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# Who invests in training if contracts are temporary? Empirical evidence for Germany using selection correction\*

## Abstract

This study deals with the effect of fixed-term contracts on work-related training. Though previous studies found a negative effect of fixed-term contracts on the participation in training, from the theoretical point of view it is not clear whether workers with fixed-term contracts receive less or more training, compared to workers with permanent contracts. In addition to the existing strand of literature, we especially distinguish between employer- and employee-financed training in order to allow for diverging investment patterns of worker and firm. Using data from the German Socio-Economic Panel (GSOEP), we estimate a bivariate probit model to control for selection effects that may arise from unobservable factors, affecting both participation in training and holding fixed-term contracts. Finding negative effects for employer-sponsored, as well as for employee-sponsored training, leads us to conclude that workers with fixed-term contracts do not compensate for lower firm investments.

**Keywords:** training, fixed-term contracts, bivariate probit model

**JEL-Codes:** C35, J24, J42

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## Zusammenfassung

Ähnlich zu anderen europäischen Ländern wurde die Nutzung von befristeten Beschäftigungsverhältnissen in Deutschland seit den 1980ern durch verschiedene Reformen vereinfacht. Im Gegensatz zu unbefristeten Beschäftigungsverhältnissen, enden befristete Beschäftigungsverhältnisse mit dem Ende der Laufzeit, wodurch keine institutionellen Kündigungskosten entstehen. Obwohl die Nutzung der Befristung insgesamt relativ gering ist, ist gerade bei neu eingegangenen Beschäftigungsverhältnissen der Anteil der Befristung hoch. Trotz positiver Aspekte befristeter Beschäftigungsverhältnisse wie der Senkung der Anpassungskosten und Screening, können befristete Beschäftigungsverhältnisse auch zu geringeren Aufstiegschancen oder unsicheren Erwerbsverläufe führen. Ein weiterer wichtiger Punkt ist ein negativer Zusammenhang zwischen Befristung und Investitionen in berufliche Weiterbildung. Um zudem Unterschiede im Investitionsverhalten zwischen Arbeitgebern und (befristeten) Arbeitnehmern aufzudecken, werden Schätzungen getrennt für Arbeitgeber- und Arbeitnehmer-finanzierte Weiterbildung durchgeführt. Die Ergebnisse zeigen, dass befristet Beschäftigte weniger an Weiterbildung partizipieren. Weil Teilnahme an Weiterbildungsmaßnahmen wie auch die Befristung von unbeobachtbaren Faktoren beeinflusst werden kann, wird für Selektion kontrolliert.

**Schlagwörter:** berufliche Weiterbildung, befristete Beschäftigungsverhältnisse, bivariates Probit-Modell

**JEL-Codes:** C35, J24, J42

# 1 Introduction

Similar to other European countries, the German legislation on fixed-term employment has been deregulated since the 1980ies. In contrast to permanent contracts, fixed-term employment contracts end without dismissal at the end of the contract period and thus lower institutional firing costs. Though the overall use of fixed-term employment is still low, a remarkable share of all hirings are based on fixed-term contracts.<sup>1</sup>

At the same time, concerns have arisen relating to the increasing share of temporary workers. It is argued that temporary work lowers upward job mobility and that especially low-skilled temporary workers have lower transition rates to permanent jobs. It is also argued that temporary workers are less satisfied with their jobs in comparison to permanent workers. In addition, there is a negative nexus between temporary work and work-related training.<sup>2</sup> From the theoretical perspective it is not clear why temporary workers receive less training compared to permanent workers. Whilst most theories indicate lower firms' investments in human capital of temporary workers, temporary workers may have incentives to invest in human capital themselves, e.g. to force the transition to permanent contracts.

In addition to the existing strand of literature on the influences of contract type on investments in human capital, we especially distinguish between employer- and employee-financed training in order to allow diverging investment patterns of worker and firm. Methodological, we control for selection to yield unbiased estimates, because training participation as well as holding a fixed-term contract can be driven by unobservable factors.

The remainder of this paper is structured as follows: *section 2* summarises the theory on work-related training and draws implications for training of workers with fixed-term contracts. *Section 3* contains method, data and descriptive statistics, estimation results are presented in *section 4*. *Section 5* concludes.

## 2 Theory and previous empirical findings

Following the seminal study of Becker (1962; 1993), investments in human capital are categorised in general and firm-specific human capital. Assuming perfect labour markets, investments in firm-specific human capital are shared between employer and employee, depending on labour turnover (Hashimoto, 1981). Because

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<sup>1</sup> Hagen (2004, p. 110) notes that within West German private sector establishments between 1997-1999, 6.1% of all employees work on the basis of a fixed-term contract, whereas it is almost 43% of all hirings. See *figure 1* for the development of fixed-term employment, based on the German Mikrozensus.

<sup>2</sup> See Arulampalam and Booth (1998), Booth, Francesconi and Frank (2000), Wallete (2005), OECD (2002), or Albert, García-Serrano and Hernanz (2005).

investments in general human capital increase the worker's marginal product in all firms and because perfect information is assumed, firms do not invest in general human capital. Relaxing the assumption of perfect labour markets, recent theoretical models explain firms' investments in general human capital by compressed wages (Acemoglu and Pischke, 1999).<sup>3</sup> Intensely discussed reasons for compressed wages are transaction costs (Acemoglu, 1997) and asymmetric information. The latter occurs if incumbent firms have superior information about their employees' human capital and training (Katz and Ziderman, 1990), or if "outside" firms observe training intensity, but not ability (Acemoglu and Pischke, 1999). Autor (2001) models training choice by workers as a screening device that induces self-selection of high-ability workers.<sup>4</sup>

Except for Autor's model, theoretical models on investments in human capital do not deal with fixed-term contracts. However, there are arguments for positive, as well as for negative, influences of fixed-term contracts on investments in human capital. First, expected job duration of fixed-term workers is shorter compared to workers with permanent contracts. Therefore, the discount period for employer's and employee's investments is shorter (Arulampalam, Booth and Bryan, 2005). If temporary workers are hired as specialists for certain tasks for a fixed period ("on-call"), firm will not provide training to them (Walette, 2005). Secondly, fixed-term workers invest in human capital more, e.g. to obtain particular skills for on-call jobs, to compensate for lesser firm investments, to increase the probability of receiving a permanent job, or to show loyalty towards the employer. Another argument is put forward by Autor (2001): in order to elicit private information (ability), firms offer training for screening purposes and self-selection. Thirdly, theory offers arguments which finds there to be no or no definite influence of contract type on investments. This is because employment of fixed-term workers is faced by higher turnover, workers finance investments indirectly by lower wages (OECD, 2002, p. 156). Even if fixed-term workers are hired as on-call workers, they may need training to perform well in their jobs, a situation similar to new workers with permanent contracts. Of course, investments could also be determined by other factors such as technical developments instead of the contract type.

Similar to the theoretical literature, there are only few empirical studies on training of temporary workers. For Germany, Wilkens and Leber (2003) include a dummy variable for individuals holding a fixed-term contract and find a significant negative effect of fixed-term contracts on training participation.<sup>5</sup> Regarding different types of temporary jobs, Walette (2005) argues for heterogeneous effects for (temporary) replacement, project, on-call and probation jobs in Sweden. Another important

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<sup>3</sup> See Leuven (2005) for a survey on theoretical models.

<sup>4</sup> Other market imperfections that result in compressed wages are complementary between general and firm-specific human capital (Acemoglu and Pischke, 1998) and trade unions (Acemoglu and Pischke, 1999).

<sup>5</sup> A positive influence of fixed-term contracts is found by McIntosh (1999) for Germany. This result could be biased by the inclusion of apprentices.

result comes from Albert et al. (2005), who isolate the effect of being enrolled in a firm that offers training from the effect of being selected to participate in training within a firm that offers training. They find that workers with fixed-term contracts are less likely to be employed in “training firms” and if so, receive less training compared to permanent workers.

For the analysis of the influence of fixed-term contracts on training participation, it is important to know why firms offer fixed-term contracts alongside permanent contracts: first, if firing costs of permanent contracts are higher than those for fixed-term contracts, fixed-term contracts can be used to ease adjustment and thus to lower adjustment costs (Hunt, 2000). Second, fixed-term contracts can be seen as prolonged probation in order to allow screening (Autor, 2001). Then, low-ability workers could be laid off less costly (Boockmann and Hagen, 2005). Third, fixed-term contracts can induce self-selection of “good” workers (Loh, 1994).

The German legislation on employment contracts is characterised by a high level of employment protection with respect to permanent contracts,<sup>6</sup> whilst the use of fixed-contracts has gradually been deregulated since 1985. Fixed-term contracts are legal if employers can either show to have “objective reasons” or if a fixed-term job is temporary limited. Temporary limited fixed-term contracts can be renewed at most three times with a maximum length of two years. If objective reasons can be proven, iterative fixed-term contract spells are legal.

### 3 Estimation strategy, data, and descriptive statistics

This paper analyses the effect of worker’s employment contract, i.e. fixed-term versus permanent contracts, on participation and financing of work-related training. The empirical analysis is accomplished in two steps: first, we analyse the effect on participation in training. In the second step, we examine whether there are differences with regard to financing work-related training.

#### 3.1 Estimation strategy

When estimating the influence of contract type on participation in training, it is necessary to control for potential selection effects. If the occurrence of fixed-term contracts is not random but rather driven by unobserved factors, then estimation

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<sup>6</sup> Hunt (2000) notes, that individual and collective dismissals of workers with permanent contracts are costly either in “terms of time, money or procedural complexity”. However, employment protection for permanent workers was deregulated for small and start-up establishments (Jahn (2005) and *appendix A.1*).



without selection correction would produce biased estimators. Previous empirical studies on training, which controlled for fixed-term contracts, mostly include a dummy variable for temporary employment into the estimation equation. In contrast to these studies, we argue that unobservable effects may bias the occurrence of fixed-term contracts. With detailed information on worker's and firm's characteristics, a large part of the variation in training can be explained. However, (unobserved) ability can be correlated to fixed-term contracts because of self-selection (Loh, 1994). Firms may use fixed-term employment relationships in order to screen their temporary workers (Autor, 2001). Finally, we can not observe whether temporary workers are on-call workers which may need less firm-provided training.

Since both the decision to participate in training and the decision on being employed on a fixed-term contract are dichotomous, the bivariate probit model (van de Ven and van Praag, 1981; Maddala, 1983) is an appropriate econometric method. It consists of two equations: the first equation contains the training probability ( $y_{1i}$ ), the second is the selection equation for fixed-term contracts ( $y_{2i}$ ). It is a recursive simultaneous-equations model since ( $y_{2i}$ ) enters the training equation:

$$y_{1i}^* = \mathbf{x}'_{1i}\boldsymbol{\beta}_1 + \gamma y_{2i} + \varepsilon_{1i} \quad \text{with} \quad y_{1i} = \begin{cases} 1 & \text{if } y_{1i}^* > 0, \\ 0 & \text{else.} \end{cases} \quad (1)$$

$$y_{2i}^* = \mathbf{x}'_{2i}\boldsymbol{\beta}_2 + \varepsilon_{2i} \quad \text{with} \quad y_{2i} = \begin{cases} 1 & \text{if } y_{2i}^* > 0, \\ 0 & \text{if else.} \end{cases} \quad (2)$$

Subscript  $i$  denotes the individuals,  $y_{1i}^*$  and  $y_{2i}^*$  are latent variables, and regressors in vectors  $\mathbf{x}_{1i}$  and  $\mathbf{x}_{2i}$ , respectively, include worker's and firm's characteristics. Error terms  $\varepsilon_{1i}$  and  $\varepsilon_{2i}$  are assumed to have the following properties:

$$\begin{aligned} E(\varepsilon_{1i}|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= E(\varepsilon_{2i}|\mathbf{x}_{1i}, \mathbf{x}_{2i}) = 0, \\ \text{Var}(\varepsilon_{1i}|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= \text{Var}(\varepsilon_{2i}|\mathbf{x}_{1i}, \mathbf{x}_{2i}) = 1 \text{ and} \\ \text{Cov}(\varepsilon_{1i}, \varepsilon_{2i}|\mathbf{x}_{1i}, \mathbf{x}_{2i}) &= \rho. \end{aligned}$$

If the error terms  $\varepsilon_{1i}$  and  $\varepsilon_{2i}$  are uncorrelated, i.e.  $\rho = 0$ , the two equations can be estimated separately using the probit model. If  $\rho \neq 0$ , the separate estimates would be biased. The bivariate probit model controls for this selection effect.

The model is identified, if either the error terms of both equations are mutually independent ( $\rho = 0$ ) or if each equation contains at least one regressor which is excluded from the other equation (Maddala, 1983, p. 122). Though most regressors appear in both equations, there are some regressors that can be excluded from one equations (see *section 3.3*).

## 3.2 Data

The data used in this study is taken from the German Socio-Economic Panel (GSOEP).<sup>7</sup> The GSOEP is a representative longitudinal household dataset with an overall number of individuals of about 22,000 in 2004. The GSOEP was started in 1984 and expanded by various “filling” samples. The questionnaire consists of information collected annually and supplementary modules which are not collected in every wave. The latter applies to the module “training” which has been collected in 1989 (Pischke, 2001; Pannenberg, 1997), 1993, 2000 (Wilkins and Leber, 2003) and 2004.

The information on work-related training is collected retrospectively for a period of three years prior to the interview. The questions on training were posed to all respondents aged 16 to 64. The interview sequence is related to work-related training courses and workshops and explicitly excludes reading of technical literature, and the attendance at trade fairs and congresses. Respondents which have participated in at least one workshop or training course are asked about the start date, duration, goals in detail. Further questions are posed concerning whether the course was conducted during work hours or leisure, based on self-finance, who arranged the training, whether they received financial support and by whom, whether the course was certified, and whether the contents of training can be applied in other establishments as well. This information is gathered for the last three training courses and workshops prior to the interview.<sup>8</sup>

In order to analyse investments in human capital within employment relationships, the sample in this study is restricted to all respondents in dependent employment at the 2004 interview. The estimation sample then includes 8,363 individuals. We use training data from the 2004 wave of the GSOEP. Taking advantage of the GSOEP’s panel structure, other variables are taken from the training’s start date.<sup>9</sup> It is crucial to do so because otherwise the current employment status could be the result of past training which would mean that variables could be biased. For non-participants, we use data from the 2004 wave. *Figure 2* shows the distribution of training start dates of training participants from the 2004 wave (see *appendix A.2*).

## 3.3 Dependent and identifying variables

We use different dummy-variables to analyse the influence of workers’ contracts on training. The first, and most obvious variable for the training equation, is participation in work-related training within the three years immediately prior to the interview. However, the use of this variable may hide two divergent effects: the

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<sup>7</sup> For a recent documentation of GSOEP, see SOEP Group (2001) or Haisken-DeNew and Frick (2005).

<sup>8</sup> As mentioned by Pischke (2001), the questions on training are related to mostly formal courses.

<sup>9</sup> For a similar procedure, see Pischke (2001) and Wilkins and Leber (2003).

theoretical discussion shows that firm and temporary workers may have opposing incentives (not) to invest in a temporary worker's human capital. Therefore, we created two variables to explain different financing patterns: the variable "employer financed training" covers all work-related training within three years immediately prior to the interview if the training is on-the-job, or if there is financial assistance by the employer.<sup>10</sup> To analyse employee-sponsored training, we defined a variable which includes work-related training if the employee had direct costs related to the training. Unfortunately, we are not able to measure indirect cost participation, such as temporary or permanent wage cuts to finance training.

For identifying purposes, we include the variables "risk aversion" and "working overtime" in the training equation, but not in the fixed-term contract equation. Neither theory nor previous empirical studies have found these variables to be able to explain fixed-term contracts and training, respectively. This procedure is underlayed by probit regressions in *table 3*, where the estimates for "risk aversion" and "working overtime" are insignificant. To identify the fixed-term contract equation, we use a dummy variable for employment relationships which have started after January, 2001, where a major change in legislation took place. We argue that this had an effect on the use of fixed-term contracts, but not on the participation in training.

### 3.4 Descriptive statistics

On the descriptive level (see *table 1* and *2*), participation in training shows some interesting results: while there is only a minor difference between participation in training among permanent workers (31.4%) and workers with fixed-term contracts (30.6%), training and financing characteristics clearly show diverging patterns. Workers with fixed-term contracts, participating in training, receive their training more often "off"-the-job, i.e. not during working hours (23.6% vs. 18.9%). This pattern is complemented by the figures of own payments for training: while permanent workers which participate in training invest 112 Euro, the number rises to 129 Euro among workers with fixed-term contracts (*table 2*). Unfortunately, there is no data on what amount the firm pays for training of workers, both directly in terms of training costs, or indirectly in terms of temporary loss of wages. We defined two further variables, employer-financed training and employee-financed training (see *subsection 3.3*). This was necessary to roughly account for "assistance" by firms, e.g. through training during working hours. According to this measure, it is 72.8% of temporary workers which participate in training financed (at least partly) by their employer, whereas 83.9% of permanent workers do the same. In contrast, the figures for employee-financed training, i.e. if employees paid for training through direct costs, are 19.7% and 15.4%, respectively. Descriptive statistics on the aims of training support theoretical considerations on training of temporary workers: 31.0%

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<sup>10</sup> We assume that on-the-job training is a kind of "indirect" financing by the employer. Costs are temporary productivity loss or direct training costs.

of temporary workers with training aim at doing career advancement, whereas it is only 23.5% among workers with permanent contracts.

Regarding firms' and workers' characteristics and the participation in training in general, descriptive statistics show that part-time and marginal part-time workers participate in training clearly less compared to workers with fixed-term or permanent contracts. Regarding formal qualification and skill level in the current job, it is obvious that low- and medium-skilled blue collar workers, as well as low-skilled white collar workers receive less training. Whereas especially high-skilled white collar workers participate more in training.<sup>11</sup> The greater share of workers with training in large firms can be explained by economies of scale within providing training.

Similar to the occurrence of training, fixed-term contracts are more widespread among low-skilled blue collar workers, medium- and high-skilled white collar workers as well as workers with no occupational degree. With respect to firm characteristics, workers within the agricultural and the service sector are employed on a temporary basis more often. Due to data restrictions, we are not able to differentiate between seasonal and non-seasonal fixed-term employment. There are no differences regarding firm size: for small firms (< 10 employees) it is legal to employ workers on a fixed-term basis, but at the same time they are not faced by dismissal protection.

## 4 Estimation results

The main aim of this paper is to analyse the effect of the worker's type of contract (fixed-term vs. permanent) on participation and financing of training. We apply the bivariate probit method (see *subsection 3.1*) in order to regard potential selection effects. To analyse different financing patterns of workers and firms, we use different dependent variables.

### 4.1 The effect of fixed-term contracts

Within the first estimation (*table 4*, column (1) and (2)), the dependent variable is a dummy with work-related training participation within the three years immediately prior to the interview, independently of who financed the training and at what time the training took place. Fixed-term employment has a significant negative influence on participation of training. Among all dummy variables included in the regression, this variable is the most important determinant for the probability

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<sup>11</sup> The definition of high- medium- and low-skilled is taken from Blossfeld (1989). This classification, which is used widely in labour market research, stratifies employees into groups which are homogeneous with respect to their occupational tasks and educational and occupational qualification.

of receiving training. This first evidence suggests that there is indeed an overall negative influence of fixed-term contracts on training. Similar, but weaker results can be found for part-time and casual workers employees.<sup>12</sup>

The second dependent variable is defined as training within the three years immediately prior to the interview which is either directly financed by the employer, or indirectly financed, if training takes place during working hours (“on-the-job”). As in the first model, the workers with fixed-term contracts have a lower probability of participating in training. This supports the hypothesis that firms are less willing to finance work-related training if workers have fixed-term contracts. Thus, firms do not pay lower wages in order to finance training. However, there are other arguments to explain lower wages of temporary workers, such as specific investments like search costs.

In contrast to the dependent variable “employer-sponsored training”, we use “employee-sponsored training” as the third dependent variable (*table 4*, column (5) and (6)). This variable contains training at least partly financed by the worker through direct costs. The effect of this variable is again negative. This result indicates that workers with fixed-term contracts do not compensate for lower firm investments.

Of course, since we are not able to observe whether the firm pays lower wages to finance investments in human capital, we can not determine the actual costs related to training. Thus, distinguishing between employer-, employee- and shared-financing remains imprecise.

## 4.2 Selection effects

This study explicitly uses a selection correction mechanism, namely the bivariate probit model. Selection effects may arise because the decision to participate in training, as well as the decision whether to have a fixed-term contract may not be random, but rather might be determined by unobservable factors, such as ability. The correlation term  $\rho = Cov(\varepsilon_{1i}, \varepsilon_{2i} | \mathbf{x}_{1i}, \mathbf{x}_{2i})$  indicates whether selection correction is appropriate. If  $\rho = 0$ , estimating single-equation probit is sufficient. Within all models, we find correlation terms which are significantly different from zero.

This result has two implications: firstly, as proposed by theoretical models (Loh, 1994; Autor, 2001), there are selection effects. Secondly, previous results of studies neglecting this relationship should be interpreted carefully with respect to the influence of contract type.

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<sup>12</sup> However, it should be noted that casual work plays a minor role within the regression sample ( $N = 345$ ).

### 4.3 Further results

The results of the other explaining variables are similar to those found in previous studies<sup>13</sup> and are similar across the estimated models.<sup>14</sup> Firstly, age has a positive influence, squared age a negative one. This result can be interpreted with diminishing information asymmetries of the firm towards the employee but it also depends on the worker's knowledge about his own ability, and thus about expected returns from training. Job tenure within current firms has a significant negative influence, and can be explained by investments undertaken throughout the beginning of the employment relationship. In accordance with human capital theory, high risk aversion lowers the probability of participation in training. However, the strength is surprising as risk aversion should affect only the worker's investments. Working overtime regularly has a positive impact on training participation. Gerfin, Leu and Nyffeler (2003) explain this as a positive signal towards the employer. Regarding firm size, it is argued that larger firms yield returns to scale in providing training (Zwick, 2005). Within the estimation of training in general, and employer-sponsored training, this result holds and workers in larger firms indeed participate in training more, in comparison to smaller firms. Results for skill groups are very clear: workers in medium- and high-skilled jobs participate in training more (see also Pischke (2001), Büchel and Pannenberg (2004), and Wilkens and Leber (2003)). This can be due to higher returns from investments, as they are aware of their ability, or because their skills complement capital investments, such as investments in information and communication technologies (Bartel and Lichtenberg, 1987).

Regarding the probability of being employed on a fixed-term contract, the results are quite similar across the estimated models: age as well as job tenure within the current firm has a negative influence. This result is not surprising because fixed-term contracts are either terminated after the contract duration or converted to permanent contracts.<sup>15</sup> Additionally, younger workers are more faced with employment relationships based on fixed-term contracts.<sup>16</sup> Similar, employment relationships that started after January 2001 have a higher probability of being temporary. Regarding firm size, the effect can be observed, that larger firms rather use fixed-term contracts. This result can be explained by the fact that small firms are not bound to legal dismissal protection.

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<sup>13</sup> See Pischke (2001) and Büchel and Pannenberg (2004) for an comprehensive overview on training in Germany.

<sup>14</sup> Pischke (2001) also finds that similar results for employer-sponsored, as well as for training participation in general applies.

<sup>15</sup> See *figure 3* for duration of employment relationships.

<sup>16</sup> However, other studies find negative influence of age on the occurrence of fixed-term contracts (Boockmann and Hagen, 2005, for men).

## 5 Conclusions

This study dealt with the effect of fixed-term contracts on participation and financing of work-related training. In order to measure the effect accurately, we used a recursive simultaneous-equation model to take selection effects into account.

Using data from the German Socio-Economic Panel (GSOEP) from 1997 to 2004, we found that holding a fixed-term contract lowers the probability of participating in work-related training. These results are in line with the previous literature on the effects of fixed-term contracts on work-related training (Albert et al., 2005; Wallette, 2005). This result supports the argument that firms are averse to invest in human capital of temporary workers due to their shorter job tenure.

In addition to the previous studies on the effect of fixed-term contracts on training participation, we addressed the question whether there are divergent investment patterns between employer and employee with respect to contract type. However, the effect of fixed-term contracts on employer-sponsored, as well as on employee-sponsored training, is negative. Therefore, we conclude that fixed-term workers do not compensate for low firm investments through own investments in human capital. These results stand in contrast with the argument that temporary workers are on-call workers with special skills which are developed or maintained by own investments.

Applying the bivariate probit method, we found that selection correction is an appropriate method, and that probit estimation thus yields biased estimates when estimating the effect of fixed-term contracts on training participation.

These results have important implications for labour market policy. Of course, when employment protection of permanent workers is high, fixed-term contracts allow the firms more flexibility (Hagen, 2003), or can be used as a sorting mechanism (Boockmann and Hagen, 2005). However, if workers are employed on a fixed-term basis, repeated temporary employment can explain long-term negative effects. Temporary work gains importance as an alternative to permanent employment and thus may have severe influence on the stock of human capital.

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## A Appendix

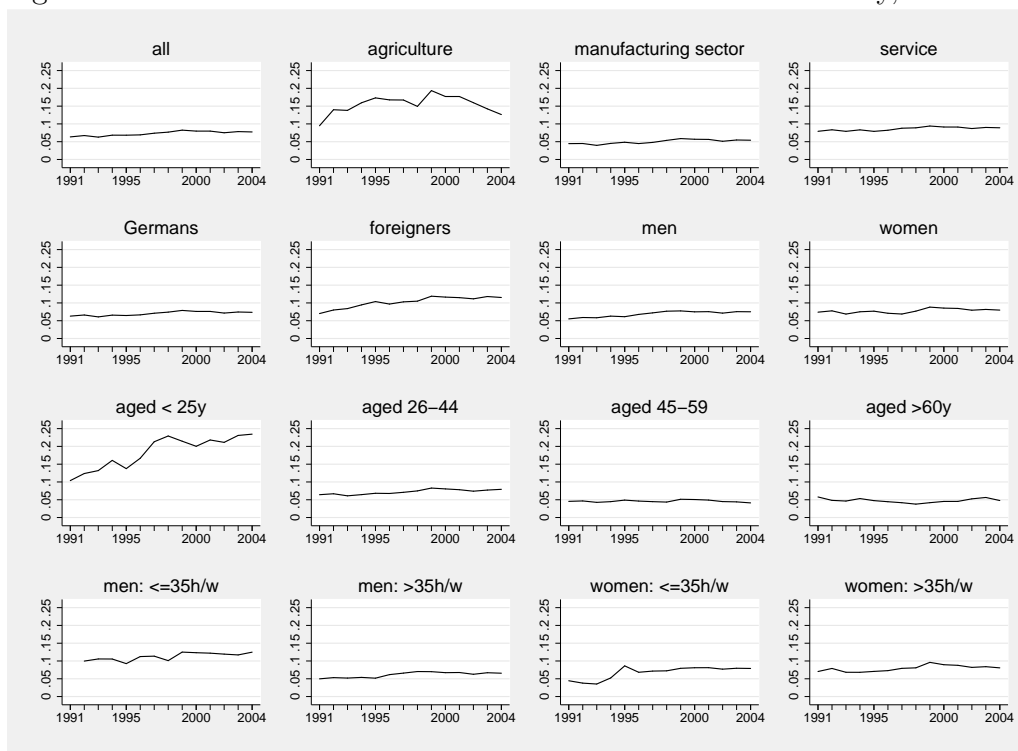
### A.1 Institutional Background for Germany

In Germany, workers can be dismissed only if the employer shows that there are either operational reasons or reasons that are caused by “the person or the person’s behaviour” (§2 (2) Employment Protection Act, KSchG). If dismissal is caused by operational reasons, the employer has to select a worker from a group of comparable workers for whom dismissal will have the least effect (“Sozialauswahl”). Then, periods of notice range from one to twenty month, depending on job tenure and age (§622 (2) German Civil Code, BGB). Dismissed workers are entitled to severance payments if the dismissal is unfair (§9 (1) KSchG), e.g. if the objective reasons have turned out to be incorrect. Severance payments depend on age, job tenure, and previous earnings. In addition, employment protection on permanent contracts is regulated by the Works Constitution Act (BetrVG), by decisions of labour courts, and may depend on collective agreements. There are exceptions to dismissal protection for small establishments as well as newly founded firms.

Until the first major deregulation of fixed-term contracts in 1985, fixed-term contracts were allowed if the employer could satisfactorily show to have “objective reasons” (§14 (1) Part-time Work and Fixed-term Contracts Act, TzBfG). The main objective reasons are seasonal fluctuations or temporarily higher labour demand, temporary replacement, carrying out special tasks, and employment as probation. If objective reasons can be proven, iterative fixed-term contract spells are legally allowed. In addition to fixed-term contracts with objective reasons, fixed-term contracts can be applied if they are temporarily limited (“kalendermäßige Befristung”, §14 (2) TzBfG). Then, fixed-term contracts are limited to at most three renewals within the maximum length of two years.

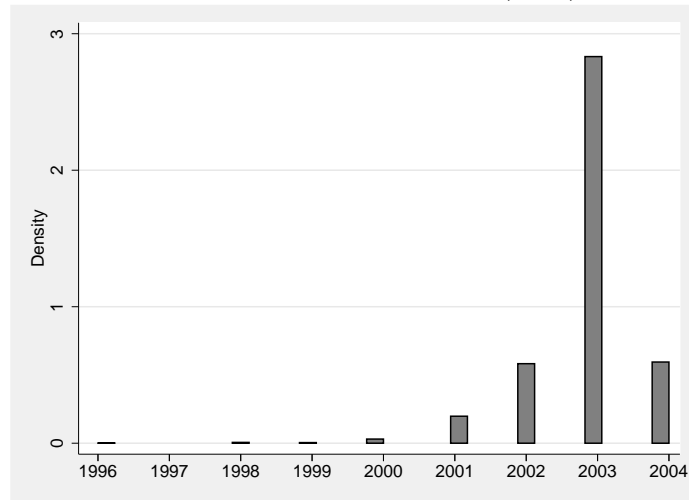
## A.2 Tables and figures

Figure 1: Share of workers with fixed-term contracts in Germany, 1991-2004



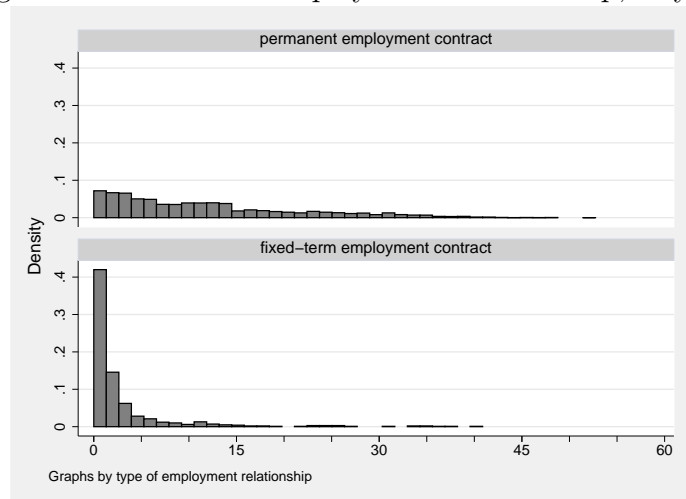
Source: Institute for Employment Research (IAB), Mikrozensus.

Figure 2: Start of training (year)



Source: German Socio-Economic Panel, own calculations.

Figure 3: Duration of employment relationship, in years



Source: German Socio-Economic Panel, own calculations.

Table 1: Descriptive statistics of the regression sample<sup>a</sup>

	whole sample ( $N = 8363$ )		respondents with training ( $N = 2619$ )								
	all	fixed-term contract	with training	age	length			general human cap. <sup>b</sup>	with certificate		
					< 10h/w	11-20h/w	21-30h/w	> 30h/w	hours of tr.		
whole sample	1.000	0.083	0.313	41.7	0.467	0.216	0.131	0.185	18.5	2.766	0.752
<i>Individual characteristics</i>											
temporary workers	0.083	1.000	0.306	34.8	0.429	0.172	0.084	0.314	46.5	2.905	0.789
permanent workers	0.917	0.000	0.314	42.4	0.471	0.220	0.136	0.174	16.0	2.754	0.748
full-time workers	0.757	0.075	0.337	41.5	0.443	0.218	0.138	0.200	17.9	2.766	0.757
part-time workers	0.201	0.085	0.267	43.1	0.565	0.214	0.103	0.118	19.9	2.773	0.728
casual workers	0.041	0.226	0.093	38.6	0.690	0.103	0.103	0.103	32.8	2.656	0.750
men	0.524	0.075	0.330	42.1	0.396	0.225	0.154	0.225	16.9	2.753	0.759
women	0.476	0.092	0.295	41.4	0.557	0.205	0.104	0.134	20.4	2.780	0.742
foreigner	0.075	0.081	0.154	40.4	0.412	0.259	0.106	0.224	26.8	2.845	0.750
German	0.925	0.083	0.326	41.8	0.469	0.214	0.133	0.183	18.2	2.762	0.752
East Germany	0.231	0.113	0.328	42.0	0.522	0.193	0.098	0.186	27.0	2.662	0.771
West Germany	0.769	0.074	0.309	41.6	0.450	0.223	0.142	0.185	15.8	2.799	0.745
<i>Occupation</i>											
Blue collar low skilled	0.082	0.096	0.131	41.4	0.561	0.098	0.134	0.207	21.3	2.755	0.807
Blue collar medium skilled	0.194	0.062	0.231	40.3	0.408	0.220	0.128	0.244	19.4	2.840	0.810
Blue collar high skilled	0.055	0.068	0.522	43.5	0.341	0.272	0.190	0.198	9.3	2.894	0.728
White collar low skilled	0.240	0.084	0.189	41.9	0.529	0.201	0.101	0.170	17.3	2.632	0.751
White collar medium skilled	0.290	0.069	0.397	41.5	0.502	0.225	0.117	0.156	21.5	2.758	0.719
White collar high skilled	0.139	0.142	0.493	44.2	0.445	0.203	0.157	0.195	17.1	2.766	0.770
<i>Education</i>											
no degree	0.119	0.133	0.126	39.2	0.570	0.158	0.096	0.175	13.8	2.872	0.766
vocational degree	0.617	0.071	0.287	40.9	0.473	0.213	0.123	0.191	21.4	2.746	0.753
university (former GDR)	0.034	0.063	0.495	48.0	0.496	0.223	0.132	0.149	19.3	2.604	0.809
university	0.229	0.091	0.455	44.3	0.438	0.228	0.153	0.182	14.1	2.8	0.738
<i>Sectors</i>											
agriculture	0.010	0.151	0.186	44.0	0.500	0.142	0.286	0.071	2.0	2.375	0.500
manufacturing	0.326	0.053	0.248	41.6	0.442	0.227	0.120	0.211	19.1	2.879	0.788
service	0.664	0.097	0.347	41.7	0.475	0.213	0.134	0.177	18.4	2.729	0.741
<i>Firm size</i>											
< 20 employees	0.219	0.077	0.228	40.1	0.583	0.204	0.087	0.125	24.7	3.010	0.806
20–199 employees	0.303	0.091	0.268	42.3	0.511	0.223	0.122	0.144	17.0	2.864	0.771
200–1999 employees	0.234	0.081	0.347	42.4	0.467	0.236	0.129	0.169	15.3	2.653	0.750
≥ 2000 employees	0.244	0.081	0.413	41.8	0.379	0.199	0.163	0.258	19.3	2.656	0.710

Source: GSOEP 1996-2004. For the construction of the dataset, see section 3.2.

<sup>a</sup> Figures above show unweighted shares related to the regression sample and the individuals with training, respectively.

<sup>b</sup> “General human capital” is measured as “0” if it is completely firm-specific, and “4” if it is completely general.

Table 2: Training characteristics and type of contract<sup>a</sup>

	whole sample		temp. workers		perm. workers		full-time		part-time		casual work	
	N = 2619		N = 213		N = 2406		N = 2137		N = 450		N = 32	
<i>Number of observations</i>												
<i>Type of training</i>												
training	0.313		0.306		0.314		0.337		0.267		0.093	
employee-sponsored training	0.830		0.728		0.839		0.854		0.740		0.437	
employee-sponsored training	0.157		0.197		0.154		0.151		0.184		0.188	
On-the-job training	0.680		0.594		0.688		0.720		0.516		0.313	
Off-the-job training	0.193		0.236		0.189		0.162		0.319		0.469	
Off- and on-the-job training	0.118		0.142		0.117		0.110		0.156		0.125	
<i>Aim of training</i>												
- occupational retraining	0.012		0.052		0.010		0.011		0.018		0.094	
- adjustment to a new job	0.460		0.099		0.042		0.046		0.044		0.125	
- for career advancement	0.241		0.310		0.235		0.263		0.142		0.125	
- Adaption to new requirements	0.752		0.549		0.770		0.745		0.800		0.593	
- without aim	0.119		0.146		0.116		0.115		0.128		0.250	
<i>Financing</i>												
Worker's payment for training (in Euro)	113.3		129.1		111.9		117.5		98.4		39.7	
Financial assistance by...												
- employer	0.730		0.635		0.738		0.752		0.650		0.375	
- employment office	0.090		0.023		0.008		0.008		0.011		0.094	
- others	0.010		0.033		0.008		0.009		0.014		0.031	
- no financial assistance	0.251		0.308		0.245		0.231		0.325		0.500	

Source: GSOEP 1996-2004. For the construction of the dataset, see *section 3.2*.

<sup>a</sup> Figures above show unweighted shares related to the individuals with training in the corresponding group. For the construction of the dataset, see *section 3.2*.

Table 3: Probit estimates<sup>a</sup>

Dependent variable	training	FTC
fixed-term contract	-.015 (.061)	—
part-time	-.220 (.045)	.127 (.066)
casual work	-.710 (.104)	.356 (.096)
age	.072 (.012)	-.091 (.015)
age (squared)	-.001 (.0001)	.001 (.0002)
job tenure	-.032 (.006)	-.164 (.008)
job tenure (squared)	.0008 (.0002)	.003 (.0002)
male	.166 (.038)	.042 (.058)
foreign	-.349 (.068)	.056 (.091)
East Germany	.055 (.037)	.231 (.054)
firm size: 20-199 empl.	.005 (.046)	.312 (.066)
firm size: 200-1999 empl.	.189 (.049)	.437 (.074)
firm size: $\geq$ 2000 empl.	.294 (.049)	.463 (.076)
hired after January, 2001	-.410 (.053)	—
risk aversion <sup>b</sup>	—	.013 (.011)
working overtime	—	-.009 (.007)
— sector and skill dummies are included —		
constant	-2.037 (.240)	.553 (.311)
Observations	8589	8325
log likelihood	-4666.17	-1752.959
Pseudo-R <sup>2</sup>	.124	.268
$\chi^2$ (p-value)	1322.345 (.000)	1280.684 (.000)

Source: GSOEP 1996-2004. For the construction of the dataset, see *section 3.2*.

<sup>a</sup> The regression sample is unweighted. Table presents coefficients, and standard errors in parentheses.

<sup>b</sup> Risk aversion is 0 if an individual has high risk aversion and 10 for low risk aversion.



Table 4: Bivariate probit estimates<sup>a</sup>

Equation	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variables	training	fixed-term contracts	employer-sponsored training	fixed-term contract	employee-sponsored training	fixed-term contract
fixed-term contract	-1.098 (.117)	—	-1.150 (.126)	—	-.851 (.271)	—
part-time	-.156 (.045)	.128 (.065)	-.162 (.047)	.116 (.065)	-.134 (.072)	.107 (.066)
casual work	-.540 (.103)	.385 (.095)	-.740 (.131)	.365 (.095)	-.410 (.185)	.349 (.096)
age	.052 (.012)	-.076 (.015)	.051 (.012)	-.077 (.015)	.026 (.021)	-.082 (.016)
age (squared)	-.0008 (.0001)	.0008 (.0002)	-.0008 (.0001)	.0008 (.0002)	-.0005 (.0003)	.0009 (.0002)
job tenure	-.026 (.006)	-.101 (.01)	-.020 (.007)	-.105 (.01)	-.033 (.014)	-.108 (.01)
job tenure (squared)	.0006 (.0002)	.002 (.0003)	.0005 (.0002)	.002 (.0003)	.0008 (.0003)	.002 (.0003)
male	.064 (.038)	.096 (.056)	.134 (.039)	.089 (.056)	-.040 (.061)	.077 (.057)
foreign	-.331 (.066)	.056 (.09)	-.313 (.069)	.055 (.09)	-.424 (.147)	.080 (.091)
East Germany	.079 (.037)	.252 (.053)	.048 (.038)	.248 (.053)	.155 (.057)	.248 (.054)
risk aversion <sup>b</sup>	.040 (.007)	—	.041 (.007)	—	.022 (.012)	—
working overtime	.030 (.004)	—	.025 (.004)	—	.025 (.006)	—
Blue collar: low-skilled	-.212 (.076)	.285 (.105)	-.271 (.081)	.300 (.105)	-.024 (.141)	.286 (.106)
Blue collar: medium-sk.	.077 (.055)	.064 (.087)	.061 (.057)	.052 (.087)	.051 (.102)	.051 (.089)
Blue collar: high-sk.	.661 (.072)	.127 (.121)	.604 (.074)	.124 (.124)	.212 (.126)	.097 (.125)
White collar: medium-sk.	.387 (.046)	-.082 (.071)	.334 (.048)	-.092 (.071)	.180 (.083)	-.085 (.072)
White collar: high-sk.	.527 (.057)	.368 (.083)	.448 (.058)	.369 (.083)	.524 (.091)	.360 (.085)
firm size: 20-199 empl.	.072 (.045)	.317 (.065)	.131 (.048)	.313 (.065)	-.091 (.077)	.319 (.067)
firm size: 200-1999 empl.	.278 (.049)	.426 (.074)	.359 (.051)	.422 (.074)	.025 (.084)	.438 (.075)
firm size: ≥ 2000 empl.	.392 (.049)	.482 (.075)	.481 (.051)	.475 (.074)	.074 (.084)	.465 (.076)
hired after January, 2001	—	.643 (.066)	—	.619 (.066)	—	.578 (.069)
— sector dummies are included —						
constant	-1.818 (.251)	-.314 (.312)	-2.019 (.268)	-.266 (.312)	-2.010 (.461)	-.142 (.316)
$\hat{\rho}$	.691 (.102)		.712 (.117)		.489 (.212)	
Observations	8363		8363		8363	
log likelihood	-6255.71		-5909.62		-3175.38	
$\chi^2$ (p-value)	2439.46 (.000)		2308.32 (.000)		1333.38 (.000)	

Source: GSOEP 1996-2004. For the construction of the dataset, see section 3.2.

<sup>a</sup> The regression sample is unweighted. The table presents coefficients, and standard errors in parantheses.

<sup>b</sup> Risk aversion is 0 if an individual has high risk aversion and 10 for low risk aversion.