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Effects of Workplace Representation on Firm-Provided Further Training in Germany

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Abstract

Unions are an important indicator of various measures of firm performance in Anglo-Saxon countries. The same holds for the German analogue of workplace unionism – the works council. Using the IAB Establishment Panel I examine the impact of works councils and shop-floor participation on further training and training intensity. As some studies suggest that the impact of workplace representation varies with firm size, I also test for differences between large and small/medium-sized establishments. Pooled logit and count data models are employed to analyze firms' further training activity and training intensity. Because the treatment variables may suffer from endogeneity I also adopt linear and nonlinear instrumental variables techniques. The analysis reveals a positive impact of works councils on firm-provided further training, but provides slightly weaker evidence of firm-size differentials of workplace representation.

Zusammenfassung

In angelsächsischen Ländern stellen Gewerkschaften einen bedeutsamen Indikator für verschiedene Kennzahlen der betrieblichen Leistungserstellung dar. Das gleiche gilt für die deutsche Form der betrieblichen Interessenvertretung – den Betriebsrat. Unter Verwendung des IAB-Betriebspanels untersuche ich den Einfluss des Betriebsrats und anderen, informelleren Mitarbeitervertretungsformen auf die betriebliche Weiterbildungsaktivität und -intensität. Da aus der Literatur hervorgeht, dass der Einfluss der Mitbestimmung mit der Betriebsgröße variiert, prüfe ich weiter, ob damit Betriebsgrößendifferenziale verbunden sind. Die Weiterbildungsaktivität bzw. -intensität wird anhand von gepoolten Logit- und Zähldaten-Modellen analysiert. Da ein Endogenitätsproblem nicht auszuschließen ist, kommen ferner lineare wie nichtlineare Instrumentalvariablen-Ansätze zur Verwendung. Die Ergebnisse zeigen, dass der Betriebsrat einen positiven Einfluss auf die betriebliche Weiterbildung hat. Hinsichtlich der betriebsgrößenspezifischen Wirkung ist die Beweisdecke dünner.

JEL classification: J53 J24

Keywords: works council, shop-floor participation, firm-provided further training

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1 Introduction

The effects of German works councils (*Betriebsrat*) on a variety of aspects, productivity, employment growth and wages for instance, have received increasing attention in recent decades (see Addison et al. 2004 for an in-depth survey). Despite these advances the critique of Frege (2002) that effects of works councils on firm-provided further training have been neglected so far still prevails, as most studies on training treat work councils rather incidentally. However, against the background of the increasing importance of lifelong learning and the qualification-unemployment link, vocational training is becoming increasingly relevant for workers. Recognizing the works council as an instrument to counterbalance the power of the employer and to raise the workers' voice, it may promote firms' training activities. This and similar arguments can be derived from the Exit-Voice Theory (Freeman & Medoff 1979). On the other hand, theoretical considerations suggest not only positive effects of works councils on firm-provided training. According to FitzRoy & Kraft (1985/1987), works councils may emerge in firms where the owner or manager is either unwilling or unable to consider employees' interests properly. So it is far from certain what to expect.

The focus of the present inquiry is therefore to evaluate the impact of works councils on firm-provided further training. However, workplace representation, that is informing, consulting and involving workers as regards the process and outcomes of management decision-making at the establishment or workplace level can also be assured via other facilities. Shop-floor participation comprises more informal mechanisms at the workplace level that are not set up on the basis of a law, such as employee spokesmen. These more voluntary or even management-driven forms of workplace representation have been widely neglected so far and are also a subject of this study. As some literature (e.g. Green 1993) suggests that the impact of workplace representation varies with firm size, large and small establishments are compared. Finally, I provide evidence of the impact of works councils and shop-floor participation not only regarding the incidence of further training but also its intensity.

This study adds to the literature a simultaneous analysis of effects of German works councils and shop-floor participation on firm-provided further training and gives an idea of the economic significance of this effect. Moreover it attempts to tackle issues of causation by deploying instrumental variable techniques, thereby corroborating existing simple cross-sectional results. To my knowledge this study is the first attempt to test whether the effects of workplace representation on further training differ with firm size. The findings show considerable evidence in favour of a positive impact of workplace representation on firm-provided further training – at least with regard to works councils. Evidence on shop-floor participation also shows a remarkable positive relationship, whereas findings on firm-size differentials are slightly weaker but altogether suggest that there is a stronger impact of workplace representation in smaller firms.

All in all this study suggests that policy makers should introduce more positive stimuli to enhance management-employee relations by mechanisms of workplace representation if they wish to improve firms' training efforts.

The plan of the paper is as follows. The next section lays out some theoretical considerations and presents hypotheses. Section 3 briefly introduces the German works council, the mechanism of shop-floor participation and considers related training literature. Section 4 introduces the IAB Establishment Panel and discusses my key variables. Section 5 deals with the empirical strategy and Section 6 presents the findings. A summary concludes.

2 Theoretical Backdrop

The Works Constitution Act (WCA, *Betriebsverfassungsgesetz*) equips works councils with various rights (see next section). Among other things, works councils may initiate checks of further training needs and participate in the organization of further training measures. So it is reasonable to attribute a direct training effect to works councils. However, it is not clear whether these changes should lead to more training, as intended, since firms may also reduce their training effort due to fears of new conflicts with the works council. So it is necessary to look at more indirect effects of works councils on firm-provided further training.

Classical human capital theory (Becker 1962) still provides a sound basis to reflect on the effects of workplace representation on a firm's training activity. The essential idea of human capital theory is that the decision to train can be seen as a decision to invest. An important property of the investment process is that it takes time for returns on investment to emerge. Meanwhile, several problems may occur which inhibit or reduce the expected returns. I therefore use the three potential training barriers listed below to evaluate the *Exit-Voice Theory* and the *Managerial (In-)Competence Hypothesis* with regard to training. This provides a way of explaining the effects of workplace representation on training, although the theoretical approaches do not necessarily offer direct access to training issues.

1) According to Hashimoto (1995) there are informational asymmetries between the trained worker and the training firm regarding the external and internal productivity of the trained worker. This informational problem leads to *inefficient separations* which reduce investments in human capital as they lower the expected returns from training. As workplace representation increases the information flow between employer and employees, these informational asymmetries are reduced (Rogers & Streeck 1994). Therefore better channels of communication between employers and employees should boost training activities.

2) Every investment process is endangered – including the training investment – if one party can capture parts or all of the other party's returns. Smith (1991) emphasizes this *hold-up problem* and concludes that there is a great deal of leeway for opportunistic behaviour, especially on the part of employers, and emphasizes the

need for some form of process protection for investments in human capital. As works councils (and to some degree other forms of employee representation) empower the employees to reduce such opportunistic behaviour, there should be more training.

3) Besides the classical distinction between specific and general human capital, human capital is known to be at least partly transferable. Therefore the workers' increased productivity is of some value not only within the training firm but also outside the firm, thus creating an incentive for outside firms to *poach trained workers* (Stevens 1996). Because works councils are known to reduce labour turnover (Frick & Möller 2003, Hirsch et al. 2009), they should also stimulate firms' training efforts. Again given that there are functional alternatives to works councils, the same should hold for shop-floor participation.

So far these are only some hints regarding the effects of workplace representation on firm-provided training. But these potential training barriers (inefficient separations, hold-ups and poaching) will now be linked to two established theories of workplace representation. This provides a way to discuss the effects of workplace representation on firm-provided further training in-depth and more systematically, although there is no obvious or direct impact channel.

The Managerial (In)Competence Hypothesis

The Managerial Incompetence Hypothesis (FitzRoy & Kraft 1985/1987) argues that works councils emerge in firms where the owner or manager is either unwilling or unable to consider employees' interests properly. The introduction of a works council serves as an instrument to force the employer to communicate and to respect the employees' needs. In addition, as the autocratic managers' incapability yields inefficiencies, works councils should emerge as a reaction to a (conceivable) crisis. On the other hand, the Managerial Competence Hypothesis refers to the most competent managers, who devote a lot of time to employees' interests. These employers typically establish mechanisms of employee representation to maintain or enhance the employer-employee relations without imposing formal institutions. This therefore helps to explain the existence of shop-floor participation in such firms. Furthermore, in contrast to the Managerial Competence Hypothesis, the Managerial Incompetence Hypothesis is not suitable for explaining more informal forms of representation like shop-floor participation as they are not enforceable by employees.

Regarding the potential problems of human capital investment introduced above, one can expect works councils – imposed by employees – to be found in firms with more inefficient separations, due to the insufficient communication. Because of their potential inefficiencies, these firms will also pay lower wages and therefore boost possible hold-up problems. Concerning the poaching phenomenon, the arguments are ambiguous, because unhappy employees are more likely to leave the firm than employees of competent managers. Therefore the existence of a works council is

related to a lower training effort of the firm. On the other hand, outside firms could interpret a firm's poor performance as a signal of low productivity among its employees, which should lead to less poaching. The opposite propositions hold in the case of shop-floor participation introduced by competent managers (see also table 1). So shop-floor participation should have a positive effect on firm-provided training.

Exit-Voice Theory

The Exit-Voice Theory (Freeman & Medoff 1979) is one of the most prominent explanations of unionism that can easily be extended to works councils. This theory starts out from the consideration that there are two basic mechanisms in society which make it possible to cope with divergences between actual and desired social conditions. The first mechanism is the market mechanism (exit/entry). On the one hand the dissatisfied employee quits his job or the unhappy couple divorces, while on the other hand there will be new matches. A second mechanism refers to Albert Hirschman's "Voice" (Hirschman 1970). This means that parties talk about the diverging conditions and about their problems and try to find a solution by means of bargaining and discussion. So the dissatisfied employee complains and the unhappy couple tries to solve its problems. Effective voice is characterized by collective rather than individual action, because most goods in the context of industrial relations are public goods. Additionally some employees will refuse to reveal their true preferences due to the fact that exit is not a real option. Both unions and works councils (and to some extent other forms of workplace representation) are thus voice-institutions that allow problems regarding public goods to be solved in the context of industrial relations. Moreover, the appropriateness of works councils to serve as a voice-institution and to ensure bottom-up communication arises not only from their special rights, which are protected by law, but also because they can be used as an effective channel for top-down communication. This last fact holds especially for shop-floor participation.

Regarding again the three potential problems of investment in human capital, it can be argued that works councils reduce the costs of communication or even make trustful communication possible in the first place, thereby decreasing inefficient separations. Furthermore, the survival of the firm can be regarded as an important public good which is threatened by opportunistic action. So it is reasonable to suppose that works councils or other forms of employee representation should make an effort to avoid hold-up problems. Finally, poaching ought to be reduced as well, because voice is an alternative to exit by definition. Altogether these considerations suggest a positive effect of works councils and shop floor participation on a firms' training effort.

Hypotheses

The theoretical approaches introduced contradict each other at least partially and lead to conflicting hypotheses regarding human capital investment. Table 1 sums up the relations described above.

Table 1

Workplace representation and potential training barriers

	Ineff. separations	Hold-up	Poaching
Managerial Incompetence Hypothesis[a]	+	+	+/-
Managerial Competence Hypothesis[b]	-	-	+/-
Exit-Voice Theory	-	-	-

Example: The theoretical approaches suggest that firms with workplace representation will face more (+) or fewer (-) potential problems regarding the human capital investment; [a] refers only to works council, [b] refers only to shop-floor participation.

Hence, there are conflicting propositions regarding the effect of works councils' on training, because the Managerial Incompetence Hypothesis suggests more inefficient separations and hold-up problems, whereas the Exit-Voice Theory argues that these problems should be reduced. For this reason I formulate three hypotheses, two of which conflict:

Hypothesis 1a: *The existence of a works council leads to a higher training probability and intensity.*

Hypothesis 1b: *The existence of a works council is related to a lower training probability and intensity.*

Hypothesis 2: *The existence of shop-floor participation leads to a higher training probability and intensity.*

It should be emphasized that, strictly speaking, hypothesis 1b – which is based solely on the Managerial (In)Competence Hypothesis – only makes it possible to predict a relationship because the works council is a result of the inefficiency but does not trigger it. This is also necessary if both hypotheses (1a and 1b) should be simultaneously true. Actually some of my empirical results provide evidence for both hypotheses (see discussion of the bivariate probit model in section 6).

Concerning the firm-size-specific effects of workplace representation, the existing literature arrives at different conclusions. On the one hand, Green (1993) points out that effects of workplace representation should have most impact where there is an absence of other pressures to train. This holds especially for a lot of small firms as they often use less modern technologies or make fewer investments for example. Therefore a larger firm can be expected to be influenced to a lesser extent. On the other hand, Addison et al. (2000) argue – at least regarding the works council – that as the WCA provides the works councils of larger firms with more rights, the effects of works councils should be greatest in larger firms. So once again, conflicting hypotheses (concerning works councils) are inevitable:

Hypothesis 3a: *Works councils have most impact in small and medium-sized firms.*

Hypothesis 3b: *Works councils have most impact in large firms.*

Hypothesis 4: *Mechanisms of shop-floor participation have most impact in small and medium-sized firms.*

As the Managerial (In)Competence Hypothesis allows no causal statements regarding the analyzed training barriers but the firm-size-specific considerations require a causal relationship between training and workplace representation, hypotheses 3a/b and 4 are based only on the Exit-Voice Theory.

3 Workplace Representation in Germany and Previous Literature

The rights and responsibilities of the works council are determined by the Works Constitution Act (WCA), which became effective in 1952. Amendments were made in 1972 and in 2001. A works council consists of workers who are elected for a period of four years and they can be set up in establishments with at least five workers, three of whom must be eligible for election. Since the employees alone can decide whether or not they wish to elect a works council, formation is not automatic. The rights of the works council, which increase with the size of the firm, comprise information rights, consultation rights, veto rights and co-determination rights and provide the basis for representing the employees' interests regarding labour (protection) laws. The works councils' sphere of action covers for example working conditions (e.g. working time, overtime), remuneration (e.g. payment schemes, performance-related remuneration) and personnel affairs (e.g. hirings, layoffs, employment protection). [1]

Moreover, the reform of the WCA in 2001 strengthened the influence of the works council in matters of training. The works council may initiate checks regarding the need for training (WCA §96) and co-determine further training measures (WCA §97). This holds especially with respect to employees whose qualifications are likely to become obsolete. It is also worth noting that these new training rights are irrespective of firm size. Other important changes under the 2001 reform of the WCA were: simplified voting procedure, reduced employment thresholds to determine the number of councillors, more influence regarding employment protection and additional entitlements concerning the internal organization of the works council. For an in-depth review of the 2001 reform see Addison et al. 2004.

However, besides the works council, the participation of employees can also be assured via shop-floor participation (Ellguth 2009). But in contrast to works councils, mechanisms of shop-floor participation have no legal basis and lack a common definition. These forms of participation may exist alternatively or simultaneously to works councils and are typically less stable. Examples are employee spokesmen, employee councils or committees and similar forms of communication mechanisms between management and employees. In contrast to works councils, shop-floor participation is also more often induced by the management, meaning that these forms of representation have clearly less potential to strengthen the position of employees in times of conflict.

The Anglo-Saxon analogue of the German works councils is workplace unionism. It is therefore worth starting the review of literature with union effects on training.

These findings are particularly interesting, because theoretical explanations (e.g. Freemann & Medoff 1979) of collective action can be adopted regarding both phenomena. Whereas Mincer (1983) concludes from a theoretical point of view that unions should strengthen firms' training activities, his empirical findings rather suggest a negative effect. Green (1993) builds on this analysis and exploits the UK Labour Force Survey. His results show a positive effect of union membership on the training probability, but only in small firms. He arrives at the conclusion that "[…] any union is likely to have the most impact where there is an absence of other pressures to train. For this reason, the larger firm […] may be less influenced by unions in this respect than the smaller firm" (Green 1993: 1035). Furthermore, Booth et al. (2003) find a positive effect of individual union membership on the training probability and the duration of the training measures. On the other hand, Addison and Belfield (2008), who examine training incidence, intensity and duration, find no significant effects of unions apart from the duration of the measures.

The results of previous research often state a positive relationship between training and works councils in Germany. For instance, Gerlach and Jirjahn (2001) report a positive relationship between works councils and the firms' decisions to finance training and the amount spent on training. Some studies using the IAB Establishment Panel report no significant effect of works councils on training intensity (Zwick 2004), but a positive effect on training incidence (Zwick 2005). Bellmann and Ellguth (2006) implement a matching technique to exploit the 2001 WCA reform and conclude that firms with a works council have a higher level of training activity and – contrary to Zwick (2004) – training intensity. Yet they find no statistically significant effects regarding the WCA reform. Finally, Bellmann and Leber (2006) decompose the training differences between large and small firms and find that half of the difference explained by firm characteristics is due to the works council, thereby emphasizing the significance of this institution. While there are some findings on works councils and training, results on determinants of shop-floor participation in Germany are quite scarce. Ellguth (2009) explores the effects of the introduction of shop-floor participation on a set of personnel activities of firms. Aside from a less smaller training intensity after the introduction of shop-floor participation he identifies no significant effects. He also points out that the closure of a works council is a crucial precondition for the introduction of shop-floor participation itself, while the permanent existence of a works council has no significant effect. On the other hand, the abandonment of shop-floor participation raises the probability of a works councils' being introduced. So the two forms of workplace representation are substitutes to some extent.

4 Data and Variables

This study uses the German IAB[2] Establishment Panel, an annual survey of approx. 16,000 establishments representing all industries and establishment sizes. The survey is based on a stratified sample from the population of all German establishments with at least one employee liable to social security (as of 30 June of the pre-

vious year). The data are collected in personal interviews with the owners or managers. To correct for panel mortality and to reflect the foundation of new establishments the sample is augmented every year. As the Establishment Panel is created to serve the needs of the German Federal Employment Agency, it focuses on employment-related matters. Nonetheless it covers a large range of topics. In-depth information can be found in Fischer et al. (2009).

This inquiry uses information on the years 2003 to 2007 since the information on shop-floor participation has only been collected since 2003. I excluded establishments in the non-profit sector as well as those with fewer than five employees, because the WCA does not allow works councils in establishments with fewer employees.

Information on training is collected every second year up to 2007.[3] The opening question asks if the establishment promoted further training in the first half of the year (reference date of the survey is 30 June) by releasing employees from work and/or meeting the costs entirely or in part. The variable “training activity” is therefore a dummy (1 = firm provides training). To analyze “training intensity” I use the number of workers trained during the first half of the year.[4] Depending on the econometric model (see next section), I employ the number or the fraction of workers trained as a proportion of all employees. Regarding workplace representation the data contain two more dummies, one for works council (1 = existence of a works council as of 30 June) and one for shop-floor participation (1 = existence of shop-floor participation as of 30 June). As the information on workplace representation refers to 30 June but training to the first half of the year, I employ the representation status of the previous year. This additionally takes into account the commonplace that any impact should occur after the treatment.

Beyond the mere existence of works councils and shop-floor participation I also investigate the introduction of these institutions. The hypotheses therefore cover the introduction as well although this was not mentioned explicitly. I thus constructed a set of dummy variables in order to measure whether a) the works council/shop-floor participation was introduced or closed during the previous two years or whether b) there was always or never a works council/shop-floor participation during this period. Table A1 (appendix) summarizes the procedure.

Considering firm size I compare small and medium-sized establishments (SMEs) with large establishments. An establishment is an SME if it has at least five but not more than 249 employees. Establishments with more than 249 employees are considered large establishments. Furthermore, establishments with at least five employees which are not a single firm entity are also regarded as large establishments, as the data contain no information on the size of the firm. This definition is based upon the legal definition which is often important regarding public-funded measures for SMEs in the European Union. It should be stressed that my empirical findings are robust with respect to the single-firm criterion.

Table 2

Incidence of works councils and shop-floor participation (% establishments)

	Existence [a] (N=15.113)		Introduction [b] (N=12.042)	
	Works council	Shop-floor part.	Works council	Shop-floor part.
All establishments	31.5	8.8	2.4	5.8
SMEs	15.5	8.2	1.5	5.4
Large establishments	65.1	10.2	4.6	6.7

SMEs = small and medium-sized establishments; [a] refers to logit model I (table 5) [b] refers to logit model II (table 7). Source: IAB Establishment Panel (2003-2007).

As is shown in Table 2, works councils are more common than shop-floor participation. Around one third of all observations have a works council, whereas only nine percent exhibit shop-floor participation. The findings show that works councils are a function of firm size. Throughout, one has to emphasize the rather scarce occasions of works councils or shop-floor participation being introduced.

Beyond these key variables I control for a range of firm characteristics that are typically deployed in training models (e.g. Gerlach & Jirjahn 2001; Lynch & Black 1998; Neubäumer et al. 2006): A larger proportion of part-time workers and of fixed-term contract workers should reduce further training activities, as they shorten the period of returns; similar arguments hold for higher labour turnover. It is common knowledge that a larger share of skilled workers is associated with a stronger further training activity. Equipment and investment in a firms' equipment (technology of equipment, IT investment, investment in the production facility or equipment) often induce a need for further training. Collective agreements lead to a compressed wage structure encouraging employers to invest more in human capital as they have to share returns only partially with trained employees. Moreover, the estimations control for the type of establishment (single establishment or firm), the firm's profitability in the previous year, region (eastern/western Germany), dummies for industries and firm size (see appendix table A2 for more information on these variables).

5 Econometric Strategy

I estimate pooled logit models to analyze further training activity, while training intensity is estimated by applying pooled zero-inflated-negative-binomial models (ZINB) (Hardin & Hilbe 2007). The ZINB model makes it possible not only to model the number of workers trained (count coefficient) but also to consider the inverse training probability of the establishment (inflate coefficient). This takes into account the fact that some establishments fail to train by coincidence while others are systematically inactive, although the data themselves cannot distinguish between the two types. By including the logarithm of the number of employees as a regressor with a coefficient restricted to one, the dependent variable can be interpreted as a proportion (see appendix for more information). To justify the usage of the ZINB model I employ a likelihood-ratio test to decide whether the assumption of equidispersion (mean equals the variance) of the zero-inflated-poisson model (ZIP) is violated (Hilbe 2007) and a Vuong test to check whether there is indeed an excess zeros problem (Greene 1994). If there are no excess zeros the negative-binomial model (NB) would be more suitable.

Because raw coefficients are difficult to interpret, I estimate marginal effects (strictly speaking I calculate discrete changes, as my regressors are dummies) for the average establishment ($\bar{\eta}$, with $\eta = \mathbf{x}'\boldsymbol{\beta}$), as well. This makes it possible to assess the size of the effect in nonlinear models. In order to test for firm-size differentials, marginal effects are compared similar to Weesies (1999) procedure. The hypothesis is

$$F(\bar{\eta}_l + \gamma_l) - F(\bar{\eta}_l) = F(\bar{\eta}_s + \gamma_s) - F(\bar{\eta}_s)$$

where F denotes the c.d.f. of the logistic distribution in the case of the logit model (and the c.d.f. of the normal distribution in the case of the probit model). γ is the coefficient of works council and shop-floor participation respectively. The subscripts l and s represent large establishments and SMEs. *Mutatis mutandis* for the ZINB model:

$$\Big(\big(1 - F(\bar{\eta}_l + \gamma_l)\big) * e^{(\bar{\eta}_l + \gamma_l)}\Big) - \Big(\big(1 - F(\bar{\eta}_l)\big) * e^{(\bar{\eta}_l)}\Big) =$$
$$\Big(\big(1 - F(\bar{\eta}_s + \gamma_s)\big) * e^{(\bar{\eta}_s + \gamma_s)}\Big) - \Big(\big(1 - F(\bar{\eta}_s)\big) * e^{(\bar{\eta}_s)}\Big)$$

The test statistic and its significance are to be found in the last rows of the regression tables. Because the models are applied to pooled data I have to allow for correlation within establishments. This is done by clustering the standard errors and applying a modification of Whites (1980) sandwich-estimator.

So far it should be borne in mind that the results could suffer from unobserved heterogeneity. Especially regarding the works council, existing literature (e.g. Addison et al. 2006, Mueller 2009) emphasizes that endogeneity might be a problem. Firms with a high level of further training activity or intensity could differ from establishments with low levels in an unobserved way that is also related to a higher probability of having a works council. For example, such establishments might have a special management emphasizing employees' needs and participation. Another bias could result from the fact that works councils are introduced in times of poor performance (Jirjahn 2009), thus related to a lower level of training activity. In more econometric terms: the estimated coefficients are potentially biased (omitted variable bias) because $\mathrm{E}(\mathrm{x}, \varepsilon) \neq 0$. I therefore checked different strategies for dealing with unobserved factors. First, I estimated various fixed-effects models. This strategy would control for unobserved time-constant effects. But as the data cover only a short period and there is only a small within-variation regarding workplace representation, the coefficients are insignificant and the models did not converge.

Another way to deal with unobserved heterogeneity is to use an observable variable z that satisfies the assumption $\mathrm{E}(\mathrm{x}, \mathrm{z}) \neq 0$ and $\mathrm{E}(\mathrm{z}, \varepsilon) = 0$. If there is such an instrumental variable (IV) for x it is possible to use an IV estimator. Beyond the fixed-effects models mentioned above, this strategy even solves the problem of time-varying unobserved variables. I thus estimated bivariate probit models and linear IV models[5] (Evans & Schwab 1995; Wooldridge 2002). As an instrument I use a dummy variable indicating whether or not the establishment was founded before

1990. As I have only one instrument my model is just identified. To check the validity of the instrument I document the correlation of works council and the age dummy (shorthand in tables: IV correlation), I include the age dummy jointly with all exogenous variables in a probit model explaining the works council (shorthand: IV coefficient) and I examine whether the related F statistic is larger than the critical rule-of-thumb value of 10 (Cameron & Trivedi 2009).

Unfortunately I only have an instrument for works council and I cannot extend this approach to shop-floor participation. As I suppose that shop-floor participation suffers from the same endogeneity problem, all results should be biased if shop-floor participation is included. Excluding shop-floor participation from the estimations, however, results in an omitted variable bias as well. I therefore ran both versions and found only small differences, none of which were substantial regarding my hypotheses. The presented results rely on estimations without shop-floor participation.

6 Empirical Findings

Descriptive Evidence

Table 3 shows some *prima facie* evidence on the relationship between workplace representation and further training. Across all groups, there is a larger proportion of training firms in the presence of workplace representation. The same holds for the proportion of workers trained, though the differences are smaller. Regarding the proportion of establishments providing training, this gap is found to be larger in SMEs than in large establishments. This finding holds again for training intensity, but only with regard to shop-floor participation. So far, there is descriptive evidence in favor of hypotheses 1a and 2, which is a positive relation between further training and workplace representation. Furthermore, some evidence is gained in favor of hypothesis 4 and parts of hypothesis 3a.

Table 3

Proportion of establishments providing training / proportion of workers trained

	Training activity[a] (N=15.113)				Training intensity[b] (N=14.909)			
	Woco	No woco	Sfp	No sfp	woco	No woco	Sfp	No sfp
All e.	89.4	59.6	79.1	68.0	25.1	20.9	25.6	21.9
SMEs	82.2	56.5	72.2	59.4	20.6	20.0	24.4	19.7
Large e.	93.0	75.5	90.5	86.5	27.4	25.9	27.7	26.8

SMEs = small and medium-sized establishments; [a] observations of logit model I, [b] observations of ZINB model I; woco = works council, sfp = shop-floor participation, e. = establishments. Source: IAB Establishment Panel (2003-2007).

The findings in Table 4 refer to the introduction of a works council and shop-floor participation respectively. The first part presents evidence on the proportion of establishments providing further training and the second part on the proportion of workers trained by comparing the training measures of establishments introducing such a mechanism of representation with establishments that never had such mechanisms. The description reveals that establishments introducing workplace representation usually have a higher level of further training activity and intensity

than establishments which never had such mechanisms. Thus, there is support for hypothesis 1a and hypothesis 2. The findings for firm-size differentials suggest that the difference in further training activity and intensity between firms that introduce shop-floor participation and firms that do not do so, is larger for SMEs (hypothesis 4). As for works councils, there is only a small difference that supports hypothesis 3a regarding the training intensity.

Table 4

Proportion of establishments providing training / proportion of workers trained in establishments with introduction of /without workplace representation

	Training activity[a] (N=12.042)		
	All establishments	SMEs	Large est's
Introduction of works councils	73.8	68.5	77.8
Without works councils	58.3	55.4	75.8
Introduction of shop-floor part.	80.4	73.7	92.7
Without shop-floor part.	66.2	57.7	86.4
	Training intensity[b] (N=11.910)		
	All establishments	SMEs	Large est's
Introduction of works councils	25.1	22.1	27.4
Without works councils	20.6	19.7	26.0
Introduction of shop-floor part.	27.6	26.4	29.9
Without shop-floor part.	21.5	19.3	26.8

SMEs = small and medium-sized establishments; [a] observations of logit model II, [b] observations of ZINB model II. Source: IAB Establishment Panel (2003-2007).

Econometric Analysis

All of the tables show the coefficients and standard errors considered. Regarding training intensity I focus on the count coefficients of the ZINB models. Inflation coefficients are presented for completeness only. Marginal effects are reported for small and large establishments. The significance of their difference is shown in the last row (test). To judge the relevance of the effects the training probability and intensity of the average firm is also given (ref. point). Depending on the model other test statistics are also presented. Table 5 outlines the results of the logit model (see appendix table A2 for description) regarding the firms' further training activity. Throughout all of the models, there are positive significant coefficients for works councils and shop-floor participation, indicating an increased training probability in firms with workplace representation. The marginal effect of shop-floor participation among SMEs, indicating an increase in the training probability of about ten percentage points, is about four times larger than among large establishments. The test statistic (see last row) denotes a significant difference. Although the marginal effect of works councils is larger among SMEs as well, the difference is not significant. Moreover, Table 6 shows the findings on training intensity (see appendix table A2 for description). First the likelihood-ratio test of the dispersion parameter alpha suggests that the Poisson assumption of equidispersion does not hold (therefore ZINB > ZIP) and

the Vuong test prefers the ZINB model as there is indeed an excess zeros problem (therefore ZINB > NB).

Table 5

Logit model I
Dependent variable: training activity

	All estab's	SMEs		Large establishments		
	Coefficient (Std. E.)	Coefficient (Std. E.)	Marginal Effect	Coefficient (Std. E.)	Marginal Effect	Test
Shop-floor participation	0.481*** (0.0848)	0.490*** (0.0962)	0.106***	0.459** (0.183)	0.0256***	15.25***
Works council	0.375*** (0.0781)	0.302*** (0.0993)	0.0677***	0.482*** (0.127)	0.335***	2.37
Ref. point			0.635		0.930	
Observations	15,113	10,229		4,884		
Pseudo-R^2	0.2324	0.1735		0.2228		

SMEs = small and medium-sized establishments; controls as reported in section 4, for full results see appendix A3; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Source: IAB Establishment Panel (2003-2007).

Table 6

Zero inflated negative binomial model I
Dependent variable: number of workers trained

	All estab's	SMEs		Large establishments		
	Coefficient (Std. E.)	Coefficient (Std. E.)	Marginal Effect	Coefficient (Std. E.)	Marginal Effect	Test
Sfp (count)	0.0822** (0.0329)	0.125*** (0.0438)	0.0528***	0.0520 (0.0489)	0.0206	3.13*
Sfp (inflate)	-0.605*** (0.131)	-0.580*** (0.142)		-0.610** (0.293)		
Woco (count)	0.0386 (0.0328)	-0.169 (0.0456)	0.00872	0.100** (0.481)	0.0184***	0.63
Woco (inflate)	-0.387*** (0.113)	-0.266** (0.132)		-0.633*** (0.210)		
Ref. point			0.196		0.275	
LR test	3.5e+05***	4.0e+04***		3.1e+05***		
Vuong test	23.50***	20.61***		9.76***		
Observations	14,909	10,178		4,713		
Wald-X^2	896.00	615.34		460.62		

Woco = works council, sfp = shop-floor participation, SMEs = small and medium-sized establishments; LR test = Likelihood-ratio test; controls as reported in section 4, for full results see appendix A4; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Source: IAB Establishment Panel (2003-2007).

The results regarding the introduction of a works council or shop-floor participation (tables 7 and 8) are estimated with firms that always have such forms of workplace representation as the reference group. Again the Poisson assumption of equidispersion does not hold and the Vuong test prefers the ZINB model. In most of the estimations the results indicate a positive significant effect of shop-floor participation on both training activity and intensity. There is also evidence of the expected difference

between large establishments and SMEs, but only as regards training activity: the estimated training probability grows by only four percentage points in large establishments but by fourteen percentage points in SMEs after introducing shop-floor participation. However, regarding the introduction of works councils, there are no significant coefficients concerning either training activity or training intensity. Only establishments which have works councils all the time again show a significant positive coefficient (see appendix table A5).

Table 7

Logit model II
Dependent variable: training activity

	All estab's	SMEs		Large establishments		Test
	Coefficient (Std. E.)	Coefficient (Std. E.)	Marginal Effect	Coefficient (Std. E.)	Marginal Effect	
Introduction sfp[a]	0.695*** (0.116)	0.648*** (0.130)	0.138***	0.912*** (0.276)	0.044***	13.64***
Introduction woco[b]	-0.168 (0.156)	-0.201 (0.218)	-0.048	-0.0308 (0.238)	0.002	0.69
Ref. point			0.624		0.929	
Observations	12,042	8.377		3.665		
Pseudo-R^2	0.2340	0.1753		0.2268		

Woco = works council, sfp = shop-floor participation, SMEs = small and medium-sized establishments; [a] reference group = never works council, [b] reference group = never shop-floor participation; controls as reported in section 4, for full results see appendix A5; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Source: IAB Establishment Panel (2003-2007).

The results of the logit and ZINB models regarding the existence and introduction of workplace representation provide some support for hypothesis 1a and strong support for hypothesis 2. So altogether this suggests rather positive effects of workplace representation on further training, particularly for shop-floor participation. However, findings on the difference between large and small establishments reveal support for hypothesis 4 only. There is no systematic difference regarding works councils.

Table 8

Zero inflated negative binomial model II
Dependent variable: number of workers trained

	All estab's	SMEs		Large establishments		
	Coefficient (Std. E.)	Coefficient (Std. E.)	Marginal Effect	Coefficient (Std. E.)	Marginal Effect	Test
Introduction sfp[a] (count)	0.120*** (0.0444)	0.161*** (0.0571)	0.072***	0.0809 (0.0696)	0.030*	2.57
Introduction sfp[a] (inflate)	-0.967*** (0.214)	-0.846*** (0.226)		-0.979** (0.470)		
Introduction woco[b] (count)	0.0143 (0.0708)	0.0911 (0.112)	-0.001	-0.0259 (0.0930)	-0.004	0.01
Introduction woco[b] (inflate)	0.234 (0.212)	0.342 (0.268)		-0.111 (0.380)		
Ref. point			0.193		0.279	
LR test	2.6e+05***	3.1e+04***		2.2e+05***		
Vuong test	21.56***	18.92***		8.74***		
Observations	11,910	8,343		3,567		
Wald-X^2	790.62	540.61		403.69		

Woco = works council, sfp = shop-floor participation, SMEs = small and medium-sized establishments; LR test = Likelihood-ratio test; [a] reference group = never works council, [b] reference group = never shop-floor participation; controls as reported in section 4, for full results see appendix A6; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Source: IAB Establishment Panel (2003-2007).

The results of the bivariate probit model can be found in table 9. Here, rho makes it possible to decide whether the instrumented or the uncorrected results should be preferred. Throughout, both the IV coefficients and the marginal effects are larger than the uncorrected coefficients and marginal effects. As they are positively significant, this confirms the findings of the logit model I – the marginal effects are even larger and indicate an increase in the training probability of roughly 18 percentage points among SMEs. Regarding large establishments I find an insignificant rho. So there should be no endogeneity problem. This is reflected in rather similar coefficients and marginal effects regarding the instrumented and not instrumented results. In contrast to the uncorrected results (logit model I), the difference between large establishments and SMEs is now significant, suggesting that works councils should have a stronger impact (of about 13 percentage points) on training activity in SMEs.

It is worth mentioning that rho not only makes it possible to decide on the endogeneity problem, but also provides information about the correlation of the error terms, that is all unobserved characteristics. As I find a negative rho, there should also be a negative relationship between the existence of a works council and firm-provided further training (at least for SMEs). This finding supports the Managerial Incompetence Hypothesis according to which works councils emerge as a reaction to a (conceivable) crisis. So indeed, both hypotheses 1a and 1b gain support as there is a positive direct effect of works councils on and an indirect negative relationship with further training. So the two hypotheses do not really conflict but rather show oppositional effects (or relations), which also helps to explain why there is an even larger effect in the bivariate probit model than in the simple logit model.

Regarding the quality of the instrument I use here, there is literature on works councils which suggests that the age of an establishment is an important predictor of the existence of works councils. Addison et al. (2009), for example, argue that age is important because of the very persistence of bargaining structures. Or the other way around: younger firms may need more flexible institutions. Apart from this argument, I document the correlation of works council and the age dummy (IV correlation), which is between 0.11 and 0.23. Furthermore, a probit model (including various controls) explaining the works council reveals a statistically significant coefficient for the instrument (IV coefficient). Moreover, regarding the linear IV estimator, the F statistic is larger than the critical rule-of-thumb value of 10 (Cameron & Trivedi 2009).

Table 9

Bivariate probit model
Dependent variable: training activity

	All estab's	SMEs		Large establishments		
	Coefficient (Std. E.)	Coefficient (Std. E.)	Marginal Effect	Coefficient (Std. E.)	Marginal Effect	Test
Works council	0.473*** (0.0863)	0.516*** (0.112)	0.182***	0.305* (0.157)	0.0459**	12.29***
Woco not instrumented	0.195*** (0.0358)	0.140*** (0.0461)	0.052***	0.268*** (0.0568)	0.0412***	2.36
Ref. point			0.621		0.928	
Obervations	20,547	13,745		6,802		
Wald-χ^2	8107.15	4401.39		2334.26		
Rho	-0.179***	-0.229***		-0.0470		
IV correlation	0.18***	0.10***		0.22***		
IV coefficient	0.14***	0.143***		0.165***		

Woco = works council, SMEs = small and medium-sized establishments; controls as reported in section 4, instrument = founding-year before/after 1990; for full results see appendix A7; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Source: IAB Establishment Panel (2003-2007).

The results of the linear IV estimation are somewhat uncomfortable (table 10). First, it can be noted that there are again positive significant effects to be found. So, due to the presence of works councils, not only the probability of training but also the training intensity is larger. The Durbin-Wu-Hausman (DWH) statistic (Cameron & Trivedi 2009) leads to a reasonable rejection of the hypothesis that the variable works council is exogenous for the overall case. Regarding the SMEs I can reject this hypothesis only at the 0.1 level, whereas for large establishments this test even suggests preferring the uncorrected results. Again, in the latter case the coefficients are quite similar compared to the uncorrected model. So considering the firm-size differentials I find a slightly larger coefficient for the SMEs – but only in the IV case, the uncorrected coefficient is smaller. Regarding the 0.1 level of the DWH statistic again this finding is slightly problematic. But even if I prefer the IV estimations (for SMEs) and compare them with the uncorrected coefficient (for large establishments), the test does not work within the linear IV framework. Besides, the two coefficients do not differ so considerably, suggesting only a small, unsystematic difference. Altogether these results corroborate hypothesis 1a, thus suggesting that there is indeed a positive impact of works councils on further training activity and intensity.

Regarding the firm-size differentials the IV estimations, unlike the logit estimations, shed new light on hypothesis 3a and provide evidence that works councils have a stronger impact on further training activity but not on its intensity in SMEs.

Table 10

Linear instrumental variable model
Dependent variable: training intensity

	All estab's Coefficient (Std. E.)	SMEs Coefficient (Std. E.)	Large estab's Coefficient (Std. E.)	Test
Works council	0.0847*** (0.0289)	0.0677** (0.0341)	0.0301 (0.0506)	a
Woco not instrumented	0.0217*** (0.00604)	0.00375 (0.00751)	0.0438*** (0.00978)	10.90***
Observations	21,363	14,391	6,972	
DWH statistic	4.950**	3.593*	0.0717	
F statistic	18.45***	39.40***	11.11***	
R^2	0.1303	0.1327	0.1141	
IV correlation	0.18***	0.10***	0.23***	
IV coefficient	0.0189***	0.0123*	0.0410***	

Woco = works council, SMEs = small and medium-sized establishments; DWH = Durbin-Wu-Hausman; a = test not feasible; controls as reported in section 4, instrument = founding-year before/after 1990; for full results see appendix A8; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1.
Source: IAB Establishment Panel (2003-2007).

7 Conclusions

Typically, discussion of the economic effects of workplace representation comprises various aspects such as productivity, profitability, employment growth and wages. There are also numerous empirical studies that deal with these topics and try to measure these effects or relations. But to date there are only few studies that try to evaluate the effects of workplace representation on training. One reason might be that the effects on training are not (all) obvious at first sight but are more indirect. Regarding the German experience it is also noteworthy that the mere enrichment of works councils' rights regarding training (direct effect) does not have positive effects, or only to a small extent (Bellmann & Ellguth 2006). It should also be mentioned that the increased training activity does not necessarily lead to more profits or a rise in productivity. But as policy makers and researchers stress the current and future need for trained workforces it is important to know that workplace representation indeed has positive effects on firm-provided training.

However, my results show that there are nonetheless general positive effects especially of works councils on firm-provided training even after taking unobserved factors into account. The bivariate probit model documented a negative relationship between works councils and further training that is outweighed by a stronger positive effect. In particular regarding the existence of works councils there is a positive im-

pact on the further training activity and on the training intensity. On the other hand there is also strong evidence of a positive relationship between shop-floor participation and both training activity and intensity. Moreover, the IV analysis brings forward new evidence that the findings regarding works councils even hold in the presence of unobserved factors. However, as it was not possible to extend the IV analyses to the mechanism of shop-floor participation, one should be wary of causal statements regarding shop-floor participation and it remains an open question how to cope with its potential endogeneity.

It is a stylized fact about workplace training that larger firms typically train more than smaller firms do. The manifold reasons why this is the case include for example: collecting information and organizing training lead to fixed costs and economies of scale favouring larger firms. Another reason for the lower training effort in smaller firms is that higher monitoring costs in larger firms should also lead to stronger training activity. Against this background it is important to know that some determinants of training and their effects or relationships differ in terms of strength according to firm size. The presented results of this study reveal new evidence that this is the case with workplace representation. As for shop-floor participation a stronger further training activity and intensity is observed among smaller establishments. Furthermore, while the results of the linear IV estimation cannot detect any significant firm-size differentials, the bivariate probit suggests a stronger impact of works councils among SMEs regarding further training activity.

All in all these results emphasize that the (empirical) assessment of workplace representation is incomplete if training effects are not taken into account. It should also be emphasized that it is not necessarily the direct rights and responsibilities that will boost a firms' training effort. So the results suggest providing more incentives to establish mechanisms of employer-employee relations and making these positive effects (and explanations of these effects) more publically known.

Endnotes

[1] Niedenhoff (2005) offers a comprehensive description of the German system of co-determination and the rights and responsibilities of the works council.

[2] Institute for Employment Research (*Institut für Arbeitsmarkt- und Berufsforschung*, IAB) of the German Federal Employment Agency (*Bundesagentur für Arbeit*, BA))

[3] The questionnaires are available in English online: http://www.fdz.iab.de/en/FDZ_Establishment_Data/IAB_Establishment_Panel_Working_Tools.aspx

[4] The IAB Establishment Panel leaves it to the respondent to decide whether to report the number of employees trained or the number of cases of participation in training. To avoid a selection bias I convert the number of cases of participation into the number of employees trained following the procedure used by Düll & Bellmann (1998).

[5] Implementing an IV approach for count data models is beyond the scope of this paper. Therefore I stay with Angrist (1991:24): “Linear IV estimation of average treatment effects in nonlinear models can often be justified.”

References

Addison, J. T. and Belfield, C. R. (2008). Unions, Training, and Firm Performance. IZA Discussion Paper 3294.

Addison, J. T.; Schank, T.; Schnabel, C.; Wagner, J. (2006). Works Councils in the Production Process. Schmollers Jahrbuch 126: 251-283.

Addison, J. T.; Schnabel, C.; Wagner, J. (2004). The Course of Research into the Economic Consequences of German Works Councils. British Journal of Industrial Relations 42: 255-281.

Addison, J. T.; Schnabel, C.; Wagner, J. (2000). Die mitbestimmungsfreie Zone aus ökonomischer Sicht. Hamburger Jahrbuch für Wirtschafts- und Gesellschaftspolitik 45: 277-292.

Addison, J. T.; Bryson, A.; Teixeira, P.; Pahnke, A.; Bellmann, L. (2009). The Extent of Collective Bargaining and Workplace Representation: Transitions between States and their Determinants. A Comparative Analysis of Germany and Great Britain. NIESR Discussion Paper 341.

Angrist, J. D. (1991). Instrumental Variables Estimation of Average Treatment Effects in Econometrics and Epidemology. NBER Technical Working Papers 0115.

Becker, G. S. (1962) Investment in Human Capital: A Theoretical Analysis. Journal of Political Economy 70: 9-49.

Bellmann, L.; Ellguth, P. (2006). Verbreitung von Betriebsräten und ihr Einfluss auf die betriebliche Weiterbildung. Jahrbücher für Nationalökonomie und Statistik 226: 487-504.

Bellmann, L.; Leber, U. (2006). Weiterbildung in KMU. In: Weiß, M. (Ed.). Evidenzbasierte Bildungspolitik: Beiträge der Bildungsökonomie. Berlin: Duncker und Humblot, 115-130.

Booth, A. L.; Francesconi, M.; Zoega, G. (2003). Unions, Work-Related Training, and Wages: Evidence for British Men. IZA Discussion Paper 737.

Cameron, A. C.; Trivedi, P. K. (2009). Microeconometrics Using Stata. College Station: Stata Press, 2009.

Düll, H.; Bellmann, L. (1998). Betriebliche Weiterbildungsaktivitäten in West- und Ostdeutschland. Eine theoretische und empirische Analyse mit den Daten des IAB-Betriebspanels 1997. Mitteilungen aus der Arbeitsmarkt- und Berufsforschung 31: 205-225.

Ellguth, P. (2009). Betriebsspezifische Formen der Mitarbeitervertretung – welche Betriebe, welche personalpolitischen Wirkungen. *Industrielle Beziehungen* 16: 109-135.

Evans, W. N.; Schwab, R. M. (1995). Finishing High School and Starting College: Do Catholic Schools Make a Difference? Quarterly Journal of Economics 110: 941–974.

Fischer, G.; Janik, F.; Müller, D.; Schmucker, A. (2009). The IAB Establishment Panel - Things Users Should Know. Schmollers Jahrbuch 129: 133-148.

FitzRoy, F. R.; Kraft, K. (1985). Unionization,Wages and Efficiency. Kyklos 38: 537-554.

FitzRoy, F. R.; Kraft, K. (1987). Efficiency and Internal Organization: Works Councils in West German Firms. Economica 54: 493-504.

Freeman, R.; Medoff, J. (1979): The two faces of unionism. *The* public interest 57: 69-93.

Frege, C. M. (2002). A Critical Assessment of the Theoretical and Empirical Research on German Works Councils. British Journal of Industrial Relations 40: 221-248.

Frick, B.; Möller, I. (2003). Mandated Works Councils and Firm Performance: Labor Productivity and Personnel Turnover in German Establishments. Schmollers Jahrbuch 123: 423-454.

Gerlach, K.; Jirjahn, U. (2001). Employer Provided Further Training: Evidence from German Establishment Data. Schmollers Jahrbuch 121: 139-164.

Green, F. (1993): The impact of trade union membership on training in Britain. Applied Economics 25: 1033-1043.

Greene, W. H. (1994). Accounting for excess zeros and sample selection in poisson and negative binomial regression models. Working Paper 94-10, Stern School of Business. New York University. Department of Economics.

Hardin, J. W.; Hilbe, J. M.(2007). Generalized Linear Models and Extensions. College Station: Stata Press.

Hashimoto, M. (1995). Investment in Employment Relations in Japanese Firms. Journal of the Japanese and International Economies 9: 75-95.

Hilbe, J. M. (2007) Negative Binomial Regression. Cambridge, UK: Cambridge University Press.

Hirsch, B.; Schank, T.; Schnabel, C. (2009) Works Councils and Separations: Voice, Monopoly, and Insurance Effects. IZA Discussion Paper 4126.

Hirschman, A. O. (1970). Exit, Voice, and Loyality. Responses to Decline in Firms, Organizations and States. Cambridge: Harvard University Press.

Jirjahn, U. (2009). The Introduction of Works Councils in German Establishments – Rent Seeking or Rent Protection. British Journal of Industrial Relations 35: 521-545.

Long, J. S.; Freese, J. (2006) Regression Models for Categorial Dependent Variables Using Stata. College Statio: Stata Press.

Lynch, L. M.; Black, S. E. (1998) Beyond the incidence of employer-provided training. Industrial and Labor Relations Review 52: 64-81.

Mincer, J. (1983). Union Effects: Wages, Turnover and Job Training. In: Reid, J. D. (Ed.): New Approaches to Labor Unions. Research in Labor Economics. Greenwich : JAI Press, 217-252.

Mueller, S. (2009) Are the firm owners really worse off with a works council? BGPE Discussion Paper *81.*

Neubäumer, R.; Kohaut, S.; Seidenspinner, M. (2006). Determinanten betrieblicher Weiterbildung - ein ganzheitlicher Ansatz zur Erklärung des betrieblichen Weiterbildungsverhaltens und eine empirische Analyse für Westdeutschland. Schmollers Jahrbuch 126: 437-471.

Niedenhoff, H.-U. (2005). Mitbestimmung in der Bundesrepublik Deutschland. Köln: Deutscher Instituts-Verlag.

Rogers, J. and Streeck, W. (1994). Works Councils. Chicago: University of Chicago Press.

Smith, S. C. (1991). On the economic rationale for codetermination law. Journal of Economic Behavior and Organization 16: 261-281.

Stevens, M. (1996) Transferable Training and Poaching Externalities. In: Booth, A. L. (Ed.); Snower, Dennis J. (Ed.): Acquiring Skills. Cambridge: Cambridge University Press, 21-40.

Weesie, J. (1999). Seemingly unrelated estimation and the cluster adjusted sandwich estimator. Stata Technical Bulletin 52: 230-257.

White, H. (1980). : A heteroskestasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. Econometrica 48: 817-838.

Wooldridge, J. M. (2002). Introductory Econometrics. A Modern Approach. Itps Thomson Learning.

Zwick, T. (2004). Weiterbildungsintensität und betriebliche Produktivität. Zeitschrift für Betriebswirtschaft 74: 651-668.

Zwick, T. (2005). Continuing Vocational Training Forms and Establishment Productivity in Germany. German Economic Review 6: 155-184.

Appendix

Table A1

Variables capturing dynamics of workplace representation

Existence of workplace representation in year …			Dummy variables set			
t_1	t_2	t_3	Introduction	Closure	Always	Never
0	0	0	0	0	0	1
0	0	1	1	0	0	0
0	1	1	1	0	0	0
1	1	1	0	0	1	0
1	1	0	0	1	0	0
1	0	0	0	1	0	0
0	1	0	0	1	0	0
1	0	1	1	0	0	0

Note: The conclusions derived from tables 7 and 8 hold also if establishments with multiple changes (last two lines) are excluded from the analysis. Example: In the second line I observe the introduction of a works council, for example, because there is a works council in t_3 but not in t_2 and t_1.

Table A2

Description

Variable	Logit I		ZINB I	
	Mean	Std. Dev.	Mean	Std. Dev.
Training activity (d)	0.680	0.463		
Number of workers trained			36.95	218.49
10-49 employees (d)	0.393	0.488	0.397	0.489
50-99 employees (d)	0.126	0.332	0.127	0.332
100-249 employees (d)	0.125	0.331	0.124	0.330
250-499 employees (d)	0.0650	0.247	0.0635	0.244
500-999 employees	0.0340	0.181	0.0325	0.178
1000 + employees (d)	0.0253	0.157	0.0227	0.149
Region (d, 1 = western Germany)	0.622	0.485	0.619	0.486
Skilled workers (p)	0.696	0.254	0.696	0.255
Fixed-term contract workers (p)	0.0491	0.117	0.0490	0.117
Part-time workers (p)	0.174	0.210	0.174	0.220
Labour turnover*	0.103	0.205	0.103	0.206
Technology (five-point scale, 1 = new, 5 = old)	2.147	0.754	2.148	0.754
IT investments (d)	0.537	0.499	0.534	0.499
Investments in production facilities (d)	0.528	0.499	0.525	0.499
Type of establishment (d, 1 = single firm establishment)	0.269	0.444	0.266	0.442
Last year's profitability (five-point scale, 1 = very good, 5 = very poor)	2.865	1.057	2.867	1.0571
Shop-floor participation (d)	0.0881	0.284	0.0877	0.283
Works council (d)	0.315	0.464	0.309	0.462
Collective agreement (d)	0.508	0.500	0.505	0.500
Industry dummies, year dummies	included			

d = dummy (1 = true if not indicated otherwise), p = proportion; * hires+layoffs/0.5*(number of employees+(number of employees – hires+layoffs)); Source: IAB Establishment Panel (2003-2007).

Interpretation of the ZINB model

Training intensity is the proportion of workers trained P. This proportion is computed from the number of workers trained y and the total number of workers in the establishment N:

$$P = \frac{y}{N}$$

Count data models can be interpreted as a proportion (Long & Freese 2006) by including the logarithm of the number of employees as a regressor with a coefficient restricted to one $(\ln(N))$. This results from the ZINB model

$$y = \left(1 - F(\eta)\right) * e^{(\eta + \ln(N))} = \left(1 - F(\eta)\right) * e^{(\eta)} * N.$$

From this it follows that

$$\frac{y}{N} = \left(1 - F(\eta)\right) * e^{(\eta)}.$$

Table A3
Logit model I
Dependent variable: training activity

	All estab's	SMEs	Large es-tab's.
10-49 employees	0.428***	0.463***	0.270*
	(0.0535)	(0.0575)	(0.157)
50-99 employees	0.885***	0.941***	0.705***
	(0.0831)	(0.0954)	(0.191)
100-249 employees	1.406***	1.474***	1.211***
	(0.109)	(0.133)	(0.215)
250-499 employees	2.095***		1.821***
	(0.175)		(0.286)
500-999 employees	2.454***		2.137***
	(0.305)		(0.381)
1000 + employees	3.211***		2.793***
	(0.506)		(0.556)
Region	-0.105**	-0.114**	-0.0697
	(0.0507)	(0.0562)	(0.116)
Skilled workers	1.011***	1.036***	0.961***
	(0.0967)	(0.111)	(0.200)
Fixed-term contract workers	-0.213	-0.0594	-0.605
	(0.198)	(0.227)	(0.402)
Part-time workers	-0.498***	-0.505***	-0.317
	(0.115)	(0.132)	(0.239)
Labour turnover	-0.345***	-0.453***	-0.0534
	(0.107)	(0.132)	(0.177)
Technology	-0.237***	-0.257***	-0.162**
	(0.0297)	(0.0332)	(0.0652)
IT investments	0.647***	0.607***	0.834***
	(0.0476)	(0.0527)	(0.114)
Investments in production facilities	0.434***	0.428***	0.451***
	(0.0489)	(0.0538)	(0.120)
Type of establishment	0.467***		0.539**
	(0.0633)		(0.267)
Last year's profitability	-0.0571***	-0.0566**	-0.0488
	(0.0212)	(0.0237)	(0.0493)
Shop-floor participation	0.481***	0.490***	0.459**
	(0.0848)	(0.0962)	(0.183)
Works council	0.375***	0.302***	0.482***
	(0.0781)	(0.0993)	(0.127)
Collective agreement	0.339***	0.308***	0.450***
	(0.0501)	(0.0559)	(0.117)
Constant	-0.801***	-0.818***	-0.870**
	(0.146)	(0.164)	(0.444)
Observations	15,113	10,229	4,884
Pseudo-R^2	0.2324	0.1735	0.2228

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

Table A4
ZINB model I
Dependent variable: number of workers trained

	Count All estab's	Inflate All estab's	Count SMEs	Inflate SMEs	Count Large est.	Inflate Large est.
10-49 employees	-0.211***	-0.0147	-0.170***	-0.0678	-0.284***	0.569
	(0.0274)	(0.0812)	(0.0312)	(0.0846)	(0.0644)	(0.348)
50-99 employees	-0.416***	-0.150	-0.377***	-0.244*	-0.421***	0.442
	(0.0402)	(0.114)	(0.0508)	(0.125)	(0.0754)	(0.379)
100-249 employees	-0.468***	-0.539***	-0.373***	-0.672***	-0.547***	0.128
	(0.0440)	(0.143)	(0.0598)	(0.165)	(0.0757)	(0.404)
250-499 employees	-0.543***	-1.164***			-0.631***	-0.392
	(0.0543)	(0.217)			(0.0829)	(0.478)
500-999 employees	-0.534***	-1.382***			-0.625***	-0.549
	(0.0687)	(0.343)			(0.0911)	(0.537)
1000 + employees	-0.396***	-2.109***			-0.524***	-1.183
	(0.0704)	(0.583)			(0.0938)	(0.744)
Region	-0.175***	0.00587	-0.197***	0.000983	-0.180***	0.0375
	(0.0241)	(0.0717)	(0.0293)	(0.0773)	(0.0399)	(0.175)
Skilled workers	0.532***	-1.078***	0.485***	-1.091***	0.581***	-1.019***
	(0.0595)	(0.139)	(0.0796)	(0.157)	(0.0858)	(0.301)
Fixed-term contract workers	0.0698	0.300	0.114	0.147	-0.0445	0.988
	(0.153)	(0.269)	(0.180)	(0.300)	(0.210)	(0.681)
Part-time workers	0.0634	0.699***	0.0901	0.695***	0.103	0.535
	(0.0630)	(0.160)	(0.0744)	(0.179)	(0.105)	(0.348)
Labour turnover	-0.196**	0.337**	-0.128	0.495***	-0.306**	-0.617
	(0.0789)	(0.147)	(0.0910)	(0.177)	(0.125)	(0.655)
Technology	-0.0915***	0.269***	-0.108***	0.277***	-0.0685***	0.149
	(0.0152)	(0.0431)	(0.0191)	(0.0470)	(0.0240)	(0.0968)
IT investments	0.0994***	-0.848***	0.115***	-0.743***	0.0653	-1.212***
	(0.0254)	(0.0721)	(0.0307)	(0.0774)	(0.0433)	(0.180)
Investments in production facilities	0.0334	-0.540***	0.00641	-0.533***	0.0861**	-0.590***
	(0.0254)	(0.0730)	(0.0304)	(0.0788)	(0.0430)	(0.188)
Type of establishment	0.191***	-0.538***			0.234***	-0.604*
	(0.0249)	(0.0905)			(0.0541)	(0.324)
Last year's profitability	-0.0150	0.0631**	-0.0142	0.0504	-0.0168	0.114
	(0.0103)	(0.0305)	(0.0131)	(0.0334)	(0.0164)	(0.0738)
Shop-floor participation	0.0822**	-0.605***	0.125***	-0.580***	0.0520	-0.610**
	(0.0329)	(0.131)	(0.0438)	(0.142)	(0.0489)	(0.293)
Works council	0.0386	-0.387***	-0.0169	-0.266**	0.100**	-0.633***
	(0.0328)	(0.113)	(0.0456)	(0.132)	(0.0481)	(0.210)
Collective agreement	0.0286	-0.411***	0.0618**	-0.334***	-0.0327	-0.607***
	(0.0259)	(0.0728)	(0.0308)	(0.0786)	(0.0460)	(0.184)
Constant	-1.341***	0.0920	-1.348***	0.171	-1.342***	-0.209
	(0.0754)	(0.207)	(0.0981)	(0.225)	(0.137)	(0.684)
ln(alpha)	-0.198***		-0.286***		-0.160***	
	(0.0244)		(0.0408)		(0.0301)	
Observations	14909		10178		4731	
Wald-X^2	896.00		615.34		460.62	

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

Table A5
Logit model II
Dependent variable: training activity

	All estab's	SMEs	Large estab's
10-49 employees	0.424***	0.446***	0.340*
	(0.0588)	(0.0629)	(0.176)
50-99 employees	0.865***	0.886***	0.797***
	(0.0948)	(0.107)	(0.226)
100-249 employees	1.384***	1.479***	1.181***
	(0.124)	(0.152)	(0.244)
250-499 employees	2.028***		1.734***
	(0.206)		(0.328)
500-999 employees	2.382***		2.031***
	(0.372)		(0.456)
1000 + employees	2.795***		2.373***
	(0.507)		(0.578)
Region	-0.145**	-0.146**	-0.152
	(0.0568)	(0.0624)	(0.135)
Skilled workers	1.005***	1.036***	0.942***
	(0.110)	(0.125)	(0.236)
Fixed-term contract workers	-0.255	-0.0649	-0.846*
	(0.226)	(0.254)	(0.470)
Part-time workers	-0.503***	-0.531***	-0.300
	(0.128)	(0.145)	(0.277)
Labour turnover	-0.297**	-0.414***	-0.0116
	(0.118)	(0.144)	(0.219)
Technology	-0.258***	-0.276***	-0.187**
	(0.0333)	(0.0371)	(0.0754)
IT investments	0.659***	0.610***	0.912***
	(0.0530)	(0.0582)	(0.131)
Investments in production facilities	0.442***	0.446***	0.397***
	(0.0547)	(0.0597)	(0.140)
Type of establishment	0.495***		0.464
	(0.0725)		(0.314)
Last years profitability	-0.0640***	-0.0651**	-0.0524
	(0.0237)	(0.0262)	(0.0576)
Introduction woco	-0.168	-0.201	-0.0308
	(0.156)	(0.218)	(0.238)
Closure woco	0.0455	0.215	-0.167
	(0.162)	(0.215)	(0.253)
Always woco	0.522***	0.446***	0.605***
	(0.0966)	(0.122)	(0.159)
Introduction sfp	0.695***	0.648***	0.912***
	(0.116)	(0.130)	(0.276)
Closure sfp	0.275***	0.347***	0.0147
	(0.0935)	(0.104)	(0.212)
Cont´d			
Always sfp	0.444**	0.442*	0.293
	(0.212)	(0.234)	(0.498)

Collective agreement	0.332***	0.305***	0.448***
	(0.0557)	(0.0616)	(0.137)
Constant	-0.806***	-0.826***	-0.747
	(0.163)	(0.182)	(0.513)
Observations	12042	8377	3665
Pseudo R^2	0.2340	0.1753	0.2268

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

Table A6
ZINB model II
Dependent variable: number of workers trained

	Count All estab's	Inflate All estab's	Count SMEs	Inflate SMEs	Count Large est.	Inflate Large est.
10-49 employees	-0.206***	-0.00691	-0.157***	-0.0307	-0.332***	0.422
	(0.0302)	(0.0881)	(0.0342)	(0.0918)	(0.0732)	(0.388)
50-99 employees	-0.429***	-0.128	-0.388***	-0.164	-0.491***	0.228
	(0.0462)	(0.128)	(0.0579)	(0.139)	(0.0869)	(0.433)
100-249 employees	-0.498***	-0.521***	-0.407***	-0.665***	-0.625***	0.107
	(0.0507)	(0.162)	(0.0690)	(0.187)	(0.0863)	(0.449)
250-499 employees	-0.589***	-1.099***			-0.724***	-0.374
	(0.0631)	(0.251)			(0.0952)	(0.529)
500-999 employees	-0.567***	-1.305***			-0.699***	-0.488
	(0.0810)	(0.419)			(0.106)	(0.616)
1000 + employees	-0.430***	-1.658***			-0.584***	-0.725
	(0.0817)	(0.568)			(0.109)	(0.773)
Region	-0.218***	0.0427	-0.239***	0.0284	-0.218***	0.108
	(0.0273)	(0.0810)	(0.0328)	(0.0864)	(0.0466)	(0.221)
Skilled workers	0.516***	-1.042***	0.456***	-1.070***	0.587***	-0.938**
	(0.0678)	(0.160)	(0.0899)	(0.180)	(0.0988)	(0.367)
Fixed-term contract workers	0.265	0.442	0.294	0.231	0.232	1.904**
	(0.181)	(0.303)	(0.216)	(0.331)	(0.239)	(0.838)
Part-time workers	0.0928	0.784***	0.0918	0.789***	0.177	0.627
	(0.0703)	(0.180)	(0.0822)	(0.199)	(0.123)	(0.424)
Labour turnover	-0.211**	0.290*	-0.169*	0.447**	-0.332**	-1.507
	(0.0899)	(0.163)	(0.0998)	(0.194)	(0.131)	(0.950)
Technology	-0.0974***	0.290***	-0.109***	0.301***	-0.0763***	0.143
	(0.0171)	(0.0489)	(0.0216)	(0.0532)	(0.0274)	(0.119)
IT investments	0.0991***	-0.851***	0.131***	-0.735***	0.0260	-1.251***
	(0.0289)	(0.0802)	(0.0344)	(0.0851)	(0.0505)	(0.215)
Investments in production facilities	0.0447	-0.560***	0.00854	-0.568***	0.138***	-0.546**
	(0.0288)	(0.0825)	(0.0339)	(0.0879)	(0.0511)	(0.218)
Type of establishment	0.177***	-0.574***			0.219***	-0.509
	(0.0284)	(0.104)			(0.0638)	(0.377)
Last year's profitability	-0.0222*	0.0608*	-0.0150	0.0571	-0.0352*	0.0870
	(0.0115)	(0.0340)	(0.0145)	(0.0368)	(0.0188)	(0.0885)
Introduction woco	0.0143	0.234	0.0911	0.342	-0.0259	-0.111
	(0.0708)	(0.212)	(0.112)	(0.268)	(0.0930)	(0.380)
Closure woco	-0.0713	-0.158	-0.0490	-0.323	-0.0462	0.0477
	(0.0755)	(0.256)	(0.103)	(0.326)	(0.115)	(0.457)
Always woco	0.0892**	-0.547***	0.0427	-0.442***	0.129**	-0.705***
	(0.0396)	(0.138)	(0.0552)	(0.161)	(0.0599)	(0.255)
Introduction sfp	0.120***	-0.967***	0.161***	-0.846***	0.0809	-0.979**
	(0.0444)	(0.214)	(0.0571)	(0.226)	(0.0696)	(0.470)
Closure sfp	0.0372	-0.353**	0.0197	-0.406***	0.0822	-0.179
	(0.0403)	(0.138)	(0.0520)	(0.149)	(0.0647)	(0.327)
Always sfp	0.128	-0.588*	0.207**	-0.501	0.00172	-0.564
	(0.0811)	(0.324)	(0.105)	(0.331)	(0.124)	(0.985)

Cont´d

Collective agreement	0.0490*	-0.380***	0.0869**	-0.301***	-0.0360	-0.680***
	(0.0294)	(0.0806)	(0.0345)	(0.0857)	(0.0543)	(0.226)
Constant	-1.318***	0.111	-1.345***	0.147	-1.241***	-0.0931
	(0.0851)	(0.229)	(0.109)	(0.252)	(0.155)	(0.736)
ln(alpha)	-0.212***		-0.299***		-0.173***	
	(0.0282)		(0.0470)		(0.0353)	
Observations	11910		8343		3567	
Wald-X^2	790.62		540.61		403.69	

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

Table A7
Bivariate probit model
Dependent variable: training activity & works council

	Training All estab's	Woco All estab's	Training SMEs	Woco SMEs	Training Large est.	Woco Large est.
10-49 employees	0.253***	0.753***	0.261***	1.036***	0.249***	0.374***
	(0.0300)	(0.0584)	(0.0324)	(0.0973)	(0.0877)	(0.0983)
50-99 employees	0.501***	1.610***	0.507***	2.036***	0.513***	0.918***
	(0.0514)	(0.0657)	(0.0627)	(0.103)	(0.110)	(0.110)
100-249 employees	0.692***	2.244***	0.694***	2.826***	0.710***	1.352***
	(0.0695)	(0.0686)	(0.0937)	(0.106)	(0.127)	(0.111)
250-499 employees	0.952***	2.637***			0.977***	1.786***
	(0.0926)	(0.0843)			(0.150)	(0.121)
500-999 employees	1.200***	2.946***			1.223***	2.081***
	(0.123)	(0.117)			(0.170)	(0.144)
1000 + employees	1.326***	3.138***			1.316***	2.303***
	(0.158)	(0.148)			(0.197)	(0.167)
Region	-0.0804***	0.0328	-0.0841***	0.0578	-0.0818	0.0702
	(0.0268)	(0.0424)	(0.0306)	(0.0561)	(0.0556)	(0.0645)
Skilled workers	0.564***	0.803***	0.566***	0.792***	0.605***	0.718***
	(0.0500)	(0.0703)	(0.0588)	(0.0981)	(0.0963)	(0.0973)
Fixed-term contract workers	-0.0620	0.137	-0.00629	-0.0832	-0.224	0.141
	(0.104)	(0.164)	(0.122)	(0.212)	(0.197)	(0.255)
Part-time workers	-0.314***	-0.111	-0.307***	-0.556***	-0.217*	0.148
	(0.0609)	(0.0874)	(0.0731)	(0.130)	(0.114)	(0.124)
Technology	-0.145***	0.156***	-0.168***	0.217***	-0.0720**	0.0757**
	(0.0153)	(0.0210)	(0.0176)	(0.0282)	(0.0301)	(0.0320)
IT investments	0.377***	0.107***	0.358***	0.187***	0.430***	-0.00253
	(0.0245)	(0.0329)	(0.0276)	(0.0436)	(0.0538)	(0.0532)
Investments in production facilities	0.244***	0.101***	0.238***	0.138***	0.257***	0.0469
	(0.0254)	(0.0317)	(0.0282)	(0.0418)	(0.0574)	(0.0518)
Type of establishment	0.225***	0.657***			0.257***	0.156*
	(0.0345)	(0.0368)			(0.0975)	(0.0889)
Last year's profitability	-0.0473***	0.0399***	-0.0377***	0.0615***	-0.0743***	0.0248
	(0.0107)	(0.0135)	(0.0122)	(0.0179)	(0.0222)	(0.0214)
Collective agreement	0.149***	0.890***	0.135***	0.801***	0.213***	1.037***
	(0.0278)	(0.0346)	(0.0310)	(0.0455)	(0.0652)	(0.0537)

Cont´d

Labour turnover	-0.259***	-1.091***	-0.283***	-1.043***	-0.140	-1.055***
	(0.0582)	(0.132)	(0.0701)	(0.200)	(0.0931)	(0.177)
Works council	0.473***		0.516***		0.305*	
	(0.0863)		(0.112)		(0.157)	
Age dummy		0.0883**		0.0766		0.130**
		(0.0386)		(0.0513)		(0.0580)
Constant	-0.453***	-3.261***	-0.460***	-3.849***	-0.462**	-1.922***
	(0.0755)	(0.116)	(0.0863)	(0.174)	(0.195)	(0.198)
Rho	-0.179***		-0.229***		-0.0470	
Wald-χ^2	8107.15		4401.39		2334.26	
Observations	20547		13745		6802	

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

Table A8
Linear instrumental variable model
Dependent variable: training intensity

	All estab's	Large estab's	SMEs
10-49 employees	-0.0388***	-0.0939***	-0.0250***
	(0.00616)	(0.0201)	(0.00639)
50-99 employees	-0.0794***	-0.113***	-0.0612***
	(0.0122)	(0.0259)	(0.0143)
100-249 employees	-0.112***	-0.142***	-0.0854***
	(0.0176)	(0.0300)	(0.0227)
250-499 employees	-0.130***	-0.159***	
	(0.0209)	(0.0341)	
500-999 employees	-0.124***	-0.151***	
	(0.0233)	(0.0357)	
1000 + employees	-0.120***	-0.153***	
	(0.0240)	(0.0365)	
Region	-0.0434***	-0.0516***	-0.0429***
	(0.00486)	(0.00942)	(0.00554)
Skilled workers	0.114***	0.158***	0.0973***
	(0.00952)	(0.0186)	(0.0105)
Fixed-term contract workers	0.00113	-0.00798	0.00374
	(0.0214)	(0.0383)	(0.0234)
Part-time workers	-0.0114	0.0169	-0.0145
	(0.0114)	(0.0217)	(0.0133)
Technology	-0.0356***	-0.0305***	-0.0358***
	(0.00278)	(0.00524)	(0.00322)
IT investments	0.0503***	0.0427***	0.0527***
	(0.00469)	(0.00914)	(0.00539)
Investments in production facilities	0.0204***	0.0224**	0.0204***
	(0.00462)	(0.00917)	(0.00525)
Type of establishment	0.0522***	0.0491***	
	(0.00670)	(0.0110)	
Last year's profitability	-0.00843***	-0.0115***	-0.00604***
	(0.00186)	(0.00330)	(0.00224)
Collective agreement	0.0137**	0.0203	0.0174***
	(0.00662)	(0.0172)	(0.00655)
Labour turnover	-0.0304***	-0.0192	-0.0408***
	(0.00943)	(0.0200)	(0.0103)
Works council	0.0847***	0.0301	0.0677**
	(0.0289)	(0.0506)	(0.0341)
Constant	0.208***	0.281***	0.189***
	(0.0138)	(0.0309)	(0.0159)
Observations	21363	6972	14391
R^2	0.130	0.114	0.133

SMEs = small and medium-sized establishments; robust standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1; industry and year dummies included. Source: IAB Establishment Panel (2003-2007).

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