

# Short-term and long-term benefits as determinants of the training behaviour of companies\*

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This paper adopts an economic perspective for an investigation of the correlation between cost-benefit aspects and company decisions regarding training. A differentiation is drawn between the basic decision about whether a company should provide its own training and the stipulation of the number of trainees. The basis of the data used is information on the cost-benefit aspects of training from a survey conducted by the Federal Institute for Vocational Education and Training in 2001, the information being supplied by companies which provide training and companies which do not provide training. It becomes apparent that cost-benefit aspects are highly significant in both phases of the company training decision. Possible starting points for vocational education and training policy primarily emerge from encouraging additional companies to provide training rather than from increasing the number of training places at companies already providing training, however. In overall terms, longer-term benefits appear to be accorded more importance than short-term cost aspects.

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Annex

## 1 Introduction

Recent times have seen a significant decline in the number of newly concluded training contracts in Germany (cf. Federal Ministry of Education and Research 2006). Having reached its highest level of 631,000 in 1999, the figure decreased in subsequent years. In 2006, the number of newly concluded training contracts was 576,000 (representing an increase compared to 2005). The debate on the possible causes of the reduction in training focuses mainly on the following aspects.

Reference is firstly made to the direct dependency of company training on the employment system. Extensive cuts in employment of the kind which have taken place in recent years have necessarily resulted in direct negative implications for training (cf. Walden 2005: 102 ff.). Empirical analyses on the interdependency of employment and training development for the period 1996–2005 also indicate a clear statistical correlation in this area (cf. Ulrich/Eberhard/Krewerth 2006: 16 ff.). Within the debate on the causes of the decline in training, attention is also drawn to shifts which have taken place within the economic structure. The fact that company training in Germany has traditionally had its roots in the manufacturing industry means that the increasing shift towards the tertiary sector of trade and industry tends to have negative effects on training. Analyses on the ramifications of sectoral shifts conducted in this field have produced a variety of results (Plünnecke/Werner 2004; Troltsch 2005). A third and final strand of the discussion centred on identifying an explanation for the decline in company training postulates a crisis in the system, the argument being that the development towards a knowledge society tends to lead to changes in skills requirements and recruitment strategies within the companies, resulting in the increased replacement of workers who have completed vocational training by higher education graduates (e.g. Baethge/Solga/Wieck 2007, in particular pp. 73 ff. and Euler/Severing 2006: 22 ff.).

Cost-benefit<sup>1</sup> aspects have also played a significant part in the debate surrounding opportunities for bringing about an increase or stabilisation in companies' readiness to provide training. Decreases in training allowances in particular are often recommended as a way of creating greater levels of incentive for the company (cf. e.g. FAZ 2006). The aim of this paper is thus to investigate the correlation between cost-benefit aspects and company decisions

regarding training. Since only cross-sectional data are available, the time series of training activities can not be taken into consideration. Irrespective of potential reasons referenced for the decline in training, however, cost-benefit aspects could in general terms constitute an important starting point for education policy measures.

## 2 Research question: company training decisions as a consideration of costs and benefits

If company training is viewed from an economic perspective, the company has incentives to provide training only if the total benefits gained from training exceed the costs arising. Dietrich/Koch/Stolpe (2004) state that economic profitability is an essential prerequisite for company training. In terms of a company decision-making calculation, however, a basic differentiation between two possibilities needs to be made at this point. The first possibility is that training costs can be covered by the productive deployment of the trainees during the training itself. In such a production model case (Lindley 1975), employing trainees as workers (and as a replacement for regular workers earning a higher level of remuneration) may constitute an essential motive for providing training.<sup>2</sup> Companies pursuing this model in providing training represent a short-term benefits perspective with regard to training. The second possibility is that it is not possible to cover training costs during the training phase itself. In such a case, training is only worthwhile for a company if the trainees enter into an employment contract on completion of training, allowing the internalisation of further benefits. This would constitute the so-called investment model, in which companies pursue a longer-term benefits perspective.

Overall costs arising during training have been designated as gross costs since the fundamental investigation conducted by the "Commission of experts on costs and financing of vocational education and training" (1974). Subtracting from this the returns generated from the productive work carried out by trainees gives us the so-called net costs:

$$G - R = NC \quad (1)$$

In a typical ideal case and depending on whether the production or investment model is being pursued, training is worthwhile for a company if

<sup>2</sup> In addition to the operational deployment of the trainees, an enhancement of the public image or reputation of companies may also result in a further benefit of training for the company, thus improving a company's position on the external labour market (Sadowski 1980). Such benefits may be both short-term and long-term in nature.

<sup>1</sup> This paper treats the terms 'returns' and 'benefits' as synonyms.

$$NC < 0 \quad (2)$$

or

$$LR > NK \quad (3)$$

G = Total gross costs over the entire period of training

R = Total returns over the entire period of training

NC = Total net costs

LR = Net present value of the long-term returns resulting from training after completion of training.

Longer-term returns from training result from employment advantages and from the permanent employment of skilled workers trained by the company itself. Aspects particularly worthy of mention here are cost savings compared to recruiting skilled workers via the external labour market, productivity benefits compared to externally recruited skilled workers and the avoidance of recruiting the wrong workers, fluctuation costs and production downtime costs (shortfall in production due to a lack of skilled workers, cf. Beicht/Walden 2004: 36 ff.).

According to the classical theory of human capital (Becker 1964), which assumes that labour is paid in line with its marginal product, companies are only afforded the opportunity of achieving longer-term returns to the extent to which specific human capital can be trained. In general human capital terms, any higher level of productivity generated by trained workers within a company would need to be passed on to them in the form of higher remuneration. Company vocational education and training in Germany probably represents a mixture of the training of general and specific human capital. To all intents and purposes, given the fact that the assumption of perfect competition which underlies classical human capital theory is unlikely to be found in reality, general human capital also provides the potential for companies to realise longer-term benefits from training. Both, theoretical analyses (Acemoglu/Pischke 1998 and Acemoglu/Pischke 1999) and empirical work (such as Beicht/Walden/Herget 2004; Schøne 2006), have demonstrated this.

The subject of the significance of cost-benefit aspects for company readiness to provide training within the dual system of vocational education and training in Germany has been addressed in a series of theoretical works (cf. most notably Kempf 1985; Niederalt 2004). Empirical analyses of the determinants of company training behaviour have also been conducted (e.g. Neubäumer/Bellmann 1999; Niederalt 2005), although these have not been able to model cost-benefit aspects explicitly. In an analysis

of the German training places market, Neubäumer (1999) was able to draw on aggregate data on training costs. Although work has also been conducted both on the amount of costs and benefits involved in training in general terms (Beicht/Walden/Herget 2004) and on a case study basis (Hansjosten 2000; Grossmann/Meyer 2002), a broadly based empirical analysis of the correlation of cost-benefit aspects and company readiness to provide training in Germany using micro data has not hitherto been conducted. The aim of the present paper is to close this gap.

Research on the fundamental correlations between company readiness to provide training and training costs has recently been conducted for Switzerland on the basis of enterprise survey data (Wolter/Mühlemann/Schweri 2006 and Mühlemann et al. 2005). In considering the situation in Germany, the present paper takes its lead from this work in terms of its methodological approach and compares the results for Germany with those obtained in Switzerland. In contrast to the Swiss analysis, this paper also includes aspects of longer-term returns from training alongside training costs, the focus of attention being the issue of what role can be ascribed to short-term and long-term benefits in explaining company training behaviour.

When analysing company training decisions, it is necessary to differentiate between two phases: the basic decision about whether a company should provide its own training at all and the stipulation of the number of trainees. Since it is not possible to exclude the fact that the significance of the individual factors may vary within these phases, each decision-making situation needs to be investigated separately (cf. Niederalt 2005: 5). Economic objectives are used as a starting point to formulate a standardised hypothesis of the effects produced:

The lower the net training costs are, the greater the tendency will be for companies to initiate their own training, and lower net training costs will also result in a larger number of people being trained. A positive effect on the fundamental decision to provide training and the stipulation of the number of trainees is assumed for the long-term benefit.

### 3 Empirical basis and operationalisation

#### 3.1 Data record

The data used for the analysis originate from two parallel surveys of companies providing training and

companies not providing training which were conducted by the Federal Institute for Vocational Education and Training (BIBB) in 2001 (cf. in the following Beicht/Walden/Herget 2004).<sup>3</sup> A total of 2518 companies providing training were questioned as to the costs and benefits of their own training. This was supplemented by a survey of 463 companies not providing training on the reasons why they chose not to provide training and on the potential benefits of providing their own training. The latter survey used the same scales as deployed in the survey of companies providing training.

The survey of companies providing training focused on individual training occupations, 52 being selected. The sampling procedure took place by random selection with the Chambers of Industry and Commerce and the Chambers of Crafts and Trades. For the companies not providing training, the operational data of an address management company was used to make a random selection stratified by company size. The survey of companies providing training took place orally, the survey of the companies not providing training was conducted in writing.

A highly differentiated set of instruments was used to record training costs in the relevant survey. Since only very few companies in Germany are in a position to provide direct information on the extent of their training costs, the approach adopted placed a much greater emphasis on recording individual relevant cost components as quantitative and value indications and using a standardised cost model to convert these into cost items rather than making straight enquiries about the overall level of cost. The set of survey instruments used goes back to that developed by the first cost survey conducted in Germany in the 1970s, the "Commission of experts on costs and financing of vocational education and training" (1974). A similar approach was also adopted by the Federal Institute for Vocational Education and Training when conducting cost surveys in the 1980s (including Noll et. al. 1983) and in the 1990s (Bardeleben/Beicht/Fehér 1995).

The costs of training were calculated by the Federal Institute for individual training occupations and as costs per trainee and year respectively.

### 3.2 Analytical variables included

#### *Short-term benefit: the net costs of training*

The net costs per trainee and year are included in the analysis. The net costs represent an indicator of

the short-term benefit of a course of training. The lower the costs, the higher the short-term benefit all other things being equal.

In surveys undertaken to record the costs of company training for Germany, a differentiation is made between the concepts of full costing and direct costing (cf. Beicht/Walden/Herget 2004: 21 ff.). Full costing allocates a proportion of all costs to company training, including both variable and proportionate fixed costs. This means that costs which a company would incur even if it did not provide training are also allocated to company training. The costs of part-time training staff particularly need to be mentioned here. This is a group of people primarily responsible for fulfilling other duties in their capacity as skilled workers or management staff. In many companies, the instruction of trainees takes place in a manner which is integrated into the working process, the courses of instruction being organised in such a way that as few restrictions as possible result for productivity on the part of those workers involved in training duties. In the last survey on training costs conducted by the Federal Institute for Vocational Education and Training (Beicht/Walden/Herget 2004: 27), companies were asked how high the productivity of part-time trainers was compared to employees not involved in training. Only a few companies estimated the productive work of their part-time trainers to be noticeably less than that of the other skilled workers (Beicht/Walden/Herget 2004: 27). Using full costing would thus lead to an overestimation of the actual cost burden on companies conducting their own training. For this reason, the Federal Institute additionally calculated direct costs, which do not include the costs of part-time training staff and the part-time administration of training (Beicht/Walden/Herget 2004: 25 ff.). Direct costs provide a more realistic measure of the actual cost burden on companies shown by the results of the survey conducted by the Federal Institute and thus tend to be more relevant to a decision on training than full costs. In terms of identifying a relevant value, the present paper places the main emphasis on direct costs. All analyses are, however, also calculated on the basis of full costs.

#### *Long-term benefit*

As far as longer-term benefits are concerned, company evaluations of the advantages provided by company training are used. In each case, a scale of 1 (very important) to 5 (completely unimportant)

<sup>3</sup> All analyses of statistical correlations are based on unweighted data. Extrapolated structural characteristics were calculated using

data records weighted according to economic branches and company size classes.

was used. The values were recoded for the analyses to make higher values on the scale represent a higher level of benefits. The following individual aspects were considered (cf. also Walden/Beicht/Herget 2002):

- Obtaining skilled workers when there is a shortage of qualified staff on the labour market
- Saving recruitment costs on the labour market
- Saving higher introductory training costs for skilled workers coming from outside the company
- Training young workers precisely in line with company requirements
- Avoiding the risk of recruiting the wrong employees, always present when recruiting skilled workers from outside the company
- Providing an opportunity to select “the best” when offering trainees employment on completion of training
- Avoiding high staff turnover by obtaining skilled workers who feel a particular association with the company.

Multicollinearity problems meant that the values of the individual indicators were not included in the statistical analyses, a factor analysis was therefore carried out for the indicators.<sup>4</sup> Only one factor turned out to have an eigenvalue of greater than one (3.76), this factor accounting for 53 % of total variance. All of the other factors extracted had an eigenvalue of less than one. This result shows that there is a strong level of correlation between the individual aspects and that these may be of considerable relevance to general, longer-term benefit orientation. In the analyses conducted for this paper, the factor values were either inserted for the first factor or an overall indicator was formed from the values of all the items. The results of the variations using the overall indicator were largely identical with the results from the inserted factor values, so only the results based on the factor value are presented. A series of alternative variations was also tested, integrating one item each time. Further supplementary details of this are provided in the presentation of the results of the statistical analyses where there is evidence of specific characteristics.

### *Control variables*

Further company characteristics determining the general conditions underlying company training

<sup>4</sup> Principal components analysis.

were included alongside the central analytical variables. These additional variables are company size, the economic branch,<sup>5</sup> location in former East or West Germany, training field, the length of time a company has been in existence, the status of the company (stand-alone company, part of a group, headquarters of a group, branch or subsidiary and other) and the share of skilled workers (proportion of employees who have completed an apprenticeship).<sup>6</sup> All the above features may be assumed to influence the starting situation for training decisions made by companies. These variables therefore control the analysis of cost-benefit aspects.

## **4 Results of the analyses**

### **4.1 On the potential amount of training costs for companies not providing training**

Evaluations of the longer-term benefits of training from the company surveys conducted by the Federal Institute for Vocational Education and Training are available for both companies providing training and companies not providing training. The same does not apply to the costs of training which, by their very nature, can only be calculated for companies providing training. For this reason, an initial evaluation of the (probable) training costs of companies not providing training is undertaken within the framework of a “sample selection model”.<sup>7</sup> Two partial models need to be differentiated here. A selection or probit model is used to estimate the extent of the probabil-

<sup>5</sup> Analyses conducted previously (cf. Beicht/Walden/Herget 2004: 113 ff.) have shown that training costs vary strongly according to training occupations. Since no information on a potential training occupation is available for companies which have hitherto not provided training, affiliation to an economic branch was taken as a proxy variable. A differentiation was made between a total of 29 economic branches. In the case of the analyses conducted solely on the basis of companies providing training, information on the training occupation or occupational group was used instead of the economic branch.

<sup>6</sup> Cf. for example the selection of variables in the analysis conducted by Niederalt (2005).

<sup>7</sup> A maximum likelihood estimation of a selection or probit model (company providing training versus company not providing training) and of a regression model for the evaluation of the net costs was made. Both models were evaluated simultaneously. The disturbance variance of the probit estimation and the ratio of the covariance of the disturbance terms of both estimations and of the disturbance variance of the probit estimation ( $\rho$ ) are taken into the regression analysis. The greater the deviation of  $\rho$  from zero, the greater the extent of selectivity. For the estimation of selection models generally cf. Greene 2003: 780 ff. and in respect of the specific approach adopted particularly Mühlemann et al. 2005: 8 and Wolter/Mühlemann/Schweri 2006. The authors in question have conducted their own evaluations on the basis of data from Swiss companies. For more detailed information on the Swiss database cf. Schweri et al. 2003.

ity that affiliation to the group of companies providing training or to the group of companies not providing training is determined by a series of relevant independent variables. The factors used here are those named above as representing the essential general conditions for company training decisions: company size, the economic branch, location in former East or West Germany, training field, the length of time a company has been in existence, the status of the company and the share of skilled workers. The information obtained flows into a regression evaluation of the training costs applying to all companies (irrespective of whether they provide training or not). A normal regression evaluation also conducted in respect of training costs only for companies that actually have cost values available can be described as selective to the extent that only information for companies providing training is available and the influence of the relevant variables only applies to companies providing training. The inclusion of the information from the probit estimation on the systematic differences between companies providing training and companies not providing training corrects this selectivity. The results from this expanded regression analysis are then used to calculate appropriate values which a company not providing training would have, if it were to provide training. This therefore represents an estimation of the training costs of companies not providing training on the basis of the available information in the data records on the costs of companies providing training and the existing differences in terms of the individual relevant variables between companies providing training and companies not providing training. Only the variables company size, economic branch, location in former East or West Germany and training field were included in the regression evaluation for the costs, as the exertion of an influence on the amount of costs by the other features did not appear plausible.

Table 1 presents the results of the regression analyses of training costs (variants for net direct costs and net full costs respectively) without taking selectivity into account. Tables 2a and 2b present the results of the relevant regression analyses taking both selectivity and the results of the underlying probit estimations into account.

### *Results including direct costs*

An initial viewing of the results of the regression analysis without taking selectivity into account (Table 1) shows company size to be a particularly strong influencing factor.<sup>8</sup> Smaller companies with fewer

<sup>8</sup> No further differentiation in company size classes above the level of 50 employees was undertaken in light of the fact that the

than 10 employees and up to 49 employees have lower costs than larger companies.<sup>9</sup> In addition to this, certain economic branches (such as energy and water supply, the chemical industry) have significantly higher training costs, whereas the training costs in other branches (such as agriculture and forestry) are significantly lower. The training field is also of significance. Significantly higher costs are incurred in the field of trade and industry and in the public sector.

The results for the regression analysis where selectivity is taken into account are largely similar. Although there is some weakening of the influence exerted by company size, this remains of overriding significance. The value of the extent of selectivity ( $\rho$ ) of the cost evaluation purely on the basis of companies providing training is thus also of no significance. If the average costs for companies providing training and companies not providing training are calculated on the basis of the regression coefficients, the value for companies not providing training lies at € 2,215, above that of companies providing training, which is estimated at € 1,628.<sup>10</sup> Table 3 contains information on the non-weighted actual values for training costs and on estimated values.

Owing to the strong influence exerted by company size (smaller companies have lower training costs) and due to the fact that companies not providing training frequently tend to be smaller companies it is astounding, notwithstanding the theoretical plausibility of the result, that the average value for companies not providing training lies below that of companies providing training. The probable reason for this is that when control of company size takes place companies providing training tend to operate in economic branches where costs are lower, this being demonstrated by a comparison of the cost and probit estimation coefficients. This means that the probability of a company participating in training tends to rise when costs are lower (and vice versa), although the fact that this is overlaid by the counter

group of companies not providing training largely falls into the segment of companies employing up to 50 workers and insofar as sample size does not permit any further sub-categorisation.

<sup>9</sup> The division of company size in question was selected in light of the fact that companies not providing training are only very seldom major companies with 500 employees and upwards. The fact that sample size was therefore too small did not make it expedient to form a separate group of larger companies. The primary reason for the lower costs incurred by smaller companies is that such companies less frequently need to employ full-time trainers.

<sup>10</sup> Both these values are weighted according to company sizes and economic branches. The estimated values for the companies providing training are, of course, not identical with the empirically determined values contained in Beicht/Walden/Herget 2004, where the average value of direct costs for companies providing training is put at € 2,448.

Table 1

**Results of regression analysis for costs of company training – companies providing training**

Variable	Dependent variable: net full costs		Dependent variable: net direct costs	
	Coefficient	z-value	Coefficient	z-value
Constant	7807.534***	6.805	3820.480***	3.847
<b>Company size</b>				
1–9 employees	152.963	0.322	–3358.039***	–8.178
10–49 employees	–768.838*	–1.870	–2991.620***	–8.405
<b>Economic branches</b>				
Agriculture and forestry, fishery	–3813.140***	–3.147	–2120.306**	–2.021
Energy and water supply, mining	857.863	0.587	3635.295***	2.872
Chemical industry, petroleum, plastics, rubber processing	954.396	1.013	1964.988**	2.408
Non-metallic minerals, fine ceramics, glass	–423.114	–0.269	773.613	0.569
Metal production, foundry working, metal working and similar	1024.170	0.966	1144.107	1.246
Engineering, metal engineering, railway engineering, marine engineering, aviation engineering	1462.701*	1.679	2132.522***	2.827
Road vehicle engineering, vehicle repair	–943.530	–0.854	206.932	0.216
Electronics, IT systems, office machines	–885.739	–0.970	–400.677	–0.507
Precision mechanics, optics, watch making	1250.740	1.042	455.552	0.438
Iron, steel plate, metal, toy and jewellery manufacture	–22.581	–0.015	733.735	0.571
Wood working and processing, paper and pulp production/processing	–971.381	–0.971	–1228.408	–1.419
Printing, reproduction	1786.252	1.576	714.422	0.728
Textiles, clothing and leather industry	–7253.784***	–3.768	–4712.340***	–2.828
Food and luxury goods	–1709.089*	–1.901	–2343.428***	–3.012
Construction industry (main construction industry, sub construction work including gas and water installation, central heating and air conditioning engineering, painting and varnishing)	–1421.660*	–1.728	–1200.463*	–1.686
Retail trade (including mail order trade)	–3896.967***	–4.361	–2137.996***	–2.764
Wholesale and foreign trade	–4718.359***	–4.375	–2814.033***	–3.015
Communications and information transmission (including forwarding agencies, courier services)	–1029.941	–0.731	793.776	0.651
Banking and insurance industry	–355.959	–0.391	1421.622*	1.803
Publishing, advertising, print and electronic media, radio and television	–1716.805	–1.307	–2141.503*	–1.883
IT software service providers, technical and IT consultancy	–158.752	–0.162	–1269.219	–1.497
Property and residential property, asset management	–2831.267	–1.002	–2099.111	–0.858
Legal, tax, human resources, finance and business consultancy/investigation	–2678.902**	–2.099	–2189.932**	–1.982
Architectural and engineering companies	–3324.785***	–2.932	–3763.222***	–3.835
Independent doctors' surgeries and other health sector occupations	–178.233	–0.153	–1439.427	–1.427
Catering and hotels	–6025.464***	–5.909	–3303.654***	–3.743
Tourism, sport, fitness, leisure sector	–3671.923***	–2.909	–1047.816	–0.959
Other private services (hairdressing, cosmetics, cleaning industry and similar)	–2985.484***	–2.781	–1656.702*	–1.783
States of former West Germany	3387.289***	9.301	427.088	1.355
<b>Training field</b>				
Chamber of Industry and Commerce (IHK)	3708.495***	3.732	2488.323***	2.893
Chamber of Crafts and Trades (HWK)	420.721	0.420	918.833	1.059
Public sector	1339.189	1.140	2434.935**	2.395

Direct costs  $R^2 = 0.19$ ; Full costs  $R^2 = 0.15$ 

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group: company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions.

Table 2a

**Maximum likelihood selection model for the estimation of net direct costs for all companies**

Variable	Selection model		Regression model	
	Coefficient	z-value	Coefficient	z-value
Constant	1.0128***	2.990	3845.504***	3.160
<b>Company size</b>				
1–9 employees	-1.121***	-7.400	-3055.253***	-5.352
10–49 employees	-0.742***	-5.140	-2746.809***	-6.161
<b>Economic branches</b>				
Agriculture and forestry, fishery	2.007***	2.858	-2310.063*	-1.720
Energy and water supply, mining	0.6579	0.895	3454.225***	3.306
Chemical industry, petroleum, plastics, rubber processing	0.4774*	1.683	1620.128**	2.230
Non-metallic minerals, fine ceramics, glass	-0.218	-0.712	1984.174**	2.161
Metal production, foundry working, metal working and similar	0.617*	1.738	1310.841	1.569
Engineering, metal engineering, railway engineering, marine engineering, aviation engineering	0.457*	1.811	2186.151***	3.265
Road vehicle engineering, vehicle repair	0.238	0.744	-207.405	-0.257
Electronics, IT systems, office machines	0.750***	2.830	-739.063	-0.923
Precision mechanics, optics, watch making	1.119*	1.926	425.094	0.434
Iron, steel plate, metal, toy and jewellery manufacture	0.020	0.066	1101.415	0.801
Wood working and processing, paper and pulp production/processing	0.533*	1.726	-1177.691	-1.405
Printing, reproduction	1.293***	2.989	905.656	0.776
Textiles, clothing and leather industry	0.027	0.076	-4447.803**	-2.075
Food and luxury goods	0.563**	2.178	-2354.437***	-2.622
Construction industry (main construction industry, sub construction work including gas and water installation, central heating and air conditioning engineering, painting and varnishing)	0.292	1.390	-1338.458*	-1.832
Retail trade (including mail order trade)	0.802***	3.335	-2091.724**	-2.103
Wholesale and foreign trade	0.121	0.542	-2499.727***	-2.489
Communications and information transmission (including forwarding agencies, courier services)	0.302	0.973	540.532	0.453
Banking and insurance industry	0.813***	2.963	1315.297	1.537
Publishing, advertising, print and electronic media, radio and television	0.670***	2.639	-1888.656	-1.554
IT software service providers, technical and IT consultancy	1.274***	4.619	-1554.908	-1.637
Property and residential property, asset management	-0.141	-0.404	-1836.702	-0.527
Legal, tax, human resources, finance and business consultancy/investigation	1.687***	3.930	-2228.415	-1.647
Architectural and engineering companies	0.945***	3.350	-3508.877***	-3.251
Independent doctors' surgeries and other health sector occupations	1.989***	3.831	-1586.752	-1.188
Catering and hotels	0.989***	3.591	-3341.000***	-2.661
Tourism, sport, fitness, leisure sector	1.611***	2.995	-1049.423	-0.938
Other private services (hairdressing, cosmetics, cleaning industry and similar)	0.965***	2.684	-1719.165	-1.463
States of former West Germany	-0.406***	-2.738	179.972	0.482
<b>Training field</b>				
Chamber of Industry and Commerce (IHK)	-0.247	-1.014	2479.296*	2.284
Chamber of Crafts and Trades (HWK)	0.385	1.414	940.138	0.853
Public sector	0.978*	1.718	2183.801	1.764
Years since foundation of company	0.5D-03	0.362		
<b>Status of the company</b>				
Stand-alone company	-0.595***	-3.089	-	-
Part of a group	-0.613***	-2.715	-	-
Headquarters of a group	-0.321	-0.990	-	-
Share of skilled workers	0.0149***	9.847	-	-
SIGMA (1)	-	-	6152.516**	92.549
RHO (1, 2)	-	-	-0.057	-0.368
Observations	2946		2496	
Log likelihood	-24124,3			

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group (Selection model): company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions; branch or subsidiary, other.

Reference group (Regression model): company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions.

Table 2b

**Maximum likelihood selection model for the estimation of net full costs for all companies#**

Variable	Selection model		Regression model	
	Coefficient	z-value	Coefficient	z-value
Constant	1.221***	3.610	6465.147***	5.401
<b>Company size</b>				
1–9 employees	-1.138***	-7.595	-356.669	-0.578
10–49 employees	-0.762***	-5.345	-1039.141**	-2.120
<b>Economic branches</b>				
...				
States of former West Germany	-0.428***	-2.907	3176.555***	6.843
<b>Training field</b>				
Chamber of Industry and Commerce (IHK)	-0.242	-0.993	3412.039***	3.286
Chamber of Crafts and Trades (HWK)	0.422	1.550	444.568	0.415
Public sector	0.837	1.478	2563.484**	1.995
Years since foundation of company	0.3D-03	0.252	–	–
<b>Status of the company</b>				
Stand-alone company	-0.497***	-2.579	–	–
Part of a group	-0.593***	-2.606	–	–
Headquarters of a group	-0.240	-0.738	–	–
Share of skilled workers	0.014***	9.904	–	–
SIGMA(1)	–	–	7259.241***	95.084
RHO(1, 2)	–	–	0.111	0.782
Observations	2946		2496	
Log likelihood	-24508,8			

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group (Selection model): company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions; branch or subsidiary, other.

Reference group (Regression model): company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions.

# The coefficients for the economic branches are not included for reasons of space.

effect of company size is unlikely to make this correlation immediately apparent in reality. Smaller companies have lower training costs than larger companies, though the probability of the former commencing their own training is also significantly lower. This may be interpreted in the following way: certain prerequisites are conducive to a company's providing its own training and the larger a company is the higher the likelihood is that such prerequisites will be in place. These prerequisites may relate both to entitlement to provide training (human resources and material conditions) and to opportunities to utilise training (such as a demand for skilled workers). The relevant threshold value is likely to differ according to branch and training occupation.

### Results including full costs

When the full costs are included, the principal feature of the results of the regression analysis not including selectivity (Table 1) is that although the influence of company size still tends to be exerted in the same direction, this influence is clearly weakened and not significant. The analysis of selectivity (Table 2b) reveals similar results to when direct costs are used. Nor is the value for the extent of selectivity in the regression equation significant. In contrast to the direct costs, hardly any differences are evident in respect of the extrapolated costs for companies providing training and companies not providing training. The costs for companies provid-

**Table 3**  
**Descriptive values for the training costs\***

Actual values**				Estimated values***			
Direct costs		Full costs		Direct costs		Full costs	
M	s	M	s	M	s	M	s
3,310	7,039	11,287	7,895	3,012	2,928	10,997	2,975

M = Arithmetical means; s = Standard deviation

\* Unweighted values; \*\* Only companies providing training; \*\*\* All companies

ing training (€ 10,330)<sup>11</sup> are even slightly above those of companies not providing training (€ 9,669). These theoretically implausible results indicate, as already pointed out, that the full costs provide only an inadequate reflection of the actual cost burden incurred by companies.

#### 4.2 The decision for or against training

The aim of the following is to analyse the correlation of cost-benefit aspects of training by undertaking an initial investigation of a company's decision for or against commencing its own training.

Low levels of net costs constitute a yardstick for the short-term benefit to be achieved via training and thus represent to this extent only one element for evaluating the overall benefit. Even training involving high levels of training costs may be worthwhile in principle if long-term benefits are correspondingly high. Both benefit components therefore need to be taken into consideration if the decision for or against training is to be investigated. A probit model was estimated (companies providing training versus companies not providing training) in which training costs<sup>12</sup> and the values of the most important factor relating to long-term benefit were included alongside the cause variables contained within the selection model. Different models for direct and full costs respectively were once again calculated. The results are presented in Table 4.

<sup>11</sup> As in the case of the direct costs, these values naturally do not correspond to the actual training costs of € 8,700 as representatively calculated by BIBB.

<sup>12</sup> Actual values were used for companies providing training, estimated values only being deployed in the case of companies not providing training. This makes it possible to avoid multicollinearity problems which would otherwise arise. Implementing the cost values for companies not providing training acquired via a probit estimation into an extended probit estimation is not without its problems in statistical terms. The results should therefore be interpreted with caution and only evaluated as statements on trends.

#### Results including direct costs

An initial observation of the value of training costs confirms the statements which have already been made. Although this value lies only at the threshold of significance, the preliminary indication is, as expected, negative. An overall tendency may therefore be identified to the effect that, when other relevant cause variables are taken into consideration, the likelihood of companies' commencing their own training decreases as costs rise. A clearly higher significance results in respect of the longer-term benefits. The higher companies evaluate the longer-term benefits of training, the higher is the probability that they commence training. As an alternative to the factor values used, variables were calculated including respective individual items. Significant values in the expected direction resulted for virtually all items, the highest z-value being ascribed to the item "Avoiding the risk of making wrong human resources decisions".

In overall terms, the analyses therefore provide clear indications that the (expected) benefits of training influence the decision for or against training accordingly. The assumed hypothesis is generally confirmed both in respect of costs and in terms of longer-term benefits.

Finally, the share of skilled workers also plays a marked role, with the provision of training by companies rising in line with this share. Whereas some investigations reach similar results regarding some aspects of this (Niederalt 2005: 21), others tend to suggest an opposite correlation (Hartung/Leber 2004; Beckmann 2002; Neubäumer/Bellmann 1999). The presumption here is that the respective investigations into the formation of a share of skilled workers also included those who had pursued different training pathways (such as graduates of Universities of Applied Sciences, cf. Niederalt 2005: 14). The fact that the share of skilled workers also determines future requirements for skilled workers makes it particularly plausible that this share exerts a positive effect on participation in training.

Table 4

**Probit model 'Companies providing training versus companies not providing training taking cost-benefit aspects into account'**

Variable	Taking net full costs into account		Taking net direct costs into account	
	Coefficient	z-value	Coefficient	z-value
Constant	0.989***	3.365	1.190***	4.072
<b>Company size</b>				
1–9 employees	-0.971***	-7.835	-1.012***	-7.983
10–49 employees	-0.712***	-6.446	-0.772***	-6.807
<b>Economic branches</b>				
Agriculture and forestry, fishery	1.985***	5.188	1.850***	4.889
Energy and water supply, mining	0.558	1.306	0.633	1.493
Chemical industry, petroleum, plastics, rubber processing	0.592***	2.634	0.612***	2.741
Non-metallic minerals, fine ceramics, glass	-0.245	-0.903	-0.222	-0.822
Metal production, foundry working, metal working and similar	0.534**	2.095	0.564**	2.220
Engineering, metal engineering, railway engineering, marine engineering, aviation engineering	0.509**	2.491	0.569***	2.803
Road vehicle engineering, vehicle repair	0.307	1.262	0.275	1.141
Electronics, IT systems, office machines	0.949***	4.276	0.903***	4.096
Precision mechanics, optics, watch making	1.060***	3.093	1.098***	3.217
Iron, steel plate, metal, toy and jewellery manufacture	0.088	0.313	0.088	0.315
Wood working and processing, paper and pulp production/processing	0.809***	3.198	0.758***	3.015
Printing, reproduction	1.503***	4.090	1.569***	4.298
Textiles, clothing and leather industry	0.320	0.956	0.080	0.242
Food and luxury goods	0.862***	3.826	0.792***	3.527
Construction industry (main construction industry, sub construction work including gas and water installation, central heating and air conditioning engineering, painting and varnishing)	0.412**	2.280	0.356**	1.979
Retail trade (including mail order trade)	0.957***	4.664	0.860***	4.218
Wholesale and foreign trade	0.309	1.463	0.189	0.903
Communications and information transmission (including forwarding agencies, courier services)	0.694**	2.020	0.672**	1.973
Banking and insurance industry	0.773***	3.418	0.811***	3.587
Publishing, advertising, print and electronic media, radio and television	0.744***	3.089	0.698***	2.910
IT software service providers, technical and IT consultancy	1.237***	5.573	1.234***	5.582
Property and residential property, asset management	-0.058	-0.154	-0.143	-0.378
Legal, tax, human resources, finance and business consultancy/investigation	1.706***	5.293	1.622***	5.059
Architectural and engineering companies	1.167***	4.420	1.049***	3.988
Independent doctors' surgeries and other health sector occupations	2.113***	5.325	2.118***	5.348
Catering and hotels	1.217***	5.191	1.048***	4.529
Tourism, sport, fitness, leisure sector	1.745***	4.432	1.688***	4.299
Other private services (hairdressing, cosmetics, cleaning industry and similar)	1.038***	3.752	0.934***	3.395
States of former West Germany	-0.550***	-4.854	-0.453***	-4.116
<b>Training field</b>				
Chamber of Industry and Commerce (IHK)	-0.358	-1.551	-0.229	-0.996
Chamber of Crafts and Trades (HWK)	0.234	0.946	0.297	1.203
Public sector	1.071***	2.856	1.171***	3.121
Years since foundation of company	0.001	1.191	0.001	1.293
<b>Status of the company</b>				
Stand-alone company	-0.585***	-3.861	-0.591***	-3.911
Part of a group	-0.754***	-4.364	-0.705***	-4.116
Headquarters of a group	-0.412*	-1.720	-0.426*	-1.787
Share of skilled workers	0.014***	10.826	0.014***	10.691
Long-term benefit	0.130***	3.435	0.132***	3.525
Training costs	0.2D-04***	3.819	-0.1D-04*	-1.826

Direct costs Pseudo-R<sup>2</sup> (McFadden) = 0.25; Full costs Pseudo-R<sup>2</sup> (McFadden) = 0.25

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group: company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions; branch or subsidiary, other.

### Results including full costs

An alternative variable using net full costs was also calculated for the probit model, although this runs contrary to the result for the direct costs by producing a positive significant coefficient for the full costs. The negative coefficients for the direct costs mean that the positive effect for full costs is caused exclusively by expenditure on part-time trainers, the higher this expenditure, the greater the actual tendency for companies to provide training. This initially implausible result cannot, of course, be viewed in terms of an incentive for providing training in case of higher costs, as it is far more likely to constitute an indication of the human resources prerequisites for conducting training. In order to be able to provide training at all, companies need to have a certain range of availability of part-time staff or time resources. This mass of availability seems to be lower to begin with for companies not providing training, meaning that commencing training fails because human resources prerequisites are not in place. According to the results of the IAB Establishment Panel Survey (EPS), in 2004 44 % of all companies did not have the prerequisites in place to implement training (Federal Ministry of Education and Research 2006: 146).

### 4.3 Stipulation of the number of trainees

#### Model approach

Once companies have made a positive decision to provide their own training, they need to stipulate how many trainees they actually wish to train. In the case of a rationally determined training behaviour, this may also be fundamentally based on short-term or longer-term benefits. Since the direction of effect of individual variables differs depending on whether the issue at stake is the basic decision to provide training or the stipulation of the number of trainees, the aim of the following is to include exclusively available information on companies providing training (cf. Niederalft 2005: 5). Due to the direct dependency of the absolute number of trainees on the size of the company, a previously standardised value is observed. The object of the investigation is the so-called training intensity or training rate,<sup>13</sup> in other words the number of trainees relative to the overall number of employees. Since, for the reasons provided above, it is not proposed to include companies that do not provide training and therefore have a

<sup>13</sup> Trainees in relation to employees. The number of trainees has been included in the number of employees.

training rate of zero in the relevant analysis and given the fact that the lower limit of the range of the dependent variable has been truncated and has an upper limit of one, the aim is to base the analysis on a truncated regression model (cf. in general terms Greene 2003: 756 ff. and for the rationale in this specific case Niederalft 2005: 9). Taking the lower and upper distribution limits into account, consistent maximum likelihood estimators can be calculated. The same independent variables<sup>14</sup> are observed as in the probit model on the fundamental provision of training, but information on training occupations can be considered in lieu of economic branches, since only information on companies providing training is required. It is therefore likely that the various training occupations together with the varying demands they make of the curricula to be imparted and the resultant organisational requirements exert a stronger influence on costs than the mere affiliation to different economic branches.

#### Results including direct costs

Two different regression models have been estimated (Table 5). An initial estimate included company size, and a second estimate did not incorporate company size into the group of variables to be explained.

The initially striking feature of the results of the first regression model is that no significant values are produced either for the training costs or for the indicator of longer-term benefits, meaning that no influence on the training rate in line with the hypothesis can be demonstrated in this model either in terms of short-term or long-term benefits<sup>15</sup> of training. Company size is of significant importance: the larger a company is, the lower the attendant training rate.

Alongside company size class, training in a certain training occupation also plays a part in the level of the training rate. Compared to technical Chamber of Commerce and Industry occupations, for example, higher training rates result for IT occupations, catering occupations and the various craft trades occupations, whereas a tendency towards a lower training rate is demonstrated in respect of companies providing training in administrative occupations in the public sector. In addition to this, significant coefficients are also discernable for other variables which have been included. The fact that the location

<sup>14</sup> Other specification models for the determination of training intensity may be found in such studies as Niederalft 2005 and Dietrich/Gerner 2005.

<sup>15</sup> Variants substituting individual long-term benefit items for the factor value used produced similar results.

Table 5

## Truncated regression model for the explanation of the training rate including direct costs

Variable	Model 1		Model 2	
	Coefficient	z-value	Coefficient	z-value
Constant	-0.124***	-4.591	-0.097*	-2.852
<b>Company size</b>				
1–9 employees	0.357***	18.938	–	–
10–49 employees	0.214***	12.631	–	–
<b>Occupational group</b>				
Commercial Chamber of Commerce and Industry (CCI) occupations	0.030*	1.748	0.104***	4.352
Technical CCI occupations in IT	0.053**	2.076	0.141***	4.047
Commercial CCI occupations in IT	0.075***	2.809	0.165***	4.574
Trade sector CCI occupations	-0.007	-0.278	0.066*	1.788
Catering CCI occupations	0.195***	8.908	0.319***	10.694
Other CCI occupations	0.102***	4.198	0.201***	6.179
Metal and electrical Craft Trades (CT) occupations	0.091***	5.082	0.262***	10.481
Commercial CT occupations	0.085***	3.372	0.189***	5.546
Bricklayer CT	0.048	1.412	0.130***	2.886
CT occupations in sub construction sector	0.072***	3.103	0.256***	8.122
Commercial CT occupations (baker, butcher)	0.087***	3.567	0.222***	6.756
Hairdresser	0.152***	5.285	0.354***	9.301
Other CT occupations (such as dental technician)	0.098***	4.290	0.313***	10.089
Agricultural occupations	0.101***	4.227	0.282***	8.711
Liberal professions: legal assistant and tax clerk	0.087***	3.841	0.259***	8.382
Liberal professions: medical and dental assistant	0.034	1.471	0.201***	6.310
Technical occupations in the public sector	-0.039	-1.104	0.036	0.741
Commercial administration occupations in the public sector	-0.156***	-4.160	-0.195***	-3.668
States of former West Germany	-0.022**	-2.277	-0.009	-0.728
Years since foundation of company	-0.3D-04	-0.428	-0.5D-03***	-4.174
<b>Status of the company</b>				
Stand-alone company	-0.015	-0.973	0.061***	3.005
Part of a group	-0.055**	-2.454	-0.133***	-4.347
Headquarters of a group	-0.018	-0.669	-0.075**	-2.020
Share of skilled workers	0.2D-03	1.275	0.3D-03*	1.695
Long-term benefit	0.003	0.712	-0.011**	-1.990
Net direct costs	0.3D-06	0.426	-0.2D-05**	-2.163

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group: company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions; branch or subsidiary, other.

of companies in the states of former West Germany tends to have a negative influence on the training rate is initially surprising, although such a result is

in line with official statistics (Report on Vocational Education and Training 2005: 124). The status of the company also has an influence. Companies belong-

**Table 6**  
**Provision of training, training costs and company size**

	Company size			
	1 to 9 employees	10 to 49 employees	50 to 499 employees	500 employees and over
Share of companies providing training*	16.9 %	47.5 %	69.9 %	90.7 %
Training rate (of companies providing training only)*	31.4 %	13.9 %	7.8 %	6.0 %
Average net direct costs**	€ 542	€ 1,423	€ 3,402	€ 8,176

\* Source: Employment statistics 2004; \*\* Weighted values

ing to a group (thus constituting a part of a larger company) tend to have a lower training rate corresponding to the influence of company size. In contrast to the issue of the fundamental provision of training, no significant influence is demonstrated in respect of the explanation of the training rate for the share of skilled workers.

We know from Table 1 that company size exerts a strong influence on the amount of training costs. In addition to this, a regression analysis also conducted using the relevant data and including the indicator value for longer-term benefits as a dependent variable shows a clear correlation between company size and longer-term benefits. The larger the company is here, the more marked are the aspects of longer-term benefits. If company size is also included in the explanatory variables alongside the various beneficial aspects in a regression analysis, the possibility arises that correlations between the cause variables prevent correlations or explanatory components which are actually present from becoming visible. In order to clarify this, an additional regression model was estimated which did not take company size explicitly into consideration. This model produces a significant negative value for training costs and a nearly significant negative value in respect of longer-term benefits. The lower the training costs (in other words the greater the short-term benefit) the higher the training rate accordingly tends to be. On the other hand, a contrary influence may be derived with regard to longer-term benefits. In this respect, companies for which longer-term benefits are more significant tend to have a lower training rate (and vice-versa). In relative terms, (expressed as a proportion of employees), the tendency is therefore towards a lower amount of training when longer-term benefits increase.

In addition to this, separate respective regression analyses were conducted for the classes of company

size considered here,<sup>16</sup> although neither the training costs nor the indicator value was shown to be significant in terms of longer-term benefits for any of the groups of companies. The effects measured for the overall sample may therefore be traced back to variances arising beyond company size classes.

The effects described by the two regression models are an expression of the fact that in Germany there is a strong mutual overlapping of company benefit motives for training and the varying institutional conditions as they apply to the individual companies respectively. Company size represents a central element within these varying general conditions under which training takes place. Table 6, which compares information on training and training costs for differing company sizes, illustrates this correlation.

The so-called share of companies providing training, in other words the proportion of companies actually conducting training, increases along with company size. In contrast to this, the training rate of companies providing training falls as company size rises. The larger a company is, the higher training costs tend to be.

Because the organisation of training is easier in smaller companies and owing to the fact that overheads and costs of full-time trainers do not occur until above a threshold value of the number of trainees in absolute terms, smaller companies are fundamentally able to structure training in a more cost-effective way. Secondly, the higher level of risk of trainees leaving the company after completion of training make it likely that smaller companies will tend to make the establishment of their own training dependent on the expected amount of training costs. Smaller companies will also be concentrated in oc-

<sup>16</sup> It is not the intention to present individual results here.

Table 7

**Truncated regression model for the explanation of the training rate including full costs**

Variable	Model 1		Model 2	
	Coefficient	z-value	Variable	Coefficient
Constant	-0.071*	-2.728	-0.060*	-1.783
<b>Company size</b>				
1–9 employees	0.352***	19.411	–	–
10–49 employees	0.208***	12.739	–	–
<b>Occupational group</b>				
Commercial Chamber of Commerce and Industry (CCI) occupations	0.021	1.242	0.098***	4.163
Technical CCI occupations in IT	0.050**	1.972	0.141***	4.110
Commercial CCI occupations in IT	0.072***	2.746	0.167***	4.704
Trade sector CCI occupations	-0.029	-1.080	0.051	1.398
Catering CCI occupations	0.169***	7.929	0.303***	10.394
Other CCI occupations	0.076***	3.201	0.189***	5.927
Metal and electrical Craft Trades (CT) occupations	0.073***	4.157	0.250***	10.266
Commercial CT occupations	0.060**	2.430	0.175***	5.265
Bricklayer CT	0.034	1.033	0.115***	2.589
CT occupations in sub construction sector	0.051**	2.233	0.245***	7.940
Commercial CT occupations (baker, butcher)	0.066***	2.785	0.212***	6.624
Hairdresser	0.124***	4.383	0.335***	8.954
Other CT occupations (such as dental technician)	0.087***	3.880	0.308***	10.137
Agricultural occupations	0.068***	2.883	0.263***	8.307
Liberal professions: legal assistant and tax clerk	0.061***	2.763	0.245***	8.158
Liberal professions: medical and dental assistant	0.020	0.877	0.197***	6.362
Technical occupations in the public sector	-0.054	-1.551	0.026	0.561
Commercial administration occupations in the public sector	-0.164***	-4.466	-0.203***	-3.868
States of former West Germany	-0.011	-1.175	0.002	0.156
Years since foundation of company	-0.3D-04	-0.365	-0.5D-03***	-4.224
<b>Status of the company</b>				
Stand-alone company	-0.016	-1.116	0.061***	3.079
Part of a group	-0.050**	-2.307	-0.133***	-4.401
Headquarters of a group	-0.020	-0.732	-0.077***	-2.100
Share of skilled workers	0.2D-03	1.399	0.3D-03*	1.690
Long-term benefit	0.003	0.800	-0.011**	-2.111
Net full costs	-0.3D-05***	-6.154	-0.3D-05***	-4.809

\* Significant at the 10 % level; \*\* Significant at the 5 % level; \*\*\* Significant at the 1 % level

Reference group: company with at least 50 employees; public services, non-commercial organisation or other economic branch; federal states of former East Germany, liberal professions; branch or subsidiary, other.

occupations or fields in which training costs are correspondingly lower. Given the fact that training costs are lower in smaller companies, and to this extent

the likelihood that training will prove profitable during the period of training itself is greater, such companies are able to realise a higher training rate. The

profitability of the training they provide is less dependent on whether it is possible to achieve a corresponding longer-term benefit.

Larger companies with higher training costs, on the other hand, tend to be more dependent on achieving further benefits after completion of training. The higher training costs inevitably mean that the number of trainees is strongly oriented towards later opportunities for taking on these trainees permanently or towards the company's own longer-term demand for skilled workers. The negative correlation between longer-term benefits and the training rate comes about because according high significance to longer-term benefits also means that companies need to adapt the number of their training places immediately and directly to the actual demand for skilled workers if training is to be really worth their while. The relevant considerations here are also supported by an additional regression analysis of the share of company trainees taken on permanently. According to this analysis, the increase in company size exerts a clearly positive effect on the share of trainees taken on permanently.

According to these considerations, the influence that company size exerts on the amount of training costs means that it therefore forms a central determining factor of training intensity. If this is taken into consideration, evidence is provided of clear and theoretically plausible effects on the training rate for cost-benefit aspects. Lower costs, or higher short-term benefit, permit a higher level of training intensity. Higher costs, on the other hand, and the attendant dependency of also having to achieve longer-term training benefits in order to be able to maintain the profitability of training, require a correspondingly careful calculation of the number of trainees and thus result in a lower level of training intensity.

#### *Results including full costs*

As for the other analyses conducted, a variant on the basis of net full costs was also calculated for the regression model in order to determine the training rate (cf. Table 7). A clearly negative effect for the full costs results here, even if company size is included in the model equation. The differing results produced when the direct costs are used mean that this is exclusively due to expenditure on part-time trainers. If costs for the part-time trainers are inserted into the regression equation in lieu of the full costs, an even stronger negative effect is produced. Lower costs for part-time trainers thus signalise a positive effect on the training rate. Since it was not possible to observe this effect on direct costs, in

other words those costs directly incurred as a result of training, independently from company size, it is not appropriate to evaluate the relevant facts and circumstances as a causal correlation in the sense of a general positive stimulus in the event of lower costs. These results are far more likely to lend expression to the fact that, all other things being equal, a higher training rate is associated with higher numbers of trainees in a company and that costs for part-time trainers therefore can be distributed ex post over a greater number of trainees, meaning that costs per trainee fall. The fact that the total expenditure on part-time trainers falls only relative to the number of trainees rather than in absolute terms probably means, however, that it is not possible to derive a primary motive for the stipulation of the number of trainees from this.

#### **4.4 Comparison of results with analyses of company vocational education and training in Switzerland**

As already mentioned, similar analyses on the basis of data obtained from Swiss companies have been conducted in the recent past (Wolter/Mühlemann/Schweri 2006 and Mühlemann et al. 2005). In detail, this also involved using a selection model as the basis for estimating the costs of companies not providing training and for evaluating the significance of these costs in respect of the costs of the fundamental provision of training (Wolter/Mühlemann/Schweri 2006 and Mühlemann et al. 2005). The correlation between training costs and the supply of trainees also constituted an object of investigation,<sup>17</sup> but the Swiss analysis did not take longer-term benefits into account. Solely net full costs were taken into consideration for Switzerland, whereby it should be pointed out that narrower plausibility limits were drawn in Switzerland for calculating the costs of part-time trainers (cf. Schweri et al. 2003: 82 ff.), meaning that the proportion of full costs accounted for by part-time trainers turns out to be lower than in Germany, all other things being equal. To this extent, the Swiss cost input falls between the full costs calculated for Germany on the one hand and the direct costs on the other.

Notwithstanding the limitations to comparison described above, the intention is to provide a brief description of the commonalities and differences between the German and Swiss results. The first point which needs to be addressed here is the potential training costs calculated for companies not provid-

<sup>17</sup> In contrast to the present paper, the absolute number of trainees was investigated rather than training intensity.

ing training. One fact that should be pointed out initially is that the selectivity of companies providing training in respect of the amount of training costs is significantly higher in Switzerland. The deviations recorded in the average values of the training costs are considerable. In the paper by Wolter/Mühlemann/Schweri (2006), the estimated values for companies providing training are 6,174 Swiss francs, with the figure for companies not providing training reaching 33,478 Swiss francs. A further analysis using the same data puts the costs for companies providing training at 9,453 Swiss francs, with the figure for companies not providing training being estimated at 18,540 Swiss francs (Mühlemann et al. 2005: 10). An important result of the Swiss analyses also related to the influence exerted by company size. Whereas the values observed for companies providing training are lowest in the group of small companies, these small companies would actually have the highest costs according to the results of the regression model taking selectivity into consideration. No such result could be derived for Germany either on the basis of marginal or full costs. The self-selection of companies providing training in respect of the amount of training costs therefore has a clearly lower significance in Germany than is the case in Switzerland.

A highly significant influence of training costs on the fundamental decision to provide training may be derived in Switzerland. The lower the costs, the higher is the tendency for companies actually to provide training accordingly. When including the direct costs, a similar effect could be discerned for Germany, albeit at a lower level of significance.

In respect of the stipulation of the number of trainees and in a similar way to Germany when the direct costs are taken into consideration, the Swiss analyses also fail to show any significant effect for training costs.

The direction of the effects is similar in Switzerland and Germany when direct costs are included for the German companies. This does not, however, apply to the German full costs. Some of the results here were theoretically unexpected. This indicates that the narrower plausibility limits set in Switzerland for the costs of part-time trainers means that the German and Swiss full costs are not directly comparable. In Germany direct costs rather than full costs should be suitable for evaluating the actual cost burden incurred by companies by providing training.

Even if long-term benefits are not included for Switzerland, the results indicate that the influence of costs on the fundamental decision to provide training is more significant than in Germany.

## 5 Conclusion and possible implications for vocational education and training policy

If a summary is made of the results of the analyses conducted on the significance of short-term and longer-term benefits for company training decisions in Germany, the following aspects need to be highlighted. The question of whether a company provides training or not largely depends whether longer-term benefits are relevant for a company. This does not mean that such longer-term benefits are more important than short-term benefits. What it does mean, however, is that with regard to a company commencing its own training it is important that a longer term-benefit from training arising from the development of young skilled workers is given or perceived in the first place. In addition to this, a theoretically plausible influence of the amount of training costs (direct costs) is demonstrated. The higher the direct costs, the lower the provision of training. The share of skilled workers is of central significance for the provision of training. There are also indications that a minimum level of personnel and time resources for the organisation of training at the workplace must be available if training is to be commenced.

If a company has taken the decision to provide training, the multivariate observation does not initially permit further influences on the training intensity to be determined, either in respect of the direct costs or of longer-term benefits. If company size (as a material influencing factor for both the training rate and the amount of costs) is taken out of the equation, however, the theoretically plausible correlation becomes discernable. Lower direct costs exert a positive effect on training intensity, whereas training intensity is lower for companies which emphasise the long-term aspects of the benefits of training. This applies, however, in general terms only across all company size classes and cannot be isolated from the size of a company. Smaller companies have lower costs and adapt their training behaviour to the general conditions applying. Larger companies, on the other hand, frequently have higher costs and are therefore forced to realise a lower level of training intensity.

Higher training rates per se, for all classes of company size, are associated with lower costs for part-time trainers. This implies only a distribution of expenditure across more trainees rather than a lower level of overall expenditure, however, meaning that it is not possible to derive a direct causal stimulating effect on training.

In respect of the suitability of vocational education and training policy measures aimed at increasing the supply of in-company training places, the analyses produce the following indications. In order to encourage additional companies to provide training, the most important thing seems to be to convince companies which have not hitherto provided training of the longer-term advantages of training. A decrease in training costs may also be of significance.

On the other hand, using a decrease in training costs to increase the training intensity of companies already providing training (cf. e.g. Dietrich/Koch/Stops 2004) appears very difficult in the light of the existing dependencies between costs and company size. Larger companies orient their training strictly towards the later opportunities to take on trainees permanently or towards the long-term demand for skilled workers. Certain decreases in costs would do nothing to alter this. In the case of smaller companies, no precise figure can be put on the relative significance ascribed to the demand for skilled workers versus cost benefits and short-term benefits, although relevant investigations emphasise that the development of young skilled workers is generally the most important motive for in-company training (cf. Troltsch/Krekel 2006), the same also applying to smaller companies. The higher levels of training intensity and lower shares of trainees who are taken on permanently at small companies do not constitute a contradiction in this respect. This means that, because of the higher risk of trained skilled workers leaving the company, smaller companies with a prevailing longer-term interest in training have been compelled in the first place to train a significantly larger number of people than can later be taken on permanently. Relatively low costs facilitate such a strategy, although the question arises as to the extent to which cost decreases in the relevant company segment where costs are in any case low would lead to a further increase in the safety margin in the recruitment of young skilled workers respectively to an increase in the number of training places. A direct positive effect on the supply of training places could only be derived theoretically in such cases where companies are primarily interested in the short-term benefits of training. Nonetheless, an increase in training places induced by cost decreases would not result in additional workers being taken on permanently at a later stage on completion of training. A similar argumentation results from the well-known thesis of the two segments of the German training system (Franz/Soskice 1995 and Neubäumer 1999), although the analyses conducted for the present paper show that these segments do not need to be fully congruent with the scope of application of the production or investment model.

Cost and benefit aspects play a significant role in company training behaviour. Even if a precise quantitative determination of the significance of short-term and longer-term aspects is not possible within the framework of the analyses conducted, the indication is that investment interest preponderates over short-term production interest.

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## Annex: Overview of the analytical and control variables included

Table A1

### As metrically observed variables

	Mean value	Standard deviation
Net full costs	11,287	7,895
Net direct costs	3,310	7,039
Share of skilled workers	67.8	28.2
Years since foundation of company	44.9	65.2
<b>Long-term benefits* (items)</b>		
Obtaining skilled workers when there is a shortage of qualified staff on the labour market	2.0	1.1
Saving recruitment costs on the labour market	2.9	1.2
Saving higher introductory training costs for skilled workers coming from outside the company	2.6	1.2
Training young workers precisely in line with company requirements	1.9	0.95
Avoiding the risk of recruiting the wrong workers, always present when recruiting skilled workers from outside the company	2.4	1.1
Opportunity to select "the best" when offering trainees employment on completion of training	2.2	1.1
Avoiding high staff turnover by obtaining skilled workers who feel a particular association with the company	2.3	1.1

\* Items from 1 = very important to 5 = completely unimportant.  
The values were recoded for the analyses.

Table A2

**Nominally scaled variables: frequency distributions**

	%
<b>Company size</b>	
1 to 9 employees	31.3
10 to 49 employees	34.4
50 employees and more	34.3
<b>Economic branch</b>	
Agriculture and forestry, fishery	3.1
Energy and water supply, mining	1.1
Chemical industry, petroleum, plastics, rubber processing	4.1
Non-metallic minerals, fine ceramics, glass	1.3
Metal production, foundry working, metal working and similar	2.7
Engineering, metal engineering, railway engineering, marine engineering, aviation engineering	5.3
Road vehicle engineering, vehicle repair	2.6
Electronics, IT systems, office machines	4.7
Precision mechanics, optics, watch making	1.9
Iron, steel plate, metal, toy and jewellery manufacture	1.5
Wood working and processing, paper and pulp production/processing	3.4
Printing, reproduction	2.2
Textiles, clothing and leather industry	0.9
Food and luxury goods	5.6
Construction industry (main construction industry, sub construction work)	8.9
Retail trade (including mail order trade)	5.3
Wholesale and foreign trade	3.4
Communications and information transmission (including forwarding agencies, courier services)	1.5
Banking and insurance industry	4.3
Publishing, advertising, print and electronic media, radio and television	2.0
IT software service providers, technical and IT consultancy	3.7
Property and residential property, asset management	0.5
Legal, tax, human resources, finance and business consultancy/investigation	3.4
Architectural and engineering companies	2.2
Independent doctors' surgeries and other health sector occupations	3.9
Catering and hotels	3.6
Tourism, sport, fitness, leisure sector	1.7
Other private services	2.7
Public services	8.1
Other	4.4
<b>Federal state</b>	
Former West Germany	80.3
Former East Germany	19.7
<b>Training field</b>	
Trade and industry	58.0
Craft trades	25.1
Public sector	7.1
Liberal professions	9.5
<b>Status of the company</b>	
Stand-alone company	66.8
Part of a group	12.4
Headquarters of a group	4.7
Other	16.1

Table A3

**Nominally scaled variables: frequency distributions continued**

<b>Occupations*</b>	<b>%</b>
Commercial Chamber of Commerce and Industry (CCI) occupations	22.2
Commercial CCI occupations	13.9
Technical CCI occupations in IT	3.8
Commercial CCI occupations in IT	3.4
Trade sector CCI occupations	3.7
Catering CCI occupations	4.0
Other CCI occupations	3.8
Metal and electrical Craft Trades (CT) occupations	10.0
Commercial CT occupations	3.1
Bricklayer CT	1.6
CT occupations in sub construction sector	3.4
Commercial CT occupations (baker, butcher)	3.3
Hairdresser	1.6
Other CT occupations (such as dental technician)	3.3
Agricultural occupations	3.4
Liberal professions: legal assistant and tax clerk	3.5
Liberal professions: medical and dental assistant	3.6
Technical occupations in the public sector	2.2
Commercial administration occupations in the public sector	6.3

\* Companies providing training only.