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Evidence from German Establishment Panel Data

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Katja Görlitz and Joel Stiebale*

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Abstract

Using a large panel data set of German manufacturing establishments, this paper investigates the impact of competition on training incidence as well as on the number of trained workers. According to theory, one would expect a negative relationship between product market competition and firms' incentives to invest in employees' general skills (Gersbach and Schmutzler 2006). In our empirical analysis, product market competition is approximated by various measures of competition such as the Herfindahl Index, the number of firms at the 3-digit industry level and the price cost margin. After controlling for unobserved heterogeneity across industries and establishments, there is no significant effect of competition on training. This result is robust towards different samples, model specifications and estimation techniques.

JEL Classification: J24, L22, D43, C23

Keywords: Training, human capital, product market competition

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Introduction

Within a globalized economy, changes of job tasks are frequent and tend to become an integrate part of everyone's working life. Continuous training was found to be a promising possibility to deal with the challenges of a changing work environment (Van Loo et al. 2001). Employers play an important role as sponsor of training. More than 80% of employees' training was (co-)financed by firms by bearing direct costs of training or by sponsoring training during work hours (Pischke 2001). In 2005, German firms that invested in training spent on average 651 Euro per employee for further training courses (Statistisches Bundesamt 2007). Productivity increases after training are large which is an indicator of high training returns for firms. For instance, Dearden et al. (2006) find that raising the fraction of trained workers by 1% point is associated with a 0.6% increase in productivity. Using German data, Zwick (2006) confirms a relationship between training intensity and establishment productivity in similar magnitude.

Given the importance of firms' engagement in continuous training, there is still little known on training incentives and cost sharing between workers and firms, although a variety of training theories were established, most notably the human capital theory (Becker 1964) and theories of wage compression (Katz and Ziderman 1990, Acemoglu and Pischke 1998). Recently, Gersbach and Schmutzler (2006), henceforth GS, expanded the training literature by presenting a new theoretical model. Their model emphasizes the role of imperfect product markets as a new aspect determining firms' training decisions. This paper makes a first attempt of testing this model empirically.

In the model of GS, training is assumed to be transferable within industries and to have a positive but decreasing effect on firms' productivity. Product markets are characterized by imperfect competition which implies own profits to depend negatively on the productivity of one's competitors. Therefore, the productive value of every trained worker can differ between but also within firms, because it depends on the number of trained workers at one's own firm and on the number of workers trained by the competitor. Thus, wages for workers with similar training attendance might vary within but also between firms. In highly competitive markets, the incentives to poach increase because hiring a competitors' trained employees translates into higher rents by the twofold effect of weakening the competitor and by obtaining a trained, more productive worker. Hence, there should be a negative effect of product market competition on firms' training investments.

This paper contributes to the existing literature by analyzing the direct effect of product market competition on employer-financed further training.[1] Thereby, it provides an empirical test of the training theory of GS. To the best of our knowledge there are no previous studies evaluating the effect of market concentration on further training. Furthermore, the empirical analysis also expands the literature on the effects of competition. It is well known that intense competition can have a positive effect on investments and technological innovations (Scherer 1967, Aghion et al. 2004) and accelerate productivity growth (Aghion et al. 2005, Januszewski et al. 1999). However, the effect of competition on human capital accumulation is fairly unexplored, although this information could be helpful for policymakers to foster and influence competition and/or training policies.

[1] We focus solely on further training and do not consider apprenticeship training. This is because the reasons to provide apprenticeships are manifold. In theories such as wage compression (Acemoglu and Pischke 1998) and screening (Spence 1973) training only pays off when the apprenticeship was completed and some graduates were retained. During the period of apprenticeship training firms bear net expenses. There is evidence that apprentices can enhance productivity (Wolter et al. 2006), however, this does not apply to all firms.

For the empirical investigation, the IAB Establishment Panel, that contains information on training decisions in addition to a variety of establishment attributes, is augmented with the Herfindahl Index at the 3-digit industry level and the number of firms at the 3-digit industry level. All firms acting in the same industry are regarded as competitors. The Herfindahl Index is a proxy for product market competition that is commonly used in empirical evaluations.[2] The number of firms was used less often in previous work.[3] The Herfindahl Index is available for the manufacturing sector only. For reasons of comparability, all other regressions are also restricted to manufacturing firms. It will be explored, how these measures of competition affect training incidence, i.e. the decision of firms to train or not, and training intensity, i.e. how many workers participate in training. The chosen estimation strategy controls for unobserved time-invariant effects such as the ability of the work force and its capability to acquire new knowledge or managerial ability. Using measures of competition merged at the 3-digit industry level has some shortcomings as it may not reflect all aspects of competition which is because international competition is ignored. We therefore analyze also the impact of the price cost margin on training decisions.

Our results show that there is no statistically significant effect of any of our measures of competition on training incidence or intensity after controlling for unobserved time-invariant effects for German establishments in the manufacturing sector. These results hold even after applying a variety of sensitivity checks such as using different samples and regression specifications.

The remainder of the paper is set out as follows. The second section describes the theoretical models and previous literature. The next section presents the data and summary statistics. Afterwards, the empirical framework is specified and estimation results as well as sensitivity analysis are presented. The last section provides some conclusions.

Theoretical Background and Previous Literature

Gary Becker (1964) established the first training theory within the framework of the human capital theory. It is assumed that training enhances worker's productivity and that two types of training can be distinguished that differ in terms of transferability after job loss. General training will affect workers productivity in all firms whereas specific training is only applicable in the firm of acquisition. According to the nature of training, the willingness of employers to bear the costs differs. Although this theory first emphasized the role of training and embedded it into a theoretical framework, it seems to be at odds with reality seeing that firms finance general training activities to a great extent (Loewenstein and Spletzer 1999, Pischke 2001). This finding can be explained by another stream of literature that is consistent with the empirical evidence. This literature relaxes Becker's strong assumption of competitive labor markets and assumes that labor markets are imperfect. Labor market imperfections such as information asymmetries or mobility costs can provide employers with monopsony power which can lead to wage compression, i.e. wages are paid below productivity (Katz and Ziderman 1990, Acemoglu and Pischke 1998). This wage-productivity differential induces rents for employers to recoup their training investments. The incentives to train should increase in firms with more monopsony power.[4]

[2] See, for example, Levin and Reiss (1988) or Gottschalk and Janz (2001) for an application to analyze the impact of market concentration on innovation activities.
[3] For an application see Kraft (1989).
[4] For a survey of recent theoretical and empirical contributions to the training literature see Asplund (2004) or Leuven (2005).

The model of Gersbach and Schmutzler (2006) expands the previous training literature by emphasizing that market concentration could also be of importance for firms' decisions to train. In particular, imperfect product markets could lead to investments in industry-specific training which is of general nature as it is transferable between firms within industries. Their model predicts a negative impact of product market competition on training.

GS set up a three stage game where firms in the first step decide on the number of workers trained which involves sunk costs for every trained employee. In the second stage, a wage bidding-game takes place, i.e. the level of wages is set determining the extent of employees' poaching and turnover. Workers choose their employer according to the highest wage offer. A worker stays at the firm where he or she was trained if two firms make the same wage offer. In the final stage, oligopolistic competition at product markets takes place.

In the model of GS it is assumed that training investments enhance labor productivity, e.g. because they help to adopt worker's knowledge faster to new technologies or enhance product quality. For this reason, a firm's gross profits, which are defined as profits excluding training costs and wages, are positively affected by training. Gross profits do not depend on whether the firm's employees were trained by itself or by the competitor since training is assumed to impart industry-specific knowledge only. A crucial assumption, that leads the wage-bidding game to an equal distribution of workers across firms and to multiple equilibria, is that the marginal productivity of a trained worker is a decreasing function of the number of trained employees in the market. This implies that a firm's marginal valuation of a trained employee and hence the wage offer decreases with the number of trained workers. GS argue that it is plausible that wages decline with training intensity because of competition between trained workers within an industry.

The marginal effect of training an additional worker on net profits consists of the direct effect through increased productivity, an indirect effect because it decreases competitors' profits, the decreasing wage effect on other trained workers and the training costs plus the increased wage costs for the trained worker. Training only takes place if the effect of own training on workers is sufficiently strong to overturn the additional costs. Wages are high when the marginal valuation of poaching a worker is high. Since the marginal effect of poaching is the highest if products are close substitutes, GS argue that strong competition, i.e. strong substitutability between products, reduces training incentives. The model also implies that an increase in market size increases the incentives to train, because productivity enhancing investments apply to a larger potential output. Although the case of more than two competitors is not explicitly analyzed, GS argue that for a given market size the number of competitors should decrease the incentives to train, because the effect of training a worker on wages will be small if there are many firms. The hypothesis that increased competition, e.g. by an increasing number of competitors, decreases employers' training investments will be tested empirically.

Data and Summary Statistics

The German Establishment Panel[5] is an annual survey that is conducted by the Institute for Employment Research (IAB) in Nuremburg and covers the years 1993 to 2005. East German establishments are surveyed since 1996. The panel study is representative for all German establishments having at least one employee covered by social security systems, which refers to 80% of the German work force. Holding companies and subsidiaries are regarded as single firms in the Establishment Panel as the unit of surveying is the establishment and not the enterprise. The core topics of the questionnaire cover the skill structure of the workforce, employment fluctuations, collective pay commitments, sales, general investments and also investments in human capital.

For the analysis, we extract an unbalanced panel from the Establishment Panel for the years 2001, 2003 and 2005. The focus on this relatively short time horizon is caused by modifications of the industry classification in the Establishment Panel in 2000 due to changes in the standard national industry classification. Comparability of the industry classification with waves before 2000 is limited to analyses using the 1- or 2-digit code only. For our analysis, information at the 3-digit industry level is necessary in order to merge information on competition. The main analysis is restricted to manufacturing industries because manufacturing establishments are more homogenous than establishments in the service sector. Moreover, some of the variables for competition are only available for manufacturing firms. A detailed description of the variables and corresponding sample statistics of the main sample is provided in Table A- 1 in the Appendix. There are 12125 observations in the final sample.

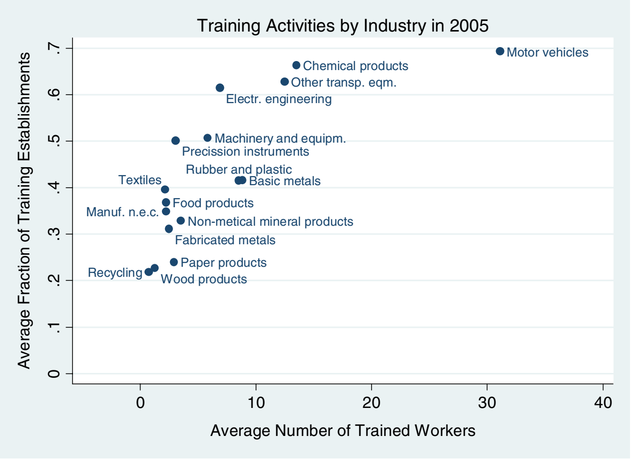
In a regular two-year cycle starting in 1993 detailed questions on training investments with a reference period of the last six months are asked. Establishments report whether they have contributed financially to employee's training (either by covering direct costs of training and/ or by providing training during working hours) and how many workers participated in training[6]. Overall, 63% of the establishments in our data report to have undertaken training investments which corresponds to 36% in Germany when taking oversampling of large establishments into consideration.

Training activities vary substantially between establishments of the manufacturing sector. Figure 1 contains the average percentage of training establishments in 2005 and the average number of trained workers separately by industry measured at the 2-digit level. The average number of establishments sponsoring training ranges from 20 to more than 60 percent. These differences might reflect different market concentration but they could also be explained by differences in technological intensity. While only 20% of establishments in low-tech industries such as paper and wood products invest in employer-sponsored training, training incidence and intensity is more than three times larger for establishments that produce knowledge-intensive products such as chemicals, motor vehicles and transportation equipment.

[5] See Bellmann (2002) for a more detailed description of the data and Alda et al. (2006) for generating the data.

[6] Establishments have to chose, if they report the number of training participants as the number of individuals that took part in training (employees' participation) or as the overall number of participants that also encompasses repeated participation of a single worker (number of training attendances). Because approximately 80% of firms report employees' participation rates, we chose to use this number as a measure of training intensity.

Figure 1: Training Investments by 2-digit Industry Level



Notes: The average values are weighted with the weighting factors provided in the data.

The Establishment Panel was merged at the 3-digit industry level[7] with the Herfindahl–Hirshman Index (HHI) that is provided by the monopoly commission (Monopolkommission 2003, 2004, 2006). The Herfindahl Index is defined as the sum of squared market shares of all firms operating in the 3-digit industry.[8] The HHI is regarded as an appropriate indicator for product market competition because it takes into account the entire distribution of competitors' market shares within an industry and not only the number of competitors a firm faces. Further, it is the standard measure of market concentration in the empirical industrial organization literature and is commonly used to account for market concentration in innovation studies.[9] Nevertheless, using the HHI is also associated with some shortcomings. For example, it is only available for the manufacturing sector and it is measured with a one-year lag. Small values for the HHI refer to intense competition and a high value indicates that competition is weak. The HHI is usually bounded between $1/n$ and 1 where n denotes the number of firms per industry. As we multiply the HHI with 100, the boundaries changed to a minimum of $100*(1/n)$ and a maximum of 100. The HHI is available for the years 1999, 2001 and 2003. For every year, the HHI could be merged for roughly 100 industries.

To check the robustness of our results, a second proxy for competition is calculated and merged at the 3-digit industry level to the Establishment Panel. In particular, we use the number of competitors per industry obtained from the German *Umsatzsteuerstatistik* (statistic on value-added tax)[10] that is provided by the Federal Statistical Office. The number of competitors operating in each industry (NOF) represents a direct measure of competition.

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[7] In the Establishment Panel, the 3-digit industry classification refers to the WZ 1993 code for 2001 and 2003 and to the WZ 2003 code for 2005. The WZ 2003 is equivalent to NACE Rev 1.1.

[8] It is computed as $HHI_j = \sum_{i\in j}\left(a_i \Big/ \sum_{i\in j} a_i\right)^2$ where a_i measures firm i's sales and j is an industry identifier.

For the calculation of the Herfindahl Index the German monopoly commission takes into account all firms with at least 20 employees.

[9] See Cohen and Levine (1989) for a survey on innovation and market structure.

[10] The *Umsatzsteuerstatistik* contains information aggregated on 3-digit NACE Rev 1.1. industry level on the total amount of firms as well as on total sales generated in Germany that are liable to the German value-added tax. This encompasses all firms with annual sales above 17500 €.

Using merely NOF as a measure of competition could be misleading. For instance, the abolition of trade barriers could increase the size of the market and the number of firms operating in these markets at the same time. Without keeping the size of the market constant, it is ceteris paribus not clear, if competition increases or decreases. Therefore, we inserted in addition to NOF the total sales of firm's competitors (SAL) which we calculated as industry-specific sales minus firm-specific sales. Both variables are measured in logarithms. Hence, changes of NOF within an industry across time are equivalent to net entry rates and changes of SAL within an industry across time are equivalent to a market's growth rate. Since 1999, NOF and SAL are available on an annual basis for all industries.

The disadvantage of using a proxy at the industry level is that it relies on a good approximation of markets by the industrial classification and that it only takes into account domestic competition. To reply to these objections, the Lerner Index representing firms' price cost-margins is used as a second alternative measure of competitive pressure.[11] Price cost margins reflect a mark-up over firms' marginal costs. In the case of perfect competition price cost margins should be zero, while they increase with market concentration. The price cost margin is calculated as follows:

$$pcm_{it} = \frac{value\ added_{it} - wage\ costs_{it}}{sales_{it}}$$

where value added is computed as sales minus intermediate inputs. The price cost margin can be calculated with the Establishment Panel for every year and was multiplied with 100 to represent percentage points. The Lerner Index is clearly affected by endogeneity problems because firms' profits are affected by training and other productivity enhancing investments. In our data set, there is no suitable external instrument to deal with this problem. These shortcomings have to be considered when interpreting the results. Specifically, the estimated effect of the price cost margin on training does not have a causal interpretation and should thus rather be seen as a robustness check.

Competition and training might be quasi-fixed factors when related to a short time series, i.e. they do not vary across time. However, variation of these variables across time is necessary for estimation. To check if there is enough variation, we calculated deviations of the Herfindahl Index, NOF, the price cost margin and training outcomes from their previous values within each firm. 26% (of 5075 deviations) of the Herfindahl Index are at least 0.5, 38% of the deviations of NOF exceed a change of the number of firms of at least 5% (overall, the deviations are reported for 5346 observations) and 53% of deviations (of a total of 4140) of the price cost margin are larger or equal to 10. Furthermore, the binary training variable changes in 22% and there are changes of the number of trained workers larger or equal to 1 for 64%. In conclusion, there appears to be substantial variation of all of the three measures of competition and training outcomes across time.

Empirical Framework

This paper aims at exploring the direct effect of product market competition on firms' decision to contribute financially to training. Two different variables that represent firms' training activities are regressed on the same set of explanatory variables. The explanatory variables comprise a measure for product market competition and additional controls. The following empirical model is specified:

[11] The Lerner Index was first proposed by Collins and Preston (1969). See Czarnitki and Kraft (2005) for a recent application.

$$T_{ijt}^{k} = F(C + X_{ijt}'\gamma) \qquad k=1,2;\ i=1,..N;\ j=1,...J;\ t=1,...T \qquad (1)$$

T^1 denotes a binary variable for ***training incidence*** of establishment i in industry j at time t. Particularly, firms are asked in the survey whether they engaged in training either by bearing direct costs for training or by releasing employees from work in the first half of year t. Secondly, T^2 represents ***training intensity***, i.e. the number of trained employees per firm. Considering two different outcomes enables us to discover the impact of competition on training investments in more than one dimension. The chosen training variables include investments in further training but exclude human capital activities within the framework of the German apprenticeship system. This exclusion is due to the heterogeneous nature of apprenticeship training and its returns.

Training is specified as a function of product market competition C. Because we use three different proxies for competition in order to check the robustness of our results, the regression analyses of (1) will be estimated three times for training incidence and three times for training intensity. The indices of C differ between the competition measures because they are measured at different units in different time periods. C_{jt-2} is the competition indicator for the Herfindahl, C_{jt-1} is the indicator for the number of firms and with C_{ijt-1} is the indicator for the price cost margin. To avoid simultaneity bias, training information always refers to the year t which prevents that competition and training are measured in the same time period. NOF and SAL are included in logarithmic form.

The vector X contains a variety of control variables accounting for observable heterogeneity at the establishment level. The percentage of sales generated in international markets is incorporated as control variable. This variable considers that the export intensity differs between industries and that the measures for competition merged at the 3-digit level disregard international competition. Export activity could also represent an indicator for competitive pressure, since competition intensity might differ between domestic and international markets. However, it is not clear if a higher export share represents more or less competition. It seems reasonable to suggest that exporting firms face intense competition because they have to overcome higher transport costs compared to firms that operate solely on the domestic market as well as sunk costs[12] that arise when a foreign market is entered (Roberts and Tybout 1997). On the contrary, firms acting in international markets might also have more differentiated products in order to escape intense competition (Skaksen and Munch 2006). Nevertheless, a correlation between export activity and training could also be unrelated to market concentration. For instance, export firms are on average more productive than firms that operate solely on the domestic market and foreign market entry often follows an increase in firm performance (Arnold and Hussinger 2005).
As additional control variables, investments in ICT (information- and communication technologies), real estate, machines, transport systems and the current state of technical equipment are introduced. These variables represent amongst other things the adoption of technological change at the establishment level. Human capital is a key factor to adopt technological change because it is essential for the work force to learn how to use recent technologies (Fabiani et al. 2005). Several empirical studies confirm a strong and positive association between ICT and employer-provided training (Bresnahan et. al 2002, Hempell 2003).

[12] Sunk costs may consist of expenditures for logistics, distribution networks, market research or product customization.

Furthermore, the skill level of the work force is correlated with company training (Lynch and Black 1998). This could be because high-skilled workers might be more willing and able to adopt new skills since their costs of learning might be lower. Therefore, we use the fraction of skilled white collar workers (employees receiving apprenticeship or university degree) and the fraction of skilled blue collar workers (workers with apprenticeship degree) as additional control variables.

Apprenticeship training was often found to be positively correlated with further training investments (Gerlach and Jirhahn 2001). An explanation for this correlation may be that firms invest in human capital (e.g. in apprenticeship and further training) to react to skill gaps. It could also be that apprenticeship firms have already borne sunk costs for the training facility (e.g. for class rooms).

Moreover, binary variables for the existence of a collective wage agreement and a work council enter the regression. Especially collective wage agreements can increase the monopsony power of employers. Monopsony power can lead to wage compression when labor markets are imperfect which makes it easier for employers to recoup their training investments and therefore increase the incentives to train for employers. The empirical evidence for Germany confirms a positive relationship (Gerlach and Jirhahn 2001, Dustman and Schoenberg 2004, Zwick 2004).

Since the Establishment Panel surveys establishments and not single firms, some variables are generated to allow for the distinction between headquarters, subsidiaries and independent firms. Each regression contains a dummy variable for West Germany that captures regional differences and variables for size, industry and year.

Training incidence is a binary variable that will be analyzed within the framework of a discrete choice model. The following observation rule applies:

$$T^1_{ijt} = \begin{cases} 1, \text{if } T^{1*}_{ijt} = \beta^1 C + X_{ijt}'\gamma^1 + \alpha^1_i + \varepsilon^1_{ijt} > 0 \\ 0, \text{ else} \end{cases} \tag{2}$$

α^1_i represents a firm-specific time-invariant effect and ε^1_{ijt} is an idiosyncratic error term. The firm-specific effect captures unobservable, time-invariant characteristics that are likely to be correlated with both product market competition but also with training. For instance, the firm-specific effect could represent the willingness and ability of the work force to acquire new knowledge. It is a well-known fact that ability plays an important role for individual training participation and firms that act in competitive markets probably search for workers with higher ability (that is unobserved in the data). The time-invariant effect could also represent differences of the production technologies or management quality. If unobservable characteristics are indeed correlated with training and competition, disregarding these characteristics could cause a spurious correlation between competition and training with no causal interpretation. Therefore, we consider it as necessary to incorporate unobserved time-invariant heterogeneity for the estimation by utilizing the longitudinal nature of the data.

Equation (2) will be estimated by a Probit model, which assumes that ε^1_{ijt} is normally distributed with constant variance. C_{ijt} and X_{ijt} are assumed to be strictly exogenous conditional on firm-specific effects. This implies that $P(T_{it} = 1 | C_{ijt,} X_{ijt}) = P(T_{it} = 1 | C_{ij,} X_{ij})$ where C_{ij} and X_{ij} contain observations for all time periods. Unfortunately, estimating α_i along with the slope coefficients yields inconsistent estimates of all parameters. Hence, we have to specify a conditional distribution for the firm-specific effects to allow for a correlation between α_i and C_{ijt} and X_{ijt}. We use Chamberlain's random effects Probit model (Chamberlain 1980) which assumes that $(\alpha_i^1 \mid X_{ij}, C_{ij}) \sim N(\varsigma_0 + \bar{X}_{ij}^{'}\varsigma_1 + \varsigma_2 \bar{C}_{ij}, \sigma_{a^1}^2)$ where $\bar{X}_{ij}$ and $\bar{C}_{ij}$ denote the mean variables for each firm across time.

The averages of the regressors across time are included in the regression model as additional control variables. Estimation can be carried out by a traditional random effects Probit model or by a pooled Probit model. The pooled Probit model is advantageous because it does not assume independence of observations across time (see e.g. Wooldridge 2002) as it has to be assumed when using the random effects model. Independence of observations may be violated if unobservable firm-specific shocks persist over time. The preferred estimation technique is therefore the pooled Probit model that includes in addition to the control variables in vector X the means of all regressors (except for size, industry and whether the firm is a headquarter, subsidiary or independent firm).[13] Using the pooled estimator comes at the cost of a loss in efficiency compared to the random effects model (if the assumptions of the random effects model hold). Therefore, we will compare the results when using the random effects Probit model instead of the pooled model. In addition, a Probit model without incorporating time-invariant effects will be estimated as baseline specification and compared with the results of the preferred specification. This yields further insights into the importance of unobserved heterogeneity.

When analyzing ***training intensity*** as outcome, censoring will be taken into account by using a Tobit model (Tobin 1958). Censoring occurs because a substantial amount of firms is not engaged in training.

$$T_{ijt}^2 = \begin{cases} T_{ijt}^{2*}, \text{if } T_{ijt}^{2*} = \beta^2 C + X_{ijt}'\gamma^2 + \alpha_i^2 + \varepsilon_{ijt}^2 > 0 \\ 0, \text{ else} \end{cases} \tag{3}$$

Again, there is a firm-specific effect α_i^2 and ε_{ijt}^2 denotes a normally distributed error term. The Tobit model imposes the assumption that the decision to train and the decision on the number of participants underlie the same mechanism. Since sign and significance of most of the regressors are similar in the Probit and the Tobit model in our empirical results, we conclude that this assumption is not violated. Because of the nonlinearity of the Tobit model, estimating α_i^2 would be computationally demanding and yields a biased estimate of the disturbance variance (Greene 2004). Thus, we have to specify a conditional distribution for the firm-specific effects. Analogous to the Probit model, a Chamberlain-like random effects Tobit model will be used which can be implemented by adding firm-specific mean variables of all time-varying regressors to the model (Wooldridge 2002). Again, we include firm-specific mean variables and run both a pooled estimator that is the main specification and a random effects model to check the sensitivity of our results. Furthermore, a Tobit model without controlling for unobserved heterogeneity reveals information on the prevalence of endogeneity problems in this more restrictive specification.

[13] To check whether our results are sensitive to the distributional assumption of the firm-specific effects, we also estimate the equation for training incidence with a fixed effects Logit model and a Linear Probability model with fixed effects. Though these models are not restrictive in terms of the distributional assumption, they are restrictive in other respects. The fixed effects Logit model only incorporate firms with a change of their training behavior and the competition measure and assumes independence across firms. The linear probability model has the disadvantage that the predicted probabilities are not bounded between 0 and 1 and can yield quite imprecise estimates.

When regressing aggregate variables like the Herfindahl Index on firm-level training data, standard errors can be biased downwards (Moulton 1990). This is because firms of the same industry might be affected by unobserved industry-specific shocks which can result in correlated errors. Therefore, the standard errors are adjusted by clustering standard errors at the industry level. By clustering at the industry level, we implicitly control for dependence of repeated observations of the same establishment (see e.g. Pepper 2002) since establishment clusters are nested into industry clusters.

Results

First of all, we present the regressions results for the Herfindahl Index and the number of firms and total sales. Table 1 contains regression results without incorporating any control variables. There is no statistically significant correlation between the HHI and training incidence as well as training intensity. However, the sign of the coefficients for NOF and SAL are in line with the predictions of the model of GS: average training investments of establishments seem to be lower in highly competitive markets. This correlation could be caused by differences between establishments operating in markets with different levels of concentration that are also associated with training investments, such as the pace and frequency of introducing new technologies. Therefore, control variables are considered in all subsequently presented regressions.

Table 1: Coefficients of Regressions Without Control Variables

	Herfindahl Index		Number of Firms and Total Sales	
	Probit	Tobit	Probit	Tobit
HHI	0.014	5.274		
	(0.0101)	(4.1157)		
NOF			-0.273 ***	-63.260 **
			(0.0290)	(16.4381)
SAL			0.305 ***	74.405 **
			(0.0370)	(20.6240)
Control Variables	No	No	No	No
Wald χ^2	1.83	1.64	115.22	14.81
Wald χ^2, p-value	0.17	0.20	0.00	0.00
Log Pseudolikelihood	-7210.80	-42745.42	-6570.36	-39586.43
Pseudo R-squared	0.003		0.053	
Observations	11028	9537	10527	9117

Notes: Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**

Table 2 contains the results for the HHI and NOF/ SAL after controlling for various covariates as well as for time-invariant unobserved heterogeneity. Columns one to four contain estimation results that do not control for unobserved heterogeneity. There is still no effect of the Herfindahl Index. For NOF, there remains a statistical significant association between competition and training incidence (but no longer with training intensity) although it is weaker compared to the former specification.

Sign and significance of the control variables are also in accordance with the literature (Lynch and Black 1998, Gerlach and Jirhahn 2001, Zwick 2004) and with the expectations presented in the previous section. The higher the share of profits generated in international markets the higher the probability to train and the higher the number of trained workers. Investment activity and new technical equipment are positively associated with training. West German establishments and establishments that do not provide apprenticeship training invest on average less in continuous training. The average training intensity in establishments with a work council or a collective wage agreement is higher as well as for establishments with a higher share of skilled workers.

After controlling for unobserved heterogeneity (see columns 5 to 8 of Table 2), the coefficients for NOF/ SAL become also insignificant. This result remains unchanged when estimating the relationship between competition and training incidence with the fixed effects Logit model and with the linear probability model with fixed effects. Furthermore, the result is also not sensitive to the use of the random effects Probit and Tobit model including mean variables because the results of NOF become insignificant as well. In addition, the initially positive correlation between export activity and training renders also insignificant. On the one hand, this could indicate that the result of no effect of competition on training also holds for international competition. On the other hand, one should be careful with this interpretation as the result could also simply reflect that export establishments have unobservable characteristics that are correlated with training.

Table 2: Coefficients of the Regressions for the Herfindahl Index and NOF/ SAL

	No consideration of unobserved heterogeneity				With consideration of unobserved heterogeneity			
	Herfindahl Index		Number of Firms and Total Sales		Herfindahl Index		Number of Firms and Total Sales	
	Probit	Tobit	Probit	Tobit	Probit, CH	Tobit, CH	Probit, CH	Tobit, CH
HHI	0.004	2.233			0.023	0.442		
	(0.0029)	(1.9650)			(0.0120)	(2.2409)		
NOF			-0.047 **	-20.255			-0.027	-3.793
			(0.0216)	(11.1094)			(0.0790)	(10.1491)
SAL			0.065 ***	29.581			0.159 **	18.629
			(0.0235)	(17.0887)			(0.0733)	(10.2328)
Share of Sales with Exports	0.002 **	0.653	0.002 **	0.583	0.001	0.615	0.003	0.711
	(0.0010)	(0.4156)	(0.0011)	(0.3483)	(0.0024)	(0.3149)	(0.0028)	(0.3897)
Investments in ICT	0.391 ***	43.884 ***	0.370 ***	39.120 ***	0.240 ***	28.073 ***	0.210 ***	24.474 **
	(0.0344)	(15.3144)	(0.0367)	(13.9209)	(0.0451)	(10.7949)	(0.0487)	(10.2656)
Investments in Real Estate	0.098 **	35.038 **	0.090 **	29.216 **	0.028	-4.906	0.039	-4.043
	(0.0432)	(15.8863)	(0.0400)	(14.1158)	(0.0602)	(8.0165)	(0.0584)	(7.8256)
Investments in Machines	0.195 ***	23.979 ***	0.192 ***	23.655 ***	0.067	13.203	0.057	12.671
	(0.0402)	(8.9086)	(0.0386)	(8.8648)	(0.0554)	(7.5419)	(0.0534)	(7.3735)
Investments in Logistics	0.115 ***	29.176 **	0.133 ***	27.870 **	0.061	2.364	0.085	2.925
	(0.0360)	(13.3656)	(0.0360)	(13.2446)	(0.0507)	(7.4922)	(0.0454)	(6.8875)
Excellent State of Techn. Equipm.	0.181 ***	28.057 ***	0.200 ***	27.945 **	0.085	31.456 **	0.120	24.267
	(0.0468)	(10.4375)	(0.0502)	(11.3642)	(0.0788)	(13.8164)	(0.0925)	(13.4111)
West Germany	-0.122 ***	-0.785	-0.123 ***	-0.859	-0.139 ***	-4.927	-0.138 ***	-5.883
	(0.0431)	(5.7923)	(0.0454)	(6.0029)	(0.0420)	(5.7912)	(0.0449)	(5.5144)
Apprenticeship	0.276 ***	35.468 ***	0.256 ***	33.864 ***	0.079	6.826	0.034	11.156
	(0.0314)	(13.7003)	(0.0323)	(13.0171)	(0.0677)	(11.5279)	(0.0634)	(10.5844)
Work Council	0.229 ***	25.247 ***	0.221 ***	20.150 **	-0.152	-15.836	-0.129	-11.567
	(0.0589)	(9.4026)	(0.0592)	(8.1974)	(0.1182)	(13.1678)	(0.1108)	(10.9035)
Collective Wage Agreement	0.183 ***	27.510 ***	0.205 ***	29.047 ***	-0.012	-0.358	-0.019	-2.414
	(0.0342)	(8.9399)	(0.0342)	(9.2838)	(0.0890)	(10.1935)	(0.0954)	(10.8001)
Fraction of Skilled White Collar Employees	0.690 ***	68.508 ***	0.731 ***	68.330 ***	0.222	51.046	0.112	64.200
	(0.1117)	(21.0779)	(0.1025)	(21.6542)	(0.1572)	(52.0713)	(0.1667)	(64.8697)
Fraction of Skilled Blue Collar Employees	0.437 ***	55.063 ***	0.468 ***	57.765 **	0.323	102.894	0.223	120.108
	(0.0894)	(21.0515)	(0.0956)	(24.9500)	(0.1719)	(75.2777)	(0.1726)	(93.8017)
Firm, Size and Industry Controls	Yes	Yes	Yes	Yes	No	No	No	No
Year Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mean Values for all Variables	No	No	No	No	Yes	Yes	Yes	Yes
Wald χ^2	5585.43	553.32	4318.37	626.01	6394.88	899.28	4934.24	963.11
Wald χ^2, p-value	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Log Pseudolikelihood	-4512.69	-36519.05	-4408.94	-35135.32	-4480.46	-36491.57	-4374.28	-35110.36
Pseudo R-squared	0.3265		0.323		0.3313		0.329	
Observations	10142	8845	9855	8581	10142	8845	9855	

Notes: The model includes dummy variables with 7 categories for size, 16 categories for industry and three binary variables for 'firm' indicating if the establishment is a single firm, subsidiary or headquarter. Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**

The marginal effects of the Probit and Tobit regressions for the specification with and without control variables are contained in Table 3. Including control variables reduces the marginal effects to a large extent which highlights the necessity to incorporate additional variables. Furthermore, this provides some suggestive evidence that competition could have an indirect effect on training provision. For example, establishments in highly concentrated markets might be more likely to adopt new technologies which could be positively associated with training.

Table 3: Marginal Effects of Regressions With and Without Control Variables

	Herfindahl Index				Number of Firms and Total Sales			
	Probit		Tobit		Probit		Tobit	
HHI	0.005 (0.0038)	0.002 (0.0011)	1.616 (1.2512)	0.648 (0.5598)				
NOF					-0.102 *** (0.0052)	-0.016 *** (0.0076)	-19.100 *** (4.648)	-5.841 (3.081)
SAL					0.114 *** (0.0140)	0.023 (0.0083)	22.465 *** (5.911)	8.5299 (4.7531)
Control Variables	No	Yes	No	Yes	No	Yes	No	Yes
Observations	11028	10142	9537	8845	10527	9855	9117	8581

<u>Notes</u>: The model includes the full set of control variables also used in the preceding model. Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**

Using a measure for competition that is aggregated at the 3-digit industry level can be problematic because it does not take international competition into account and its validity as a proxy for product market competition critically hinges on a proper classification of markets by the NACE codes. This is why we also use the price cost margin as measure for competition. The results are presented briefly in Table 4 (full estimation results are contained in Table A- 2). Independent of the estimation technique, there is no association between market concentration and training.

Table 4: Coefficients of the Regressions for the Price Cost Margin

	Price Cost Margin			
	Probit	Tobit	Probit, CH	Tobit, CH
Price Cost Margin	-0.001 (0.0008)	-0.031 (0.1223)	-0.000 (0.0016)	0.138 (0.2363)
Control Variables	Yes	Yes	Yes	Yes
Mean Values for all Variables	No	No	Yes	Yes
Wald χ^2	3291.28	487.06	4253.97	797.83
Wald χ^2, p-value	0.00	0.00	0.00	0.00
Log Pseudolikelihood	-3975.31	-31972.14	-3946.71	-31950.40
Pseudo R-squared	0.320		0.325	
Observations	8853	7716	8853	7716

<u>Notes</u>: The model includes the full set of control variables also used in the preceding model. Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**

In conclusion, there does not seem to be an effect of competition on training investments of German manufacturing establishments.

Sensitivity Analysis

To check the robustness of our results, different samples and estimation specifications were utilized and the main regressions were re-estimated. For ease of exposition, we concentrate on the Herfindahl Index when presenting the results of the following robustness checks.

Mergers and acquisitions come along with wide changes of the organizational structure and working tasks (Weston et al. 1990). Thus, we consider it as likely that the reasons to train might be more heterogeneous for these firms and training intensity might change after takeovers. Mergers and acquisitions can also have a large impact on market concentration which could affect our results. Therefore, another sample was established by deleting all firms that were merged with other establishments or that integrated other establishments. There was no change of the main results.

In the main analysis, it was assumed that the effect of competition on training is homogenous. Regardless of firm characteristics such as size and industry, a one unit increase of competition was assumed to affect training in the same magnitude in absolute values. The analysis was re-estimated relaxing this strong assumption for firms of different size and industry. The results for firms of different size (classified in three groups: <50, 50 to 99, ≥ 100) comply with the main results. Based on the 3-digit industry classification, knowledge-intense and R&D-intense industries were differentiated.[14] Regressions were run separately for these industries indicating no changes of the results.

In addition, outliers could be problematic when using the Herfindahl Index. All in all, there are about 90 establishment-year observations where the Herfindahl Index exceeds 40 which characterize highly concentrated industries. However, excluding these firms did not change the results noticeably.

Due to the differentiation between the measurements of training intensity that was either reported as employees' participation rates or as the number of training attendances, we re-estimated the Tobit model using training attendances as outcome variable. Comparing these results with the results using the number of trained employees indicates no substantial changes.

Finally, the main regressions are re-estimated for the service sector considering observed and unobserved heterogeneity.[15] Since the Herfindahl Index is not available for the service sectors, Table 5 contains only results for the number of firms and the price cost margin. Again, there is no effect of competition on training in the service sector.

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[14] For the classification of knowledge- and R&D- intensive industries see Legler and Frietsch (2007).

[15] Service sectors are defined as NACE two-digit industries 40-92 excluding non-profit organizations.

Table 5: Results for the Service Sector

	Number of Firms and Total Sales		Price Cost Margin	
	Probit, CH	Tobit, CH	Probit, CH	Tobit, CH
NOF	-0.033	-3.372		
	(0.1160)	(5.8827)		
SAL	-0.027	-0.119		
	(0.1194)	(7.4070)		
PCM			-0.001	0.006
			(0.0009)	(0.0320)
Control Variables	Yes	Yes	Yes	Yes
Mean Values for all Variables	Yes	Yes	Yes	Yes
Wald χ^2	8659.75	5673.63	12181.65	3802.67
Wald χ^2, p-value	0.00	0.00	0.00	0.00
Log Pseudolikelihood	-9204.3408	-54252.323	-9139.1168	-54197.363
Pseudo R-squared	0.263		0.255	
Observations	18234	16668	15736	14420

Notes: The model includes the full set of control variables also used in the preceding model. Control variables for industry are introduced at the 2-digit level. Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**

In conclusion, the results presented above are robust to using different sample definitions, regression specifications, and estimation techniques. The finding that there is no effect of competition on training is not only restricted to establishments of the manufacturing sector but could also be confirmed for German establishments in the service sector.

Conclusion

This paper provides a first attempt to test the implications of the theoretical model of Gersbach and Schmutzler (2006) empirically. Using data on German establishments for the years 2001, 2003 and 2005, the impact of market concentration on the probability to invest in training and on the number of workers trained is analyzed. Three measures for market concentration frequently used in the empirical literature are utilized: (1) the Herfindahl Index at the 3-digit industry level, (2) the number and total sales of competitors, i.e. firms operating within the same 3-digit industry, (3) price cost margins that represent the ratio of value added minus wage costs to total sales at the establishment level.

When running the regressions for the Herfindahl Index, no significant correlation between market concentration and training is measured with or without introducing control variables. When using the number of firms as measure of competition without considering any control variables, a negative correlation between competition and training emerges. After including various controls, this effect reduces sharply but remains statistically significant. After controlling for unobserved heterogeneity, there is no direct effect of product market competition on training incidence or intensity. When using the price cost margin, there is no statistical significant effect in any of the regressions. In addition, the percentage of exports generated in international markets becomes insignificant after controlling for unobserved heterogeneity in all specifications. To the extent that export activity reflects another aspect of competition, the main result is strengthened once again. Even after running a variety of sensitivity analyses such as using several empirical specifications and estimation techniques, we cannot confirm a causal effect of competition on training for manufacturing establishments and establishments of the service sector. To sum up, the implications of the model of GS contradict with our empirical results.

Our finding that there is no impact of competition on training could be attributed to various reasons which will be discussed in the following.
First, the crucial assumptions of positive but decreasing productivity gains of training could be violated. There is a large literature on productivity effects of training that find in the majority of cases a significant positive effect (Bartel 2000, Dearden et al. 2006, Zwick 2006). However, most of these papers use a linear functional form or introduce training measure(s) as binary variable(s). In addition, it is often assumed that there is a homogenous effect of productivity on training. Against the background of the importance of heterogeneity in terms of observables and unobservables for evaluating the returns to education (Carneiro et al. 2001), it might be more realistic to assume that only those firms invest in training that have the highest expected returns. Hereafter, training does not increase productivity equally in all firms.
Second, productivity gains might differ by the type of training provided. For example, there is some evidence that off-the-job training has a higher productivity enhancing effect than on-the-job training (Black and Lynch 1996). Due to data limitations, our study focuses solely on rough training measures which are firms' investment decisions and the number of employees that participate in further training. Thereby, outcome variables such as the amount spent in training and the purpose of training are not considered. Using more detailed training outcomes could yield different results.
Finally, our analysis only provides results for the short-run effect of competition on training. Even if firms do recognize changes of market concentration rapidly, adapting their training behavior might be a longer lasting process. Training is still a new concept for firms with highly insecure returns that depend on the kind of training, the performance and ability of trained workers but also on the interaction of both. Using a longer panel data set, one could analyze whether there is an impact of competition on training investments in the long run.

Even though our results conflict with the model of GS, their model is still tempting in that it combines labor market views with industrial economics. The model of GS emphasizes the role of firms to subsidize worker training and the role of product markets for firm's training decisions. Their paper shows that the returns to training could differ between firms which could explain the large variation of training investments of German manufacturing establishments provided in this paper. There is evidence that the importance of training increased recently since the average number of establishments undertaking training investments increased since the beginning of the 90ies (Görlitz 2008). Hence, it is important to extend our knowledge from a theoretical and an empirical point of view on questions such as why firms train and why training investments differ between firms to such a large extent.

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Appendix

Table A- 1: Description of the Variables and Sample Statistics (Manufacturing Establishment)

Variables	Description	Obs.	Mean	Min.	Max.
Overall number of observations		12125			
Training incidence	Dummy is 1 if firms contributed financially to training	12103	0.63	0	1
Training intensity	Number of trained employees	10477	35.58	0	12963
HHI	Herfindahl Index at 3-digit industry level (multiplied by 100)	11043	3.64	0.31	65.02
NOF	Log of number of competitors at the 3-digit industry level	11783	8.36	1.95	12.40
SAL	Log of total sales at 3-digit industry level (minus own sales)	10542	23.56	17.09	26.34
Price cost margin	Price cost margin (in percentage points)	9589	22.21	-97.00	95.84
Share of sales with exports	Share of sales generated in international markets	11721	16.32	0	100
Investments in ICT	Dummy is 1 if investments in ICT	12074	0.58	0	1
Investments in real estate	Dummy is 1 if investments in real estate	12074	0.19	0	1
Investments in machines	Dummy is 1 if investments in machines	12074	0.63	0	1
Investments in logistics	Dummy is 1 if investments in logistics/ transport systems	12074	0.25	0	1
Excellent state of techn. equipm.	Dummy is 1 if technical equipment is excellent	12068	0.17	0	1
West Germany	Dummy is 1 if West German establishment	12125	0.56	0	1
Apprenticeship	Dummy is 1 if at least one apprentice at firm	12120	0.61	0	1
Work council	Dummy is 1 if work council at firm	11725	0.43	0	1
Collective wage agreement	Dummy is 1 if covered by collective wage agreement	12101	0.52	0	1
Fraction skilled white collar	Share of white collar workers with university degree	12111	0.34	0	1
Fration skilled blue collar	Share of blue collar workers with apprenticehip degree	12111	0.40	0	1
Separate enterprise	Dummy is 1 if separate enterprise/ single firm	11956	0.74	0	1
Headquarter	Dummy is 1 if headquarter	11956	0.09	0	1
Subsidiary	Dummy is 1 if subsidiary (or equivalent)	11956	0.17	0	1
Firm size	Dummy equals 1 for firms of particular size:				
1-9	1-9	12125	0.22	0	1
10-19	10-19	12125	0.12	0	1
20-49	20-49	12125	0.18	0	1
50-99	50-99	12125	0.12	0	1
100-149	100-149	12125	0.07	0	1
150-199	150-199	12125	0.05	0	1
more than 200	more than 200	12125	0.24	0	1
Industry	Dummy equals 1 for firms in industry:				
Food products	Food products and tobacco (NACE 15-16)	12125	0.11	0	1
Textiles and clothes	Textiles and clothes (NACE 17-19)	12125	0.04	0	1
Paper products	Paper products, Publishing, Printing (NACE 21-22)	12125	0.06	0	1
Wood products	Wood products (NACE 20)	12125	0.06	0	1
Chemical products	Chemical products (NACE 24)	12125	0.06	0	1
Rubber and plastic	Rubber and plastic (NACE 25)	12125	0.05	0	1
Non-metical mineral products	Other Non-metical mineral products (NACE 26)	12125	0.06	0	1
Basic metals	Basic metals (NACE 27)	12125	0.07	0	1
Recycling	Recycling (NACE 37)	12125	0.01	0	1
Fabricated metals	Fabricated metals except machinery (NACE 28)	12125	0.12	0	1
Machinery and equipm.	Machinery and equipment (NACE 29)	12125	0.12	0	1
Motor vehicles	Motor vehicles (NACE 34)	12125	0.05	0	1
Other transport equipm.	Other transport equipment (NACE 35)	12125	0.02	0	1
Electrical engineering	Electrical engineering (NACE 30-32)	12125	0.07	0	1
Precission instruments	Medical, precission and optical instruments (NACE 33)	12125	0.06	0	1
Manufacturing n.e.c.	Manufacturing n.e.c.(NACE 36)	12125	0.04	0	1
Year 2001	Dummy is 1 if year is 2001	12125	0.35	0	1
Year 2003	Dummy is 1 if year is 2003	12125	0.33	0	1
Year 2005	Dummy is 1 if year is 2005	12125	0.32	0	1

Table A- 2: Full Estimation Results for the Price Cost Margin

	Price Cost Margin			
	Probit	**Tobit**	**Probit, CH**	**Tobit, CH**
Price Cost Margin	-0.001	-0.031	0.000	0.138
	(0.0008)	(0.1223)	-0.0016	(0.2363)
Share of Sales with Exports	0.003**	0.654	0.003	0.674
	(0.0012)	(0.4270)	(0.0028)	(0.4294)
Investments in ICT	0.368 ***	40.376 ***	0.206 ***	23.039 **
	(0.0389)	(15.3498)	(0.0504)	(10.7152)
Investments in Real Estate	0.089 **	30.324 **	0.043	-3.326
	(0.0396)	(15.0874)	(0.0597)	(8.4367)
Investments in Machines	0.200 ***	25.973 **	0.094	18.329
	(0.0407)	(10.3226)	(0.0575)	(9.4539)
Investments in Logistics	0.124 ***	26.082	0.073	1.556
	(0.0389)	(13.4504)	(0.0498)	(7.3918)
Excellent State of Techn. Equipm.	0.200 ***	28.763 **	0.098	23.253
	(0.0532)	(12.4077)	(0.0986)	(14.5810)
West Germany	-0.121 ***	-1.201	-0.137 ***	-7.106
	(0.0432)	(5.8762)	(0.0427)	(5.8404)
Apprenticeship	0.248 ***	34.684 **	0.050	13.824
	(0.0359)	(13.5831)	(0.0646)	(11.8126)
Work Council	0.223 ***	21.831 **	-0.130	-16.670
	(0.0582)	(9.0435)	(0.1202)	(13.3903)
Collective Wage Agreement	0.199 ***	28.923 ***	-0.019	-3.167
	(0.0347)	(9.9138)	(0.0985)	(11.6696)
Fraction of Skilled White Collar Employees	0.761 ***	76.467 ***	0.110	66.316
	(0.1062)	(25.6818)	(0.1893)	(72.6294)
Fraction of Skilled Blue Collar Employees	0.459 ***	62.164 **	0.190	127.035
	(0.1032)	(29.3299)	(0.1875)	(103.0704)
Firm, Size and Industry Controls	Yes	Yes	No	No
Year Controls	Yes	Yes	Yes	Yes
Mean Values for all Variables	No	No	Yes	Yes
Wald χ^2	3291.28	487.06	4253.97	797.83
Wald χ^2; p-value	0.00	0.00	0.00	0.00
Log Pseudolikelihood	-3975.31	-31972.14	-3946.71	-31950.396
Pseudo R-squared	0.320		0.325	
Observations	8853	7716	8853	7716

Notes: The model includes dummy variables with 7 categories for size, 16 categories for industry and three binary variables for 'firm' indicating if the establishment is a single firm, subsidiary or headquarter. Standard errors, clustered at the 3-digit industry level, are shown in parentheses. Significance level: * 1%, ** 5%.**