

# You Live and Learn: Private-Sector Training in Germany\*

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## Abstract

This paper analyzes the incidence, wage effects and employment effects of private-sector training in Germany. Using data from the SOEP, we concentrate on two periods: *a*) 1997–2000 and *b*) 2001–2004. Our results indicate a fairly similar pattern with regard to the incidence of private-sector training in Germany in both periods, while the picture which arises with respect to the effects of private-sector training on wages is not very robust to the econometric approach. We find positive wage effects of about 4–6 percent in both samples in the fixed effects specifications, but these effects generally decrease quite substantially in the fixed growth rates specifications. With respect to the effect of participation in private-sector training on subsequent employment prospects, we find a positive effect in both samples as the probability of being employed in subsequent years is raised by about 2–3 percentage points. However, this positive employment effect disappears after around 5 years.

**Keywords:** Human Capital; On-the-Job Training; Germany

**JEL Classification:** J24, J31

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# 1 Introduction

Nowadays the speed with which knowledge changes is enormous. In addition, the need—and the possibility—to extend the working life becomes more and more apparent. Both of these facts necessitate a broader provision of training as, e.g., Brenke and Zimmermann (2005) point out. Although this consequence applies to many industrialized countries, this paper focuses on the specific situation in Germany.

We concentrate on training activities of employed individuals, and more specifically on their effectiveness. Training for employed individuals is frequently referred to as private-sector or workplace training. In the literature the distinction between on-the-job and off-the-job training is also often found in this context, but its definition varies and thus does not seem helpful for the purpose of this paper. While dictionaries typically define on-the-job training as being located at the workplace and supervised by experienced workers (Rutherford, 1992; Black, 2002), some studies define on-the-job training as financed or arranged by the employer (e.g., Evertsson, 2004) and other studies regard the formality or informality of training as the distinctive feature (e.g., Dearden et al., 2000). In the course of this paper we thus avoid the terms on-the-job and off-the-job training and use private-sector or workplace training instead.<sup>1</sup>

For many decades the dominant view in Germany had been that school education and initial training provide a sufficient endowment for the entire working life. Further qualifications, if necessary at all, could be obtained through experience on-the-job. However, this view has changed. Lifelong learning is now viewed as a necessary complement to school education and initial training in order to acquire and to update vocational skills and qualifications. This notion has also become an integral part of the federal government's and federal states' agenda. For instance, in 2001 two programs were launched by the Federal Ministry of Education and Research (BMBF) to provide a more systematic approach for stimulating lifelong learning.

While the provision of (public) training for unemployed individuals and for

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<sup>1</sup>Leuven (2005) uses private-sector and on-the-job training interchangeably. According to his definition, both activities exclude formal education, training of the unemployed and learning activities that workers undertake independently from their employer.

those at risk of unemployment is well developed in Germany, the training sector for employed individuals is not well developed in Germany compared to other European countries.<sup>2</sup> According to Figure 1, the participation rate of employed individuals in non-formal education and training is comparatively low in Germany. It amounts to only 16 percent in 2003 which is clearly below the average of 25 member states of the European Union (EU25). In this context, non-formal education and training includes learning activities which are not part of a formal education program.<sup>3</sup> On the other hand, the conditional average intensity of these training activities—given that an employed individual participates in non-formal education—is 74 hours in Germany and thus exceeds the EU25 average. Figure 1 moreover indicates that Sweden, Finland and Denmark exhibit the highest participation rates across the EU25, while Hungary exhibits the highest (conditional) intensity.

Figure 2 displays the development of participation rates of employees in training activities between 1979 and 2003 in Germany.<sup>4</sup> In West Germany, for which data are available over the whole period, the share of participants has been almost steadily increasing during the 1980s and 1990s. Starting in 1997, participation rates decreased slightly. A similar pattern can be observed in East Germany, for which information is however only available from 1991 onwards: Participation rates increased during the 1990s and started to decrease after 1997. While the share of participants has been consistently higher in East Germany with a maximum of 37 percent in 1997, participation rates in East and West Germany were exactly the same in 2003 (26 percent). This latter rate corresponds to about 13 million individuals who participated in workplace training in that year (Kuwan and Thebis, 2004).

The theoretical literature on private-sector training is large. It is comprehensively surveyed by Leuven (2005). The first milestone was set when Jacob Mincer

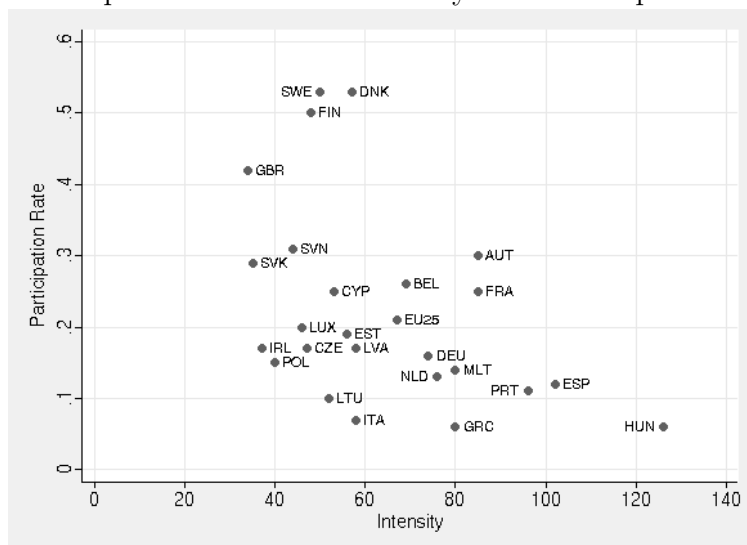
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<sup>2</sup>Public training for the unemployed constitutes the most important part of Germany's active labor market policy (Eichhorst and Zimmermann, 2007). Expenditures on this type of training are also high in comparison to other member states of the European Union (Melis, 2006). For recent studies on its effectiveness see, e.g., Biewen et al. (2007), Lechner and Wunsch (2008), and Rinne et al. (2007).

<sup>3</sup>In contrast, formal education and training corresponds to learning activities which are part of the regular system of schools, universities and colleges.

<sup>4</sup>This definition of training includes both general and specific training provided in courses, seminars or lectures.

Figure 1: Participation Rates and Intensity in the European Union (2003)

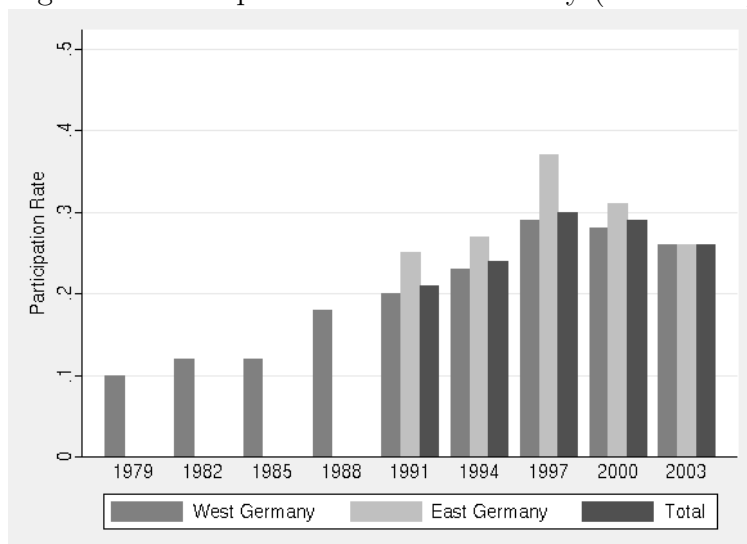


*Note:* Participation Rates (in percent) and mean intensity (in hours taught) of non-formal education and training in 25 member states of the European Union in 2003. Only employed individuals aged 25–64 years are considered. Non-formal education and training includes learning activities which are *not* part of the regular system of schools, universities and colleges.

*Abbreviations:* EU25: EU average (25 member states); BEL: Belgium; CZE: Czech Republic; DNK: Denmark; DEU: Germany; EST: Estonia; GRC: Greece; ESP: Spain; FRA: France; ITA: Italy; IRL: Ireland; CYP: Cyprus; LVA: Latvia; LTU: Lithuania; LUX: Luxembourg; HUN: Hungary; MLT: Malta; NLD: Netherlands; AUT: Austria; POL: Poland; PRT: Portugal; SVN: Slovenia; SVK: Slovakia; FIN: Finland; SWE: Sweden; GBR: United Kingdom.

*Source:* Kailis and Pilos (2005).

Figure 2: Participation Rates in Germany (1979–2003)



*Note:* Participation rates (in percent) in workplace training which includes both general and specific training provided in courses, seminars or lectures. Data for East Germany is only available from 1991 onwards.

*Source:* Kuwan and Thebis (2004), p. 22.

highlighted its importance for a worker's human capital stock and estimated that this type of training accounts for at least half of it (Mincer, 1962).<sup>5</sup> About the same time, the formalization of the human capital theory started with Becker (1962, 1993). This literature can still be considered as the dominant perspective on private-sector training. Importantly, the distinction between general training and specific training has been established since then. Its two main predictions can be summarized as follows: *a*) under perfect competition workers receive all the returns to general training and also pay for this type of training (directly or through lower wages), while liquidity constraints can lead to under-investment; and *b*) firms finance specific training and the returns of this type of a training might be shared between the firms and workers to reduce inefficient turnover.

Motivated—among other things—by the empirical observation that there are many instances in which firms bear significant fractions of the costs of general training, the assumption of perfect competition was subsequently dropped and non-competitive theories of training evolved. These theories focus on market imperfections and information asymmetries and are summarized by Acemoglu and Pischke (1999). Major results of this line of research are the following: *a*) liquidity constraints are not sufficient to ensure firm-sponsored training in the standard perfectly competitive set-up; *b*) underinvestment in training is likely to happen; and *c*) wage compression may encourage firms to pay for training.

These theoretical predictions have been analyzed in a number of empirical studies. Pfeiffer (2001) and Frazis and Loewenstein (2005) summarize the findings for Europe and the U.S., respectively. Typically, the estimates of the wage returns to private-sector training are found to be very high. For Germany, there are already a number of related empirical studies using the same data source used in this paper including Christensen (2001), Pischke (2001), Büchel and Pannenberg (2004) and Sauermann (2006). But these studies either focus on earlier periods (the former three ones) or focus on a specific aspect of the incidence of workplace training (the latter one which explicitly accounts for fixed-term contracts).

This paper studies the incidence and effects of private-sector training on wages and employment stability for two different periods of time: *a*) between 1997 and 2000

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<sup>5</sup>Previous contributions include Pigou (1912) and Rosenstein-Rodan (1943).

and *b*) between 2001 and 2004. Next to investigating the incidence of training in cross-sectional regressions, we exploit the longitudinal dimension of our data. We estimate fixed effect models and random growth models to assess the wage effects of training as well as of different types of training. Furthermore, results on the effects of participation in private-sector training on subsequent employment are presented.

Our results indicate a fairly similar pattern with regard to the incidence of private-sector training in Germany in both periods. However, the picture which arises with respect to the effects of private-sector training on wages is relatively unstable. While we find positive wage effects of about 4–6 percent in both samples in the fixed effects specifications, these effects generally decrease quite substantially in the fixed growth rates specifications. Finally, our results indicate positive effects of participation in private-sector training on subsequent employment prospects, which seems to be solely based on whether or not an individual engaged in training at all and not on the respective duration of training.

The remainder of this paper is organized as follows. Section 2 describes the data of this study. The econometric approach is presented in Section 3, and the results are discussed in Section 4. Finally, Section 5 concludes.<sup>6</sup>

## 2 Data

The data of this study comes from the German Socio-Economic Panel Study (SOEP).<sup>7</sup> The SOEP is a representative longitudinal study of private households in Germany. Its first wave started in 1984, and currently wave 24 is available which covers 2007. In that year, nearly 11,000 households were included, and more than 20,000 persons sampled.

The SOEP data cover a wide range of subjects which are included annually as well as subjects covered in modules of the survey which are not collected in every wave. The latter applies to the module “training” on which data has been collected in 1989 (Pischke, 2001), 1993, 2000 (Wilkins and Leber, 2003; Büchel and Pannenberg, 2004) and 2004 (Sauermann, 2006). In this module, information about

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<sup>6</sup>Section ?? (Appendix) contains additional tables.

<sup>7</sup>See Wagner et al. (2007) for a comprehensive description of this data set.

training activities is collected retrospectively for a period of three years prior to the interview. Individuals aged between 16 and 64 are the target population. Besides data on whether or not the individual has participated in any kind of work-related training, additional information is collected on the total number of training courses during the 3-year-period as well as more specific details about the three most recent courses. These details include start dates, duration, intensity, goals and financing. In what follows, we concentrate on the training information included in 2000 and 2004.

Focusing on that information, we can however not create a panel data set covering the period from 1997 to 2004. Since the training information is collected only for the three years prior to the respective interview date, our data does not cover the training activities which took place between 2000 and 2001. Therefore, we create two different samples: *a)* Sample A covers the period from 1997 to 2000 for which training information was retrospectively collected in 2000, and *b)* Sample B covers the period from 2001 to 2004 for which information was collected in 2004. Both samples are restricted to individuals who were included in the target population of the training questions in 2000 or 2004, respectively. Additionally, we only keep information on individuals who are between 25 and 55 years old and were employed during the entire observation period, i.e., from 1997 to 2000 or from 2001 to 2004, respectively.<sup>8</sup> After dropping observations with missing information in important characteristics, we end up with 2,394 individuals (9,576 observations) in Sample A and 3,432 individuals (13,728 observations) in Sample B.

Table 1 displays descriptive statistics of these samples at the beginning of the respective observation period. The basic socio-demographic characteristics of individuals are fairly similar in both samples. However, individuals in Sample B are about 1.5 years older, more experienced and better educated than in the sample for the earlier period.<sup>9</sup> The share of male and full-time employed individuals is lower in Sample B, while there are more German persons in this sample. With respect to training incidence the descriptive statistics are virtually the same in both samples: Roughly 34 percent have received any kind of training and an individual

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<sup>8</sup>More precisely, we exclude unemployed, inactive, and self-employed individuals. Furthermore, we do not consider persons in full-time education as well as individuals working in military service, in agricultural or fishing industries, or as civil servants.

<sup>9</sup>Potential experience is  $\max(\text{age} - \text{years of schooling} - 6, 0)$ .

Table 1: Descriptive statistics

	Sample A (1997–2000)	Sample B (2001–2004)
Male	0.594 (0.491)	0.578 (0.494)
Age	38.001 (7.431)	39.471 (7.094)
German	0.870 (0.337)	0.913 (0.282)
Full time	0.867 (0.339)	0.830 (0.376)
East Germany	0.286 (0.452)	0.247 (0.431)
Years of schooling	11.962 (2.497)	12.261 (2.471)
Potential Experience	20.039 (7.848)	21.210 (7.646)
Training participant	0.340 (0.474)	0.337 (0.473)
Number of courses	1.282 (2.766)	1.219 (2.725)
# observations	2,394	3,432

*Note:* Standard errors in brackets.

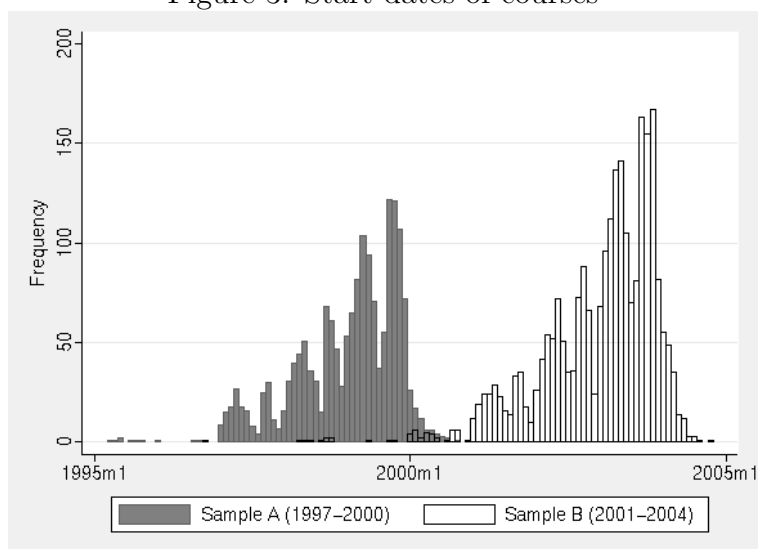
has participated on average in about 1.2 courses.

Although the training questions explicitly refer to the three years prior to the respective interview date, some courses are reported to have started earlier. Figure 3 depicts the distribution of start dates in our working samples. Courses which have started before the respective observation period, i.e., before 1997 or 2001, are only considered in what follows as far as they ended during the observation period.

Table 2 displays more detailed descriptive information about the incidence, duration and various types of training at the individual level. Firstly, the share of individuals participating in any kind of training between two subsequent interviews increases during the respective observation period. This may—at least in part—reflect that the training information is collected retrospectively and that information about the timing of training is only available for the three most recent courses. The descriptive information moreover reveals that most of the training is taught with less than 15 hours per week and aimed to adjust the skills and qualifications to the standards of the current job. Furthermore, the majority of training in our data takes place during leisure hours. Concerning the financing of private-sector training activities, the descriptives show that the majority is financed by the em-



Figure 3: Start dates of courses



*Note:* Start dates of the three most recent courses prior to the respective interview date.

ployer alone in Sample A. In Sample B, which covers the period from 2001 to 2004, the sources of financing are relatively evenly distributed across the four categories we consider. Finally, we can distinguish between general and specific training in Sample B. Clearly, most of the training activities are categorized as specific training by the participants.

Table 2: Training participation

	Sample A			Sample B		
	1997/1998	1998/1999	1999/2000	2001/2002	2002/2003	2003/2004
Participation	0.081 (0.272)	0.190 (0.393)	0.261 (0.439)	0.082 (0.274)	0.171 (0.377)	0.262 (0.440)
Duration	3.853 (30.251)	6.999 (37.987)	9.185 (44.272)	3.267 (27.153)	5.177 (34.416)	7.091 (37.500)
Duration in full-time course	0.326 (6.510)	0.655 (6.136)	0.712 (4.689)	0.308 (7.145)	0.567 (7.226)	0.748 (6.912)
Duration in part-time course	0.491 (11.808)	0.749 (12.150)	1.138 (13.214)	0.388 (9.261)	0.453 (8.319)	0.787 (10.355)
Duration in course with less hours	2.490 (24.638)	3.975 (28.753)	5.508 (35.899)	1.998 (21.300)	3.342 (29.780)	4.296 (30.611)
Duration in correspondence course	0.414 (10.690)	1.378 (19.638)	1.778 (22.047)	0.306 (8.779)	0.417 (9.067)	0.911 (15.994)
Duration in course with aim 1	0.009 (0.429)	0.000 (0.000)	0.066 (3.068)	0.253 (8.428)	0.158 (6.870)	0.219 (8.704)
Duration in course with aim 2	0.093 (3.306)	0.222 (6.525)	0.210 (5.162)	0.006 (0.162)	0.055 (2.124)	0.149 (6.225)
Duration in course with aim 3	0.898 (14.702)	1.833 (20.734)	2.227 (23.848)	1.257 (17.955)	1.457 (19.308)	2.240 (23.071)
Duration in course with aim 4	2.402 (24.056)	4.185 (28.885)	5.685 (34.257)	1.494 (16.570)	2.954 (25.279)	3.710 (25.033)
Duration in course with aim 5	0.450 (10.774)	0.756 (12.651)	0.994 (14.696)	0.308 (9.244)	0.552 (11.677)	0.774 (12.638)
Duration during work hours	1.099 (12.673)	2.615 (21.191)	3.431 (23.476)	1.217 (15.023)	1.973 (18.241)	3.584 (24.995)
Duration during leisure hours	2.753 (27.563)	4.313 (31.631)	5.633 (37.693)	2.050 (22.729)	3.158 (29.284)	3.469 (28.210)
Duration without any financing	0.534 (11.512)	0.837 (13.063)	1.342 (18.924)	0.185 (5.258)	0.447 (9.011)	1.052 (14.272)
Duration financed by employer	0.703 (9.888)	1.510 (11.988)	2.695 (18.480)	0.689 (9.132)	1.297 (13.654)	2.644 (20.176)
Duration financed by employee	1.547 (19.129)	3.139 (27.903)	4.077 (32.901)	1.381 (18.305)	2.139 (24.503)	1.988 (21.930)
Duration financed by both employer and employee	1.060 (18.112)	1.584 (19.660)	1.063 (13.725)	0.820 (15.734)	1.008 (16.090)	1.166 (16.475)
Duration general training				0.582 (10.598)	0.748 (10.833)	1.026 (9.560)
Duration specific training				2.686 (25.058)	4.429 (32.761)	6.030 (36.323)
# observations	2,394	2,394	2,394	3,432	3,432	3,432

*Note:* Standard errors in brackets. Unconditional duration of training activities (in days). Course with aim 1: re-training in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims. Full-time courses: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week. Information about general and specific training only available for Sample B.

### 3 Econometric Approach

#### Incidence

To investigate who participates in private-sector training in our data, we estimate linear probability models (LPM) with a dummy indicating participation at all in workplace training during the three years prior to the interview in 1997 or 2004, respectively. The independent variables included in these models reflect a selection of regressors which are typically included in cross-sectional earnings regressions (e.g., experience, education, firm size).

#### Wage Effects

We moreover exploit the longitudinal dimension of our data. Among other things, this perspective provides a good opportunity to study the wage effects of workplace training. To assess the effects of this type of training, we follow an approach where a wage equation is augmented with training variables (Pischke, 2001).

We start by estimating standard fixed effect regressions to eliminate any effects correlated with the level of wages. Therefore, these models deal with the (potential) selection issue addressed above. Formally, the fixed effect models are as follows:

$$\ln w_{it} = X_{it}\beta + \gamma T_{it} + \alpha_i + \epsilon_{it} , \quad (1)$$

where  $X_{it}$  is a set of regressors including labor market experience and tenure with the current employer,  $T_{it}$  denotes the receipt of training *before* period  $t$ , and  $\alpha_i$  is a fixed individual-specific constant affecting all time-invariant determinants of the level of wages.

However, fixed effect models may still overestimate  $\gamma$ . It is possible that a correlation between training and the growth rates of wages remains, in which case the fixed effect results are biased. We thus also estimate alternative models including individual specific growth rates of wages or earnings:

$$\ln w_{it} = X_{it}\beta + \gamma T_{it} + \alpha_i + \delta_i t + \epsilon_{it} . \quad (2)$$

Table 3: Patterns of training spells

1997/1998	Sample A (1997–2000)			2001/2002	Sample B (2001–2004)		
	1998/1999	1999/2000	# obs.		2002/2003	2003/2004	# obs.
0	0	0	1625	0	0	0	2333
0	0	1	266	0	0	1	438
0	1	0	65	0	1	0	90
0	1	1	245	0	1	1	291
1	0	0	30	1	0	0	44
1	0	1	17	1	0	1	30
1	1	0	50	1	1	0	65
1	1	1	96	1	1	1	141

Equations of this form are commonly referred to as random growth models (see, e.g., Heckman and Hotz, 1989). The coefficient  $\delta_i$  is (roughly) the average annual growth rate—holding the explanatory variables fixed (Wooldridge, 2002).

These models are identified as long as there are at least three periods available on each individual. We already ensured this to be the case when selecting our working samples. Additionally, enough variation in the individuals' training receipt across the periods is needed since individuals who receive (the same amount of) training each year do not contribute to the estimation of  $\gamma$  (Pischke, 2001). Table 3 displays the patterns of training spells in our working samples. Since only about 4 percent of the individuals in both samples received training between each of the waves being analyzed, the remaining participants will allow estimating the wage effects in the model with heterogenous growth rates.

## Subsequent Employment

To assess the effects of participation in private-sector training on subsequent employment, we estimate linear probability models (LPM) with a dummy indicating that the given individual is employed in the primary labor market at the respective interview date. The respective investigation period ranges from 2001 to 2007 for Sample A and from 2005 to 2007 for Sample B. Besides variables that describe the training activities in the three years prior to the investigation period, the regressions include additional control variables such as years of education, experience, unemployment rates, and GDP growth.

## 4 Results

This section presents the results of our empirical analyses. After analyzing the incidence of private-sector training in our samples, we present our estimates of the wage effects of this type of training.<sup>10</sup> Finally, the results on the effects of private-sector training on subsequent employment are displayed.

### Incidence

The first two columns of Table 4 present estimates of a linear probability model investigating the incidence of workplace training in the two samples. The dependent variable is a dummy variable indicating whether or not the individual receives any kind of training during the respective observation period.

Our results indicate that individuals with a German citizenship, employees of larger firms and more educated individuals are significantly more likely to receive training during both periods. The incidence of training significantly decreases with the potential experience of a given individual. After additionally controlling for the occupational level, individuals living in East Germany are significantly more likely to receive training in both samples.

### Wage Effects

Below, we will assess the effect of participation in workplace training on hourly wages (and earnings). Figure 4 shows the annual average gross hourly wages in our working samples. For this representation, we differentiate between individuals who receive any kind of training during the observation period and those who do not. It shows that there are substantial differences between individuals who participate in private-sector training and those who do not both in terms of the level of hourly wages as well as the growth rates. It thus seems to be appropriate taking this into account when analyzing the wage effects of private-sector training.

As mentioned above, fixed effect regressions will eliminate any effects correlated with the level of wages. This type of models is therefore a way to deal with the

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<sup>10</sup>The Appendix contains estimates of the earnings effects of private-sector training.

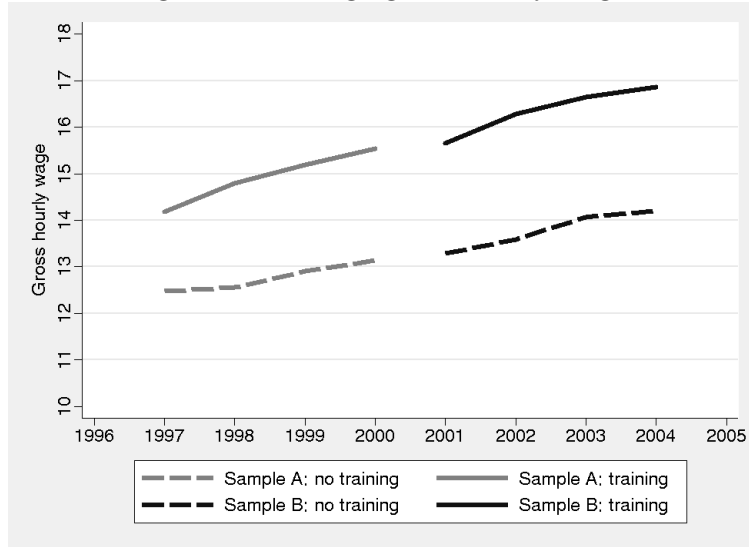
Table 4: Training incidence

	Sample A (1997–2000)		Sample B (2001–2004)	
	(1)	(2)	(1)	(2)
Years of schooling	0.03*** (0.004)	0.007 (0.005)	0.028*** (0.004)	0.003 (0.004)
Potential experience	-.004*** (0.001)	-.004*** (0.001)	-.005*** (0.001)	-.006*** (0.001)
Male	-.006 (0.022)	0.029 (0.024)	0.012 (0.019)	0.027 (0.02)
German	0.175*** (0.03)	0.1*** (0.03)	0.105*** (0.029)	0.043 (0.029)
Full time	0.05 (0.031)	0.042 (0.03)	0.032 (0.024)	0.006 (0.024)
East Germany	0.032 (0.022)	0.06*** (0.022)	0.005 (0.019)	0.038** (0.019)
Untrained worker		— (—)		— (—)
Semi-trained worker		0.031 (0.059)		0.047 (0.063)
Trained worker		0.121** (0.059)		0.137** (0.063)
Foreman		0.227*** (0.067)		0.245*** (0.071)
Untrained employee		0.167** (0.072)		0.148* (0.076)
Trained employee		0.263*** (0.065)		0.197*** (0.067)
Qualified professional		0.331*** (0.058)		0.303*** (0.063)
High qualified professional / managerial		0.356*** (0.064)		0.38*** (0.067)
Firm size <20	— (—)	— (—)	— (—)	— (—)
Firm size 20–200	0.04 (0.027)	0.037 (0.026)	0.018 (0.022)	0.011 (0.022)
Firm size 200–2000	0.076*** (0.028)	0.066** (0.027)	0.078*** (0.024)	0.075*** (0.024)
Firm size ≥2000	0.156*** (0.029)	0.131*** (0.028)	0.143*** (0.024)	0.128*** (0.024)
# obs.	2,394	2,394	3,432	3,432
R <sup>2</sup>	0.118	0.158	0.097	0.131

*Note:* Regressors refer to 1997 or 2001, respectively. Regressions additionally include a constant and 12 industry dummies. Standard errors in brackets.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%; — reference category.

Figure 4: Average gross hourly wages



Note: Gross hourly wages in Euros. We adjust for inflation by using the respective CPI.

selection issue, i.e., the selection into training based on unobservable characteristics which are related to the level of wages. Tables 5 and 6 display the results of fixed effect regressions on log hourly wages, where specifications (1)–(6) include a series of different training variables. In the first specification we estimate the annual effect of training on the hourly wage rate of about 4 percent in Sample A and 6 percent in Sample B. However, only in the latter case the estimated coefficient is significantly different from zero. The additional inclusion of a dummy variable for participating in training at all (in addition to the duration variable) slightly raises the effects in both cases. The estimated coefficient on the dummy variable is negative, which can be interpreted as evidence in favor of the notion that participation itself does not itself have a positive impact on hourly wages but the respective duration does so. Or, alternatively, very short training courses do not improve the wage prospects.

Further specifications include the respective training duration for different types of training, where we distinguish courses *a)* by intensity, *b)* by aim, *c)* whether taking place during work or leisure hours (or while being unemployed), and *d)* by sponsor. For Sample B we can moreover distinguish between general and specific training. The results of these regressions indicate that full-time training courses, i.e., courses which are taught with 30 hours per week or more, have negative wage effects in both samples—although these effects are not significantly different from

zero. With respect to the aim of the courses, the picture is less clear cut. While in Sample A courses which aim to adjust skills and qualifications to the standards of the current job show significantly positive wage effects, we identify courses with other as courses with significantly positive wage effects in Sample B. With respect to the timing of the courses, the results for the two samples essentially point into the opposite directions: While training which takes place during work hours has a significantly positive wage effect in Sample A, it is training which takes place during leisure hours for which we find such an effect in Sample B. We find positive wage effects in both samples for courses which are financed by both the employer and employee, although only in Sample A the estimated coefficient is significantly different from zero. In Sample B we instead find a significantly positive wage effect of training which is financed by the employee alone. Finally, the distinction between general and specific training which we can only perform in Sample B reveals a significantly positive wage effect of specific training.

However, fixed effect models may still overestimate  $\gamma$  (i.e., the effect of one year spent in training on wages) for the reasons mentioned above. Therefore, we also estimate random growth models which include individual specific growth rates of wages. Tables 7 and 8 present the results of these regressions. Compared to fixed effect models, the estimated coefficients indeed generally decrease quite substantially. While in the first specification the estimated annual effect of training on the hourly wage rate remains at about 4 percent in Sample A, it decreases and becomes virtually zero in Sample B. Further specifications which include the respective training duration for different types of training reveal the following results: *a)* in both samples, correspondence courses have positive wage effects (significantly positive only in Sample A), while all other types of courses with higher intensities have negative wage effects; *b)* courses without any financing have a significantly positive wage effect in Sample A; and *c)* general training has a positive wage effect in Sample B, but this effect is not significantly different from zero.

## Subsequent Employment

We assess the effects of participation in private-sector training on subsequent employment by estimating linear probability models with a dummy indicating that the



Table 5: Fixed effects log hourly wage regressions: 1997–2000

	(1)	(2)	(3)	(4)	(5)	(6)
Any training		-0.004 (0.01)				
Training duration	0.04 (0.03)	0.046 (0.033)				
Training duration full-time			-0.128 (0.224)			
Training duration part-time			0.28*** (0.089)			
Training duration less hours			0.02 (0.038)			
Training duration correspondence course			0.011 (0.064)			
Training duration aim 1				0.869 (0.831)		
Training duration aim 2				0.055 (0.229)		
Training duration aim 3				0.0008 (0.056)		
Training duration aim 4				0.066* (0.039)		
Training duration aim 5				-0.001 (0.087)		
Training duration during work					0.136** (0.058)	
Training duration during leisure					0.007 (0.035)	
Duration without any financing						0.028 (0.079)
Duration financed by employer						0.013 (0.085)
Duration financed by employee						0.009 (0.042)
Duration financed by both employer and employee						0.134** (0.065)
# obs.	9,576	9,576	9,576	9,576	9,576	9,576
$R^2$	0.016	0.016	0.017	0.016	0.016	0.016

*Note:* Unbalanced sample including 3,224 individuals. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table 6: Fixed effects log hourly wage regressions: 2001–2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Any training		-0.015 (0.01)					
Training duration	0.06* (0.036)	0.081** (0.039)					
Training duration full-time			-0.110 (0.187)				
Training duration part-time			0.062 (0.128)				
Training duration less hours			0.068 (0.044)				
Training duration correspondence course			0.123 (0.105)				
Training duration aim 1				0.233 (0.148)			
Training duration aim 2				0.035 (0.345)			
Training duration aim 3				0.025 (0.06)			
Training duration aim 4				0.029 (0.054)			
Training duration aim 5				0.215** (0.106)			
Training duration during work					-0.025 (0.064)		
Training duration during leisure					0.103** (0.044)		
Duration without any financing						-0.028 (0.134)	
Duration financed by employer						-0.016 (0.086)	
Duration financed by employee						0.093* (0.053)	
Duration financed by both employer and employee						0.063 (0.075)	
Duration general training							-0.045 (0.122)
Duration specific training							0.07* (0.038)
# obs.	13,728	13,728	13,728	13,728	13,728	13,728	13,728
R <sup>2</sup>	0.008	0.009	0.009	0.009	0.009	0.008	0.008

*Note:* Unbalanced sample including 4,487 individuals. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table 7: Fixed growth rates log hourly wage regressions: 1997–2000

	(1)	(2)	(3)	(4)	(5)	(6)
Any training		-.085*** (0.025)				
Training duration	0.041 (0.092)	0.14 (0.097)				
Training duration full-time			-.300 (0.467)			
Training duration part-time			-.298 (0.327)			
Training duration less hours			-.044 (0.117)			
Training duration correspondence course			0.382** (0.185)			
Training duration aim 1				-.499 (1.408)		
Training duration aim 2				0.439 (0.583)		
Training duration aim 3				0.073 (0.184)		
Training duration aim 4				-.003 (0.115)		
Training duration aim 5				0.175 (0.307)		
Training duration during work					0.212 (0.174)	
Training duration during leisure					-.021 (0.108)	
Duration without any financing						0.51** (0.228)
Duration financed by employer						0.03 (0.239)
Duration financed by employee						-.068 (0.132)
Duration financed by both employer and employee						-.075 (0.2)
# obs.	7,182	7,182	7,182	7,182	7,182	7,182
$R^2$	0.001	0.003	0.002	0.001	0.001	0.002

*Note:* Unbalanced sample including 3,224 individuals. The models are estimated by applying fixed effects to the differenced equation. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table 8: Fixed growth rates log hourly wage regressions: 2001–2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Any training		0.013 (0.027)					
Training duration	0.0006 (0.113)	-.015 (0.117)					
Training duration full-time			-.215 (0.436)				
Training duration part-time			-.472 (0.429)				
Training duration less hours			-.002 (0.136)				
Training duration correspondence course			0.365 (0.312)				
Training duration aim 1				0.264 (0.522)			
Training duration aim 2				0.106 (0.861)			
Training duration aim 3				-.121 (0.198)			
Training duration aim 4				0.127 (0.158)			
Training duration aim 5				-.323 (0.346)			
Training duration during work					-.073 (0.171)		
Training duration during leisure					0.058 (0.149)		
Duration without any financing						-.006 (0.298)	
Duration financed by employer						0.012 (0.22)	
Duration financed by employee						0.009 (0.192)	
Duration financed by both employer and employee						-.006 (0.231)	
Duration general training							0.094 (0.326)
Duration specific training							-.011 (0.12)
# obs.	10,296	10,296	10,296	10,296	10,296	10,296	10,296
R <sup>2</sup>	0.001	0.001	0.001	0.001	0.001	0.001	0.001

*Note:* Unbalanced sample including 4,487 individuals. The models are estimated by applying fixed effects to the differenced equation. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

given individual is employed in the primary labor market at the respective interview date. In these models, we include variables that describe the training activities in the three years prior to the investigation period. More specifically, we include a dummy variable indicating whether or not the individual participated in any training activities at all as well as the duration which he or she spent in training activities (in years).

The results of these regressions are shown in Tables 9 and 10. We find a positive impact of participation in private-sector training on subsequent employment probabilities in both samples. The probability of being employed in subsequent years is raised by about 2–3 percentage points. While the effect becomes significantly different from zero only in 2003 and 2004 for Sample A, i.e., 3 and 4 years after we observe the last training information, it is significantly positive immediately in Sample B. However, the positive employment effects seem to disappear after around 5 years as the results for Sample A suggest. Note that in both samples the respective duration which has been spent in training activities does not improve subsequent employment prospects. Therefore, the positive effect of private-sector training which we find seems to be solely based on whether or not an individual engaged in training at all.

Table 9: OLS: employed at all, Sample A

	2001	2002	2003	2004	2005	2006	2007
Any Training	0.009 (0.009)	0.018 (0.012)	0.024* (0.013)	0.03** (0.014)	0.015 (0.016)	0.008 (0.017)	0.012 (0.017)
Training Duration	-.003 (0.016)	0.016 (0.021)	0.03 (0.023)	-.017 (0.025)	-.003 (0.027)	0.018 (0.03)	0.033 (0.03)
# obs.	2,394	2,262	2,189	2,111	2,028	1,897	1,819
$R^2$	0.012	0.012	0.012	0.02	0.025	0.048	0.083

*Note:* Training duration in years. Regressions additionally include years of education, experience, sex, citizenship, East/West Germany, regional unemployment rate, and regional GDP growth.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table 10: OLS: employed at all, Sample B

	2005	2006	2007
Any Training	0.026*** (0.007)	0.014 (0.009)	0.017* (0.009)
Training Duration	-.019 (0.015)	-.011 (0.018)	0.023 (0.018)
# obs.	3,432	3,195	3,038
$R^2$	0.011	0.007	0.015

*Note:* Training duration in years. Regressions additionally include years of education, experience, sex, citizenship, East/West Germany, regional unemployment rate, and regional GDP growth.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

## 5 Conclusion

This paper analyzes the incidence, wage effects and employment effects of private-sector training in Germany. We use data from the SOEP and focus on a specific module, in which information about training activities is collected retrospectively for a period of three years prior to the interview. We concentrate on two periods: *a)* from 1997 to 2000 for which training information was retrospectively collected in 2000 and *b)* from 2001 to 2004 for which information was collected in 2004.

Our results indicate a fairly similar pattern with regard to the incidence of private-sector training in Germany in both periods. Individuals with a German citizenship, employees of larger firms and more educated individuals are significantly more likely to receive training during both periods. Only after additionally controlling for the occupational level, individuals living in East Germany are significantly more likely to receive training in both samples.

The picture which arises with respect to the effects of private-sector training on wages is relatively unstable. While we find positive wage effects of about 4–6 percent in both samples in the fixed effects specifications, these effects generally decrease quite substantially in the fixed growth rates specifications. More specifically, while the estimated annual effect of training on the hourly wage rate remains at about 4 percent for the earlier period, it decreases and becomes virtually zero for the later period.

With respect to the effect of participation in private-sector training on subsequent employment prospects, we find a positive effect in both samples. The probability of being employed in subsequent years is raised by about 2–3 percentage points. However, this positive employment effect seems to disappear after around 5 years. We moreover find that the respective duration which has been spent in training activities does not improve subsequent employment prospects; it thus seems that the positive employment effect of private-sector training is solely based on whether or not an individual engaged in training at all.

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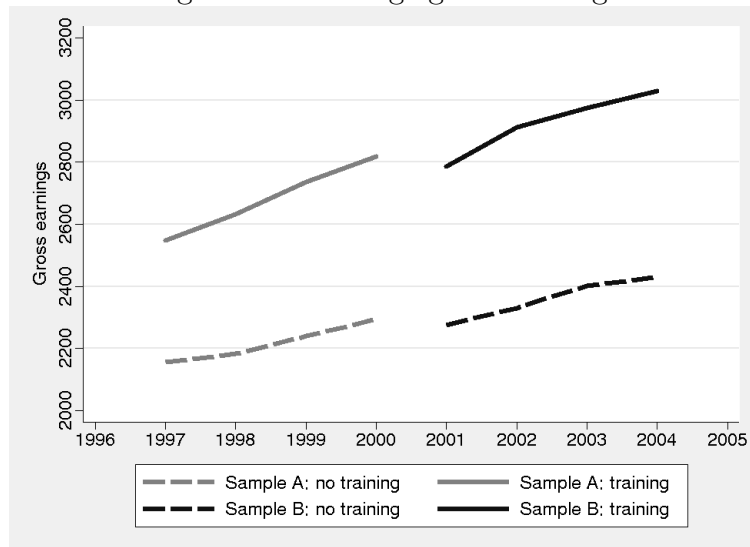
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# Appendix

Figure A1: Average gross earnings



*Note:* Gross earnings in Euros. We adjust for inflation by using the respective CPI.

Table A1: Fixed effects log earnings regressions, 1997–2000

	(1)	(2)	(3)	(4)	(5)	(6)
Any training		-.005 (0.009)				
Training duration	0.05* (0.03)	0.057* (0.032)				
Training duration full-time			-.188 (0.22)			
Training duration part-time			0.361*** (0.087)			
Training duration less hours			0.03 (0.037)			
Training duration correspondence course			-.006 (0.062)			
Training duration aim 1				0.723 (0.816)		
Training duration aim 2				-.084 (0.225)		
Training duration aim 3				0.023 (0.055)		
Training duration aim 4				0.077** (0.039)		
Training duration aim 5				-.006 (0.085)		
Training duration during work					0.166*** (0.057)	
Training duration during leisure					0.009 (0.035)	
Duration without any financing						0.023 (0.077)
Duration financed by employer						0.06 (0.083)
Duration financed by employee						-.002 (0.041)
Duration financed by both employer and employee						0.183*** (0.064)
# obs.	9,576	9,576	9,576	9,576	9,576	9,576
R <sup>2</sup>	0.031	0.031	0.033	0.031	0.031	0.031

*Note:* Unbalanced sample including 3,224 individuals. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table A2: Fixed effects log earnings regressions: 2001–2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Any training		-0.012 (0.01)					
Training duration	0.048 (0.036)	0.064* (0.039)					
Training duration full-time			-0.047 (0.186)				
Training duration part-time			0.118 (0.127)				
Training duration less hours			0.051 (0.044)				
Training duration correspondence course			0.049 (0.105)				
Training duration aim 1				0.136 (0.147)			
Training duration aim 2				0.04 (0.343)			
Training duration aim 3				0.023 (0.059)			
Training duration aim 4				0.016 (0.053)			
Training duration aim 5				0.216** (0.106)			
Training duration during work					-0.008 (0.064)		
Training duration during leisure					0.076* (0.044)		
Duration without any financing						-0.009 (0.133)	
Duration financed by employer						0.0005 (0.086)	
Duration financed by employee						0.054 (0.053)	
Duration financed by both employer and employee						0.062 (0.075)	
Duration general training							-0.037 (0.121)
Duration specific training							0.056 (0.038)
# obs.	13,728	13,728	13,728	13,728	13,728	13,728	13,728
R <sup>2</sup>	0.018	0.018	0.018	0.019	0.018	0.018	0.018

*Note:* Unbalanced sample including 4,487 individuals. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table A3: Fixed growth rates log earnings regressions: 1997–2000

	(1)	(2)	(3)	(4)	(5)	(6)
Any training		-0.075*** (0.025)				
Training duration	0.049 (0.09)	0.138 (0.094)				
Training duration full-time			-0.106 (0.455)			
Training duration part-time			-0.116 (0.319)			
Training duration less hours			-0.019 (0.114)			
Training duration correspondence course			0.302* (0.18)			
Training duration aim 1				-0.464 (1.373)		
Training duration aim 2				0.322 (0.568)		
Training duration aim 3				0.141 (0.18)		
Training duration aim 4				0.004 (0.113)		
Training duration aim 5				0.065 (0.299)		
Training duration during work					0.166 (0.17)	
Training duration during leisure					0.006 (0.106)	
Duration without any financing						0.536** (0.223)
Duration financed by employer						-0.028 (0.233)
Duration financed by employee						-0.039 (0.129)
Duration financed by both employer and employee						-0.063 (0.195)
# obs.	7,182	7,182	7,182	7,182	7,182	7,182
R <sup>2</sup>	0.009	0.011	0.009	0.009	0.009	0.009

*Note:* Unbalanced sample including 3,224 individuals. The models are estimated by applying fixed effects to the differenced equation. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.

Table A4: Fixed growth rates log earnings regressions: 2001–2004

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Any training		0.016 (0.027)					
Training duration	-0.018 (0.112)	-0.036 (0.117)					
Training duration full-time			-0.114 (0.432)				
Training duration part-time			-0.304 (0.426)				
Training duration less hours			-0.040 (0.135)				
Training duration correspondence course			0.322 (0.31)				
Training duration aim 1				0.359 (0.518)			
Training duration aim 2				0.008 (0.854)			
Training duration aim 3				-0.094 (0.196)			
Training duration aim 4				0.06 (0.157)			
Training duration aim 5				-0.259 (0.343)			
Training duration during work					-0.065 (0.169)		
Training duration during leisure					0.019 (0.147)		
Duration without any financing						-0.021 (0.295)	
Duration financed by employer						0.048 (0.219)	
Duration financed by employee						-0.062 (0.191)	
Duration financed by both employer and employee						0.041 (0.229)	
Duration general training							0.091 (0.324)
Duration specific training							-0.031 (0.119)
# obs.	10,296	10,296	10,296	10,296	10,296	10,296	10,296
R <sup>2</sup>	0.004	0.004	0.004	0.004	0.004	0.004	0.004

*Note:* Unbalanced sample including 4,487 individuals. The models are estimated by applying fixed effects to the differenced equation. Training duration in years. All regressions also include a full set of year dummies. Standard errors in brackets.

Course with aim 1: retraining in a different occupation; aim 2: adjustment to standards of new job; aim 3: qualification for promotion; aim 4: adjustment to standards of current job; aim 5: other aims.

Full-time course: 30 hours per week and more; part-time courses: between 15 and 30 hours per week; less intense courses: less than 15 hours per week.

\*\*\* significant at 1%; \*\* significant at 5%; \* significant at 10%.