The aims of lifelong learning: Age-related effects of training on wages and job security

Julia Lang

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by

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Abstract

This study analyses the effects of training participation on wages and perceived job security for employees of different ages. Based on data from the German Socio-Economic Panel, results indicate that only younger workers benefit from training by an increase in wages, whereas older employees' worries about losing their job are reduced. This observation can also be explained by the fact that goals of training courses are related to the age of participants. Moreover, I differentiate between workers who permanently and only occasionally participate in training. The results indicate that there seem to be decreasing marginal returns to training with respect to job security.

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1 Introduction

In the course of rapid technical progress lifelong investments in human capital have become indispensable for the majority of employees to be successful in their job. Starting with Becker (1962) not only a lot of theoretical work has been carried out until today. There is also an extensive empirical literature dealing with training investments and their effects.[1] Despite many educational policy demands for lifelong learning, most continuing training takes place at the beginning of working life. Many empirical studies find that the incidence of training activities decreases with age (e.g. Booth, 1991, Bassanini et al., 2007). With regard to Becker's human capital theory this finding seems to be plausible because the older an employee the shorter is the amortisation period of training investments. An argument in favour of training especially for older workers is that their initial training was a long time ago and their skills could have become obsolete over time. Regarding the effects of training, empirical analyses find that they often differ by age. Most studies analyse wage effects of training and they provide evidence for increasing wages especially for younger workers (e.g. Bassanini, 2006, Pfeifer et al., 2008 for German employees). However, workers cannot only benefit from training by rising wages but training can also increase their employability and decrease the risk to become unemployed.

In this study I use data from the German Socio-Economic Panel (SOEP) for the years 2000, 2004 and 2008 and first also estimate training effects for younger and older employees. The results indicate that training has very different impacts on the considered labour market outcomes of workers of different ages. Applying difference-in-differences I find that older workers realize no wage rise but their perceived employment security increases. Younger workers, however, mainly benefit from training by higher wage growth. Furthermore, the results indicate that some of the effects depend on whether workers have repeatedly participated in training or if training takes place occasionally. The findings suggest that there might be a decrease in marginal returns from successive training especially in the case of perceived job security of older workers. Another explanation for the results could be that for some employees with specific jobs or positions regular training is indispensable and just something like a routine job activity or might even be obligatory. Thus, it could be possible that for this group of employees positive training effects are weaker or non-existent.

It is very likely that younger and older employees pursue different objectives when participating in training courses. To analyse the different labour market effects of training for older and younger workers in more detail, I focus on the goals of training courses. I identify

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[1] For an overview over possible effects of training see e.g. Bassanini et al. (2007) and Hansson (2008).

wage and job security effects of training courses with different purposes. My results show that the two most important aims respondents assign to courses have very different impacts on labour market outcomes. If workers are trained to adjust to new demands in their current job (the most often stated aim), this can reflect in higher perceived job security after training. In contrast, as could be expected, further qualification for professional advancement (the second most important purpose) as well as training to get introduced to a new job increase wages. Different aims could explain different outcomes between several groups of trained persons. The positive impact of training on job security of older employees could be attributed to the fact that they mainly attend training courses which aim at adjusting skills to new requirements of their job. For this group of employees training can help to fill a productivity gap in their current job. In contrast, younger employees more often participate in courses aiming at qualifying them for professional advancement or introducing them to a new job, which could explain their increasing wages. In contrast to job security effects for older workers, positive wage effects for young employees do not depend on the pre-sample training history.

This paper is structured as follows: The following section provides an overview of the theoretical considerations as well as the empirical results regarding incentives for continuous training and its effects on labour market outcomes. Afterwards, Section 3 describes the data and the econometric approach used to estimate training effects, followed by the empirical analysis in Section 4. Finally, Section 5 concludes.

2 Background

2.1 Training goals in the course of working life

The theoretical discussion about investments in human capital mainly focuses on the question who invests in and benefits from training, employees or employers[2]. Studies about the determinants of training participation find that individual, job, firm and institutional characteristics are important. With regard to individual factors the probability to attend training courses can depend on the amortization period for training investments. As it is much shorter the older a worker is, human capital theory indicates that training incidence decreases with age which is also found empirically (for example Booth, 1991, Ok and Tergeist, 2003, Büchel and Pannenberg, 2004, Bassanini et al., 2007).

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[2] Becker (1962) established the idea that investments in human capital could be differentiated according to their specialisation and, depending on it, there can be different effects on workers' wages and differences in the division of training costs between employers and employees. Contrary to his theoretical predictions many empirical studies find that on-the-job training is at least partly paid for by the firm, although most training activities are identified as investment in general human capital. More recent theoretical approaches can explain these observations, e.g. Katz and Ziderman (1990), Acemoglu and Pischke (1999a, b).

There are several reasons why employers and employees consider investing and taking part in training, respectively. The purpose of investments in human capital may differ depending on the phase of working life. Training courses which aim at the introduction to a new job typically take place at the beginning of working life directly after initial training (Lois, 2007) but might also be necessary if a worker changes his or her job or place of work during working life.

Motivation for training might also change over time. This does not necessarily mean that motivation for training decreases with age, but that older and younger workers may have different motives for training participation (Zwick, 2011). Ebner et al. (2006) find that goal orientation strongly changes during the lifecycle. Young adults aim at growth, whereas older persons focus on maintenance and loss prevention. With regard to training activities, this can reflect in different training purposes. Younger workers may choose courses which boost their career and increase their wage. Older workers might pursue very different aims. As their initial training took place a long time ago, many skills might have become obsolete over time which worsens labour market prospects of this group of employees. Thus, for older workers training on-the-job can be important to adjust their skills and knowledge to new job requirements caused e.g. by technological change. A severe loss of human capital of older workers can even involve retraining for a new job although empirical studies indicate that job mobility decreases with age (see e.g. Zimmermann, 1998).

Wages of older workers might exceed their productivity due to seniority-based payment systems and stagnating or even decreasing productivity above a certain age, which negatively affects their employability (Skirbekk, 2003). Concerning empirical evidence, some studies find a wage-productivity gap for older workers (e.g. Dostie, 2006, Cataldi et al., 2011) where others report no evidence for older employees' productivity lagging behind wages (e.g. van Ours and Stoeldraijer, 2010). Skirbekk (2003) argues that older workers' experience has a positive impact on their productivity but only up to a given duration. Afterwards, job performance may decline because cognitive abilities decrease with age. If there really is a discrepancy between wage and productivity of older employees, it may be necessary to increase productivity by adjusting knowledge and skills to current demands in the job. Training participation of older workers would then be a measure to close a potential wage-productivity gap and improve employability.

If purposes of training courses are very different for older and younger workers, also the effects on different labour market outcomes should differ. Young employees at the beginning of their working life aim at professional advancement which can reflect in higher wages,

whereas older employees try to keep their skills up-to-date to prevent (job) losses. Therefore, training of older employees might not reveal in higher wages but in an increase in employability and job security. If older workers participate in training courses because productivity even lags behind their wages, they will certainly not be rewarded by a wage increase. Participation in courses that help to get introduced to a new job can reflect in higher wages if it is due to a career move, but starting a new job (regardless of whether getting training or not) can also be associated with a decrease in job security as normally there is a probationary period in a new job. Furthermore, workers might not know what to expect from a new job (with respect to job requirements, colleagues, superiors) when starting it. Clearly, in such a case training does not necessarily have a causal impact on job security but just occurs in a situation of high uncertainty.

2.2 Empirical evidence on training effects

The extensive empirical literature on wage effects mainly confirms that workers benefit from training by an increase in wages.[3] Only very few studies report no positive impact of training.[4] With regard to financing of courses Booth and Bryan (2005) find a positive wage effect of employer-financed training for British employees whereas participation in self-financed courses has no effect.[5] Pfeifer et al. (2008) obtain similar results for Germany whereas Gerfin (2004) reports somewhat lower effects for employer-sponsored training in Switzerland compared to all work-related training but the difference is not significant.

Besides effects on wages, some studies also analyse the impact of training on employability and job security or career opportunities. Dieckhoff (2007) reports that, in Germany, continuous training decreases the probability to get unemployed and increases the probability to find a new job for unemployed persons which is not the case in Denmark and the UK. Furthermore, for Danish and German workers, trained ones are more likely to change into

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[3] See e.g. Lynch, 1992, Loewenstein and Spletzer, 1998, Parent, 1999, Frazis and Loewenstein, 2005 for the US; Booth, 1991, Blundell et al., 1996, Budria and Pereira, 2004, Gerfin, 2004, Büchel and Pannenberg, 2004, Beckmann, Mühler and Schauenberg, 2007 for European countries.

[4] For example Goux and Maurin (2000) analyse wages of trained French workers. They find that, after controlling for selection into training, there is no significant wage effect anymore. They suppose that especially employees with high ability get trained. Pischke (2001) also finds positive but insignificant effects of training on wages of German employees. However, returns to training during work hours seem to be smaller than to training during leisure time.

[5] This contradicts Becker's theory, where only specific training is partly paid for by the employer, but in return the employer also profits from training investments by an increase in productivity which should exceed the increase in employees' wages. If workers finance their training without any financial help (which according to Becker's theory would be the case for general training) wage growth could be expected to be larger than in the case of employer-sponsored training. Although more recent theoretical approaches can explain the fact that employers pay for general training (see e.g. Acemoglu and Pischke, 1999a, b), it is not obvious why wage effects should be even higher in this case.

higher level occupations. Analysing European data, Ok and Tergeist (2003) come to the conclusion that, besides rising wages, continuing training significantly increases the chances to find a new job after having been laid off, but find no significant effect on the probability to be laid off for employed persons.

Several studies report that different groups of employees – e.g. workers of different age - benefit from training in different ways. Melero (2004), using data from the British Household Panel Survey (BHPS), finds training being important for careers of female workers. The correlation of training and promotion chances for women decreases with age, whereas there is no clear pattern for male employees. Wage increases caused by promotion and training are lower for older workers.

Bassanini (2006) analyses European data and comes to the conclusion that employees disadvantaged on the labour market - older and low-skilled workers - profit from training taken with previous employers by increased perceived job security, whereas workers with already good career prospects on the labour market (young and highly qualified employees) benefit from wage growth. Training taken with the current employer induces wage increases and higher job security for all workers, regardless of age, gender or educational attainment.

Picchio and van Ours (2011) report a positive impact of training participation in the previous year on the probability of not becoming unemployed for both younger and older workers in the Netherlands. Büchel and Pannenberg (2004) analyse SOEP data and find, among other things, positive wage effects especially for the group of younger workers, at least in West Germany, but in their study this is also the age group which benefits from training by a reduction of the risk to become unemployed. Pfeifer et al. (2008) also use SOEP and BHPS data. For Germany, they find that employer-financed training significantly increases wages, where the effects are higher for younger and male employees. Furthermore, low-skilled and older workers benefit from training – also especially from employer-financed courses - by a reduction of their unemployment risk. British workers realize a wage increase by participating in employer-financed training where this positive effect is stronger for older employees and women.

Besides training incidence many studies also take into account the amount of training, measured e.g. by the duration of training or the number of courses. For example Büchel and Pannenberg (2004) or Booth and Bryan (2007) find that wages increase with the number of training courses. However, Franzis and Loewenstein (2005) report that the wage return to an extra hour of training diminishes rapidly with the amount of training received. In contrast, Arulampalam and Booth (2001) report that not the number of training courses but only

training incidence matters for wage growth of young men. As I find quite clear effects of training incidence in this study and the results on training intensity are somewhat ambiguous, I only mention other measures of training (number of courses and duration) in connection with some robustness checks (see Chapter 5.4.3). Nevertheless, depreciation of human capital can necessitate multiple or repeated training events.

2.3 Empirical evidence on training goals

Different effects for special groups of workers can be explained by the fact that employees (and employers) consider training necessary due to different reasons. Budria and Pereira (2007) take into account the purpose of training courses of Portuguese workers. They differentiate between courses which are aimed at updating or improving skills that employees need for their current job and courses which aim at developing skills for future employment. They find higher wage effects for training which improves skills needed for the current job.

Booth and Bryan (2007) analyse British data and also differentiate between the aims of training. They divide courses into four different training types, "induction", "current skills", "future skills" and "general skills", which are not mutually exclusive. In their analysis of wage effects however, they mainly focus on current skills training and find that this type of training increases wages in current as well as future jobs.

Beicht et al. (2006) and Zwick (2011) use German data sets and compare goals and the self-assessed effectiveness or benefits from training. Beicht et al. (2006) find that with regard to socio-demographic aspects, older employees consider most of the different goals of training less important than younger workers. This is especially the case for aims which indicate an enhancement of career opportunities. With regard to the returns of further training, the assessed benefits of training participation mostly decrease with age. Compared to young workers, the oldest workers (aged 55-64) report lower perceived gains for almost all categories (except of social and professional contacts), even for job security. Zwick's (2011) results mainly confirm these findings. His analysis also shows that employees of the oldest age group report less importance of different training goals, they even attribute less importance to higher job security. Concerning the benefits of training, younger workers find their training activities more effective with regard to most training goals, except of higher earnings and job security. Zwick's (2011) study focuses on explaining why training for older employees is less effective. He comes to the conclusion that this is caused by a wrong allocation of training contents and training forms.

I estimate the effects of training participation on two labour market outcomes, wages and job security. Besides estimating effects for different age groups, I try to explain different effects by different training purposes. As courses with different aims may even have opposing effects on some labour market outcomes, it can be crucial to distinguish between different purposes. The precise classification of training goals is described in the following section. In contrast to the latter two studies, I do not have variables based on direct assessment of the benefits of courses. Instead, I use perceived job security and monthly wages of workers as dependent variables. At least for wages this method has the advantage that the measure of the effects of training is not subjective and it is possible to exactly quantify wage increases. Furthermore, the data of Beicht et al. (2006) and Zwick (2011) do not allow them to control for selection effects and unobserved differences between employees. Moreover, I distinguish between repeated and occasional training events and find that the effects of training participation can differ depending on pre-sample training participation.

3   Data and econometric approach

For the empirical analysis I use the waves 2000, 2004 and 2008 of the German Socio-Economic Panel (SOEP)[6] but focus on the period from 2004 to 2008 later on in the estimations (for further information on the data see Wagner et al., 2007).

The sample used for the analysis of training effects is restricted to full-time employees.[7] As I want to analyse effects on perceived job security and most workers in Germany enjoy protection against dismissal I exclude workers who are not covered.[8] In the surveys 2000, 2004 and 2008 (and also in 1989 and 1993), respondents younger than 65 are asked about further training activities during the last three years. Besides informal training (reading scientific or professional publications or attending congresses) persons are also asked if they received any formal training and how many professional training courses they have participated in. Furthermore, for the three most recent courses, the SOEP provides

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[6] The data used for this study was extracted using the Add-On PanelWhiz for Stata®. PanelWhiz (http://www.PanelWhiz.eu) was written by Dr. John P. Haisken-DeNew (john@PanelWhiz.eu). See Haisken-DeNew and Hahn (2010) for details. The PanelWhiz generated do-file to retrieve the data used here is available from the author upon request. Any data or computational errors in this study are my own.

[7] I exclude implausible answers and outliers by dropping full-time employed persons with less than 30 working hours and a monthly gross income of less than 600 Euros. The final sample consists of workers aged 20-65 (civil servants and apprentices excluded).

[8] As workers who start a new job after 1 January 2004 only enjoy protection against dismissal in firms with more than 10 workers (before this date the threshold was more than 5 employees) I exclude the two smallest firm size categories which are firms with less than five workers and firms with five to 19 workers.

information on the duration, timing and the host organization the course was held on. Moreover, there are questions about e.g. financial support, participation certificates or the aims of training. I use this information on the purpose of the last three training courses an employee participated in. Respondents can choose between five different categories which are "retraining for a different profession or job", "introduction to a new job", "qualification for professional advancement", "adjusting to new demands in my current job" and "other" (where multiple answers are possible). I generate dummy variables for each category which each equal one if a person states to have at least participated in one course (out of a maximum of three courses) with this certain purpose. Besides the possibility that persons can choose multiple aims of one course,[9] different courses could have had different goals. Therefore, the different dummies for training purpose are not mutually exclusive. The sample for the base analysis consists of 2075 persons who are observed in 2000, 2004 and 2008. Out of these employees 769 report participation in training in the last three years up to the time they were interviewed in 2008.

Participation in training is not random. Workers self-select into training and firms deciding whom to send to a training course have a fairly clear idea for whom it should be most beneficial. Several empirical studies confirm selectivity as they find that individual and also firm characteristics play an important role (see e.g. Booth, 1991, Blundell et al., 1996, Bassanini et al, 2007). This is also the case in my sample. With regard to individual and job characteristics, training participants and non-participants are very different.[10] Table 1 reports the mean values for the variables used in this analysis both for training participants and non-participants.

There seems to be persistence in training participation as 34.1% of all training participants between 2004 and 2008 also repeatedly took part in training between 1996 and 2004. Maybe this fact could be explained by different needs for keeping up to date in different occupations or industries, as, for example, not every job is affected by technological change in a similar way. If regular participation in training is even just something normal for specific employees and is necessary to practise a certain profession at all,[11] effects on wages and job security can differ from those for workers for which training is less common. However, the observed

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[9] About 86% of all training participants only report one purpose of one course.

[10] As training participants are very different from non-participants, an appropriate method to control for selection into training would be matching (Heckman et al., 1997, 1998). However, some workers change their jobs and employers during the observation period. That means that I could only match training participants and non-participants at the beginning of the observation period with respect to time-invariant individual and not with respect to any firm- or industry-specific characteristics.

[11] For example, for practicing physicians in Germany periodic continuing medical training is virtually obligatory since otherwise they risk a loss of certification or financial penalties (see § 95d SGB V for panel doctors, § 137 SGB V for medical specialists in hospitals).

persistence of training events could also be caused by different (unobservable) individual factors like ability and motivation, which have an impact on workers' training decisions. Thus, for the empirical analysis, I differentiate between workers who also regularly participated in training in the period before 2004 (between 2000 and 2004 as well as between 1996 and 2000) and those who did not.

Table 1: Differences in mean values of pre-training characteristics between training participants and non-participants

	Non-participants (between 2004 and 2008)	Training participants (between 2004 and 2008)
Pre-training characteristics in 2004		
Repeated training participation between 1996 and 2000 and between 2000 and 2004	0.080	0.341***
Female (dummy)	0.285	0.317
Years of education	12.134	13.407***
Age(years)	42.637	40.745***
Tenure (years)	12.315	11.787
Firm size: 20-99 workers (dummy)	0.251	0.176***
Firm size: 100-199 workers (dummy)	0.142	0.108**
Firm size: 200-1999 workers (dummy)	0.337	0.332
Firm size: 2000 workers and more (dummy	0.270	0.385***
Workplace in East Germany (dummy)	0.240	0.246
Working hours	38.560	38.722
Job change between 2004 and 2008 (dummy)	0.081	0.100
Gross monthly wage (€)	2867.54	3428.68***
Job security (1 = very concerned, ..,3=not concerned at all)	2.064	2.122*
Differences in outcome variables between 2008 and 2004		
Difference gross monthly wage (€)	210.741	362.637***
Difference job security	0.165	0.226*
Number of observed employees	1306	769

***/**/* indicates statistical significance of a t-test between the mean values of the variables of workers with and without training between 2004 and 2008 at the 1%, 5% and 10% level.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Regarding observable characteristics, Table 1 shows that in this sample employees participating in training are on average younger and better educated than those without training and work in larger firms. Job security is measured on a 3-point Likert scale.

Respondents are asked whether they are concerned about their job security. There are three possible answers: persons can be "very concerned" (1), "somewhat concerned" (2) or "not concerned at all" (3). Employees who participate in training already have higher wages and a weakly significant higher perceived job security than those in the control group, even before the courses take place. However, after the period of three years in which participants received training, they achieve a significantly higher wage increase and a larger rise in self-reported job security than workers who did not participate in any courses.

I use difference-in-differences to evaluate the impact of training on wages and perceived job security which allows considering unobservable time-invariant group-specific characteristics.[12] As the dependent variables are log monthly gross wages and the ordinal variable subjective job security (measured on a 3-point Likert scale), OLS and an ordered logit models are applied, respectively.

Table 2 reports the incidence and purpose of training courses. To compare workers of different ages, I divide all employees into three age groups according to their age in 2008. The first group consists of the youngest workers up to an age of 39 years. Workers between 40 and 49 build the second group and all workers who are at least 50 years old are combined in the third age group. The first row shows that more than one third of all employees participated in training between 2004 and 2008. The share of training participants in two successive periods before 2004 is 17.7%. Out of these 71.4% continue their training activities between 2004 and 2008 (not reported in Table 2). 29.9% of all employees never participated in any training courses between 1996 and 2008.

The last three columns in Table 2 report the incidence of training activities for different age groups. 42.4% of persons up to 39 and 40.1% of persons between 40 and 49 participated in at least one course between 2004 and 2008, whereas the share of workers older than 49 who report to have taken part in training is only 29.9%, which is significantly different from both the shares of training participants in the other two age groups.

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[12] A crucial assumption for the validity of difference-in-differences is that both groups of persons, training participants and non-participants, do not seriously change in their unobserved characteristics over time (see e.g. Blundell and Costa Dias, 2009). It is not clear if this assumption holds in this context. If it did not, the treatment effect of training could be wrongly estimated.

Table 2: Training incidence and purpose of courses

	All employees	Age ≤ 39	Age 40-49	Age≥50
		(p-value of t-test of equality of coefficients for groups age≤39 & age=40-49)	(…for groups age=40-49 & age≥50)	(…for groups age≥50 & age≤39)
Training participation between 2004 and 2008	0.367	0.424 (0.410)	0.401 (0.000)	0.299 (0.000)
Repeated training participation between 1996 and 2000 & between 2000 and 2004	0.177	0.166 (0.074)	0.206 (0.004)	0.150 (0.460)
No training participation between 1996 and 2008	0.299	0.246 (0.181)	0.280 (0.002)	0.354 (0.000)
Number of observed employees	2075	488	855	732
Purpose of training courses (last three years before survey 2008, trained persons only)				
Retraining for different position or job	0.007	0.005 (0.878)	0.006 (0.651)	0.009 (0.597)
Introduction to a new job	0.046	0.078 (0.068)	0.041 (0.251)	0.023 (0.009)
Qualification for professional advancement	0.289	0.420 (0.000)	0.268 (0.052)	0.196 (0.000)
Adjusting to new demands in current job	0.785	0.710 (0.102)	0.772 (0.002)	0.877 (0.000)
Other	0.153	0.169 (0.653)	0.155 (0.569)	0.137 (0.358)
Number of observed employees	769	207	343	219

Notes: p-values of t-tests of equality between coefficients of different age groups in brackets.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

For the subsample of training participants, the second part of Table 2 reports the aims of training activities. The purpose of courses most often stated by employees is adjusting to new requirements in their current job. With regard to all trained persons, 78.5% participated at least in one course with this purpose. The second most important reason for workers to get trained (for 28.9% of all training participants) is qualifying for professional advancement. The third most frequent category is the residual category "other" (15.3%), followed by "introduction to a new job" (4.6%) and "retraining" (0.7%).[13]

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[13] Although I would expect retraining to be a rare event, the percentage of courses with this purpose is very low. The small share of persons who are retrained could be explained by the fact that the sample only includes

Taking into account differences by age groups, for all workers of different age the most frequently stated aim is adapting to new demands of their current job, followed by career reasons. Nevertheless, there are differences between older and younger employees. Workers younger than 40 significantly more often get trained to qualify for professional advancement compared to workers age 40 and more, whereas older ones more frequently need training to adjust to new requirements of their job.

The differences between the share of workers who get trained to adjust their knowledge and skills to new demands in the current job increases with age and is significantly different between the group of workers older than 50 and the other two age groups. This is just what could be expected, as younger employees at the beginning or in the middle of their professional life probably try to improve their career prospects. The problem that obtained skills get redundant is especially one of older employees whose initial training was a long time ago. Therefore, this group of workers could be more in need for training to adjust to new qualification requirements which also reflects in the data.

4   Empirical analysis

4.1 Differences between regular and infrequent training

Before differentiating between different age groups or different aims of training courses, I estimate wage and job security effects of training for all trained employees. However, I distinguish between groups of employees with regard to the possibility that they also could have participated in training before the period I consider for the estimations. First, there are workers who did neither participate in training courses in the period between 1996 and the 2004 survey nor in the following period until 2008. This group of workers is used as the reference group in the following estimations.

The second group consists of persons who did not report regular training participation between 1996 and 2004[14] but participated in courses between 2004 and 2008. Employees in the third group took part in training between 1996 and 2000, between 2000 and 2004 and also between 2004 and 2008. The last group participated in training before 2004 but not after this

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persons who were permanently employed during the observation period. Retraining typically aims at unemployed persons and is often financed by the Federal Employment Agency. As there are only five retrained employees, I exclude this category from the empirical analysis of courses with different aims in the following section.

[14] Note that persons belonging to this group of irregular trained workers could have participated in training between 1996 and 2000 or between 2000 and 2004. As a robustness check I also exclude persons reporting one former training period, which leads to similar results (see Section 5.4.3).

year (only pre-sample participation). For the second and third group, I estimate difference-in-differences whereas the fourth group is only considered by a dummy variable which equals one in both years that I use for the estimations. This approach allows analysing potential increasing or decreasing marginal benefits of repeated training events by comparing training after a period with and without regular training.

I include a treatment group dummy TGinfreq (treatment group of workers with infrequent participation) which equals one both in 2004 and 2008 if a person participates in training between 2004 and 2008 but did not regularly participate in training in the period before 2004. The treatment itself is training participation between 2004 and 2008 (Training08(infreq)), which only equals one for trained persons belonging to the treatment group TGinfreq in the post-training period 2008 and zero in the pre-training period 2004.

Furthermore, the treatment group dummy for persons with frequent training activities TGfreq equals one in 2004 and 2008 if a person already took part in training repeatedly between 1996 and 2004 and between 2004 and 2008. For this group I also include a treatment variable for training participation between 2004 and 2008 (Training08(freq)), which only equals one in the post-training period 2008. The variables which indicate treatment groups (TGinfreq and TGfreq) control for unobservable differences between (infrequently or frequently) trained and untrained persons which also could have an impact on the outcome variables.

The dummy variable TGpre indicates pre-sample training participants (persons who took part in training before 2004 but not between 2004 and 2008) and equals one in both years if a worker belongs to this group. The equation which is estimated is

$$Y_{it} = \delta_1 TGpre_{it} + \delta_2 TGfreq_{it} + \delta_3 Training08(freq)_{it} \\ + \delta_4 TGinfreq_{it} + \delta_5 Training08(infreq)_{it} + \beta X_{it} + \varepsilon_{it}. \tag{5.1}$$

The outcome variable Y_{it} is the logarithm of gross monthly wages and job security, respectively. Besides the different treatment group and treatment dummies, I use a set of control variables X_{it} which are listed in Table 1, but age is considered by three age group dummies according to the differentiation in Table 2. δ_3 and δ_5 measure the treatment effects of training for participants with and without repeated pre-sample training, respectively.

The results of wage effects including the different groups of trained workers are reported in Table 3. The control variables have the expected effects. Women earn less than men, employees in East Germany earn less than similar workers in West Germany and wages increase with age, tenure, years of education, hours worked and firm size.

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Table 3: OLS Results – effects on wages for different groups of trained workers

Only pre-sample participation (before 2004)	
TGpre	0.028*
Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.069***
Training 08 (freq)	0.014
Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	0050***
Training 08 (infreq)	0.031**
Age 40-49	0.105***
Age ≥50	0.091***
Female	-0.184***
Years of education	0.045***
Tenure	0.007***
Firm size: 100-199 workers	0.041**
Firm size: 200-1999 workers	0.082***
Firm size: 2000 workers and more	0.114***
Workplace in East Germany	-0.258***
Working hours	0.009***
Job change	0.020
Number of observations	4150
R^2	0.567

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Occupation and industry dummies as well as a year dummy included but not reported. Reference group for firm size: 20-99 employees; reference group for age groups: 39 years old and younger. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

The dummy TGpre denoting workers with pre-sample training participation only, indicates that persons belonging to that group have higher wages of 2.8% in the period 2004 to 2008 compared to workers who never participated in any course in the pre-sample period and in the observation period. However, for this group it is not possible to differentiate between a selection effect and a treatment effect. Besides a real treatment effect (which was realized before 2004 but could still be at least partly persist), the coefficient could just reflect that especially high-ability workers or highly motivated ones with already higher wages select into training. For the remaining two groups of trained employees difference-in-differences allows to distinguish between both possibilities or at least to quantify the treatment effect. The two treatment group variables TGfreq and TGinfreq show that persons who participate in training between 2004 and 2008 already earn more regardless of training participation in this period.

For the group of workers who already received training repeatedly before 2004 this higher wage of 6.9% could both be explained by the prior training events and by unobservable differences. The higher wage - even before training - of 5.0% of workers who infrequently participate in training should mainly reflect positive selection on unobservable factors affecting both training participation and wages. As this coefficient is lower than (although not significantly different from) the coefficient of TGfreq, it can be supposed that TGfreq includes an effect from selection on unobservable factors as well as a positive effect of training events prior to the observation period.

With regard to the treatment variables there are differences depending on whether participants regularly attended courses before. If this is the case, the coefficient of the variable "Training08(freq)" of 0.014 shows that, for this group of workers, there is no significant wage effect of the latest training events between 2004 and 2008. In contrast, for employees who are infrequently trained, the coefficient of "Training08(infreq)" indicates a significant positive wage effect of training participation. The wage increase caused by training participation is on average 3.1% between 2004 and 2008. As there is no significant wage effect for frequently trained persons this could point to decreasing marginal returns to training. As mentioned before, another explanation could be that in some positions or jobs regular training is very common or just essential and therefore wage effects could be lower. However, as the treatment group effect for these regularly trained workers is with 6.9% higher (although not significantly different) than the treatment group effect for the group of infrequently trained workers (5.0%), decreasing marginal benefits of training seem to be even more plausible.

Table 4 presents the coefficients (column (1)) and marginal effects (columns (2)-(4)) of the ordered logit estimation with perceived job security as dependent variable.[15] Compared to the estimation results of the wage equation, less control variables have a significant impact.

Higher education has a weakly significant positive effect on job security. One additional year of tenure increases the probability to be not concerned about job security by 0.3 percentage points and decreases the probability to be very or somewhat concerned by 0.2 and 0.1 percentage points respectively. Compared to similar West German workers, workers in East Germany have a higher probability to be very or somewhat concerned of 11.5 and 3.8 percentage points. Moreover, firm size positively affects job security.

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[15] Ai and Norton (2003) argue that the standard method to compute marginal effects based on the coefficients of nonlinear models is inappropriate for interaction variables. The training variable in this analysis is a treatment variable which is the interaction between a treatment group dummy and a time dummy. That means the objection of Ai and Norton (2003) would be relevant for the estimation of treatment effects in the case of the ordered logit model. However, Puhani (2012) argues that this is not problematic in this case as the derivative of an interaction variable in non-linear models does not represent the treatment effect in difference-in-differences models. Thus, I will directly interpret coefficients and marginal effects in this section.

Table 4: Ordered logistic regression results – effects on job security for different groups of trained workers

	(1) Coefficients	Marginal effects		
		(2) Very concerned	(3) Somewhat concerned	(4) Not concerned at all
Only pre-sample participation (before 2004)				
TGpre	0.175*	-0.023*	-0.014*	0.037*
Participation in all periods (1996-2000, 2000-2004 and 2004-2008)				
TGfreq	0.218	-0.028*	-0.019	0.047
Training 08 (freq)	-0.056	0.008	0.004	-0.012
Participation between 2004 and 2008 (no regular participation before 2004)				
TGinfreq	-0.107	0.015	0.008	-0.022
Training 08 (infreq)	0.369***	-0.045***	-0.035***	0.080***
Age 40-49	-0.020	0.003	0.002	-0.004
Age ≥50	0.088	-0.012	-0.007	0.019
Female	-0.051	0.007	0.004	-0.011
Years of education	0.034*	-0.005*	-0.003*	0.007*
Tenure	0.015***	-0.002***	-0.001***	0.003***
Firm size: 100-199 workers	0.137	-0.018	-0.011	0.029
Firm size: 200-1999 workers	0.199**	-0.026**	-0.016*	0.042**
Firm size: 2000 workers and more	0.216**	-0.029**	-0.018*	0.046**
Workplace in East Germany	-0.763***	0.115***	0.038***	-0.152***
Job change	0.062	-0.008	-0.005	0.013
Number of observations	4150			
Pseudo R^2	0.053			

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Occupation and industry dummies as well as a year dummy included but not reported. Reference group for firm size: 20-99 employees; reference group for age groups: 35 years old and younger. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

With regard to the training variables not all have a significant effect. First, persons who only participated in training before the observation period (TGpre), have a higher job security. The marginal effects indicate that these workers are more likely to be not concerned at all about potential job loss by 3.7 percentage points compared to employees not taking part in training at all between 1996 and 2008. Surprisingly, and in contrast to the wage estimation, there is neither a significant treatment group (TGfreq) nor a treatment effect (Training08(freq)) for the group of workers who permanently participated in training both in the observation period and in the pre-sample period. However, the treatment group dummy TGfreq is almost significant at the 10% level (p-value of 0.102).

Finally, for the group of workers with no or occasional pre-sample training participation there is a strong treatment effect. Concerning job security before training, these persons do not differ from persons without any training during the observation period. The coefficient of TGinfreq is even negative. Participation in training significantly increases their perceived job security. The marginal effects for "Training08(infreq)" show that training reduces the probability to very or somewhat concerned about losing one's job by 4.5 and 3.5 percentage points, respectively and therefore increases the probability to be not concerned at all by 8.0 percentage points. With regard to the fact that the average probability of being very concerned is 17.3%, training reduces it by more than one fourth which is a remarkable decrease.

Just like in the case of wages, it is not obvious why training should only increase job security if it follows a period without frequent training participation. Again, maybe this could be explained by the possibility that these employees have jobs where training is necessary and just a normal regular event or there also exist decreasing marginal benefits of training with respect to perceived job security. As the treatment group effect for workers with successive training periods (TGfreq) is positive and almost significant and the treatment group effect for infrequently trained workers (TGinfreq) is negative, it is possible that training increases job security with decreasing marginal returns. A Wald-test on equality of the sum of the coefficients of "TGfreq" and "Training08 (TGfreq)" and of the sum of the coefficients of "TGinfreq" and "Training08 (TGinfreq)" indicates that there is no significant difference in the perceived job security of repeatedly and occasionally trained employees after training participation between 2004 and 2008. The same is true for employees with pre-sample training participation only (TGpre).

To analyse training effects in more detail, I concentrate on comparing both treatment groups with the group of non-participants and will not further consider persons with pre-sample training only (TGpre=1). The following analysis tries to find out if training effects are different for workers of different age, if training aims matter and finally, if, in this context, there are any differences between participants permanently attending training and employees with occasional training events.

4.2 Differences between age groups

For analysing wage and job security effects for workers of different age groups I construct two subsamples. The first one includes (permanent) non-participants and persons without successive pre-sample training but training in the observation period, the second one obtains

all (permanent) non-participants and workers who participated regularly in the pre-sample periods 1996-2000 and 2000-2004 as well as between 2004 and 2008.

The treatment group variables TGfreq and TGinfreq are each split up into three different variables according to the three different age groups. The same is done for the two treatment dummies (Training08(freq) and Training08(infreq)). The equation which is estimated separately for both subsamples is

$$Y_{it} = \delta_1 TG(\text{Age} \le 39)_{it} + \delta_2 \text{Training08}(\text{Age} \le 39)_{it} +$$
$$+ \delta_3 TG(\text{Age}=40\text{-}49)_{it} + \delta_4 \text{Training08}(\text{Age}=40\text{-}49)_{it} + \qquad (5.2)$$
$$+ \delta_5 TG(\text{Age} \ge 50)_{it} + \delta_6 \text{Training08}(\text{Age} \ge 50)_{it} + \beta X_{it} + \varepsilon_{it}.$$

Table 5 presents the results for the two wage estimations.[16] The treatment group dummies TG(Age40-49) and TG(Age≥50) indicate that workers aged 40 and older who participate in training courses are those who already earn more. This is true for both samples (1) and (2). With regard to continuously trained workers, young employees also earn more before the last training event (TG(Age≤39) in sample (1)). In contrast, for young workers up to 39 without successive periods of pre-sample training the selection effect indicated by TG(Age≤39) in sample (2) is even negative, although not significant. However, in both samples training strongly affects younger workers' wages. In the case of three successive training periods the wage effect of training participation in the observation period is 7.6% and is almost as high as the effect for infrequently trained young workers (7.8%). Employees older than 40 do not benefit from training in form of a wage increase. Although there is no significant wage effect for the group of workers between 40 and 49, compared to the oldest group the treatment coefficients are higher. The positive effect of training on wages decreases with age. One reason for that might be that older and younger workers participate in training for different purposes, which will be analysed in the following section.

Although the coefficients of the treatment group and treatment dummies for both estimations (1) for workers with and (2) without repeated pre-sample training slightly differ in size, Wald tests on equality of the coefficients of both estimations show that they are not significantly different from each other. Thus, for wage effects the results by age groups shed a different light on the results from Table 3. For younger employees permanence or continuance of training in terms of successive training periods does not have a different impact of wage effects compared to nonrecurring or infrequent training periods. Training participation increases wages for younger workers regardless of whether they participate regularly or

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[16] The estimations include the same control variables as reported in Table 3.

infrequently. At least for young employees a decrease of marginal returns to training suggested by the results without differentiating between age groups (Table 3) cannot be confirmed.

Table 1: OLS Results – effects on wages for different groups of trained workers

(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TG(Age≤39)	0.072*
Training08(Age≤39)	0.076***
TG(Age40-49)	0.119***
Training08(Age40-49)	0.017
TG(Age≥50)	0.126***
Training08(Age≥50)	-0.028
Number of observations	1760
R^2	0.581
(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TG(Age≤39)	-0.010
Training08(Age≤39)	0.078***
TG(Age40-49)	0.113***
Training08(Age40-49)	0.021
TG(Age≥50)	0.110***
Training08(Age≥50)	0.016
Number of observations	1996
R^2	0.547

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, working hours, job change, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Not only wage effects could differ by age but also the impact of training on job security. The results for different age groups as well as for both frequent and occasional training are reported in Table 6.[17] The upper part (1) for frequently trained persons shows that, regardless of age group, a third period with training participation has no effect on perceived job security. For young workers the coefficient is even negative, although not significant. Moreover, marginal effects show that repeated training for young workers significantly increases the propensity to be somewhat concerned about potential job loss by 1.2 percentage points. In contrast, training of occasionally trained employees seems to have strong positive effects especially for older workers (Training08(Age≥50) in the lower part (2) of Table 6). Their

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[17] The estimations include the same control variables reported as in Table 4.

probability to be very or somewhat concerned decreases by 7.6 and 5.2 percentage points, respectively and their probability to be not concerned at all increases by 12.8 percentage points. However, it seems that older workers without repeated pre-sample training who received training between 2004 and 2008 were worried more before training took place compared to untrained older workers, although only the marginal effect for being somewhat concerned is weakly significant (see TG (Age≥50) for infrequently trained workers in sample (2)). Although the positive training effect on job security for infrequently trained employees is stronger for the oldest age group, there also seem to be weak effects for middle-aged workers. With respect to the youngest age group only one marginal effect is weakly significant. However, the size of the marginal effects is similar for both the young and the middle age group.

Table 2: Ordered logistic regression results – effects on job security for different age groups

| | | Marginal effects | | |
	(1) Coefficients	(2) Very concerned	(3) Somewhat concerned	(4) Not concerned at all
(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)				
TG(Age≤39)	0.365	-0.048	-0.029	0.076
Training08(Age≤39)	-0.323	0.050	0.012***	-0.062
TG(Age40-49)	0.303	-0.041	-0.022	0.063
Training08(Age40-49)	0.042	-0.006	-0.003	0.008
TG(Age≥50)	0.187	-0.026	-0.013	0.039
Training08(Age≥50)	0.208	-0.028	-0.015	0.043
Number of observations	1760			
Pseudo R^2	0.058			
(2) Participation between 2004 and 2008 (no regular participation before 2004)				
TG(Age≤39)	-0.101	0.015	0.005	-0.020
Training08(Age≤39)	0.348	-0.047*	-0.025	0.072
TG(Age40-49)	0.095	-0.014	-0.005	0.019
Training08(Age40-49)	0.344*	-0.047*	-0.025	0.072*
TG(Age≥50)	-0.262	0.041	0.009*	-0.050
Training08(Age≥50)	0.598***	-0.076***	-0.052**	0.128***
Number of observations	1996			
Pseudo R^2	0.057			

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, job change dummy, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Again, comparing repeatedly with occasionally trained employees, the coefficients of the different treatment group dummies for the first group are higher (although not significantly different). That could indicate that frequently trained employees already reduced their worries about job loss by former training events and that there exist decreasing returns with respect to job security. The fact that young workers seem to be even a bit more worried if they get permanent training is surprising. However, note that after the last period of training between 2004 and 2008, overall, they do not feel more unsecure than workers without or with occasional training.[18]

To sum up, the effects of training on wages and on perceived job security differ by age. Younger workers benefit from attending training courses by a wage increase whereas older workers' job security rises. Especially with regard to job security there seem to be decreasing marginal benefits of training, as participation has no significant impact any longer for persons who already regularly attended training courses in the pre-treatment period. For young workers I do not find evidence for decreasing marginal wage returns to training. Regardless of whether they participated in training before, they always experience a wage increase by an additional training period.

The results obtained in this section confirm the findings of Pfeifer et al. (2008) who report a wage effect of training especially for younger German workers and an effect on unemployment risk especially for older ones, as well as the findings of Bassanini (2006) whose results also indicate stronger wage effects for younger and job security effects especially for older employees. In contrast, Büchel and Pannenberg (2004), also analysing SOEP data, come to the conclusion that it is the group of younger workers who benefits from training with regard to both wages and unemployment risk. However, none of these studies differentiates between infrequent and permanent training participation or takes into account the goals of training.

4.3 Differences between training goals

As there are remarkable differences with respect to training effects between workers of different age, it can be expected that younger and older employees also have different objects when participating in training. Beicht et al. (2006) and Zwick (2011) show that the assessment of both training objectives and effectiveness differs for workers of different age. Different aims can explain different outcomes. Thus, in this section, the wage and job security effects of

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[18] This can be shown by mutual Wald tests, comparing the sum of the treatment group coefficient and the treatment coefficient for the two groups of workers with permanent or occasional training with workers without training.

courses with different purposes are analysed. As I found no job security effects for frequently trained employees in the previous estimations, I concentrate on comparing infrequently trained workers with non-participants. The treatment group dummy and treatment dummy are each split up into four different dummy variables according to four different training goals[19]. As there are only three infrequently trained employees stating retraining as aim of a training course I cannot include this category in the estimations. As only one worker exclusively reported retraining, I drop the corresponding two observations for the following estimations. The estimation equation is similar to equation (5.2) but with separate treatment group and treatment dummies according to training goals instead of age groups.

Table 7 reports the results of the wage estimation. First, except for training participants with the aim of getting introduced to a new job, workers who attend courses already have higher wages before training participation. These treatment group effects are significant for workers who get trained to qualify for professional advancement or to adjust to new demands in the current job.

Table 3: OLS Results – effects of different training goals on wages

Participation between 2004 and 2008 (no regular participation before 2004)	
TG(Introduction)	-0.129**
Training08(Introduction)	0.112***
TG(Professional advancement)	0.062*
Training08(Professional advancement)	0.050*
TG(Adjustment to new demands)	0.072***
Training08(Adjustment to new demands)	0.009
TG(Other)	0.048
Training08(Other)	0.005
Number of observations	1994
R^2	0.546

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, working hours, job change, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

The treatment group effect for workers who participate in courses with the aim "introduction to a new job" is negative and significant. Those workers earn on average 12.9% less than untrained employees. Note that this is probably due to the fact that trained persons who start a new job are not compared to untrained job starters but to all non-participants. After a year period with training attendance between 2004 and 2008 this wage gap is closed as the

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[19] Note that these different aims are not mutually exclusive.

coefficient of "Training08(Introduction to new job)" shows a significant wage increase of 11.2%. Besides, only training which is aimed at qualifying employees for professional advancement increases wages, the wage effect is 5%. As Table 2 showed, workers up to an age of 39 significantly more often participate in courses with the relevant purposes for wage effects.

Moreover, Table 2 indicated that older employees significantly more often report that the training courses they attended aimed at adjusting to new requirements in their job. Table 8 shows how different training goals affect perceived job security of trained workers.

Table 4: Ordered logistic regression results – effects of different training goals on job security

		Marginal effects		
	(1) Coefficients	(2) Very concerned	(3) Somewhat concerned	(4) Not concerned at all
Participation between 2004 and 2008 (no regular participation before 2004)				
TG(Introduction to new job)	-0.651	0.112	0.004	-0.116
Training08(Introduction to new job)	0.227	-0.032	-0.015	0.047
TG(Professional advancement)	-0.050	0.007	0.003	-0.010
Training08(Professional advancement)	0.172	-0.024	-0.011	0.035
TG(Adjustment to new demands)	-0.007	0.001	0.000	-0.001
Training08(Adjustment to new demands)	0.409***	-0.056***	-0.030**	0.086***
TG(Other)	-0.045	0.007	0.007	-0.009
Training08(Other)	0.133	-0.019	-0.019	0.027
Number of observations	1994			
Pseudo R^2	0.057			

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, job change dummy, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Only training with the purpose to adapt to new demands in the current job has a significant positive impact. Participation in such a course reduces the probability to be very concerned and somewhat concerned by 5.6 and 3.0 percentage points, respectively and thus increases the probability to be not concerned at all by 8.6 percentage points. With respect to courses with other purposes, workers who receive training to get introduced to a new job seem to be more worried before they participate in training, whereas training participation somewhat reduces these worries. Again, besides the fact that both effects are not significant, the lower perceived job security may just reflect that job starters (with training) are compared to all non-participants (who mostly will not just have started a new job). To sum up, differentiating

between the goals of training could be one possible explanation for different training effects of workers of different age.[20]

4.4 Robustness checks

Finally, to check the robustness of the results, especially with respect to the training variable definition, some additional estimation results are presented. First of all, the treatment group of infrequently trained workers (TGinfreq) is replaced by the subgroup of workers who did not participate in training at all in the pre-sample period 1996-2004 but between 2004 and 2008.[21] The positive effects of training participation on wages and job security after eight years without any training are even stronger than in the case of the former definition of infrequent training.[22] The estimated average increase in wages of 3.9% (see Table 9, part A in the Appendix) is even higher than the estimated effect of 3.1% for infrequently trained workers with the original definition. This is also true for job security effects. The coefficient of irregular training participation is 0.596 (see Table 10, part A in the Appendix). Marginal effects indicate that training decreases the probability to be very or somewhat concerned about job security by 7.9 and 4.7 percentage points, respectively (compared to 4.5 and 3.5 percentage points with the original definition, see Table 4). This goes in line with the previous results, which show that there may be a decrease in marginal returns to training.

As some studies found stronger labour market effects of employer-sponsored training compared to self-financed training (e.g. Pfeifer et al., 2008), I also run estimations for employer-financed training only. This leads to a loss of 100 observations as 50 persons participated in training courses without any financial support from the employer. The results are very similar to those obtained by including all training courses, regardless of financing. The coefficients only slightly differ in size (see Table 9, part B and Table 10, part B in the Appendix). For example, for infrequent training participation employer-financed training increases wages by 2.9% (compared to 3.1% if self-financed training is not excluded, see Table 3). With regard to job security, irregular training reduces the likelihood to be very or somewhat concerned by 4.8 and 3.8 percentage points, respectively (compared to 4.5 and 3.5 percentage points, see Table 4).

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[20] Unfortunately, it is not possible to use separate dummy variables for different goals for each age group as in some cases there would be not enough observations to run any estimations.

[21] So far, persons with training either between 1996 and 2000 or between 2000 and 2004 also were included in the treatment group of infrequently trained employees.

[22] The estimations are run with a subsample of workers without any training and with employees falling under the modified definition of being infrequently trained.

Moreover, besides the dummy variable for training incidence, I additionally include the volume of received training (measured in hours) and the number of attended training courses, respectively. In contrast to the results of Büchel and Pannenberg (2004) who found positive effects of training incidence, volume and number of courses at least on wages, I do not figure out such a clear impact of hours spent for training courses or number of training courses. With regard to training volume, the variable is insignificant and for occasional training even negative in the case of job security, whereas training incidence has the same effects as in the estimations without including training duration (see Table 12, part A).[23] The overall training effect (of training incidence and duration), however, stays positive and significant for infrequently trained workers up to a maximum duration of about 335 hours. The job security effect varies between 0.381 for one hour and 0.287 for 335 hours of training. For longer durations it gets insignificant.

Regarding wage effects of training, duration has a significant negative impact for both groups of training participants. In contrast, the coefficient for training incidence still is positive and significant in the case of occasional training participation (see Table 11, part A). The overall wage effect is significant for employees with at most 154 hours of training, which is true for the majority of infrequent participants (less than 8% of training participants report a total duration of more than 154 hours between 2004 and 2008). The wage increase varies between 4.2% and 2.5%. For frequently trained workers the overall effect is insignificant.

Finally, instead of training duration, the number of training courses is included.[24] Note that the distribution of training courses between 2004 and 2008 is obviously different for infrequently and frequently trained workers, although this is not automatically implied by my definition of the two groups (see Figures 1 and 2 in the Appendix). Employees who regularly participate in training also attend more courses in one period with training than employees who occasionally participate in courses. That means that for the group of repeatedly trained persons training not only takes place more regularly but also more often. This supports the idea that for employees with certain jobs or positions, training could be something like a essential routine job activity and must not necessarily result in higher wages or job security.

With regard to wage effects, all training variables – the training incidence dummies as well as the variables measuring the number of courses – are positive but insignificant both for infrequently and regularly trained workers (see Table 11, part B). However, the overall effect of training incidence and the number of training courses gets significant for a certain number

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[23] The number of observations drops to 3954 because of missing values in the duration variable.
[24] The number of observations drops to 4136 because of missing values in the variable measuring the number of courses.

of courses in the case of infrequent participation. For three to six courses the estimated wage effects are significant and lie between 3.0% and 4.1%. This means that more than 50% of all occasional training participants in my sample realize a significant wage increase compared to non-participants (see Figure 2 in the Appendix for the distribution of the number of courses).

The effects of training on job security somewhat change compared to the specification without including the number of courses. For infrequently trained workers training incidence significantly increases job security and the number of courses is positive but insignificant (see Table 12, part B in the Appendix). The overall training effect for this group of participants increases with the number of courses but gets insignificant for employees participating in more than 17 courses. However, only three infrequently trained workers report more than 17 courses between 2004 and 2008 (see Figure 2 in the Appendix). In contrast, the coefficient of the dummy for training incidence is negative and significant in the case of regularly trained workers and the number of courses has a significant positive effect on job security (see Table 12, part B in the Appendix). Again, the overall effect of training shows that only for certain numbers of courses training has a significant impact on job security. For repeatedly trained persons who only participate in one course the effect is negative and significant on the 10% level, but less than 9% of all participants only attended one course (compared to more than 26% of infrequently trained workers, see Figures 1 and 2 in the Appendix). In contrast, for regularly trained employees with more than 11 courses the effect on job security is positive and significant. This means that for this sample about 6.5% of the group of employees with regular training are positively affected. On the whole, taking into account different measures of training mainly confirms the previous results obtained in this analysis as it is mainly the group of infrequent participants who benefit from training.

5   Conclusion

In this chapter I analyse the impact of training participation on workers' wages and perceived job security. I use SOEP data and apply difference-in-differences to control for selection into training participation. The results of the empirical analysis indicate that there are also differences with regard to the continuity of training participation. At least for job security there seem to be decreasing marginal benefits to training.

Moreover, there are considerable differences between older and younger workers. Especially young employees benefit from training in form of a wage increase whereas older employees experience a significant rise in job security. For older workers such a positive effect is only

realized after a period with irregular training participation. Persons who already frequently participated in training before the observation period report no significant rise in their perceived job security after the last training event, but they seem to already have a bit less worries about their job before. In contrast, the positive effect of one additional training period on the wages of young employees is still high after repeated pre-sample training.

Different effects can be explained by different aims of training courses older and younger workers participate in. Although for all workers, regardless of age, the most frequent purpose of training is adjusting skills to new demands in the current job, the share of courses with this aim significantly increases with age. This can be due to the fact that older workers' skills they acquired in their initial training might have become obsolete over time. Perhaps their productivity is even below their wage which necessitates continuing training. Qualification for professional advancement and introduction to a new job are important reasons to participate in training especially for workers at the beginning of their career.

Therefore, I additionally estimate wage and job security effects of courses with different purposes. I come to the conclusion that training to adapt to new requirements of the current job has a positive impact on job security but not on wages, whereas training in order to qualify for career advancement or to get introduced to a new job only affects wages. Thus, differences in training effects by age might be explained by different training purposes. All in all, taking into account the objectives of training participants but also their training history seems to be important for the evaluation of lifelong training.

Appendix

Table 5: OLS Results – wage effects of irregular training (different definition) and of employer-financed training

A) Participation between 2004 and 2008 (no participation between 1996 and2004)	
TGinfreq	0.068***
Training 08 (infreq)	0.039*
Number of observations	1596
R^2	0.556
B) (Partly) employer-financed training	
(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.068***
Training 08 (freq)	0.012
(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	0.077***
Training 08 (infreq)	0.029**
Number of observations	3842
R^2	0.571

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, working hours, job change dummy, occupation and industry dummies as well as a year dummy. Part B: additionally TGpre included. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Table 6: Ordered logistic regression results – wage effects of irregular training (different definition) and of employer-financed training

A) Participation between 2004 and 2008 (no participation between 1996 and 2004)	
TGinfreq	0.011
Training 08 (infreq)	0.596***
Number of observations	1596
Pseudo R^2	0.060

B) (Partly) employer-financed training	
(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.262*
Training 08 (freq)	-0.085
(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	-0.173
Training 08 (infreq)	0.391**
Number of observations	3842
Pseudo R^2	0.052

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, job change dummy, occupation and industry dummies as well as a year dummy. Part B: additionally TGpre included. Standard errors are robust and clustered.
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Table 7: OLS results – wage effects of training duration and number of training courses

A) Training duration (hours$*10^{-3}$)

(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.080***
Training 08 (freq)	0.025
Training duration 08 (TGfreq)	-0.070*

(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	0.060***
Training 08 (infreq)	0.042***
Training duration 08 (TGinfreq)	-0.113***
Number of observations	3954
R^2	0.570

B) Number of training courses

(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.072***
Training 08 (freq)	0.001
Number of courses 08 (TGfreq)	0.003

(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	0051***
Training 08 (infreq)	0.018
Number of courses 08 (TGinfreq)	0.004
Number of observations	4136
R^2	0.568

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, working hours, job change dummy, TGpre, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
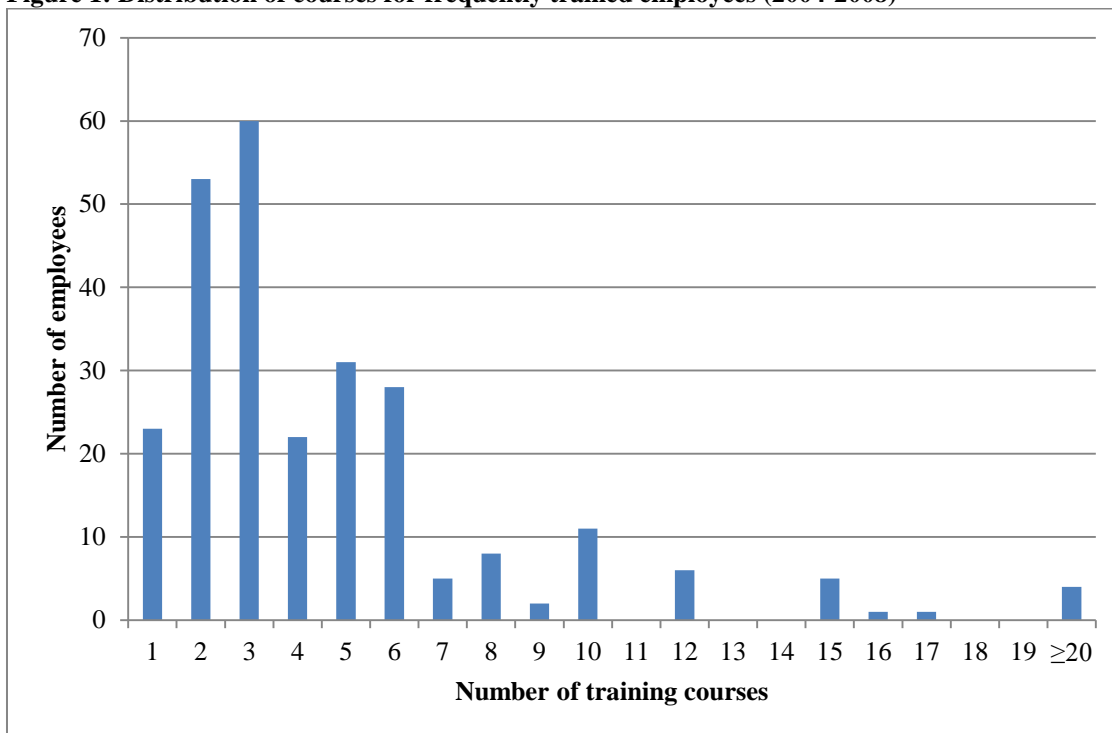Source: SOEP waves 2000, 2004 and 2008, own calculations.

Table 8: Ordered logistic regression results – job security effects of training duration and number of training courses

A) Training duration (hours*10^{-3})

(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.278**
Training 08 (freq)	-0.109
Training duration 08 (TGfreq)	0.113

(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	-0.089
Training 08 (infreq)	0.382***
Training duration 08 (TGinfreq)	-0.282
Number of observations	3954
Pseudo R^2	0.053

B) Number of training courses

(1) Participation in all periods (1996-2000, 2000-2004 and 2004-2008)	
TGfreq	0.223*
Training 08 (freq)	-0.412*
Number of courses 08 (TGfreq)	0.076**

(2) Participation between 2004 and 2008 (no regular participation before 2004)	
TGinfreq	-0.105
Training 08 (infreq)	0.277*
Number of courses 08 (TGinfreq)	0.028
Number of observations	4136
Pseudo R^2	0.054

***/**/* indicates statistical significance at the 1%, 5% and 10% level. Notes: Included control variables: Age group dummies, female dummy, years of education, tenure, firm size dummies, East Germany dummy, job change dummy, TGpre, occupation and industry dummies as well as a year dummy. Standard errors are robust and clustered.
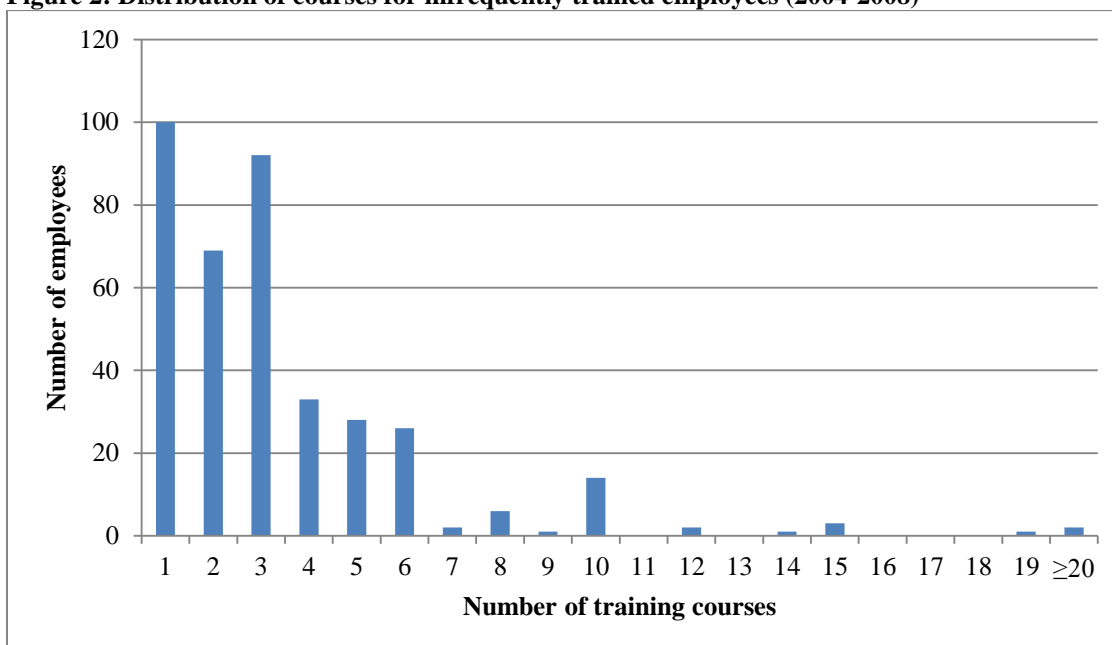Source: SOEP waves 2000, 2004 and 2008, own calculations.

Figure 1: Distribution of courses for frequently trained employees (2004-2008)

Number of observations: 260
Source: SOEP waves 2000, 2004 and 2008, own calculations.

Figure 2: Distribution of courses for infrequently trained employees (2004-2008)

Number of observations: 380
Source: SOEP waves 2000, 2004 and 2008, own calculations.

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