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## **Recruitment and Apprenticeship Training**

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# Recruitment and Apprenticeship Training

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## Abstract:

The paper assesses the potential free-riding of non-training firms on the training efforts of training firms and analyses differences in recruitment of apprenticeship graduates trained elsewhere between training and non-training firms. The paper shows that only 5.6 per cent of non-training firms hire apprenticeship graduates. On the contrary, 27 per cent of training firms hire switching apprenticeship graduates. In total, 85.5 per cent of firms that hire switching apprenticeship graduates train themselves and only four per cent of all apprenticeship graduates find their first job in non-training firms. This indicates a comparative advantage of training firms in hiring apprenticeship graduates trained elsewhere.

**JEL Codes:** J24, M51, M53

**Key words:** information asymmetries, company-sponsored training, training participation, recruiting, apprenticeship

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## **Introduction**

The willingness of firms to provide apprenticeships is of major interest to understand the incentives of firms to invest in transferable skills. Firms' investment in transferable skills induces the risk of free-riding since other companies can poach the newly trained skilled workers (Harhoff and Kane 1997; Acemoglu and Pischke 1998; Stevens, 2001; Leuven, 2005; Busemeyer, 2009; Wolter and Ryan, 2011). Free-riding is the most important fear and obstacle in countries thinking about to adapt an apprenticeship training system because the risks of poaching and free-riding are detrimental for firms' willingness to train apprentices if firms invest in transferable skills of apprentices.

The economic literature argues that market mechanisms such as monopsony power based on information asymmetry, transaction costs or complementarities to specific skills can prevent poaching (Acemoglu and Pischke, 1998; Leuven, 2005; Wolter and Ryan, 2011). Moreover, political science discusses that employer coordination solve the commitment problem to training and reduce free-riding through information circulation, deliberation, monitoring and sanctioning (Soskice, 1994; Culpepper, 2001; Trampusch and Eichenberger, 2012).

Empirical studies analysing the impact of free-riding on apprenticeship training usually focus on the provision of apprenticeships. On the contrary, this paper argues that understanding potential free-riding of non-training firms requires an analysis of the recruiting strategy of non-training firms in comparison to training firms, since the overwhelming proportion of firms does not train but employ skilled workers. Such analysis can show whether these firms are able to hire apprenticeship graduates and provide additional explanations for the functioning of apprenticeship training markets.

The paper shows that non-training firms are less likely to hire apprenticeship graduates trained elsewhere than training firms and, if they hire them, they hire a smaller number in proportion to all newly hired skilled employees during one year. Only 5.6 per cent of non-training firms hire apprenticeship graduates. For training firms, on the contrary, apprenticeship graduates are an important source of skilled workers. For them, 29 per cent of all new recruits with an apprenticeship degree are apprenticeship graduates in their first job during one calendar. Most of them are own apprenticeship graduates (26 per cent) but also 3.3 per cent were trained elsewhere. Put differentially, 85.5 per cent of firms that hire switching apprenticeship graduates train themselves. Non-training firms hire only 13 out of 100 switching apprenticeship graduates in their first job after graduation, which count for only four per cent of all apprenticeship graduates. This result is robust for each of the subgroups of

apprenticeship graduates: immediate movers, occupational changers and those with an unemployment spell between training completion and their first job.

The key finding that non-training firms are less likely to hire switching apprenticeship graduates trained elsewhere than training firms permits two novel inferences. First, non-training firms might simply not demand apprenticeship graduates. Hence, they have no incentive to free-ride. Second, the *group of training firms* might have an information advantage against non-training firms even in evaluating graduates trained elsewhere. They may ensure an information advantage because training supervisors are also members of apprentices' examination committees. They can better assess the quality of each apprenticeship graduate in comparison to all apprenticeship graduates in a respective training occupation as well as the quality of a training firm in comparison to all training firms. This superior knowledge gives training firms a head start in hiring switching apprenticeship graduates compared to non-training firms.

These explanations permit a stronger commitment of training firms to a non-poaching agreement as highlighted in the employer-coordination literature. Assuming that firms' knowledge about the quality of apprentice and training firm increases in firms' involvement in training, the potential loss from opportunistic (poaching) behaviour of training firms' increases too. Moreover, training firms are more likely to compete with each other for switching apprenticeship graduates. They may also be more likely to poach apprenticeship graduates and not – as frequently discussed – non-training firms.

### **The apprenticeship training system**

The German apprenticeship training system follows a curriculum laid down in the Vocational Training Act and occupation-related training curricula. The Vocational Training Act describes necessary equipment and requirements for training firms that have to be fulfilled to train apprentices adequately. Training firms need a permit for apprenticeship training granted by the chambers of industry and commerce or the chambers of craft. The training curricula describe (minimum) skills that have to be trained and the timing of training for each training occupation. Moreover, apprentices receive a graded skill certificate at the end of the training period. Apprenticeships and final exams are centrally monitored by the respective chambers of craft or industry and commerce.

These institutional settings impose a consistent and unambiguous definition of training across firms as well as transparent and visible skills. Apprenticeship graduates who receive training

in different firms but in the same occupation have comparable and guaranteed minimum skills. In particular, institutional requirements severely limit firms' ability to structure apprenticeship training so that it involves mostly firm-specific training. Furthermore, apprenticeship training contracts legally terminate the day after the final exam, and employment has to be negotiated at the end of the apprenticeship. Apprentices are free to switch employers after training (Franz and Soskice 1995; Mohrenweiser et al. 2013). Therefore, training firms have to actively attract apprenticeship graduates to stay as skilled workers, and non-training firms could, in principle, easily hire them and free-ride on the efforts of training firms.

The apprenticeship training system trains around two thirds of a birth cohort. Immediately after graduation, around 66 per cent of apprenticeship graduates stay in the training firm, and 75 per cent are employed one month after graduation (Autorengruppe Bildungsberichterstattung, 2010). The retention rate in the training firm decreases to 30 per cent five years after apprenticeship completion (Winkelmann, 1996). Moreover, during the first year after graduation, around one third of all graduates switch the occupation. The retention, employment rate and the rate of occupational switchers strongly vary between occupations and sectors (Autorengruppe Bildungsberichterstattung 2010).

### **Background discussions**

Analysing the decision of non-training firms to hire apprenticeship graduates incorporate two dimensions. First, the demand of apprenticeship graduates instead of experienced employees and second the (dis)advantage of non-training firms in hiring apprenticeship graduates compared to training firms.

Firms demanding apprenticeship graduates have in principle two options. Firms can decide to train apprentices and employ their graduates afterwards. This decision refers to one apprentice training motivation, the investment training motive (Merrilees, 1983; Mohrenweiser and Zwick, 2009; Ryan and Wolter; 2011)<sup>1</sup>. This motivation implies that non-training firms do not train, for example, because of higher net-training costs than training firms (Wolter et al., 2006).

A firm can also decide not to train but to hire apprenticeship graduates from outsider firms. This implies free-riding on training efforts of training firms and can imply poaching. Poaching is generally considered as a major obstacle of firms' investment in transferable skills (Acemoglu and Pischke, 1999; Stevens, 2001; Leuven, 2005). Economic theory argues

that firms can invest in transferable skills of apprentices because of labour market imperfections such as information asymmetries, a regional monopsony power, transaction costs, complementarities to specific skills, collective agreements and minimum wages. Imperfect labour markets give training firms some monopsony power to keep graduates and pay wages lower than productivity after apprenticeship (Acemoglu and Pischke, 1999; Leuven, 2005; Wolter and Ryan, 2011).

In addition, employer coordination is generally considered to play a major role in ensuring firms' commitment to apprenticeship training. Employer associations manage the communication between firms and the government as well as within the member firms by information circulation, deliberation, monitoring and sanctioning (Soskice, 1994; Culpepper, 2001, Trampusch and Eichenberger, 2012). Hence, Mohrenweiser et al. (2013) assess that poaching plays a minor role in the German apprenticeship training market (Mohrenweiser et al., 2013).

I propose an additional argument why training firms might be more likely to hire apprenticeship graduates trained elsewhere. Training firms might not only have an information advantage against the market about the type of apprentices (Chang and Wang, 1995; Acemoglu and Pischke, 1998) or training content (Katz and Ziderman, 1990) but also the *group of training firms* has an information advantage against the group of non-training firms. Training firms can better assess the quality of each apprenticeship graduate in comparison to all apprenticeship graduates in a respective training occupation as well as the quality of a training firm in comparison to all training firms<sup>2</sup>. The information advantage might be based on institutions such as that training supervisors are also members of examination committees for exams in the chambers of industry and commerce or craft. Training firms acquire thereby information about the quality of outsider training firms and outsider apprentices. This superior knowledge gives firms a head start in recruiting even apprenticeship graduates trained elsewhere. As a result, training firms may be more likely to pick cherries and non-training firms may be more likely left with lemons. Therefore, I test the hypothesis that training firms are more likely to hire switching apprenticeship graduates trained elsewhere.

I'm not aware of any paper analysing firms' demand of apprenticeship graduates or firms' recruiting strategy regarding apprenticeship graduates. Somewhat related is a paper by Bellmann and Janik (2007) analysing the impact of uncertainty in the recruitment of skilled workers and apprentices simultaneously, but they do not focus on graduate recruitment. They

estimate a positive impact of the share of skilled workers, employment growth and high investments on the recruitment of skilled workers. On the contrary, a large strand of literature investigates firms' motivation to train apprentices, whereby the investment training motive assumes that firms train because they demand the skills of apprenticeship graduates (Mohrenweiser and Zwick, 2009; Mohrenweiser and Backes-Gellner, 2010; Wolter and Ryan, 2011; Wenzelmann, 2012). Finally, empirical papers analysing information asymmetries on the training market usually focus on the relation between the training firm and the market. They usually compare the mover/ stayer wage differential between a group of employees that carries a stigma (the laid-off workers) and a group that do not carry this stigma - mostly displaced workers because of a plant closure (Grund, 1999; Göggel and Zwick, 2012) or military quitters (Acemoglu and Pischke, 1998). These studies do not include a variable training firm<sup>3</sup>.

## **Data**

The paper uses the longitudinal version 2 of the IAB linked employer-employee data set (LIAB). The longitudinal version of the LIAB comprises all establishments with three consecutive observations in the IAB Establishment Panel between 1999 and 2002 and all employees who worked at least one day in those establishments between 1997 and 2003. For these employees, the data report the complete employment history between 1993 and 2006 (Jacobebbinghaus, 2008).

The LIAB is the only available dataset that combines individual employment histories with establishment-level information. This permits the identification of apprenticeship graduates and entails establishment characteristics of training and recruiting firms. I identify staying and switching apprenticeship graduates using individual Social Security Records. Moreover, I collapse individual Social Security Records on the establishment level. This provides variables of establishment's worker composition such as qualification and age shares and shares of newly hired and laid-off workers with an apprenticeship degree. The IAB Establishment Panel provides establishment-level information such as the location, sector, legal structure, industrial relations and investments. I merge the regional unemployment rate downloaded from the Federal Bureau of Statistics.

I restrict apprentices to those apprenticeship graduates in full-time employment in their first job and with a regular training duration. A regular training duration starts at the beginning of a school year and ends in the occupation-specific exam week in the first or second quarter of a



year. This definition of regular apprenticeships prevents drop-outs in our final sample<sup>4</sup>. Moreover, I do not consider two-year apprenticeships that mostly contain low-level apprenticeships and restrict the data to spells after 1998 because the exact day of a transition from apprenticeship to work was not mandatorily reported before 1999 (Jacobebbinghaus, 2008). On the establishment-level, I exclude agriculture, public and non-profit firms, and firms with more than 50 per cent apprentices (pure training firms). Furthermore, I use only firms that train or do not train apprentices during the entire observation period, which comprises 85 per cent of all establishments.

## **Variable definitions and descriptive statistics**

### *Dependent variable*

Table 1 summarises the definition of variables and descriptive statistics. Since I focus on the demand for apprenticeship graduates of non-training firms, I define the key dependent variable as the share of newly hired apprenticeship graduates trained elsewhere among all newly hired employees holding an apprenticeship degree during one calendar year. The variable reveals the extent to which a firm hires apprenticeship graduates subjected to their demand for skilled workers in a given period, because the denominator entails also all new workers holding an apprenticeship degree with and without work experience. Apprenticeship graduates comprise 2.3 per cent of all intakes holding an apprenticeship degree in one calendar year (Table 1).

For robustness checks, I divide the nominator of apprenticeship graduates trained elsewhere into three categories: immediate switchers, who found their first job during 10 days after apprenticeship completion, occupational switchers, who work in another than their training occupation, and switchers with an unemployment spell, who need more than 10 days to find a job after apprenticeship completion. This differentiation gives additional insights to the question whether training firms are more likely to pick the cherries.

### *Explanatory variables*

The independent variable of main interest is the apprentice-training firm. Around 60 per cent of all firms train in our final sample (Table 1). Furthermore, I control for a number of covariates influencing the recruitment of newly hired workers with an apprenticeship degree.

First, firms offering specialized career opportunities, internal labour markets and deferred pay should be more likely to hire young workers. Specialised career opportunities and internal

labour markets usually require investments in human capital which is less likely demanded on the external labour market. Workers and firms are more likely to share investments in such human capital. This creates a monopsony and lead to a long employment relation (Becker, 1964; Lazear, 2009). Moreover, firms offer internal careers to attract employees preferring long employment relation (Osterman, 1984; Pfeifer et al., 2013). Those firms are also more likely to offer deferred payment schemes (Lazear, 1979; Zwick, 2012). Specialised careers, internal labour markets and deferred payment are more likely to be observed in large firms, firms with a longer average tenure of skilled workers and firms with a lower labour turnover.

Second, firms dominating the local labour market may be more likely to attract apprenticeship graduates trained elsewhere (Mühlemann and Wolter, 2011). Dominating firms are firms paying higher wages and offering a more interesting work environment than competitors. This enables them to attract employees from rivalling firms. Dominating firms possess superior production processes and produce with a more capital intensive production technology<sup>5</sup>. A further hint for dominating firms is the skill composition of the workforce. Firms employing more skilled workers are more likely to use superior and diverse production technology.

Third, the membership within an employer association plays a major role in firms' commitment to apprenticeship training (Soskice, 1994; Culpepper, 2001,). The membership in voluntary employer associations depicts a dummy whether the firm is covered by a collective bargaining agreement. Moreover, I control for the existence of a works council.

Fourth, the supply of skilled workers in a region may be an important determinant for firms hiring policy. An access supply of skilled workers may lead firms to hire experienced skilled workers instead of new graduates. Non-training firms may, in particular, be more likely to hire experienced skilled workers who are easier to evaluate since a longer employment history is more likely to reveal the individual productivity (Schönberg, 2007). The regional unemployment rate captures outside options.

Finally, I control for legal structure and ownership status with a dummy variables.

### *Descriptive statistics*

Table 2 summarises the descriptive recruiting pattern of skilled workers holding an apprenticeship certificate for training and non-training firms. The numbers relate to recruitment during one calendar year. 88 per cent of training firms hire skilled workers (row 3). These training firms can satisfy their demand for skilled workers by retaining own apprenticeship graduates, recruiting apprenticeship graduates trained elsewhere, and hiring

experienced workers with an apprenticeship degree. Restricting the analyses to training firms that hired any skilled worker, nearly all of them hire experienced skilled workers with an apprenticeship degree (94.7 per cent, row 6), and these workers account for around 81 per cent of all new recruits.

Training firms can satisfy their skill demand with own trainees. 50 per cent of training firms retain own apprentices (row 4). Indeed, several training firms do not have an apprenticeship graduate every year. Restricting training firms to those with apprenticeship graduates (row 5), 83 per cent of those training firms retain at least one apprenticeship graduate. Own apprenticeship graduates account for 26 per cent of total new skilled workers. Put differentially, 17 per cent of all training firms do not hire own apprenticeship graduates during one year. Moreover, 27 per cent of training firms hire apprenticeship graduates trained elsewhere, which accounts for 3.3 per cent of all new hires (row 7). This proportion entails 0.6 per cent immediate switchers, 1.2 per cent occupational switchers, and 1.7 per cent<sup>6</sup> of apprenticeship graduates with an unemployment spell between apprenticeship completion and the first job.

Contrary to training firms, only 48 per cent of the non-training firms hire skilled workers holding an apprenticeship certificate during one calendar year (row 3). This is around half the number of training firms. Non-training firms that hire skilled workers mostly hire experienced skilled workers (98 per cent), accounting for 97 per cent of all new recruits holding an apprenticeship degree during one year (row 6). Moreover, 11.8 per cent hire apprenticeship graduates trained elsewhere in their first job after graduation, accounting for 3.2 per cent in total new skilled employees (row 7). The newly hired apprenticeship graduates in non-training firms entail 0.7 per cent immediate switchers, 1.7 per cent occupational switchers and 1.9 per cent switchers with an unemployment spell between training completion and the first job among all newly hired skilled workers.

Training firms are much more likely to hire apprenticeship graduates trained elsewhere. Even after restricting the sample to firms that hire apprenticeship graduates in their first job, 85.5 per cent of them train apprentices themselves (Table 3). This proportion is slightly higher for immediate switching apprenticeship graduates (88.3 per cent). Furthermore, 71.7 per cent of all firms that hire experienced workers holding an apprenticeship degree train apprentices. This proportion can be interpreted as a benchmark for the general demand for skilled workers holding an apprenticeship degree. Comparing both proportions emphasizes that training firms are more likely to hire apprenticeship graduates trained elsewhere.

These relative proportions on the establishment-level translate in an even larger difference in total numbers on the apprentice-level: only 13 out of 100 apprenticeship graduates who leave the training firm after graduation find their first job in a non-training firm. Moreover, only four out of 100 apprenticeship graduates find their first job in a non-training firm.

## **Findings**

This section presents, first, estimations of the incidence of recruiting apprenticeship graduates trained elsewhere in their first job. These estimations use a Probit ML procedure with standard errors clustered on the establishment-level. Second, I estimate the intensity of apprenticeship graduates trained elsewhere among all newly hired skilled workers using a corner solution model, the Tobit ML approach. This estimation method is appropriate because around 84 per cent of all firms do not hire apprenticeship graduates trained elsewhere. Third, I divide the apprenticeship graduates trained elsewhere into three categories: immediate switchers, occupational changers and those with an unemployment spell, and repeat the estimations described above.

Model 1 and 2 in Table 4 show coefficients and marginal effects for the incidence regression. Training firms are more likely to hire apprenticeship graduates trained elsewhere in the first job. A training firm is 10.5 percentage points more likely to hire an apprenticeship graduate trained elsewhere among all newly hired skilled employees than non-training firms. The control variables show expected signs. Larger firms hire more apprenticeship graduates trained elsewhere among all new recruits. Firms with a higher share of workers above 54 years and a higher share of skilled workers hire fewer apprenticeship graduates trained elsewhere. The share of apprenticeship graduates trained elsewhere among all new recruits is higher in firms with a more capital-intensive production and in firms with a works council. On the contrary, firms with a higher average tenure of skilled workers tend to hire fewer apprenticeship graduates trained elsewhere.

Model 3 in Table 4 presents the estimations for the recruiting intensity. In training firms, apprenticeship graduates trained elsewhere account for a larger proportion among all newly recruited skilled workers during a calendar year than in non-training firms. The marginal effect on the probability to hire those apprenticeship graduates is 9 percentage points – similar to the previous model – and the marginal effect on the intensity is 2.9 percentage points<sup>7</sup>. The control variables show similar influences as in Model 3.

The estimations presented in Table 5 split the numerator of the apprenticeship graduates trained elsewhere into three categories: immediate switchers, occupational switchers and switchers with an unemployment spell between completion of the apprenticeship and the first job. The control variables are the same as in Table 3. The cells in the first column of the table show point estimates for the incidence and in the second column for the intensity of recruiting each of the respective apprenticeship graduates among all newly recruited skilled employees. Training firms are more likely to hire all categories of apprenticeship graduates trained elsewhere, and if they do, they also hire a larger proportion of them.

Several estimations check the robustness of the results. The findings are robust for single-site firms, for which joint apprenticeship training for several establishments can be ruled out. Moreover, using LPM instead of Probit and OLS instead of Tobit and estimating each year separately does not change the findings. Moreover, the results are robust for restricting the sample to firms with less than 1,000 and less than 500 employees.

### **Alternative Explanations**

The results of this study should, however, be carefully interpreted. The results show an association but no causal relationship between apprenticeship training and recruitment of switching apprenticeship graduates. Furthermore, recruitment of apprenticeship graduates trained elsewhere is a result of the decision of employers and employees. Even if the paper argues that a non-training firm decides not to hire apprenticeship graduates, an apprenticeship graduate may also prefer to work in a training firm and rather accepts an employment offer of a training firm. Apprenticeship graduates may see firms' non-participation in apprenticeship training as an adverse signal (Backes-Gellner and Tuor, 2010). Of course, such adverse signal should be less important in regions with a high unemployment rate. A job-shortage for skilled workers may force employees to accept second-choice jobs, such as working in a non-training firm. Since controlling for the regional unemployment rate does not affect our result, the adverse signal does not seem to be the prime explanation.

### **Conclusion**

This paper analyses to what extent non-training firms are able to hire switching apprenticeship graduates. The paper shows that non-training firms are less likely to hire apprenticeship graduates trained elsewhere than training firms. Non-training firms that hire those apprenticeship graduates hire also a smaller share of them, measured as a proportion on all

newly hired skilled workers with an apprenticeship degree. Moreover, only four per cent of all apprenticeship graduates find his or her first job in a non-training firm.

The key result of the study indicates that non-training firms are less likely to hire apprenticeship graduates. The paper proposes two explanations for this finding. First, non-training firms do not demand apprenticeship graduates. Second, the *group of training firms* has an information advantage in evaluating apprenticeship graduates trained elsewhere. They may better assess the quality of training firms and of apprenticeship graduates trained elsewhere.

The finding has further implication on our understanding of training markets. First, an information advantage of the group of training firms permits a stronger commitment to a non-poaching agreement since each training firm is a potential poaching victim and coordination improves if firms become more homogenous. Moreover, if information about the type of apprentices and the quality of training firms increase in firms' involvement in training, the potential loss from being poaching victim increases too and thereby firms intention not to apply a raiding strategy.

Second, training firms are more likely to compete with each other for apprenticeship graduates and could also be more likely to poach apprenticeship graduates than non-training firms. This would imply a training market with firms that train and simultaneously hire apprenticeship graduates trained elsewhere in their first full-time job. Such result calls for theoretical models that split training firms into a group that (potentially) poaches and a group that loses some of its trained workers.

Third, the finding calls for further empirical studies analysing wage differences for switching apprenticeship graduates between training and non-training firms. Analysing this wage difference could additionally contribute to the question of whether asymmetric information exists between training and non-training firms regarding the quality of training firms and of apprentices. Such information asymmetries would induce a comparative advantage of training firms in hiring skilled workers holding an apprenticeship degree.

Fourth, if non-training firms simply do not demand apprenticeship graduates, public intervention to increase the supply of apprenticeships should concentrate on cost-benefit relations during apprenticeship to motivate training firms to increase the train intensity.

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**Table 1:** Variable definition and descriptive statistics.

Variable	Definition (Mean; Std. Dev.)
<b>Dependent variables (intensity measures)</b>	
Switcher	Share of newly hired apprenticeship graduates trained elsewhere (first job after apprenticeship) among all newly hired skilled workers (0.023; 0.098).
Immediate Switchers	Share of newly hired apprenticeship graduates (first job after apprenticeship) who found the new job within 10 days after completion of the apprenticeship among all newly hired skilled workers (0.004, 0.043).
Occupational Switchers	Share of newly hired apprenticeship graduates (first job after apprenticeship) who changed the occupation after the apprenticeship among all newly hired skilled workers (0.009, 0.059).
Switcher with Unemployment Spell	Share of newly hired apprenticeship graduates (first job after apprenticeship) who suffer an unemployment spell after completion of the apprenticeship among all newly hired skilled workers (0.012, 0.071).

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<b>Explanatory variables</b>	
Training Firm	Dummy variable; 1 if the firm trains apprentices (0.592, 0.491).
Firm Size	Number of employees (176.56; 733.48).
High-Skilled Employees*	Share of employees with a university degree among all employees (0.018; 0.056).
Skilled Blue-Collar Employees*	Share of blue-collar employees with an apprenticeship certificate among all employees (0.322; 0.330).
Skilled White-Collar Employees*	Share of white-collar employees with an apprenticeship certificate among all employees (0.379; 0.332).
Part-time Employees*	Share of part-time employees among all employees (0.111; 0.214).
Foreign Employees*	Share of non-German employees among all employees (0.047; 0.113).
Old Employees*	Share of employees older than 54 years among all employees (0.106; 0.139).
Leaving Skilled Employees	Share of skilled workers who left the firm during the last twelve months among all employees (0.162; 0.264).
ln(capital investments per Employee)	Logarithm of capital investments per employee; capital investments are calculated using the perpetual inventory method (10.85; 3.77).
Works Council	Dummy variable; 1 if the firm is covered by a works council (0.368; 0.482).
Collective Bargaining Contract	Dummy variable; 1 if the firm is covered by collective bargaining agreement (0.558; 0.496).
Average Tenure	Average tenure of all employees in the firm (2803; 1667).
Single-Site Firm	Dummy variable; 1 if the firm is a single-site firm (0.742; 0.437).
Regional Unemployment Rate	Unemployment rate in one of the 439 counties (12.26; 5.36).

N=20797, \* apprentices are not counted as regular employees in the denominator of stock variables. Source: LIAB longitudinal version 2.

**Table 2:** Incidence and intensity of newly hired apprenticeship graduates.

	Training Firms		Non-Training Firms	
	Incidence	Intensity	Incidence	Intensity
Newly Hired Skilled Workers	0.876	--	0.478	--
Stayer*	0.503	0.155	--	--
Stayer (firms with graduated apprentices only)	0.834	0.257	--	--
Experienced skilled workers*	0.947	0.811	0.985	0.968
Switcher*	0.265	0.033	0.118	0.032
of it: Immediate Switchers*	0.058	0.006	0.020	0.007
of it: Occupational Switchers* +	0.159	0.012	0.080	0.017
of it: Unemployment Spell* <sup>+</sup>	0.181	0.017	0.090	0.019

\* Firms with newly recruited skilled workers only, <sup>+</sup> occupational switcher with an unemployment spell are counted in both rows. N= 12313 training firms and 8484 non-training firms. The denominator comprises all newly hired skilled workers including apprenticeship graduates trained elsewhere in their first job (row 7-10) and self-trained apprenticeship graduates (row 4 and 5). Source: LIAB longitudinal version 2.

**Table 3:** Proportion of training firms on all firms that hire workers with the respective characteristics during on calendar year

<i>Training firms that hire ....</i>	Proportion of training firms
.. switching apprenticeship graduates	85.5
.. immediate Switchers	88.3
.. occupational Switchers	83.8
.. Switchers with an unemployment spell	84.2
.. experienced workers holding an apprenticeship degree	71.7

N = 20797 but restricted (in every row) to firms that hire the respective proportion of workers during one calendar year. Source: LIAB longitudinal version 2.

**Table 4:** The incidence and intensity of hiring apprenticeship graduates trained elsewhere in their first job.

	Incidence		Intensity
	(1)	(2)	(3)
	Coef.	dydx	Coef.
Training Firm	0.575 (15.22)***	0.105 (15.22)***	0.167 (12.80)***
Firm Size	0.001 (10.87)***	0.001 (10.87)***	0.0001 (10.01)***
Firm Size Squared divided by 1000	-0.004 (8.01)***	-0.0008 (8.01)***	-0.0005 (7.04)***
High-Skilled Employees	-0.113 (0.37)	0.021 (0.37)	0.056 (0.42)
Skilled Blue-Collar Employees	-0.258 (3.63)***	-0.049 (3.63)***	-0.048 (2.31)**
Skilled White-Collar Employees	-0.467 (6.48)***	-0.090 (6.48)***	-0.117 (5.46)***
Part-time Employees	-0.138 (1.54)	0.027 (1.54)	-0.045 (1.63)
Foreign Employees	0.144 (1.16)	0.028 (1.16)	0.022 (0.52)
Old Employees	-0.447 (3.48)***	-0.086 (3.48)***	-0.171 (3.93)***
Leaving Skilled Employees	0.472 (7.98)***	0.091 (7.98)***	0.114 (7.08)***
ln(capital investments per Employee)	0.034 (5.33)***	0.007 (5.33)***	0.008 (4.32)***
Works Council	0.395 (10.66)***	0.081 (10.66)***	0.109 (9.37)***
Collective Bargaining Contract	0.001 (0.00)	0.000 (0.00)	0.009 (0.84)
Average Tenure	-0.001 (10.35)***	-0.0001 (10.35)***	-0.0001 (8.77)***
Single-Site Firm	-0.207 (6.04)***	-0.042 (6.04)***	-0.057 (5.65)***
Regional Unemployment Rate	-0.001 (0.20)	-0.001 (0.20)	0.001 (1.33)
Number of Observations	20797	20797	20797
Pseudo Rsq	0.20	0.20	0.15

Dependent Variables: newly hired apprenticeship graduates trained elsewhere (first job) on all new recruits holding an apprenticeship degree (compare Table 1); estimation methods: incidence with a Probit procedure and intensity with a Tobit procedure; standard errors clustered on establishment level; z-values in parentheses; \*\*\* significant at the 1% level, \*\* significant at the 5% level and \* significant at the 10% level, control variables: 14 industry and 4 year dummies. Source: LIAB longitudinal version2 1999-2003.

**Table 5:** The incidence and intensity of hiring apprenticeship graduates trained elsewhere in their first job.

	Incidence	Intensity
	Coef.	Coef.
Immediate Switchers	0.414 (5.64) ***	0.123 (4.60) ***
Occupational Switchers	0.378 (8.74) ***	0.072 (6.42) ***
Switcher with Unemployment Spell	0.489 (11.95) ***	0.121 (9.88) ***

N=20797; Dependent Variables: see Table 1; estimation methods: incidence with a Probit procedure and the intensity with a Tobit procedure; standard errors clustered on establishment level; z-values in parentheses; Pseudo R<sup>2</sup> between 0.16 and 0.24; control variables as in previous table. Source: LIAB longitudinal version 2 1999-2003.

<sup>1</sup> The literature distinguishes several motivations for firms to participate in apprenticeship training beyond the investment training motive (see Wolter and Ryan 2011 for a recent survey). First, some firms train apprentices as substitutes for unskilled or semi-skilled workers because of their lower unit-labour costs (substitution training motive). Second, some firms train apprentices because training enforces the reputation of those firms as a superior employer in the regional labour market (reputation training motive). (Mohrenweiser and Zwick, 2009; Mohrenweiser and Backes-Gellner, 2010; Schoenfeld et al. 2010; Wolter and Ryan, 2011; Wenzelmann, 2012).

<sup>2</sup> Smits (2006) shows quality differences of training between training firms.

<sup>3</sup> An interesting study by Wagner and Zwick (2012) shows that high occupation-level and firm-level retention rates are negative stigmas for switching apprenticeship graduates but high apprenticeship wages, works councils and establishment size signal high training quality. Geel and Backes-Gellner (2011) show that occupational mobility within a cluster of similar apprenticeship occupations is accompanied by wage gains and mobility between skills clusters results in wage losses.

<sup>4</sup> Around 25 per cent of all apprentices leave the training firm before the final examination (Autorengruppe Bildungsberichtserstattung, 2010). This is a major problem in the German social security records because the data do not provide a variable indicating the successful completion of the apprenticeship. However, the final exams in an occupation take place during two consecutive weeks in the first half of a year, and each apprenticeship legally ends the day after the final exam. The definition of the regular apprenticeship takes advantage of institutional regulation and prevents drop-outs.

<sup>5</sup> I calculate the capital intensity using the capital-value approach suggested by Mueller (2008).

<sup>6</sup> Occupational switchers can also suffer unemployment before the first job.

<sup>7</sup> Marginal effects after Tobit at the extensive and intensive margin - results not reported in the tables.