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Train to gain – The benefits of employee-financed training in Germany

Harald U. Pfeifer

Universität Zürich
ISU – Institut für Strategie und Unternehmensökonomik

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Bundesinstitut für Berufsbildung (BIBB)
Federal Institute for Vocational Education and Training

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Abstract

Individual returns on continuing vocational training have been in the focus of many empirical and theoretical papers. Most of the works do not explicitly discuss returns to training that is financed fully or partly by the employee. This seems surprising since several publicly funded programs to increase training participation aim at a stronger employee involvement in the financing of continuing vocational training. This paper analyses the participation in and the determinants and effects of employee-financed training using German panel data. The question is addressed, which employees invest and which benefit from training. Results show that employee-investment in training yields only moderate wage returns and has no significant impact on the further career development, especially when compared to the effects of enterprise-financed training. On the other hand, employees financing their own training gain in terms of unemployment risk reduction and the improvement in the matching of individual skills and job requirements.

Keywords: costs, educational economics, human capital, rate of return

JEL-Classification: J24 - Human Capital; Skills; Occupational Choice; Labor Productivity

Introduction

For several years, continuing vocational training has been an important topic on the political agenda of many industrialised countries. It is often viewed as an essential element of human capital formation and therefore as a factor fostering economic growth and international competitiveness. In countries where demographic trends imply a future decline in the supply of skilled labour, training receives even more attention. The maintenance or further upgrading of employees' skill level in these countries is considered to be more difficult than in countries with high birth rates and a more stable inflow of qualified employees into the labour market.

Germany serves as a good example for a country with low birth rates and an aging workforce. Various data sources show that participation in continuing vocational training stagnated at a comparatively low level over the last decade (for an overview of data sources and definitions see Seidel, 2006 and Kuwan et al., 2006). Several arguments explaining the relatively low German training-participation rate have been brought forward. One argument focuses on the role played by the German *initial* vocational training system. Apprentices of the "dual system" usually acquire large parts of necessary qualifications for their future job *within* the enterprise, thereby gaining knowledge about internal workflows and the firms' technology, products and culture. This reduces the need for training at the point of transition from education to work[1]. Labour market entrants with a less occupation-specific skill-portfolio and enterprise-specific knowledge, on the other hand, would more likely need additional training when starting a job.

Another argument aims at the differences in the way relevant skills are obtained in continuation of the initial education and training phase. In many countries participation in formalised training courses is a widely practiced form of skill acquisition. In Germany, it is claimed, non-formalised and informal training forms, such as instruction at the workplace by colleagues or supervisors, are much more common. Since most indicators on the national

[1] In the case the trainee is employed in continuation of the training phase, this argument is even more valid. In West-Germany around 55% and in East-Germany close to 40% of the trainees were taken over by the training enterprise (BMBF, 2007, p. 208). Beicht, Walden & Herget (2004) find that the majority of enterprises involved in apprenticeship training perceive considerable advantages of former apprentices compared to externally recruited employees, when it comes to costs of *continuing* vocational training.

and international level measure participation in *formalised* training courses, German participation rates would not reflect upon the actual training activity in the country[2].

Regardless of the quality and relevance of different national and international training indicators, increasing training participation seems desirable and necessary in the light of future demographic challenges in Germany. Public discussion has recently been focussing on the question of how to foster employee participation in continuing vocational training and how to finance it[3]. Although a high share of training activities is still financed by German enterprises[4], political decision makers as well as scientific advisors stress the responsibility of employees to contribute to the financing of training (BMBF, 2004). This is reflected by the implementation of several publicly financed programs at the regional and state level, which are aimed to encourage individuals to invest in training. Examples are programs involving the handing out of training vouchers and the offering of favourable training loans and grants. Further, some programs are targeting individuals' incentives to save for future training activities. The rule of thumb has been formulated by the independent *Expert Commission on the Financing of Lifelong Learning* (BMBF, 2004): The contribution of individuals to the financing of training shall be in balance with the individual benefits of training (p. V). Recent research results on the benefits of training in Germany, however, are inconclusive. Büchel & Pannenberg (2004) find that especially the younger employees and those working in the western regions of Germany benefit from training in terms of wage growth and unemployment risk reduction. Older employees cannot significantly improve their income or labour market position through training-participation. On the contrary, Jürges & Schneider (2004) find on the basis of the same data source no significant wage effects for different groups of employees. Christensen (2001) finds that training significantly reduces employees' risk to be laid off. A drawback of many studies on training outcomes is the missing

[2] This argument is empirically hard to test on an international level due to discrepancies in the concepts of non-formalised and informal training. Furthermore, measuring informal training activities is methodologically problematic. Even on the national level, results from different data sources diverge considerably. Kuwan et al. (2006) find that almost 40% of German employees have participated in learning activities including observation and practicing on-the-job. 25% and 22% have been instructed either by colleagues or by a supervisor. Concerning the latter, Beicht, Schiel & Timmermann (2004) find much lower rates (7%). On the firm level, Moraal & Grünewald (2004) find that 48% of enterprises train their employees by instruction on-the-job.

[3] The *Expert Commission on the Financing of Lifelong Learning* in its final report presents several recommendations to enhance participation in lifelong learning (BMBF, 2004).

[4] For detailed analysis of the financing of training in Germany see Beicht, Berger & Moraal (2005) and Beicht, Krekel & Walden (2006).

differentiation by the source of financing. Some studies for the United Kingdom and the USA have analysed wage effects of especially *enterprise-financed* training (Booth, Francescani & Zoega, 2002; Frazis & Loewenstein, 2003). Here, research results show considerable wage gains for training participants.

On the enterprise level, also benefits of training in terms of productivity increases have been estimated, although by a much smaller range of authors. As Zwick (2006) points out, the evidence on the impact of training on firm-productivity is "thin and partly contradictory" (p. 27), which is attributed mainly to the different estimation techniques used. Zwick himself finds a significant productivity effect for firms extending their current training activity. Some authors have analysed productivity gains for the enterprise *and* wage gains for training participants simultaneously. Kuckulenz (2006) for Germany, Dearden, Reed & Van Reenen (2005) for the UK and Conti (2005) for Italy find that productivity increases through training were exceeding by far wage gains for participating employees. Putting different pieces of evidence together, enterprises reap a considerable share of the benefits related to training. Part of the productivity gain is transformed into higher wages for certain groups of participants. Some groups of employees also receive positive returns in the form of a lower unemployment risk.

But how about the effects of continuing vocational training financed by the employee? Assuming employee-financed continuing vocational training increases individual productivity, it should result in higher wages, because enterprises do not have to internalise any direct costs[5]. Evidence on the wage effect of employee-financed training is rare and inconclusive. For Germany, Pischke (2000) analyse the wage effects of training during working hours and during leisure time and find that both training forms have a significant impact on wages, although the wage effect of training during working hours is lower than the one of training during leisure time[6]. Gerfin, Leu & Nyffeler (2003) find significant positive effects of training on wages in Switzerland only in the case of enterprise-financed, not in the case of self-financed training. Booth & Bryan (2002), as a side-product of their analysis of enterprise-financed training in the UK, also estimate the effects of self-financed training aimed at the development of current skills. Participation in this form of training yields no significant wage

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[5] The assumption that self-financed training impacts on productivity of the employee is not in all cases straight forward. The training variables used for the analysis in this paper, however, explicitly address training that is *job-related*. In contrast to courses of *private interest* these training courses are assumed to have a direct impact on the employees' productivity.

[6] The author used GSOEP-Data from 1986-1989, in which a clear distinction between the financing-method of all surveyed training-events was not possible. In addition, wage was the only indicator analyzed, i.e. other possibly beneficial factors related to private investment were not discussed.

increase. The authors concluded that “this [result] is consistent with the view that firms, and not individuals, are better placed to evaluate the returns to training”.

This paper departs from the question, which groups of employees invest in continuing vocational training and who benefits in terms of wage, unemployment risk reduction and career and job development in Germany. The paper thereby contributes to the existing body of literature on the outcomes of training and to the theoretical debate on human capital investment. The following section will shortly review recent theoretical discussion. Section 3 and 4 present information on the data source and discusses descriptive results. Section 5 then presents a model to estimate the impact of training-participation on different outcome indicators and discusses estimation results from the panel regression models. The last section shortly sums up the main results and ends with some concluding remarks.

Current theoretical debate

When modelling the investment in training one starting point is human capital theory framed by Becker (1964) who transferred the analysis of investment in goods and capital to the research subject of education and training. The investment in human capital, or, in this case, the investment in the continuing vocational training of employees, differs in one important aspect from other forms of investment. Human capital is attached to the employee who may leave the firm at anytime. The firm thus bears the risk that start-up costs cannot be internalised. Becker concludes that firms would never pay for training that could also be of use for other firms (general training). Firm-specific training, on the other hand, would *only* be valuable for the training firm, which reduces incentives for the employee to quit the job, since other firms would not be willing to pay a higher wage. Firm-specific training thus is an investment option for the enterprise, if the expected returns are higher than other investment options.

From the viewpoint of the employee, the argument is equivalent. The employee would not invest in firm-specific training, since she would only increase her productivity for the current, but not for any other employer. In the case of a job-loss the investment costs for the employee could not be recovered. General training that increases productivity across firms, on the contrary, could be an option, if the expected returns are higher than other investment opportunities[7].

[7] Becker also addresses the case that the employee cannot bear the up-front costs himself and additionally faces credit constraints. She would then have to accept lower wages before and/or during the training event to finance training.

The theoretical discussion about investment in training has been intense following Becker's seminal work on human capital theory. Several authors try to explain the empirical fact that in contrast to this theory enterprises do invest extensively in general training. Glick & Feuer (1984) argue that general training is offered by enterprises instead of monetary transfers to insure against personnel turnover and to safeguard joint investments in specific training. Katz & Ziderman (1990) identify the presence of asymmetric information between the current employer and potential future employers as a source of training incentives for enterprises. Since training activities financed by the enterprise are often not well certified, future employers have difficulties to assess the increase in marginal productivity following training participation, which in turn reduces the risk of poaching for training enterprises. Another reason could be search frictions due to imperfect information on job opportunities and wages (Polachek & Robst, 1998) or mobility costs that the employee has to bear in the case of a job change (Stevens, 1994 and 1996). Acemoglu & Pischke (1998a) present a formal model for enterprise investment in general training: Firms can pay their employees below their marginal productivity and under the premise of a compressed wage structure, i.e. the gap between wage and productivity increases with the amount of training received, enterprises have incentives to invest in general training.

Apart from market induced factors, such as asymmetric- and imperfect information or transaction costs, wage compression may also be the consequence of institutional arrangements in a country. Acemoglu & Pischke (1998b, 2001), Booth et al. (2002 and 2003), Pischke (2004) and Bassanini et al. (2005), among others, discuss different institutional factors that might contribute to wage compression and thereby influence the decision of enterprises to invest in training. Powerful unions, as an example, might be contributing to a compressed wage structure, since bargaining often results in higher wages for less skilled employees. A similar mechanism is at work in the case of binding minimum wages or enterprises paying efficiency wages to reduce turnover, as discussed by Loewenstein & Speltzer (1998). The lower end of the wage curve shifts upwards, introducing incentives for enterprises to invest in training[8].

A central element of standard human capital theory is the distinction between general and specific skills. In practice this distinction is far from clear. A good example is the type of skills transferred by the German initial vocational training system. Some authors claim that skills obtained by apprentices are mostly general in the sense that the "firms training apprentices

[8] Acemoglu & Pischke (1998b) also discuss minimum wages that are not legally binding but are nevertheless paid by the enterprise to induce effort of the employee. In the presence of moral hazard the employee might otherwise refuse productive work.

have to follow a prescribed curriculum and apprentices take a rigorous outside exam [....] at the end of the apprenticeship" (Acemoglu & Pischke, 1998a, p.3). On the other hand, Estevez-Abe, Iverson & Soskice (2001) characterise the skills-type produced by the German initial training system as mainly industry-specific or firm-specific. Although both argue that institutional frameworks play an important role for the incentives of enterprises and individuals to invest in initial vocational training, the assumed type of skills is not consistent.

An alternative approach to tackle the problem has been proposed Lazear (2003). In his *skills-weight* approach all single skills are general, but enterprises differ in what combination of single skills they need. Backes-Gellner & Mure (2005) presented a first empirical test of the implications of this approach for Germany[9].

Summing up, the literature discussed here mainly touches upon the question, why *enterprises* invest in training. A question rarely addressed is why *employees* invest in training. Following standard human capital theory, investing in general training would be appealing for the employee, since increases in productivity stemming from this participation in training would force the current employer to adjust wages accordingly. If enterprise would not do so, trained employees would leave the firm, since many other employers are willing to pay wages according to the employees' higher productivity level.

Assuming a situation of wage compression, on the contrary, the employee is aware that an investment in training would increase her productivity, but that she cannot reap the *full* return on her investment. Thus, a compressed wage structure could hamper employees' investment in training (Pischke, 2000)[10]. Another possible reason for the reluctance to invest in training is connected to a situation of asymmetric information between the training participant and her current or future employer. Although self-financed training may have a considerable effect on the productivity of the employee, this might not directly become visible from the perspective of the enterprise. Even if training is certified by the training institution, employers would still find it difficult to assess the real value of an external training event and thus would be reluctant to adjust wages. Both types of *market imperfection*s thus would reduce expected returns to employee-financed training.

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[9] The authors use for their analysis data stemming from the *BIBB/IAB Qualification and Career Survey*. They conclude that the *skills-weight* approach delivers an adequate description of training-investment decisions of enterprises and employees. The authors find out that, in contrast to implications of standard human capital theory, enterprises increasingly invest in training, even if e.g. the probability of separation is high or if employees often change their jobs.

[10] Although not discussed here, time and credit constraints may also be reasons for employees not to invest in training.

Data Source and variable description

Data source for the analysis is the German socio-economic panel (GSOEP), a household panel survey conducted on a yearly basis since 1984. It contains data on a variety of topics such as employment, earnings, education and training. Apart from a set of core questions, modules on different topics are included on a non-regular basis. In 1989, 1993, 2000 and 2004 modules focussing on the individual participation in training during the previous three years of the interview have been part of the questionnaire. For the modules in 2000 and 2004, apart from number, duration and content of a maximum of three training events also financing, organisation and certification of each event have been surveyed.

Using data from the most recent module on training in 2004, the descriptive part of the paper gives some insight into the structure and determinants of employee-financed training in Germany. For the estimates of training-effects, a subpopulation of persons between 20 and 64 years of age having been employed at least twice over their period in the sample (starting from 1995 until 2004) is extracted. Since not only one but two modules on training (2000 and 2004) were conducted during this time, the subpopulation could have participated in a maximum of 6 training-activities for which detailed information is available. Because training participants report the exact starting and ending date of each of the possible training events, a precise picture emerges for each individual of when the different activities have taken place and how long they lasted.

In this paper two types of training are distinguished: Employee-financed and enterprise-financed training. The "sorting" into the two training types is done using three separate survey questions. The first question asks, whether the training course was taking place during working-time, partly during working-time or during leisure-time. The second question surveys, if there has been financial assistance by the employer, the labour agency or other parties. The third question asks, whether the respondent had to bear costs in monetary terms. In the following analysis, employees participated in *employee-financed training*, if the training took place only partly during working time, during leisure time *or* if the employee had to bear monetary costs. The concept of "costs" applied in this paper thus considers both direct costs and opportunity costs for the employee. Employees having participated in e*nterprise-financed training,* on the other hand, neither had opportunity costs nor direct monetary costs, because training took place entirely during working time and the employer organised and financed the training activity[11].

[11] Since the paper addresses training investments from the employees' perspective, all those training activities co-financed by the employee and the enterprise are subsumed under *employee-financed*

Both training types enter the model as independent variables in the following way: If a person participates in either form of training the respective variable *training* is set equal to one and continues to be one for the time the person stays in the panel. At the same time, a variable is constructed accounting for the number of training events. It changes to one when the first training event is recorded and increases to 2, 3…..,*n* for the second, third and *n*th training event. A third variable accounts for the volume of training. It adds up the training hours at the end of each training event. As described below in the section on econometric modelling this approach allows splitting the effect of training into a participation effect, a count effect and a volume effect.

Concerning the outcome of training, four different indicators are distinguished. The first indicator measures the impact on wages. This outcome variable is the logarithm of the real monthly gross wage[12] of the employee. A second indicator mirrors the risk of an employee to become unemployed. The indicator is modelled as a binary variable taking the value of one in case the employee reports that she was registered unemployed at the national labour office during the past year, and zero otherwise. The last two indicators refer to the improvement of the working conditions following a change of the job either within the enterprise or as a result of changing the employer. Indicator 3 measures, whether the employee observes an improvement in the type of job and/or whether the career prospects have improved[13]. Indicator 4 measures, if in the case of a job change the knowledge and skills can be better used in the current position than in the former position[14]. In some sense, the latter indicator mirrors in how far the *matching* of job requirements and individual skills has improved from the employees point of view. This indicator may be interpreted not only as a benefit to the employee, who is more content with her new job. A better matching of employee skills and job requirements also benefits the enterprise in the case the employee stays in the firm. Apart from training variables described above, a number of control

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training. Training-activities that were (co-)financed by the labour office or the social assistance office are not included in this analysis.

[12] Further components of the yearly wage, such as bonus payments, vacation payments, 13th and 14th monthly wage, etc. are prorated on a monthly basis.

[13] The exact wording of the question is as follows: "How would you judge your present position in comparison to your last one? In what ways has it improved, stayed the same or worsened a.) with respect to the type of job or b.) with respect to further career options?"

[14] The exact wording of the question is "Can you use your knowledge and skills more, the same or less than in your last job?"

variables, such as working-time, tenure, changes of the workplace and enterprise-size are included in the model.

Who invests in training and who does not?

A descriptive overview on the incidence of employee-financed training in Germany is given in Table I. Data source is the SOEP-cross-section file of 2004. In the first two columns the share of courses financed either (wholly or partly) by the employee or by the enterprise is displayed. The third and fourth column show the share among the group of training participants having participated in employee-financed and/or in enterprise-financed training[15]. Over one third of all training courses are either wholly or partly financed by the participating employee and more than two out of five employees contribute financially at least to one training course over the reference period of three years. The greater share of courses, however, is still financed entirely by the enterprise. Looking at training courses and participation by different characteristics, women rather than men, part-time employees rather than full-time employees and highly educated rather than lower educated employees invest in training.

Strong differences can also be observed, when considering the size of the enterprise the employee is working in. A relatively high share of training participants in small enterprises invests in training themselves, whereas the share of participants working in very large enterprises is much lower. Altogether, differentiation by enterprise size points towards an inverse relationship between employee-investment in training and enterprise size. The differences between younger and older, German and non-German employees are relatively small.

While this descriptive exercise yields some interesting information on the importance of employee-financed training for different groups of employees, it offers no insight into the question of how various characteristics influence the probability of private investment in training. At this stage, running a simple maximum-likelihood probit regression with the participation in employee-financed training as the (binary) dependent variable and the characteristics in Table I as independent variables would be an intuitive approach. The results of this exercise are not displayed here but are available upon request.

Results of the simple probit regression have to be handled with care. Following the line of reasoning suggested by Bassanini et al. (2005) there is a selection issue concerning the

[15] The percentages in column three and four may add up to over one hundred because employees may have participated in both training forms over the reference period of three years.

participation in self-financed training[16]. On an abstract level, the argumentation runs as follows. Assuming that the employee has a certain demand for training, this demand can be met in mainly two ways[17]. The first way is the participation in training financed by the enterprise. Supposing that the enterprise has a vested interest in the further qualification of its employee and therefore organises and finances the training-activity, this option would be *first-best* from the viewpoint of the employee since for her no costs are involved[18]. The alternative way is to organise training without enterprise support. From the employees' perspective, however, this is the *second-best* solution since it involves costs in terms of (leisure-) time and/or money.

Given this scenario, the individual decision to participate in self-financed training strongly depends on the opportunity of the employee to participate in enterprise-financed training. Only for those employees *not* sponsored by the enterprise the question of investing in training becomes relevant. Results of a simple probit model might therefore be biased[19]. The regression output of the probit model assuming *selection* into employee-financed training, in which the selection is on the fact that the training of employees is *not* sponsored by the enterprise, is shown in Table II[20]. Selection models of this type require a variable to be included in the selection equation that influences the selection (i.e. being sponsored by the firm) but not the main dependent variable itself (i.e. participation in employee-financed training). The identification variable chosen in the present setting is "temporary working contract". The underlying assumption is that employees with a temporary working contract are less likely to be sponsored by a firm than its permanent staff. At the same time, employees with temporary working contracts should nevertheless have the same demand for training as other employees.

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[16] Bassanini et al. (2005), among other issues, examine individual characteristics related to training incidence using the European Household Panel Survey (ECHP). Results for Germany are not presented.

[17] This scenario leaves aside training organised and financed e.g. by the labour administration or unions. Also, different co-financing schemes are not considered at this stage.

[18] As already mentioned above, various empirical results show that a large share of training-activities with firm specific and/or general contents is financed by enterprises.

[19] For a detailed discussion on selection issues see Heckman (1979), Wooldridge (2002), Greene (2003)

[20] Since the Wald test on the independence of equations is significant at the 10%-level, selection into employee-financed training has to be treated in the model.

The results of the selection model tell a different story compared to results of the simple probit model. The simple probit model suggested e.g. a higher propensity of women and employees in small enterprises to invest in training. In the selection model, these coefficients turn insignificant. At the same time, the respective coefficients of the selection equation measuring the probability of *not* being sponsored by the enterprise are positive and significant. This implies that women and employees in small enterprises are not more inclined to invest in training than men or employees working in larger enterprises, respectively. Rather, they *need to* invest themselves in order to meet their demand for training, since the enterprise does not bear the costs[21]. While this is also the case for employees with temporary working contracts, a different point has to be made for the group of part-time employees. Going back to the first simple probit model, the coefficient for the group of part-time employees implied that their propensity to invest in training does not differ significantly from the investment propensity of full-time employees. The results of the selection model show that part-time employees are neither supported by the enterprise as much as their full-time colleagues, nor are they more willing to compensate this lack of support by investing in training themselves. The same is the case for non-German employees. Also for this group the probability of participation in enterprise-sponsored training *and* the participation in self-financed training is significantly lower than for the reference group of German employees. With respect to older employees, the probability to participate in training also is relatively low in both the outcome equation and the selection equation, while the opposite is the case for employees with a medium or high level of education. This implies that those groups often identified as the *problem groups*, namely the older and less educated employees, indeed have lower probabilities to improve their skill levels *via*

[21] It has to be kept in mind that the underlying scenario assumes a lack of supply in enterprise-financed training-activities. An alternative scenario could be that employees do not accept the offer to participate in enterprise-financed training and rather *choose* to satisfy their training-demand *via* the external training-market. This decision could be taken out of various considerations, e.g. because self-financed training in many cases offers standardised certification, which is assumed to be better transferable across enterprises. Another reason is the risk to fail exams, possibly having a negative impact on the position or further career of the participant in the enterprise. The employee would then avoid negative consequences by choosing training-courses outside the enterprise. This alternative scenario would not lead to another methodological approach or change the regression results, since the model does not differentiate between demand- and supply-driven selection. It would, however, lead to a different approach to increase training-participation in enterprises, which at this point shall not be discussed in detail.

enterprise-sponsored *or* self-financed training compared to their respective comparison groups.

Having identified different characteristics influencing training-participation the following section presents estimates of wage and labour market outcomes for selected groups of participants, whereby special attention is given to the differentiation by gender, age and education level.

The outcomes of employee-financed training

The main question to be answered in this section is the following: How large are returns to employee-financed training and do they differ between socio-demographic groups of employees? If so, are these differences in line with the low (high) participation probability of the respective groups that have been estimated in the previous section?

The econometric model

The estimation strategy applied in this section mainly follows the approach chosen by Büchel & Pannenberg (2004). The starting point for their estimation of training outcomes is a linear panel model of the type:

$$y_{it} = \alpha\, x_{it} + v_i + \varepsilon_{it}$$

for i = (1,2,3,…., n), for each t = (1,2,3,….,T) and $x_i = (x_{i1}, x_{i2}, x_{i3,....,} x_{iT})$

In this model ε_{it} is the residual with the usual properties, i.e. it has a mean of 0, is uncorrelated with itself, uncorrelated with x, uncorrelated with v and homoskedastic. v_i is the individual-specific residual, capturing all those characteristics of the individual that are not observable and do not vary over time. An example could be the cognitive skills, the attitude towards learning or the social background of an employee. y_{it} is the outcome variable, such as wage, unemployment risk or career development. α is the coefficient of the different x_{it}, the vector of observable exogenous variables impacting on y_{it}. The x-variables may vary over time. Examples are working time, tenure or the number of job changes.

When estimating the linear panel regression model one question to be answered is whether to choose a random-effects model or a fixed-effects model. The random-effects model delivers estimators that are consistent *and* efficient, if the unit-specific residual v_i is *not* correlated with the x_{it}. If, however, v_i is correlated with one or more of the explanatory variables x_{it}, a fixed-effects model delivers consistent estimators by eliminating v_i from equation (1). In other words: The choice of model depends in our case on whether unobserved time-invariant characteristics influence training-participation or not. Since there

are good reasons to believe that cognitive skills, social background, attitudes towards learning and other time-constant factors influence the decision to invest in training, a fixed-effects model appears to be the right choice to control for selection due to time-invariant factors. One has to bear in mind, though, that the choice in favour of a fixed-effects model comes at the cost that observable time-invariant factors, such as gender and migration background, can not be included as explanatory variables in the model.

To test the assumption that unobservable individual-specific time-invariant factors are correlated with one or more of the explanatory variables, a Hausman specification test is performed for each of the subsequent regression equations. The test shows for all cases: The hypothesis that the random-effect estimates are efficient *and* consistent can be rejected, supporting the choice of a fixed-effects model.

Up to this point, several components possibly causing selection have been addressed: Observable *time-variant* characteristics are captured by the x-vector, observable and unobservable *time-invariant* characteristics are addressed through the use of a fixed-effects regression model. Since there still might be *time-variant* characteristics that are *not* observed, a testing procedure proposed by Heckman & Hotz (1989) is applied. The testing is done by including the (dummy-) variable *pretrain* in the regression model indicating, whether the group of future training-participants differs significantly from the group of non-participants at the time *before* training participation. Practically speaking, this variable is set equal to one for training-participants for their last observation *before* the beginning of the training-activity and cero for the group of non-participants. The model then has the following form:

$$y_{it} = \alpha_0 \, pretrain + \alpha_1 \, train + \beta \, x_{it} + v_i + \varepsilon_{it}$$

If the chosen model adequately controls for selection processes, the coefficient of the variable *pretrain* should be insignificant. If, however, the coefficient is significantly positive or negative, this would imply that the model does *not* adequately control for selection processes and further steps to improve the model need to be taken. As shown later, the included variable in most of the equations differs significantly from cero.

To correct for the so far *untreated* potential selection a solution suggested by Fitzenberger & Prey (2000) and applied to the field of continuing training by Büchel & Pannenberg (2004) is chosen. In the case the *pretrain*-variable is significantly different from cero it is subtracted from the *train*-variable, leaving the *pure* effect of *train* on the respective outcome variable. This selection correction procedure corresponds to a regression-based difference-in-difference approach that contrasts the development of the outcome-variable of training-participants with the one of non-participants.

The above model thus should deliver unbiased estimates of training *participation* on the different outcome indicators. What has been neglected so far is the possibility that number and volume of training-events may affect the outcome indicators differently over time. As the data source offers detailed information on each of the training-events, interaction terms of participation and incidence (*counts*) and participation and volume (*volume*) of each course can be included in the regression model, which leads to a model of the subsequent form:

$$y_{it} = \alpha_0\, pretrain + \alpha_1\, train + \alpha_2\, (train*counts) + \alpha_3\, (train*volume) + \beta\, x_{it} + v_i + \varepsilon_{it}$$

The net-effect of training on the outcome variable is then calculated by plugging in the respective medians of training-counts and training-volume, adding up the resulting three values and subtracting the value of the selection control term *pretrain* from the sum.

Results

Tables IV to VII report the results of the panel regression models, representing the average effect of the two training forms on the respective outcome indicators over time. Since the individuals stay in the panel for a maximum period of 10 years (on average about 5 years), the results level out short-run and long-run effects of continuing vocational training[22]. To allow for the recalculation of the selection-controlled net effects shown in the last row, the respective medians are displayed in Table III.

Starting with the overall wage effects shown in Table IV, participants of both training forms profit from training participation. The combined coefficient for both forms of training is positive and significantly different from zero (at the 1%-level for employer-sponsored training and 10%-level for employee-financed training), even if the selection control coefficient (*pretrain*) is subtracted from the raw training coefficients. For those employees having invested in training, an average wage-effect of around 1.6% is estimated. Employees participating in entirely enterprise sponsored training receive substantially higher wage-return of around 2.7%.

A somewhat different story is told by the overall results for the other indicators in Tables V to VII. Concerning the reduction in the risk to become unemployed, the return for self-financed

[22] This is of relevance especially when short-run and long-run effects differ depending on the source of financing. Pischke (2000), for example, argues that training participants attach a higher benefit to courses during working time than to courses during leisure time, possibly because courses during leisure time are “more likely to be effective further in the future” (p. 12), while courses during working time are more aimed to increase productivity in the job immediately.

training is somewhat greater than the one of enterprise-sponsored training. While the risk to become unemployed is reduced for the former by around 1.4%, estimates for the latter group show an unemployment effect of about 1.8% (both significant). Since the indicator measures the *reduction* in unemployment risk, the respective adjusted coefficients are negative.

As described above, indicator 3 captures whether the employee experiences an improvement in the type of job and/or in the career prospects. The effect for self-financed training on this indicator is not significantly different from cero, implying that there is no observable difference compared to non-participants. For persons participating in enterprise-sponsored training, on the contrary, career prospects improve slightly but significantly by about 1%. This result seems consistent with the estimates obtained from the wage equation above, in the sense that an improvement in the employees' career is usually complemented by an increase in the wage received.

With respect to the improvement in the use of knowledge and skills, the effects for both training forms are positive and significantly different from cero. Private investment in training leads to a 2% higher chance to change to a job better matching the employees' qualification. The effect for enterprise-sponsored training is small (1%) but significant.

Summing up the first set of overall estimates in Tables IV to VII, the following points can be made. Overall, training-participants of both forms benefit from their training participation, although in a different way. Concerning the career prospects within or outside the enterprise, enterprise-sponsored training participants have better chances to improve their current situation. Also, the comparatively high wage effect for this group fits well into this picture. Those employees at least partly financing their training-activities, on the contrary, can reduce their risk to become unemployed more effectively than those participating in enterprise-sponsored training. Both training forms can improve the use of knowledge and skills, once a new job has been started.

Regarding estimates for different socio-demographic groups, Tables IV to VII sum up the main results. For estimates differentiated by gender, wage effects diverge considerably for male and female training participants. Male participants receive a wage premium well over 4% for their enterprise-sponsored training activities and around 3% for self-financed training. For female participants, on the other hand, wage effects are insignificant for both training forms. Also in the case of unemployment risk, effects for men are higher than for women. As the results for the entire group of employees already suggested, both male and female employees reduce the risk of unemployment more effectively by investing in training themselves than by participating in enterprise-sponsored training. Concerning both career improvement and the matching of knowledge and skills, men can significantly improve their situation by the participation in enterprise-sponsored training, while the respective estimates for women are insignificant. With respect to employee-financed training, both male and

female employees can significantly improve the job-skill matching, but not career development.

When estimating the different outcomes for the two age groups of 20 to 44 and 45 to 64 year olds, large differences become visible. Generally speaking, younger employees receive a higher wage return to training than older employees. The difference varies, however, depending on the form of training. The younger participants of enterprise-sponsored training have a considerable wage effect with more than 3%, while older participants receive a wage premium of little more than 2%. Within the group of self-financed training-participants both younger and older employees have a wage effect not significantly different from cero. For the unemployment indicator, a completely different picture emerges. Older employees benefit strongly from participating in either form of training in terms of unemployment risk reduction, while for the younger employees both net-effects are insignificant. With respect to career development younger and older employees both benefit from enterprise-sponsored training, although the net effect is relatively small. Only for the group of younger employees a significant improvement is estimated following participation in self-financed training. In the case of matching individual skills and knowledge to the new job, only the group of younger employees has a noticeable positive outcome.

Concerning wage effects for employees with different educational background, all employees having participated in enterprise-sponsored training receive a significant wage premium of more than 3%, whereas this outcome is highest for employees with a high educational level (4%). For self-financed training, only participants with a medium educational level have significant advantages compared to the control-group of non-participants. Concerning the reduction of unemployment risk, the message is somewhat different. Each form of training has a different impact with respect to the educational background. For those employees with a low educational attainment level, the impact of enterprise-sponsored training on the reduction of unemployment risk is very strong with more than 4%. Private investment in training however, does not pay off in terms of unemployment reduction. For employees with a medium level of education, on the other hand, investment in training is more effective in reducing unemployment risk than participation in enterprise-sponsored training, which also has a significant effect. For those employees with a high educational level, effects on unemployment risk are lower and in the case of self-financed training barely significant.

When it comes to career prospects, employees with a low educational level cannot profit from either form of training. Only the group with a high educational level in the case of enterprise-sponsored training and those with a medium educational level in the case of self-financed training can improve career chances significantly. Concerning the subjective matching-indicator, however, especially employees with low educational attainment improve their position, while the net-effect for the other groups stays insignificant. For employee-

financed training, on the contrary, it is only the group of employees with a medium educational attainment that can profit from a better matching of skills and job requirements. Highly educated employees' participation in self-financed training even has a significantly negative effect.

Conclusion

This paper has departed from the question which employees invest in training and what are the outcomes for the participants. The above analysis has shown that about two out of five employees invest in training, while not all socio-demographic groups have the same disposition to do so. A regression model controlling for selection into employee-financed training has shown that some groups of employees can meet their demand for training through enterprise support. Others are not sponsored enough or at all and consequently need to invest in training themselves. The rewards for employee-financed training on an overall level are moderate or non-existent in terms of wages and career outcomes, but considerable in terms of unemployment risk and the matching of job and employee skills. The results, however, vary considerably according to gender, age or educational attainment of the trainee.

With respect to the recent theoretical debate, the results give reason to reconsider implications derived from standard human capital theory. From a human capital theory point of view, the investment in general training of individuals should yield considerable wage effects for their participants, since the enterprise bears no costs and, under the assumption of competitive labour markets, has to reward the higher productivity level of the employee. The empirical results show that, on a broad level, employees' training investment yields significant but moderate wage effects. Another important observation is that some groups that have substantial wage gains from self-financed training are not more inclined to participate in self-financed training than groups without those wage gains. This is the case for e.g. male employees. The contrary applies for employees with a high level of educational attainment. Employees in this group receive no observable wage gains following self-financed training but still they are more inclined to invest in training than employees with a medium level of education, who receive relatively high wage premium. On the other hand older employees have both, a low propensity to invest in training and low returns in form of wage increases.

Generally, the question remains why overall wage-returns to self-financed continuing vocational training are relatively low compared to those of enterprise-sponsored training. One explanation could be the existence of a compressed wage structure, in which wages rise less steep than marginal productivity. Enterprises reap a considerable share of the employees' increased marginal productivity, which in turn reduces incentives for employees to invest in

training. The above results also show that beyond wage and career considerations other beneficial factors should play a role in the considerations to invest in training. Many participants of self-financed training can significantly reduce their risk to become unemployed. This result, however, is not surprising from the perspective of enterprises facing a compressed wage structure. The additional rent received from self-financed training is a good reason not to release the employee into unemployment. The question is in how far the *employee* recognises this value of training, considering that it is rather helping to maintain the status-quo than to actually improve wage and career prospects. The benefit stemming from a reduction in unemployment risk might not be as apparent and transparent compared to wage and career benefits. The same holds true for the improved matching of employee skills and job requirements, which might be regarded as less important compared to possible monetary gains.

One factor, among others, contributing to a compressed wage structure is the diversity of training providers and training courses offered in the German private training market. The employer often is not able or willing to assess the real value of outside training activities of employees. A form of information asymmetry could thus be one of the reasons for the difficulty to realise returns from private training investments. Apart from problems for enterprises in the assessment of training events, the heterogeneity within the training market also poses problems for the employees in their choice of the “right” training course of the “right” supplier in the market. A lack of easy accessible information could be reason for not investing in training at all or for choosing a training course not well-suited for the participant.

With respect to the current political debate in Germany, the results raise an important question to be answered before engaging in the planning and implementation of further measures: Is a policy aiming at the increased involvement of employees in the financing of training reasonable from an economic and social perspective? The presented evidence points towards the possibility that a lack of individual incentives to invest in self-financed continuing vocational training could be one reason for the reluctance of German employees to invest in their training. As argued above, one important reason for this could be the existence of a compressed wage structure that hinders the direct translation of productivity increases into wage growth. Even if public programmes reduce the costs of training, incentives to invest would only be moderate. If aiming to increase the individual *employability*, on the contrary, self-financed training offers significant returns. It can be argued that this is reason enough to encourage an increasing involvement of employees in the financing of their training. If following the guideline that costs should be borne by those that benefit from training, however, a policy-driven reallocation of costs away from the enterprises towards individuals only seems justified, if enterprises are not able to extract rents from their training investment, i.e. if there is a direct impact of training on wages.

Recent research results also discussed above suggest, however, that returns to training for enterprises are much higher than wage increases for their trained employees. Thus, directing more attention towards the need to increase training activities of firms and in firms not only seems justified from a social, but also from an economic point of view.

References

Acemoglu, D. & Pischke, J.-S. (1998a), “Beyond Becker: Training in imperfect labour markets”, NBER Working Paper, no. 6740.

Acemoglu, D. & Pischke, J.-S. (1998b), “The structure of wages and investment in general training”, NBER Working Paper, no. 6357.

Acemoglu, D. & Pischke, J.-S. (2001), “Minimum Wages and On-the-Job Training”, IZA Discussion Paper, no. 384.

Backes-Gellner, U. & Mure, J. (2005), “The Skill-Weights Approach on Firm Specific Human Capital: Empirical Results for Germany”, ISU Working Paper, no. 56.

Bassanini, A., Booth, A., Brunello, G., De Paola, M. & Leuven, E. (2005), “Workplace Training in Europe”, IZA Discussion Paper, no.1640.

Becker, G. S. (1964). Human Capital. A Theoretical and Empirical Analysis with Reference to Education. Chicago, London.

Beicht, U., Berger, K. & Moraal, D. (2005), “Aufwendungen für berufliche Weiterbildung in Deutschland“, Sozialer Fortschritt, no. 54, pp.256 – 266.

Beicht, U., Krekel, E.M. & Walden, G. (2006), “Continuing Vocational Education and Training – What Costs, What Benefits Do Participants Have?” Bundesinstitut für Berufsbildung (BIBB), Bonn.

Beicht, U., Schiel, S. & Timmermann, D. (2004), „Berufliche Weiterbildung - wie unterscheiden sich Teilnehmer und Nicht-Teilnehmer?“, Berufsbildung in Wissenschaft und Praxis, no.1, pp. 5-10.

Beicht, U., Walden, G. & Herget, H. (2004), „Kosten und Nutzen der betrieblichen Berufsausbildung in Deutschland“, Bundesinstitut für Berufsbildung (BIBB), Bonn.

Booth, A. L. & Bryan, M. L. (2002) “Who Pays for General Training? New Evidence for British Men and Women”, IZA Discussion Paper, no. 486.

Booth, A. L., Francesconi, M. & Zoega, G. (2002), “Oligopsony, Institutions and the Efficiency of General Training”, IZA Discussion Paper, no. 618.

Booth, A. L., Francesconi, M. & Zoega, G. (2003), “Unions, Work-Related Training, and Wages: Evidence for British Men”, IZA Discussion Paper, no. 737.

Brunello, G. (2001), “On the Complementarity between Education and Training in Europe”, IZA Discussion Paper, no. 309.

Büchel, F. & Pannenberg, M. (2004), “Berufliche Weiterbildung in West- und Ostdeutschland – Teilnehmer, Struktur und individueller Ertrag“, Zeitschrift für ArbeitsmarktForschung, no. 2, pp.73-126.

BMBF (Bundesministerium für Bildung und Forschung) (2007), “Berufsbildungsbericht 2007“, Bonn.

BMBF (Bundesministerium für Bildung und Forschung) (2004), “Finanzierung Lebenslangen Lernens – der Weg in die Zukunft“, Schlussbericht der *Expertenkommission Finanzierung Lebenslangen Lernens*, Series no. 6.

Christensen, B. (2001), “Berufliche Weiterbildung und Arbeitsplatzrisiko: Ein Matching-Ansatz“, Kieler Arbeitspapier, no. 1033.

Conti, G. (2005), “Training, productivity and wages in Italy”, Labour Economics, no. 12, pp. 557-576.

Dearden, L., Reed, H. & Van Reenen, J. (2005), “The Impact of Training on Productivity and Wages: Evidence from British Panel Data”, Centre for Economic Performance Discussion Paper, no. 674.

Estevez-Abe, M., Iverson, T. & Soskice, D. (2001), “Social Protection and the Formation of Skills”, in Hall, P. & Soskice, D. (Eds.), Varieties of Capitalism, Oxford.

Fitzenberger, B., Prey, H. (2000), “Evaluationg Public Sector Sponsored Training in East Germany”, Oxford Economic Papers, pp. 497-520.

Frazis, H. & Loewenstein, M. A. (2003), “Reexamining the Returns to Training: Functional Form, Magnitude, and Interpretation”, U.S. Department of Labor BLS Working Paper, no. 367.

Gerfin, M., Leu, R.E. & Nyffeler, R. (2003), “Berufliche Weiterbildung in der Schweiz“, Diskussionsschriften der Universität Bern, no. 03-18.

Glick, H.A. & Feuer, M.J. (1984), “Employer-sponsored training and the governance of specific human capital investments”, Quarterly Review of Economics and Business, no. 24(2), pp. 91-103.

Greene, W. (2003). Econometric Analysis. Prentice Hall, Englewood Cliffs.

Heckman, J. J. (1979), “Sample Selection Bias as a Specification Error”, Econometrica: Journal of the econometric society, no. 47, pp. 153-161.

Heckman, J.J. & Hotz, V.J. (1989), “Choosing Among Alternative Nonexperimental Methods for Estimating the Impact of Social Programs, The Case of Manpower Training”, Journal of the American Statistical Association , pp. 862-874.

Jürges, H. & Schneider, K. (2004), “Dynamische Lohneffekte beruflicher Weiterbildung – Eine Längsschnittanalyse mit den Daten des SOEP“, Mannheim Research Institute for the Economics of Aging (MEA) Discussion Paper, no. 92.

Kuckulenz, A. (2006), “Wage and Productivity Effect of Continuing Training in Germany: A Sectoral Analysis”, ZEW Discussion Paper, no. 06-025.

Kuwan, H., Bilger, F., Gnahs, D. & Seidel, S. (2006), “Berichtssystem Weiterbildung IX. Integrierter Gesamtbericht zur Weiterbildung in Deutschland“. Bonn, Berlin.

Lazear, E. (2003), “Firm-Specific Human Capital: A Skill-Weights Approach”, IZA Discussion Paper, no. 813.

Loewenstein, M. A. & Spletzer, J. R. (1998), ”Dividing the costs and returns to general training”, Journal of Labor Economics, no 16, pp. 142-171.

Moraal, D. & Grünewald, U. (2002), “Lernformen jenseits der Kurse und Seminare“, Limpact - Leitprojekte – Informationen Compact, no. 5/2002.

Pischke, J.-S. (2000), “Continuous Training in Germany”, CEPR Discussion Paper, no. 2428.

Pischke, J.-S. (2004), “Institutions, Wages and Investment”, CEP Discussion Paper, no. 652.

Polachek, S.W. & Robst J. (1998), “Employee labor market information: Comparing direct world of work measures of workers’ knowledge to stochastic frontier estimates”, Labour Economics, no. 5, pp.231-242.

Seidel, S. (2006), “Erhebungen zur Weiterbildung in Deutschland. Pfade durch den Statistikdschungel“, in Feller, G. (Ed.), Weiterbildungsmonitoring ganz öffentlich: Entwicklungen, Ergebnisse und Instrumente zur Darstellung lebenslangen Lernens, Bielefeld, pp. 35-63.

Stevens, M. (1994), “A Theoretical Model of On-the-job Training with Imperfect Competition”, Oxford Economic Papers, Vol.46, pp.537-62.

Stevens, M. (1996), “Transferable Training and Poaching Externalities”, Chapter 2 in Booth, A. & Snower, DJ. (Eds.), Acquiring Skills: Market Failures, their Symptoms and Policy Responses, Cambridge: Cambridge University Press.

Wooldridge, J. M. (2002), Econometric Analysis of Cross Section and Panel Data, Cambridge, MA.

Ziderman A. & Katz E. (1990), "Investment in General Training: The Role of Information and Mobility," Economic Journal.

Zwick, T. (2006), “The Impact of Training Intensity on Establishment Productivity”, Industrial Relations, no. 45 (1), pp. 26-46.

Tables

Table I: Employee-financed training and enterprise-financed training in Germany

	Share of courses financed by the....		Share of training participants in....	
	...employee	...enterprise	...employee-financed training	...enterprise-financed training
Total	36.20	60.86	43.18	62.60
Gender				
Male	28.02	70.12	34.51	71.44
Female	46.06	49.71	53.44	52.16
Age				
25-44	36.08	60.38	44.80	61.35
45-64	36.44	61.80	39.86	65.18
Education level				
Low	25.66	73.97	26.51	76.47
Medium	34.03	62.72	41.71	63.71
High	41.06	56.62	47.53	59.04
Nationality				
German	36.18	60.95	43.19	62.75
Non-German	37.56	56.16	42.89	55.69
Working-time				
Full-time	32.02	65.72	38.94	67.49
Part-time	54.78	39.28	60.78	42.33
Enterprise-size				
Small	59.34	34.58	63.85	40.97
Medium	42.41	54.99	47.22	57.50
Large	30.39	67.60	39.05	68.87
Very large	23.64	74.09	31.01	74.65
Region				
East-Germany	44.24	52.06	52.29	55.22
West-Germany	34.47	62.76	41.17	64.24

Source: Own calculations on the basis of SOEP cross-section data-file for the year 2004. Results are weighted. Education level low: ISCED 0, 1 and 2; Education level medium: ISCED 3 and 4; Education level high: ISCED 5 and 6. Enterprise-size small: Lower than 20 employees; Enterprise-size medium: 20 to 200 employees; Enterprise-size large: 200 to 2000 employees; Enterprise-size very large: More than 2000 employees.

Table II: Maximum-likelihood probit model with sample selection into employee-financed training

	Coefficient	Robust Std. Err.	z	P>z
Dependent variable: Participation in employee-financed training				
Female	0.071	0.105	0.680	0.495
Age 45-64	-0.325	0.054	-5.990	0.000
Isced-level medium	0.658	0.128	5.140	0.000
Isced-level high	0.859	0.152	5.660	0.000
Non-german	-0.316	0.106	-2.990	0.003
Tenure	-0.008	0.008	-0.930	0.354
Tenure^2	0.000	0.000	0.750	0.451
Enterprise size medium	-0.076	0.079	-0.970	0.334
Enterprise size large	0.068	0.091	0.750	0.453
Enterprise size very large	-0.052	0.171	-0.300	0.761
Public sector	0.210	0.064	3.270	0.001
West-Germany	-0.018	0.059	-0.290	0.768
Part-time	-0.149	0.061	-2.430	0.015
Technology sector	0.199	0.048	4.160	0.000
Constant	-2.441	0.357	-6.830	0.000
Selection Model				
Not sponsored by the employer = 1; Sponsored by the employer = 0				
	Coefficient	Robust Std. Err.	z	P>z
Female	0.187	0.035	5.370	0.000
Age 45-64	0.187	0.034	5.460	0.000
Isced-level medium	-0.357	0.060	-5.990	0.000
Isced-level high	-0.440	0.069	-6.350	0.000
Non-german	0.279	0.067	4.160	0.000
Tenure	-0.006	0.005	-1.370	0.170
Tenure^2	0.000	0.000	1.000	0.320
Enterprise size medium	-0.102	0.042	-2.460	0.014
Enterprise size large	-0.243	0.045	-5.350	0.000
Enterprise size very large	-0.386	0.045	-8.640	0.000
Public sector	-0.267	0.035	-7.720	0.000
West-Germany	0.104	0.035	2.980	0.003
Part-time	0.194	0.040	4.880	0.000
Technology sector	-0.108	0.030	-3.600	0.000
Temporary working contract	0.121	0.059	2.040	0.041
Constant	1.795	0.107	16.790	0.000
rho	-0.726	0.255		
Wald test of indep. eqns. (rho=0): chi2(1)	2.900			
Prob > chi2	0.088			
Number of observations	9839			
Number of ind. sponsored by the firm	2769			
Number of ind. *not* sponsored by the firm	7070			
Wald chi2(22)	515.2			
Prob > chi2	0.000			

Source: SOEP cross-section data-file 2004.
In the probit model with selection it is assumed that employees, who have not been entirely sponsored by the enterprise select into employee-financed training. Not shown in the table are ISCO-Dummies 1-8.
Enterprise-size small: Lower than 20 employees; Enterprise-size medium: 20 to 200 employees; Enterprise-size large: 200 to 2000 employees; Enterprise-size very large: More than 2000 employees.
Technology sector: Technology and knowledge intensive sectors of the NACE-Classification.

Table III: Medians of continuing vocational training incidence and volume (hours)

	Training incidence enterprise-sponsored	Training incidence employee-financed	Training volume (hours) enterprise-sponsored	Training volume (hours) employee-financed
Total	2	2	40	42
Male	2	2	42	48
Female	2	2	32	48
Age 20-44	2	2	40	40
Age 45-64	2	2	40	40
ISCED-level low	2	1	60	48
ISCED-level medium	2	2	36	40
ISCED-level high	2	2	44	48

Source: SOEP data-files 1995-2004.

Table IV: Fixed-effects estimates of the impact of enterprise-sponsored training and employee-financed training on wages

Enterprise-sponsored training

	pretrain		train		counts		volume		Net-effect
Total	.038	(.0060)	.042	(.0069)	.011	(.0024)	.00003	(.00002)	2.68***
Male	.037	(.0067)	.039	(.0079)	.013	(.0028)	.00007	(.00003)	4.34***
Female	.042	(.0108)	.043	(.0122)	.005	(.0045)	.00001	(.00002)	1.19
Age 20-44	.045	(.0077)	.050	(.0091)	.013	(.0032)	.00001	(.00002)	3.22***
Age 45-64	.008	(.0093)	.010	(.0115)	.006	(.0046)	.00017	(.00009)	2.19**
ISCED-level low	.039	(.0185)	.006	(.0191)	.021	(.0071)	.00012	(.00006)	3.84*
ISCED-level medium	.019	(.0087)	.043	(.0104)	.004	(.0038)	.00002	(.00004)	3.29***
ISCED-level high	.045	(.0086)	.039	(.0103)	.015	(.0037)	.00004	(.00002)	4.04***

Employee-financed training

	pretrain		train		counts		volume		Net-effect
Total	.034	(.0087)	.046	(.0106)	.001	(.0051)	.00003	(.00001)	1.58*
Male	.016	(.0106)	.016	(.0121)	.014	(.0062)	.00001	(.00001)	2.93***
Female	.049	(.0131)	.070	(.0167)	-.008	(.0075)	.00004	(.00002)	0.66
Age 20-44	.037	(.0109)	.048	(.0144)	.004	(.0073)	.00000	(.00001)	1.84
Age 45-64	.015	(.0134)	.034	(.0162)	-.005	(.0071)	-.00002	(.00004)	0.82
ISCED-level low	.057	(.0406)	.044	(.0401)	.000	(.0168)	.00006	(.00007)	-1.08
ISCED-level medium	.022	(.0127)	.039	(.0180)	.006	(.0103)	.00005	(.00002)	2.92*
ISCED-level high	.031	(.0114)	.035	(.0135)	-.003	(.0062)	.00004	(.00002)	-0.01

*** significant at the level of .01; ** significant at the level of .05; * significant at the level of .1

Further control variables not shown in the table: Tenure, tenure2, working-time, number of job changes, educational qualification (except for estimates by ISCED), enterprise-size, public sector, set of year-dummy variables.

The net-effect is calculated by adding up train, median(*counts*)*counts and median(*volume*)*volume and subtracting *pretrain* from the sum. All models have been estimated with robust standard errors, which are shown in parentheses.

Table V: Fixed-effects estimates of the impact of enterprise-sponsored training and employee-financed training on unemployment-risk

Enterprise-sponsored training

	pretrain		train		counts		volume		Net-effect
Total	-.032	(.0040)	-.033	(.0045)	-.007	(.0014)	.00002	(.00002)	-1.44***
Male	-.038	(.0049)	-.038	(.0055)	-.010	(.0018)	.00003	(.00003)	-2.87***
Female	-.025	(.0068)	-.026	(.0077)	-.005	(.0024)	.00001	(.00002)	-1.02*
Age 20-44	-.021	(.0051)	-.023	(.0056)	-.001	(.0017)	.00000	(.00001)	-.270
Age 45-64	-.042	(.0069)	-.042	(.0082)	-.021	(.0030)	.00015	(.00009)	-3.59***
ISCED-level low	-.034	(.0126)	-.029	(.0101)	-.020	(.0041)	.00020	(.00012)	-4.33***
ISCED-level medium	-.034	(.0064)	-.038	(.0076)	-.007	(.0024)	-.00001	(.00003)	-1.87***
ISCED-level high	-.023	(.0056)	-.025	(.0062)	-.005	(.0020)	.00003	(.00002)	-1.69***

Employee-financed training

	pretrain		train		counts		volume		Net-effect
Total	-.006	(.0056)	-.005	(.0068)	-.009	(.0030)	-.00002	(.00001)	-1.76***
Male	-.010	(.0075)	-.014	(.0091)	-.010	(.0041)	.00003	(.00002)	-2.30***
Female	-.002	(.0082)	.000	(.0101)	-.005	(.0044)	-.00006	(.00002)	-1.05***
Age 20-44	.005	(.0068)	.010	(.0086)	-.007	(.0040)	.00000	(.00001)	-0.80
Age 45-64	-.029	(.0099)	-.022	(.0121)	-.016	(.0048)	-.00011	(.00006)	-2.81***
ISCED-level low	-.054	(.0256)	.031	(.0393)	-.061	(.0185)	.00006	(.00005)	2.80
ISCED-level medium	-.001	(.0088)	-.008	(.0119)	-.009	(.0054)	.00000	(.00002)	-2.51***
ISCED-level high	-.005	(.0072)	-.008	(.0088)	-.003	(.0041)	-.00007	(.00003)	-1.29*

*** significant at the level of .01; ** significant at the level of .05; * significant at the level of .1

Further control variables not shown in the table: educational qualification (except for estimates by ISCED) and set of year-dummy variables.

The net-effect is calculated by adding up train, median(*counts*)*counts and median(*volume*)*volume and subtracting *pretrain* from the sum. All models have been estimated with robust standard errors, which are shown in parentheses.

Table VI: Fixed-effects estimates of the impact of enterprise-sponsored training and employee-financed training on career

Enterprise-sponsored training

	pretrain	train	counts	volume	Net-effect
Total	.035 (.0048)	.024 (.0065	.011 (.0027)	-.00001 (.00001)	1.05**
Male	.034 (.0065)	.023 (.0088)	.010 (.0036)	.00002 (.00003)	1.99***
Female	.037 (.0069)	.026 (.0096)	.011 (.0042)	-.00002 (.00001)	1.02
Age 20-44	.042 (.0065)	.018 (.0091)	.018 (.0039)	-.00002 (.00001)	1.15*
Age 45-64	.005 (.0051)	.019 (.0080)	-.003 (.0035)	.00009 (.00008)	1.10**
ISCED-level low	.061 (.0193)	.040 (.0229)	.008 (.0098)	.00005 (.00011)	0.64
ISCED-level medium	.023 (.0067)	.017 (.0095)	.009 (.0044)	-.00002 (.00002)	1.13
ISCED-level high	.039 (.0076)	.025 (.0107)	.012 (.0043)	.00000 (.00002)	2.34**

Employee-financed training

	pretrain	train	counts	volume	Net-effect
Total	.014 (.0053)	.026 (.0082)	-.002 (.0039)	.00003 (.00002)	0.92
Male	.014 (.0076)	.027 (.0124)	-.003 (.0058)	.00003 (.00002)	0.83
Female	.014 (.0072)	.025 (.0108)	.000 (.0052)	.00003 (.00002)	1.13
Age 20-44	.020 (.0070)	.043 (.0112)	-.003 (.0054)	.00002 (.00002)	1.78**
Age 45-64	-.003 (.0056)	.006 (.0089)	-.005 (.0039)	.00004 (.00003)	0.02
ISCED-level low	.014 (.0214)	.062 (.0364)	-.006 (.0182)	-.00027 (.00007)	2.78
ISCED-level medium	.019 (.0078)	.025 (.0140)	.007 (.0069)	.00006 (.00004)	2.20**
ISCED-level high	.006 (.0070)	.003 (.0112)	-.001 (.0057)	-.00001 (.00002)	-0.52

*** significant at the level of .01; ** significant at the level of .05; * significant at the level of .1

Further control variables not shown in the table: Tenure, tenure2, working-time, number of job changes, educational qualification (except for estimates by ISCED), enterprise-size, public sector, set of year-dummy variables.

The net-effect is calculated by adding up train, median(*counts*)*counts and median(*volume*)*volume and subtracting *pretrain* from the sum. All models have been estimated with robust standard errors, which are shown in parentheses.

Table VII: Fixed-effects estimates of the impact of enterprise-sponsored training and employee-financed training on matching of employee skills and job requirements

Enterprise-sponsored training

	pretrain	train	counts	volume	Net-effect
Total	.022 (.0044)	.019 (.0061)	.007 (.0025)	.00001 (.00001)	1.02**
Male	.017 (.0058)	.022 (.0084)	.003 (.0035)	.00005 (.00003)	1.62**
Female	.030 (.0067)	.012 (.0087)	.012 (.0036)	-.00001 (.00001)	0.50
Age 20-44	.021 (.0060)	.018 (.0085)	.008 (.0036)	.00000 (.00001)	1.31**
Age 45-64	.011 (.0047)	.017 (.0067)	-.005 (.0027)	.00014 (.00008)	0.10
ISCED-level low	.029 (.0150)	.021 (.0247)	.010 (.0113)	.00038 (.00015)	4.70**
ISCED-level medium	.021 (.0063)	.016 (.0091)	.008 (.0040)	.00001 (.00002)	1.01
ISCED-level high	.010 (.0068)	.007 (.0096)	.002 (.0039)	-.00001 (.00001)	0.20

Employee-financed training

	pretrain	train	counts	volume	Net-effect
Total	.012 (.0048)	.018 (.0076)	.006 (.0036)	.00002 (.00001)	2.03***
Male	.021 (.0073)	.045 (.0115)	-.001 (.0053)	.00002 (.00002)	2.25***
Female	.003 (.0061)	-.008 (.0096)	.014 (.0048)	.00002 (.00002)	1.76**
Age 20-44	.017 (.0064)	.026 (.0105)	.009 (.0050)	.00001 (.00002)	2.69***
Age 45-64	.000 (.0047)	.002 (.0069)	-.001 (.0030)	.00006 (.00004)	0.31
ISCED-level low	.006 (.0152)	-.040 (.0222)	.014 (.0139)	.00019 (.00010)	-2.30
ISCED-level medium	.017 (.0073)	.027 (.0134)	.023 (.0071)	.00002 (.00003)	5.57***
ISCED-level high	.002 (.0063)	-.009 (.0099)	-.003 (.0049)	.00001 (.00002)	-1.60**

*** significant at the level of .01; ** significant at the level of .05; * significant at the level of .1

Further control variables not shown in the table: Tenure, tenure2, working-time, number of job changes, educational qualification (except for estimates by ISCED), enterprise-size, public sector, set of year-dummy variables.

The net-effect is calculated by adding up train, median(*counts*)*counts and median(*volume*)*volume and subtracting *pretrain* from the sum. All models have been estimated with robust standard errors, which are shown in parentheses.