males pointed to no significant overall differences in formal company training across industries differing in their rate of technological change. Their results further indicate that, although the more educated have a higher probability of being trained, the training gap between less and more educated workers tends to narrow at higher levels of technological change, a finding that largely holds for both production and non-production workers. This situation is explained to emerge because of the substitutability between a higher education and training being stronger than their complementarity, which works in favour of the training of the lower skilled. In other words, the more educated are seen to be more adaptable to new technologies than their less educated counterparts, who accordingly need more training. The results of Bartel and Sicherman (1998) also suggest that higher rates of technological change increase the pool of trainees; that is, companies are more likely to train those who did not receive training in the previous period. Technological change is not, however, found to increase the number of hours of training (Bartel and Sicherman 1995).

¹¹ For recent evidence on the training situation of low skilled employed in the service sector, as well as a brief overview of the current state-of-knowledge on this issue, see e.g. Asplund and Salverda (2004).

¹² See e.g. Lynch and Black (1998) and the references therein.

¹³ For a brief discussion of the theory aspect, see e.g. Bartel and Sicherman (1998).

¹⁴ It may be noted that the role of the rate of technological change is maintained also when controlling for differences in the level of technology across manufacturing industries.

As a final remark concerning the incidence and intensity of company training it may be noted that few studies have attempted to link companies' decisions to invest in training to explicit reasons or objectives for undertaking these investments, such as new technology or workplace reorganisation. Information on major reasons underlying companies' investments in their employees is so far mostly obtained indirectly through the inclusion of company-specific characteristics as determinants of training incidence and intensity.

5. Turnover effects of company training

Employees who are perceived to have a high probability of leaving the company are typically found to be less likely to receive employer-provided training compared to other employees. The effect may, however, also work in the opposite direction with training increasing the employee's probability of leaving the employer. In other words, the company faces an obvious risk having its trained employees hired away – 'poached' – by other companies that also value the new skills that these trained employees have acquired through their current employer's investment in them. Booth et al. (2003), for instance, show that the higher the average quit rate in a UK industry, the less likely is a full-time male employed in the industry to receive general training, and the fewer are the training days, if trained. However, they also find that unionised full-time male employees have a lower quit rate than non-unionised colleagues, which is seen to be due to unions raising the relative wages of their members. This, in turn, induces the company to provide more training also in the general skills of its employees.

An earlier UK study of the link between training and job-to-job mobility (Dearden et al. 1997) shows, in turn, that training-sponsoring employers typically face a lower-than-average probability of losing their trained employees in the next year compared to employers who do not provide their employees with training. The authors interpret this finding as an indication of employers being inclined to train employees they wish to retain. Previous job mobility seems to leave the probability of receiving training roughly unaffected. The exception to this is a very recent job move, which tends to induce a higher training probability, probably mainly due to induction training. These findings hold for both men and women. Similar findings for the UK are reported by Green et al. (2000) in the sense that mobility is found to decline with the degree of firm-specificity of the acquired skills, the extent of company sponsorship of the training, and training aimed at raising the employee's commitment to the company. For the majority of cases, however, the two mobility-expectations-of-training measuring surveys used in the analysis point to training having no significant impact on mobility.

A higher turnover of labour has occasionally been put forth as an explanation to why the US economy generates less training than many other OECD economies (e.g. Blinder and Krueger 1996). This contention of a negative relation between turnover and the level of training is, however, refuted by Acemoglu and Pischke (1998). In particular, they argue that if companies provide and pay also for skills of a more general nature (as was earlier shown to be the case, see section 3 above), then the differing amounts of general training across countries cannot be explained by exogenous differences in turnover alone.

Related to the turnover aspect is a recent paper by Diaz-Vazquez and Snower (2003), who derive a theoretical model showing how company-based specific on-the-job training¹⁵

¹⁵ Diaz-Vazquez and Snower (2003) explicitly focus on "training that arises on the job (as an automatic by-product of working), generating firm-specific skills" (p. 2).

changes the effect of firing costs on employment. Their model predicts that the effect of such training causes firing costs to have a contractionary influence on average employment, when looking over the whole business cycle. In brief, the rationale is as follows. Firing costs encourage companies to retain more employees in a recession. The more on-the-job training these retained employees receive, the larger is the productivity differential between these incumbents and any new recruits. More important, this training-induced rise in productivity implies that fewer new recruits are needed once the recovery sets in. Taken over recessions and booms, this on-the-job training in specific skills will reduce average employment. One implication of their model thus is that the less discouraging the firing costs are on firing, the less adverse is the impact of this mode of training on average employment. The authors also argue that this interdependence between companies' hiring and firing decisions can attribute the relatively weak job creation experienced in many OECD countries to skill-biased technological change occurring in combination with restrictive job security legislation.

6. Wage effects of company training

A broad number of studies report participation in employer-provided training to have a significantly positive impact on the wages of the trained employees, while little is still known about the wage effects of the intensity of the training.^{16,17} Since not all employees are equally likely to obtain training, employer-provided training thus stands out as a potentially key contributor to wage and earnings inequality, further boosted by the complementarity between education and training pointed to earlier.¹⁸ Conversely, training stands out as one key tool when trying to combat rising wage inequality in general and improve the labour market situation of the low skilled, in particular. But, as emphasized by Lynch (1995): "Training for training's sake will not eliminate the wage gap." (p. 57).

In recent years, however, the existing evidence of a strong positive association between company-provided training and subsequent wages of the trainees has been questioned due to the obvious problem of training not necessarily being randomly distributed across employees. More specifically, standard wage equations to which a dummy indicator for participation in training is added as an explanatory variable are noted to generate a biased estimate of the wage effects of training whenever the employee's and/or the employer's decision affects who is getting trained, and who is not. The literature contains a few examples, where attempts have been made to account for the unobserved heterogeneity between individuals that underlies this selectivity bias, using standard techniques – Heckman-type selection models, instrumental variable methods and fixed effects estimators.¹⁹ Booth and Bryan (2002), for instance, control for time-invariant heterogeneity using fixed effects techniques and find the wage gains from participation in company training in the UK to be positive and persistent. For France, in contrast, controlling for time-invariant heterogeneity generates statistically insignificant wage effects from company training (Goux and Maurin 2000). Evidence for Norway indicates that controlling for unobserved heterogeneity reduces the estimated wage effect to the still significant but minor magnitude of one per cent

¹⁶ For overviews of previous evidence on the wage effects of company training, see e.g. Bishop (1997) and Barrett et al. (1998).

¹⁷ Studies approximating returns to general human capital by labour market experience and returns to specific human capital by tenure are overlooked in this context.

¹⁸ See e.g. Groot and Maassen Van den Brink (2003). Arulampalan et al. (2003b), in turn, argue that at least some of the documented differences in wage inequality across EU countries could be explained by the complementarity between education and training systems.

¹⁹ For a brief review of these studies, see e.g. Leuven and Oosterbeek (2002).

(Schöne 2003). The existing evidence for Germany is inconclusive; while Pischke (2001) finds no evidence of work-related training leading to higher wages in Germany²⁰, Kuckulenz and Zwick (2003) report the wage effects of participation in company training to be positive also after correction for the endogeneity of training.

Still another technique has been suggested by Leuven and Oosterbeek (2002), the basic idea of which is to narrow down the typical comparison group of all non-participants to those who were to participate in training, but were not able to do so due to some random event. This approach leads to an estimated wage return to participation in company-provided formal training in the Netherlands that is close to zero. The authors note that this finding of no wage effects whatsoever from participation in company training is in line with previous results of theirs based on instrumental variable methods (Leuven and Oosterbeek 2001). They conclude by arguing that what is interpreted as returns to training seems to most part to be a return to unobservable characteristics.

Considerably more conformity in reported results seems to characterize the wage effects of company training received at previous employers. Thus Booth and Bryan (2002) find for the UK that employer-financed training increases wages both at the current and future employers, with the wage premium being substantially higher at future employers, especially for accredited training.²¹ They note that these results are well in line with previous findings for the UK. Furthermore, they find a similar pattern of effects for the time spent in training as well. Loewenstein and Spletzer (1998, 1999) also find company-provided training received at previous employers to exert a positive and persistent influence on wages in the USA. In contrast to the UK findings, however, Loewenstein and Spletzer (1998, 1999) obtain no, or only weak, evidence in support of general company training raising wages also at the employer providing the training, although this effect reveals a tendency to strengthen over time (Lengermann 1999). Negligible returns to general training provided by the training company, but large returns when changing employers are results that seem to hold also for full-time Swiss males employed in large companies (Gerfin 2004). For those employed in small companies, on the other hand, there is no notable difference between the returns to general training reaped by those who stay in the training company and those who move to work in another company.

Another aspect related to the wage effects of company-sponsored training, receiving growing attention in the empirical training literature, is the question of whether the return to training investments stays the same across the whole wage distribution, as assumed in standard wage regressions. Arulampalan et al. (2004b) use ECHP data for non-agricultural private-sector men aged 25 to 54 in ten EU countries to test the validity of this assumption. Their major finding is that in the vast majority of the investigated countries, the return to company training does not change significantly across the conditional wage distribution. Belgium stands out as the only notable exception in this respect. This similarity in results across the EU countries does not extend to the mean wage returns to training, though. On the contrary, the mean returns are found to vary considerably across the ten EU countries. In particular, the highest average return is obtained for Ireland, and the lowest, or zero, for Italy and the Netherlands, with the Dutch result thus being well in line with the aforementioned finding of Leuven and Oosterbeek (2001). Comparatively low average returns are obtained also for the countries with the highest incidence of company training – Britain, Denmark and Finland.

²⁰ Instead Pischke (2001) found training during leisure time to exert a significantly positive effect on wages.

²¹ Indeed, non-accredited training was found to exert no impact whatsoever on wages in future jobs.

Surprisingly minor attention has been paid to the question whether, and how, the wage effects of investments in company training vary with the characteristics of the trained employees. Recent contributions by Regnér (2002) for Sweden and by Kuckulenz and Zwick (2003) for Germany add some further light on these issues.²² Their findings confirm, by and large, a priori expectations while simultaneously offering insight on additional dimensions. The Swedish findings reveal that the wage effects are larger for employees in jobs that require long training; for recently hired; and for those receiving general as opposed to specific training, but only if employed in the private sector. Indeed, significant wage effects of specific training were obtained for public-sector employees only, which contrasts sharply with Norwegian results showing no significant difference in the returns to general and specific training in the private sector (Barth 1997).

The German results, in turn, point to high-skilled employees benefiting more from training than their low-skilled colleagues; the return from training being higher for job entrants than for tenured employees; and employees with a permanent job contract reaping higher returns from training than those employed on a temporary basis. Evidence for the UK, in turn, indicates that unionised employees tend to gain more from investments in company-sponsored (general) training than their non-unionised counterparts (Booth et al. 2003). In contrast to the aforementioned German results, however, Ok and Tergeist (2003) obtain no evidence from ECHP data in support of the impact of training on wages being significantly different between low-educated and high-educated employees.

7. Productivity effects of company training

The effects of employer-provided training on company productivity have typically been evaluated indirectly by means of its impact on wages. A major shortcoming of such an approach, however, is that wages are suitable as a direct measure of productivity only in a traditional neoclassical labour market; that is, in a labour market with perfectly competitive wages.

A slowly growing literature attempts to measure the productivity effects of company training also directly. A common feature of earlier studies in this field is rather weak evidence in support of the existence of a clear-cut, non-negligible positive association between company training and productivity.²³ Just as in the case of wage effects of training, one reason for this ambiguous outcome is that the estimated positive productivity impacts tend to disappear once the endogeneity of training is corrected for. The last few years, however, have seen several interesting contributions to this, as it seems only emerging, research field.

A study by Dearden et al. (2000) based on a panel of British industries covering the years 1983 to 1996 reports that training significantly boosts productivity and, moreover, to a much larger degree than indicated in previous studies focusing entirely on the wage effects of training. The underestimation of the productivity effects of company training is argued to be due to two major circumstances. First, usually companies make training decisions for some particular reason(s), such as negative demand shocks or low productivity, implying that training should be treated as an endogenous factor instead of being taken as exoge-

²² For other similar studies, see e.g. Lynch (1992) for the USA, Blundell et al. (1996) for the UK, and Panzenberg (1997) for Germany.

²³ Previous studies of the productivity effects of employer-provided training are mostly based on various performance measures (subjective as well as more objective ones) for rather specific samples of companies. Moreover, a majority of the studies concern the USA. See e.g. Dearden et al. (2000).

nously determined. Second, their estimated wage effects of training are found to be only about half of those on industrial productivity.²⁴ Hempell (2003) has recently reported similar results by for the service sector in Germany based on data covering the period from 1994 to 1998. Positive, albeit rather modest, productivity effects are also estimated for the Swedish machine tool industry in a study by Kazamaki Ottersten et al. (1999). The small productivity impacts of company-sponsored training they explain by these being second-order effects compared to the estimated first-order effects of company training expenditures yielding substantial cost savings in the long run. All in all, focusing merely on the wage effects of training overlooks the fact that companies profit substantially from the training they provide their employees.

A limited number of mostly US studies have tried to move one step further, in the direction of evaluating the employer's internal rate of return on investments (ROI) in formal company training. These studies have recently been reviewed by Bartel (2000), who concludes that her analysis indicates that the ROI in training might be "much higher than previously believed" (p. 522). Nevertheless, the current state-of-knowledge is that the existing evidence provides neither companies nor policymakers with much guidance on the magnitude of the employer's rate of ROI in training. She emphasises that, especially in case of under-investment problems, the ROI in training could guide companies in their investment decisions, and policymakers in their decisions on subsidies to company training. A major reason for the limited information on employers' ROI in training is lack of data on the employers' costs of training in company-level and establishment-level data sets, which explains why the focus has usually been limited to productivity effects.

Finally, an indirect approach to assessing the impact of training investments on company performance is implemented by Collier et al. (2003), who exploit the link between training and commercial survival by use of panel data on nine occupational groups within British establishments. They report evidence suggesting that, while no occupational group reveals a negative association between training and survival, certain occupational groups do stand out in the sense that increasing their training improves substantially the establishment's chances of survival. These occupational groups, however, are not the same across establishments, but differ between larger and smaller establishments.

8. Societal effects of company-provided training

Empirical evidence in support of the existence of noteworthy positive external effects from investment in human capital is weak. While there is an emerging literature focusing on spillovers from investments in formal education²⁵, few studies can say something about training spillovers. Since the Dearden et al. (2000) study focuses on the effects of training on industry productivity, the results evidently capture at least some of the externalities that can be expected to arise from company-provided training. According to the authors, such positive externalities may offer an explanation for the comparatively large effects of training that they obtained from data on British industries.

²⁴ A roughly 50–50 split of the benefits of training between employees and employers was also reported by Barron et al. (1989) based on company-level data for the USA. In a more recent study of US employer-reported data, however, Barron et al. (1997) find the estimated effect on productivity growth to be approximately ten times the effect on wage growth.

²⁵ See e.g. Sianesi and Van Reenen (2003), and Asplund (2004).

Another strand of research departs from the predictions of the standard economic theory according to which employers will not invest in general training and will under-invest in specific training, unless appropriate policy measures are undertaken. This negative impact on the training behaviour of companies is caused by the obvious risk of competitors hiring away – poaching – the trained employees. The overall consequence is under-investment in company training, as too few employees are trained and the intensity of the provided training is too low. These market failures, which are taken to be present especially in the case of more general training, are thus due to the companies' discount rate exceeding the social discount rate. In their theoretical model focusing on investment in general human capital on-the-job in an imperfectly competitive labour market, Booth et al. (1999) show that trade unions may affect this 'quitting externality' by increasing the training intensity, but at the expense of a lower number of employees being trained. Hence, there is both a positive and a negative effect on social welfare. Moreover, they obtain support for the predictions of their model from analysis of full-time male employees using British panel data for the years 1991 to 1996.

The need for government subsidies arising from poaching externalities and under-investment in general company training is also analysed in a theoretical paper by Moen and Rosen (2002). In sharp contrast with the previous literature, however, they conclude that internal efficiency is a sufficient condition for an efficient allocation of resources in an economy characterised by endogenous human capital formation and endogenous turnover in the presence of search friction. Internal efficiency can be achieved either through long-term binding contracts or efficient bargaining between employers and employees.²⁶ Under-investment in general training due to excessive turnover is shown to arise in the absence of internal efficiency; that is, if employers do not set wages for experienced employees in a competitive way, but rather drive them too low in order to maximise profits. But even in this latter case, the social and private returns on investments in general training continue to coincide, and subsidies to general training would cause a reduction in welfare in this case as well. Any subsidies should, at least, be combined with some additional policy measures aimed at reducing turnover, the authors argue.

Indeed, the finding of Moen and Rosen (2002) of 'persistent' equality between the social and the private return on investments in general company training stands in sharp contrast to several contributions arguing in favour of subsidies for general company training. It contradicts sharply with the theoretical predictions of Stevens (1994), who argue that poaching creates a wedge between the social and the private return on investment in general company training, as long as the productivity of employees exceeds their wages. In line with these arguments, Booth and Snower (1996) argue in favour of subsidies for general company training in order to mitigate the market failures caused by poaching. Acemoglu and Pischke (1999a) and Gersbach and Schmutzler (2003) present theoretical arguments justifying subsidisation of general company training. Ballot and Taymaz (2001) run experiments to test the efficiency of a number of alternative training policies for long-term macroeconomic performance, and conclude in favour of subsidy policies. Government subsidies to counteract the under-investment tendencies caused by poaching externalities have also been suggested by the OECD (1994, 2003).

²⁶ Acemoglu (1997), in contrast, finds that turnover in the presence of search frictions creates positive externalities from investment in general company training for future employers. As a consequence, internal efficiency, such as long-term contracts with current employers, cannot offset the risk of under-investment in general company training.

A different mechanism is pointed to by Leuven et al. (2002). More specifically, they argue that in case workers are sufficiently motivated by reciprocity, then the amounts of investments in both general and specific company training will be optimal also from a social point-of-view. In contrast to the standard-model opportunistically behaving individual, a reciprocal employee is characterised by being willing to give most, or all, of the return on the training investment to the employer. Using a representative sample of the Dutch population, they obtain strong support for their proposed mechanism; that is, companies are found not to under-invest in specific training and to invest substantially also in the general training of their workforce, and in their training behaviour companies show a clear preference of providing training to employees with a high sensitivity to reciprocity.

All in all, our current knowledge on the existence and magnitude of training market failures, on the one hand, and their causes and consequences, on the other, leaves a multitude of crucial questions unanswered. Among these are the need for and the most efficient mode of public intervention. The complexity of these open questions is further highlighted by the fact that there does not seem to exist a common solution for all countries and all situations. Instead, public intervention policies should be tailed, in a cost-efficient way, to fit the specific needs that occur in each country. This is certainly a challenging task, which is clearly evident also from a recent evaluation of policy measures proposed for stimulating on-the-job training in the Netherlands (van Leeuwen and van Praag 2002). More specifically, it is shown that there are large differences in the cost-effectiveness of policy measures, and that the outcome of the undertaken measures may differ substantially among employers, employees, and the government.

9. Discussion and conclusions

It seems fair to sum up by arguing that only cautious conclusions can be drawn based on the current state-of-knowledge concerning the incidence, extent and impacts of company investments in training. Among these conclusions are the following.

- ❖ There is a confusing multitude of definitions of company training in use in the empirical literature. This mitigates comparisons of results both across countries and within single countries. It also hampers the emergence of a more broad-based picture of the economic role of employers' investments in training.
- ❖ The research on incidence, extent and impacts of company training is heavily biased towards participation versus non-participation in formal training, while corresponding results for the role of the intensity of training and for different modes of training are mostly lacking.
- ❖ The empirical research has succeeded in identifying a broad number of individual and job-related characteristics determining an employee's probability of receiving employer-provided training. Many of these findings are already labelled 'stylised facts'. However, several of these stylised facts can be questioned based on more recent results. For example, better coverage of employer-related background characteristics suggests that the education–training association is not necessarily so clear-cut as indicated in earlier studies. Likewise, union wage formation does not seem to have the detrimental impact on work-related training that it is commonly alleged to have.
- ❖ One generalisation seems to hold, though: the less skilled are mostly in a less advantaged position when it comes to company training. For instance, employers engaged in sectors employing a disproportional amount of low-skilled labour are

found to be the least likely to provide training in basic general skills, although these low-skilled employees are exactly the ones that would need and also benefit most from such training. Since the training opportunities of the low skilled are likely to be affected by a combination of labour market imperfections, credit constraints, and training market failures, a recent OECD report (2003) emphasizes the need of adopting co-financing policies in order to improve the incentives of companies to invest in the training of their employees in general and of their less advantaged employees in particular.

- ❖ The link between education and training is crucial also from a broader perspective, since our knowledge on the interactions between formal education and employer-provided training is still weak. Is there an optimal mix of schooling and training? How do the return to training interact with that to schooling? How does employer-provided training interact with other modes of adulthood schooling and training?
- ❖ Empirical evidence on the economic impacts of employers' investments in training is only emerging. This situation is remarkable in view of the enormous amounts of resources invested annually in company training. So far, most effort has been taken to explore the wage effects of training but, simultaneously, better data and/or more sophisticated estimation techniques have generated an increasingly more mixed picture of the wage returns to training. Moreover, the reported wage returns to training highlight to most part only average effects, while information on the returns reaped by differently endowed individuals is still more or less missing.
- ❖ It is often argued in the economics literature as well as in policy debates that training improves an individual's employability and career prospects. A closer look at the existing empirical evidence reveals, though, that surprisingly little research has been undertaken on these aspects and that, as a consequence, there is still only weak, if any, empirical support for these arguments.²⁷ Indeed, it seems as if these contentions are rather derived indirectly from the by now stylised fact of there being a positive relationship between accumulated work experience and wages, as well as from the evidence of those in a worse labour market position having a significantly lower probability of receiving employer-provided training.
- ❖ Only limited – and highly contradictory – evidence is available on the question whether or not there are inefficiencies (under-investment) in the provision of company training. Accordingly, the training literature provides little, if any, guidance on the social return on company investments in training, or on the need and mode for public intervention.

All in all, the growing interest in investigating the incidence, determinants and impacts of company-provided training, evidently inspired by better data and more sophisticated techniques, has without doubt substantially improved our current knowledge on the role and importance of the huge amounts of money that companies annually invest in the human capital of their employees. Simultaneously, however, the expanding literature has increased, in many respects, the confusion surrounding this literature and the findings it has generated so far. For instance, the returns to the employees in the form of wage growth seem to be much more modest than indicated by the earlier literature, whereas the returns to companies in the form of productivity growth tend to be considerably larger than previously thought.

²⁷ There are, to my knowledge, few more recent empirical studies that explicitly analyze, based on broad data sets, how company training tends to affect the employability, labour market mobility, and careers of individuals. These include a few studies for Germany (see the references in Kuckulenz and Zwick (2003)) and an ECHP-based study by Ok and Tergeist (2003).

Another conspicuous feature of the training literature is that it is still quite selective in the sense that some questions have received considerable attention, both theoretically and empirically, while other aspects are so far almost entirely overlooked. Moreover, our knowledge about those questions to which relatively much attention has been paid is still quite heavily based on results concerning a specific age group (e.g. young people), a specific industry (e.g. manufacturing) or a specific country (mostly the UK or the USA). This reflects the fact that comprehensive analyses of the incidence, content, extent and effects of employer-provided training are still heavily constrained by data limitations. Indeed, it seems fair to conclude that the extensive review by Lynch (1998) of what current databases on employer-provided training are lacking, is today as relevant as it was in the late 1990s.

Taken all this together, our current state-of-knowledge on the economic role of company training demands great cautiousness in drawing policy implications concerning the crucial questions of inequality of access to company training, on the one hand, and training market failures, on the other.

Literature

Acemoglu, D. (1997), Training and Innovation in an Imperfect Labour Market, *Review of Economic Studies* 64, 445–464.

Acemoglu, D. and J-S. Pischke (1998), Why Do Firms Train? Theory and Evidence, *Quarterly Journal of Economics* 113(1), 79–119.

Acemoglu, D. and J-S. Pischke (1999a), Beyond Becker: Training in Imperfect Labour Markets, *The Economic Journal* 109(453), F112–F142.

Acemoglu, D. and J-S. Pischke (1999b), The Structure of Wages and Investment in General Training, *Journal of Political Economy* 107(3), 539–572.

Acemoglu, D. and J-S. Pischke (2003), Minimum Wages and On-the-Job Training, in Polachek S,W. (ed.), *Worker Well-being and Public Policy. Research in Labor Economics, Volume 22*. JAI Press.

Arulampalam, W. and A.L. Booth (1998), Training and Labour Market Flexibility: Is there a Trade-off? *The British Journal of Industrial Relations* 36(4), 521–536.

Arulampalam, W., A.L. Booth and M.L. Bryan (2003a), *Training in Europe*. IZA Discussion Paper No. 933.

Arulampalam, W., A.L. Booth and M.L. Bryan (2003b), *Asymmetries in the Training Effect on European Union Wages*. University of Essex. Mimeo.

Arulampalam, W., A.L. Booth and M.L. Bryan (2004a), Training and the new minimum wage, *The Economic Journal* 114(494).

Arulampalam, W., A.L. Booth and M.L. Bryan (2004b), *Are There Asymmetries in the Effects of Training on the Conditional Male Wage Distribution?* IZA Discussion Paper No. 984.

Ashenfelter, O.C. and R.J. Lalonde (eds)(1996), *The Economics Of Training*. Edward Elgar Publishing.

Ashton, D. and F. Green (1996), *Education, Training and the Global Economy*. Edward Elgar Publishing.

Asplund, R. and P. Telhado Pereira (eds)(1999), *Returns to Human Capital in Europe – A Literature Review*. The Research Institute of the Finnish Economy ETLA, Series B156, Helsinki.

Asplund, R. (2004), Education, Training and Active Labour Market Policy, in the conference volume *Impulses for European Employment Policy – Impulses for Germany – The Report of the European Employment Task Force*. BMWA-IAB, Nürnberg/Berlin. (forthcoming)

Asplund, R. and W. Salverda (2004), Company Training And Services With A Focus On Low Skills, *Special Issue of the International Journal of Manpower*. (forthcoming)

Ballot, G. and E. Taymaz (2001), Training policies and economic growth in an evolutionary world, *Structural Change and Economic Dynamics* 12(3), 311–329.

Barth, E. (1997), Firm-specific seniority and wages, *Journal of Labor Economics* 15(3), 495–506.

- Barrett, A., B. Hovels, P. den Boer and G. Kraayvanger (1998), *Exploring the Returns to Continuing Vocational Training in Enterprises: A Review of Research Within and Outside of the European Union*. CEDEFOP, Thessaloniki.
- Barrett, A. and P.J. O'Connell (2001), Does Training Generally Work? The Return to In-Company Training, *Industrial & Labor Relations Review* 54(3), 647–662.
- Barron, J.M., D.A. Black and M.A. Loewenstein (1989), Job Matching and On-the-Job Training, *Journal of Labor Economics* 7(1), 1–19.
- Barron, J.M., M.C. Berger and D.A. Black (1997), *On-the-Job Training*. W.E. Upjohn Institute for Economic Research, Kalamazoo, Mich.
- Barron, J.M., M.C. Berger and D.A. Black (1999), Do Workers Pay for On-the-Job Training?, *Journal of Human Resources* 34, 235–252.
- Bartel, A.P. (2000), Measuring the Employer's Return on Investments in Training: Evidence from the Literature, *Industrial Relations* 39(3), 502–524.
- Bartel, A.P. and N. Sicherman (1995), *Technological Change and the Skill Acquisition of Young Workers*. NBER Working Paper No. 5107.
- Bartel, A.P. and N. Sicherman (1998), Technological Change and the Skill Acquisition of Young Workers, *Journal of Labor Economics* 16(4), 718–755.
- Bassanini, A. and G. Brunello (2003), *Is Training More Frequent When Wage Compression is High? Evidence from the European Community Household Panel*. IZA Discussion Paper No. 839.
- Becker, G. (1964), *Human Capital*. The University of Chicago Press, Chicago.
- Bishop, J.H. (1997), What we know about employer-provided training: a review of the literature, in Polachek S.W. (ed.), *Research in Labor Economics, Volume 16*. JAI Press.
- Blinder, A.S. and A.B. Krueger (1996), Labor turnover in the USA and Japan: A tale of two countries, *Pacific Economic Review* 1, 27–57.
- Blundell, R., L. Dearden and C. Meghir (1996), *The Determinants and Effects of Work-Related Training in Britain*. The Institute for Fiscal Studies, London.
- Blundell, R., L. Dearden, C. Meghir and B. Sianesi (1999), Human Capital Investment: The Returns from Education and Training to the Individual, the Firm and the Economy, *Fiscal Studies* 20(1), 1–23.
- Booth, A. and D. Snower (1996), *Acquiring skills: Market failures, their symptoms and policy responses*. Cambridge University Press, Cambridge.
- Booth, A. and G. Zoega (2000), *Why do firms invest in general training? 'Good' firms and 'bad' firms as a source of monopsony power*. CEPR Discussion Paper No. 2536.
- Booth, A. and G. Zoega (2001), *Is wage compression a necessary condition for firm-financed general training?* CEPR Discussion Paper No. 2845.
- Booth, A. and M. Bryan (2002), *Who Pays for General Training? New Evidence for British Men and Women*. IZA Discussion Paper No. 486.

- Booth, A., G. Zoega and M. Francesconi (1999), *Training, Rent-Sharing and Unions*. CEPR Discussion Paper No. 2200.
- Booth, A., M. Francesconi and G. Zoega (2003), Unions, Work-Related Training, and Wages: Evidence for British Men, *Industrial & Labor Relations Review* 57(1), 68–91.
- Brunello, G. (2001), *On the Complementarity between Education and Training in Europe*. IZA Discussion Paper No. 309.
- Brunello, G. and A. Medio (2001), An explanation of international differences in education and workplace training, *European Economic Review* 45, 307–322.
- Chang, C. and Y. Wang (1996), Human capital investment under asymmetric information: the Piovian conjecture revisited, *Journal of Labor Economics* 16, 505–519.
- Collier, W., F. Green, J. Peirson and D. Wilkinson (2003), *Training and Establishment Survival*. Paper presented at the EALE Conference in September 2003.
- Dearden, L., S. Machin, H. Reed and D. Wilkinson (1997), *Labour Turnover and Work-Related Training*. The Institute for Fiscal Studies, London.
- Dearden, L., H. Reed and J. Van Reenen (2000), *Who Gains when Workers Train? Training and Corporate Productivity in a panel of British Industries*. The Institute for Fiscal Studies, WP 00/04, London.
- Diaz-Vazquez, P. and D. Snower (2003), *On-the-Job Training, Firing Costs and Employment*. CEPR Discussion Paper No. 4241.
- Dolton, P. (2004), The Economic Assessment of Training, in *International Handbook of Education Economics*, Edward Elgar Publishing. (forthcoming)
- Gerfin, M. (2004), *Firm-Sponsored General Training in Frictional Labour Markets: An Empirical Analysis for Switzerland*. IZA Discussion Paper No. 1077.
- Gersbach, H. and A. Schmutzler (2003), *A Product Market Theory of Worker Training*. CEPR Discussion Paper No. 3940.
- Goux, D. and E. Maurin (2000), Returns to Firm-Provided Training: Evidence from French Worker-Firm Matched Data, *Labour Economics* 7, 1–19.
- Green, F., A. Felstead, K. Mayhew and A. Pack (2000), The Impact of Training on Labour Mobility: Individual and Firm-level Evidence from Britain, *British Journal of Industrial Relations* 38(2), 261–275.
- Groot, W. and H. Maassen Van den Brink (2003), Firm-Related Training Tracks: A Random Effects Ordered Probit Model, *Economics of Education Review* 22(6), 581–589.
- Grossberg, A.J. and P. Sicilian (1999), Minimum Wages, On-the-Job Training, and Wage Growth, *Southern Economic Journal* 65(1), 539–556.
- Hashimoto, M. (1981), Firm-specific human capital as a shared investment, *American Economic Review* 71(3), 475–482.
- Hempell, T. (2003), *Do Computers Call for Training? Firm-Level Evidence on Complementarities Between ICT and Human Capital Investments*. ZEW Discussion Paper No. 03–20.

- Katz, E. and A. Ziderman (1990), Investment in general training: the role of information and labour mobility, *The Economic Journal* 50, 1147–1158.
- Kazamaki Ottersten, E., T. Lindh and E. Mellander (1999), Evaluating firm training, effects on performance and labour demand, *Applied Economics Letters* 6(7), 431–438.
- Kessler, A.S. and C. Lülfsmann (2002), *The Theory of Human Capital Revisited: On the Interaction of General and Specific Investments*. CESifo Working Paper No. 776.
- Kuckulenz, A. and T. Zwick (2003), *The Impact of Training on Earnings – Differences Between Participant Groups and Training Forms*. ZEW Discussion Paper No. 03–57.
- Lazear, E.P. (2003), *Firm-Specific Human Capital: A Skill-Weights Approach*. NBER Working Paper 9679.
- Lengermann, P. (1999), How long do the benefits of training last? Evidence of long term effects across current and previous employers, in Polachek S.W. (ed.), *Research in Labor Economics, Volume 18*. JAI.
- Leuven, E. and H. Oosterbeek (2001), *Evaluating the effects of a tax deduction on training*. University of Amsterdam, Department of Economics. Mimeo.
- Leuven, E. and H. Oosterbeek (2002), *A New Approach to Estimate the Wage Returns to Work-Related Training*. IZA Discussion Paper No. 526.
- Leuven, E., H. Oosterbeek, R. Sloof and C. van Klaveren (2002), *Worker Reciprocity and Employer Investment in Training*. Tinbergen Institute Discussion Paper TI 2002–090/3.
- Loewenstein, M.A. and J.R. Spletzer (1998), Dividing the Costs and Returns to General Training, *Journal of Labor Economics* 16, 142–171.
- Loewenstein, M.A. and J.R. Spletzer (1999), General and Specific Training: Evidence and Implications, *Journal of Human Resources* 34(4), 710–733.
- Lynch, L.M. (1992), Private Sector Training and the earnings of Young Workers, *American Economic Review* 82, 299–312.
- Lynch, L.M. (ed.) (1994a), *Training and the Private Sector: International Comparisons*. University of Chicago Press, Chicago.
- Lynch, L.M. (1994b), Payoffs to Alternative Training Strategies at Work, in Freeman, R.B. (ed.), *Working Under Different Rules*. Russell Sage, New York.
- Lynch, L.M. (1995), The Growing Wage Gap: Is Training the Answer?, *The Federal Reserve Bank of New York Economic Policy Review*, January 1995, 54–58.
- Lynch, L.M. (1998), A Needs Analysis of Training Data: What do we want, what do we have, can we ever get it?, in Haltiwanger, J., M. Manser and R. Topel (eds), *NBER Conference on Research in Income and Wealth: Labor Statistics Measurement Issues*. University of Chicago Press, Chicago.
- Lynch, L.M. and S.E. Black (1998), Beyond the Incidence of Employer-Provided Training, *Industrial & Labor Relations Review* 52(1), 64–81.
- Mincer, J. (1974), *Schooling, Experience, and Earnings*. Columbia University Press, New York.

Moen, E. and A. Rosen (2002), *Does Poaching Distort Training?* CEPR Discussion Paper No. 3468.

Neumark, D. and W. Wascher (2001), Minimum Wages and Training Revisited, *Journal of Labor Economics* 19(3), 563–595.

Nestler, K. and E. Kailis (2002a), Continuing vocational training in enterprises in the European Union and Norway (CVTS2), *Statistics in focus, Population and social conditions*, Theme 3 – 3/2002.

Nestler, K. and E. Kailis (2002b), First survey of continuing vocational training in enterprises in candidate countries (CVTS2), *Statistics in focus, Population and social conditions*, Theme 3 – 2/2002.

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OECD (1994), *The OECD Jobs Study – Facts, Analysis, Strategies*. Paris.

OECD (1999), *Employment Outlook*. Paris.

OECD (2003), *Employment Outlook*. Paris.

Ok, W. and P. Tergeist (2003), *Improving Workers' Skills: Analytical Evidence and the Role of the Social Partners*. OECD Social, Employment and Migration Working Papers No. 10, Paris.

Oosterbeek, H. (1998), Unravelling supply and demand factors in work-related training, *Oxford Economic Papers* 50(2), 266–283.

Oosterbeek, H., R. Sloof and J. Sonnemans (2001), *Who should invest in firm specific training?* University of Amsterdam, Department of Economics. Mimeo.

Pannenberg, M. (1997), Financing On-The-Job Training: Shared Investment or Promotion Based System? Evidence from Germany, *Zeitschrift für Wirtschafts- und Sozialwissenschaften* 117, 525–543.

Pischke, J-S. (2001), Continuous Training in Germany, *Journal of Population Economics* 14(3), 523–548.

Regnér, H. (2002), The effects of on-the-job training and wages in Sweden, *International Journal of Manpower* 23(4), 326–344.

Schöne, P. (2003), *Why is the return to training so high?* Institute for Social Research paper 2003:017, Oslo.

Sianesi, B. and J. Van Reenen (2003), The Returns to Education: Macroeconomics, *Journal of Economic Surveys* 17(2), 157–200.

Stevens, M. (1994), A Theoretical Model of On-the-Job Training with Imperfect Competition, *Oxford Economic Papers* 46, 537–562.

Tan, H.C., B. Chapman, C. Peterson and A. Booth (1992), Youth training in the US, Britain and Australia, in Polachek S.W. (ed.), *Research in Labor Economics, Volume 13*. JAI Press.

Van Leeuwen, M.J. and B.M.S. van Praag (2002), The Costs and Benefits of Lifelong Learning: The Case of the Netherlands, *Human Resource Development Quarterly* 13(2), 151–168.

Zwick, T. (2002), *Continuous Training and Firm Productivity in Germany*. ZEW Discussion Paper No. 02–50.

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