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Drivers of training participation in low skilled jobs: the role of 'voice', technology, innovation and labor shortages in German companies

Philip Wotschack

This article investigates the role of 'voice', technology, innovation (of products, services, or processes) and labor shortages in the training participation of low skilled workers in German companies. By building on the key findings of previous research, hypotheses on drivers of training participation are derived from filter theory and the concept of social embeddedness. Regression and cluster analysis based on the German IAB Establishment Panel (wave 2011) show evidence that training participation is shaped by 'voice'-related institutional company characteristics such as employee representation or formalized HR practices. Both characteristics often cluster together. Regression analyses confirm that companies in this cluster train a higher share of their low-skilled workforce. The share is particularly high when companies in this cluster face labor shortages. Apart from that, advanced technology and recent innovations at the company level are not related to higher rates of training participation among low skilled workers.

Introduction

In all European societies, low skilled workers face particular labor market risks in terms of unemployment, bad working conditions, or low pay (Eurofound, 2009). According to calculations of the German Institute for Employment Research (IAB) 45 per cent of the tasks that are recently performed by low skilled workers are routine tasks, which could be substituted by computers or computer-driven machines (Dengler & Matthes, 2019). Continuing training forms a key measure to respond to these developments

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by improving digital skills, labor market opportunities and career prospects for this group of workers (Arulampalam *et al.*, 2004; Martin & Rüber, 2016; Mohr *et al.*, 2016, p. 553). The crucial question of this paper is how low skilled workers can be better integrated into employer-provided continuing training in Germany. The focus is on the one hand on the role of technological change and innovation, on the other hand on institutional influences and mechanisms of 'voice'.

Germany does not only represent a prominent case of the dual apprenticeship system and rather moderate levels of continuing training (Thelen, 2014) it also stands for a high impact and strong regulation of continuing training activities at the company level (Allaart *et al.*, 2009, p. 105). Despite an increase in the average participation in further training in Germany the social structures of inequality in the participation in continuing vocational training persist (see Autorengruppe Bildungsberichterstattung, 2014, p. 141). Similar to many European countries (Abramovsky *et al.*, 2011; Martin & Rüber, 2016; Ramos & Harris, 2012) training participation of low skilled workers is low in Germany. As employers are the main providers of continuing training in Germany, an important question is how training participation of low skilled workers is influenced by the organizational context.

In order to investigate this issue, we need to study how continuing training is enacted and governed at the company level. This involves HR, communication tools and participation schemes, as well as institutional arrangements. As other scholars have pointed out, the processes that lead from training opportunities to achievements have in large part remained under-investigated (Subramanian & Zimmermann, 2017). This holds particularly true for low skilled workers, a group that is often lacking access to training opportunities provided by companies. This article aims to identify social mechanisms and favorable organizational settings that contribute to the training participation of low skilled workers by reinforcing 'voice'. Particular attention is paid to employee representation, institutionalized arrangements and HR and management devices. 'Voice' is understood as the medium that converts training opportunities into training outcomes, by enabling workers to express and claim their training interests (see Zimmermann, 2020 in this special issue).

By definition continuing vocational training aims at teaching new skills or adapting existing skills to new technical and professional developments (Wilkens & Leber, 2003, p. 330). Employer-provided continuing training includes all training measures, which are organized by companies or taking place in the company context, such as courses, teaching or workplace-related learning. The role of employer-provided continuing training turns out to be ambivalent: on the one hand, it is by far the largest segment of continuing vocational training in Germany with a share of 70 per cent (BMBF, 2015, p. 5). On the other hand, it is primarily focused on maintaining and advancing the skills relevant to the needs and operations of the work process. Dominant are operational skill needs and short-term adaptation measures to respond to acute technological, organizational, or market-related changes. Long-term training programs that offer substantial opportunities in terms of job mobility, professional reorientation, or promotion to higher occupational positions are less present, as reflected by the very low percentage of certified further training measures (BMBF, 2015, p. 48).

Nevertheless, access to training opportunities provided by employers plays an important role in the employability, labor market opportunities and quality of work of low-skilled workers (McVicar *et al.*, 2016; Mohr *et al.*, 2016). Even when the outcomes in terms of professional qualifications and individual capabilities tend to be small, in-firm training extends existing competencies and maintains employment security and employability. The measures also have a more direct practical relevance and the workers remain involved in processes of learning, which helps to reduce barriers for unskilled workers to participate in continuing training (Beer, 1999, p. 192).

However, according to representative data on continuing training participation in Germany (in 2017), only one out of two companies has devoted (working) time or money to continuing training (IAB, 2017). On average one-third of the employees participated in continuous training. Although around 40 per cent of the skilled workers took part in continuing training, the share among the low-skilled workers (doing work that does not require a vocational degree) was only 20 per cent (IAB, 2017; see also Janssen & Leber, 2015, p. 6).

The low training participation of low-skilled workers raises questions of possible barriers and solutions. Although there is a relatively broad literature on training participation in general (see recently Wiseman & Parry, 2017), few studies have focused on the particular group of low skilled workers (see Abramovsky *et al.*, 2011; Bellmann *et al.*, 2015; Mohr *et al.*, 2016) and mechanisms of 'voice'. This article investigates how low skilled workers' access to continuing training is shaped by the organizational context. The focus is on the one hand on organizational determinants that support workers' 'voice', on the other hand on the role of technology and innovations within organizations. Leading is the idea that structures of institutional embeddedness at the firm level in terms of regulations, norms, relative power, or long-term employment relationships are crucial for the integration of low skilled workers in continuing training. These structures can prevent statistical discrimination by employers: when employers tend to discriminate against low skilled workers by ascribing lower returns and greater risk of loss of training investments to this group of workers (regardless of their individual capabilities), institutional structures at the firm level might counteract this tendency. Although such institutional structures are particularly important also with regard to policy interventions, policy makers, and stakeholders in the field of continuing training, they did not receive much attention in previous research (Dieckhoff & Steiber, 2011).

The IAB Establishment Survey (wave 2011) is used to test these hypotheses. It provides information on both the company context (including technology, recent innovations, institutional arrangements and HR practices) and training participation of low skilled workers. The term low-skilled worker refers to workers in low skilled jobs who may or may not be low skilled or have low qualifications. They perform tasks that do not require a professional qualification, regardless of possible qualifications that they might have achieved in previous professions. In this respect, and in contrast to studies with a narrower focus on workers that do not possess any professional qualification (Beer, 1999), a broader definition of low-skilled workers is used in this study. It acknowledges the idea that employers often tend to believe that workers in low-skilled jobs are not worth training due to potential limited productivity outcomes. Nevertheless, it would be interesting to study possible differences (within this group) due to the existence or absence of a previous vocational qualification (in other professions). The absence of any professional qualification could be an additional barrier to continuing training and increase discrimination by employers. Unfortunately, it is not possible to make this distinction with the data set used in this study.

Theory and hypotheses

Previous research has identified a number of determinants that increase the likelihood that employers provide continuing training (e.g. Acemoglu & Pischke, 1998; Frazis *et al.*, 2000; Grund 2012; K pplinger 2007, p. 5, Neub umer *et al.*, 2006, p. 451; Oosterbeek, 1998). It has shown evidence that the probability of training investments is higher in larger establishments, certain sectors (such as the Education, Health and Care sector), in companies with a good business situation, with modern production facilities or a higher need for skilled work (see Bellmann *et al.*, 2010). Moreover, high engagement in initial vocational training, the presence of employee organizations, cooperative work relations (Neub umer *et al.*, 2006), institutionalized HR practices (K pplinger, 2007; Osterman, 1995), or employee-oriented HR policies (Frazis *et al.*, 2000) have been proven to be favorable influences.

However, most of these studies focus on characteristics that affect continuing training participation in general. Studies with a focus on the training participation of low skilled workers are rare. The few existing studies show evidence that training participation of low skilled workers varies between countries, sectors and firms of different sizes. It is higher in the Scandinavian countries and countries with more public spending on education (Martin & R ber, 2016), in certain sectors (such as education, human health and social care), in larger firms, in firms reporting labor shortages (Bellmann *et al.*,

2015), or when low skilled workers report higher task flexibility (Mohr *et al.*, 2016; Sanders & de Grip, 2004).

Theoretically, differences in training participation are usually explained by processes of selection (by employers) and self-selection (by employees) (Ramos & Harris, 2012; Wozny & Schneider, 2014). Barriers at the individual level, such as the subjective perception of existing continuing education needs, lack of interest in continuing education, subjective learning barriers or external constraints (such as family demands) can prevent training participation – even when there are good opportunities at the organizational level (Martin & Rüber, 2016). Many of these factors most frequently apply to low skilled workers (Mohr *et al.*, 2016). Regarding the side of the employers, the willingness to train workers tends to decrease when time or financial resources are scarce, when the expected returns to training are low, or if no need for training is perceived (Abramovsky *et al.*, 2011).

A common explanation for low training activities at the company level refers to problems of uncertainty (Germer & Stegmaier, 2009; Oosterbeek, 1998). Transaction cost theory stresses the risk of opportunistic behavior (Neubäumer *et al.*, 2006; Williamson, 1985). From the workers' perspective, desired returns to training (such as financial benefits, job security or promotion) can be denied by the employer. Employers, in contrast, bear the risk that training investments do not lead to the desired gains in productivity. Moreover, returns to training are jeopardized by career interruptions or employer change ('poaching') (Mohrenweiser *et al.* 2018). In order to cope with these risks, organizations can introduce contractual arrangements (governance structures). Contracting increases transaction costs and makes continuing training more costly.

Alternative theoretical accounts such as filter theory explain the lower training participation of low skilled workers by the (mis)attribution of low and/or uncertain returns to training (Arrow, 1973). According to this view, employers tend to ascribe lower returns and greater risk of loss of training investments to low skilled workers. As they are not able to predict actual gains in productivity (due to training), they focus primarily on groups of people, where returns to training seem high and safe. Certain personal characteristics like the educational degree (measured in certificates), gender, age, or employment relationship serve as an (indirect) indicator signaling lower risk and more gains in productivity. As a consequence, high skilled, young, male, full-time employed workers are more likely to receive continuing training (Asplund, 2005).

Following previous studies (see Bellmann *et al.*, 2015; Hirsch-Kreinsen, 2016), I expect that low skilled workers are more often included in continuing training when the company faces labor shortages or technological or organizational change. Under these conditions, organizations are more likely to invest in training of low skilled workers (despite the outlined barriers and independent from mechanisms of 'voice'). Instead of recruiting skilled employees on the external labor market, they need to invest in the human capital of low skilled workers ('Labor shortages' hypothesis H1.1). Moreover, advanced production technology, the introduction of new technology, digitization and organizational change will increase the pressure to invest in training also for low skilled workers in order to enable them to adapt to new or advanced technology, work organization, or production processes ('Adaptation' hypothesis H1).

When we follow filter theory there is good reason to be pessimistic about the long-term prospects of low skilled workers' opportunity to participate in continuing training. In the case of labor shortages or technological change, organizations adapt to situational restrictions and do not follow a substantial long-term strategy. As long as mechanisms of statistical discrimination are at work, the negative signal of a low or missing qualification (as an indicator of low or uncertain returns to training) will counteract training participation, in the long run even. Moreover, technology, innovation and labor shortages are rather drivers of *employer-oriented* training measures (in order to counter labor market restrictions or technology) and leave less room for workers' preferences. So the question arises how mechanisms of statistical discrimination and/or employer-oriented training can be canceled out or at least reduced for low skilled workers in the long run.

A qualitative study based on firm-level case studies in Germany identified a number of favorable institutional influences and mechanisms at the sectoral and company level (Wotschack & Solga, 2014). Besides the (well-known) factors that increase in-company training in general (such as a labor shortages, technological change or an existing educational infrastructure) social and institutional embeddedness of the company proved to be an essential prerequisite for both the integration of low-skilled workers through training programs and the recognition of their preferences. This includes diverse company agreements and collective regulations, long-term employment relations, worker representation, strong norms of solidarity, as well as tight cooperation between the corporate actors. Moreover, the high proportion of low-skilled workers that participate in further training could not be explained by a single characteristic. In fact, several factors worked together in specific constellations (Wotschack & Solga, 2014).

Theoretically, the qualitative study built on the concept of social embeddedness (Beckert, 1996; Granovetter, 1985, p. 142). This concept emphasizes the importance of the social context for economic action: institutions, norms, social networks, or power relations are able to reduce uncertainties in economic exchange relations. When we apply this idea to the (neglected) role of 'voice' in training participation of low skilled workers the question arises how institutional structures at the firm level can strengthen low skilled workers' 'voice' in order to counter both statistical discrimination and (sole) employer interest.

In addition to the training opportunities that are shaped by the company's economic and institutional setting, individual 'voice' is understood as the medium that is necessary to convert these (collective) opportunities into (individual) training outcomes (Subramanian & Zimmermann, 2017; see also Zimmermann, 2020, in this special issue). This can counteract the risks of statistical discrimination in two ways.

First, individual 'voice' can help to contribute more information on the (training) preferences of the workers ('express what they value'). As a consequence, decisions on training participation of low-skilled workers are not based only on (negative) attributions. Such information is on the one hand provided when employee representatives help low skilled workers to formulate their training preferences and claim their training eligibility. On the other hand, it is provided when formalized HR procedures bring managers to recognize the actual interests, performance and goals of individual workers.

Second, 'voice' can increase the weight and power of low skilled workers in management decisions on training participation ('make it count'). As the relationship between (individual) employees and management is characterized by unequal power (to the disadvantage of the employees), the representation and articulation of employee interests play an important role in realizing training opportunities (Berger, 2012). Formally, employee organizations (like works councils) are obliged to represent the interests of all employees, including low skilled workers. Moreover, I expect that low skilled workers receive more attention in the firm's training policies when HR strategies are more focused on workers' interests and employability (instead of maximizing returns to training), or when long-term employment relationships increase the pressure for the company to take care of the long-term employability of the workers.

In sum, low skilled workers should receive more training (training achievements) due to mechanisms of 'voice' ('Voice' hypothesis H2): when the firm has structures of employee representation (H2.1), formalized HR procedures (H2.2), employee-oriented HR strategies (H2.3) and long-term contracts (H2.4). As the structures of employee representation provide both more information on low skilled workers' training interests and more power in training decisions they should be of particularly high importance.

Research design, methods and variables

The IAB Establishment Panel (Fischer *et al.*, 2009; Ellguth *et al.*, 2014), wave 2011, is used in order to test the outlined hypotheses. Data access was provided via on-site use at the Research Data Centre (FDZ) of the German Federal Employment Agency (BA) at the Institute for Employment Research (IAB) and subsequently remote data

access. The IAB Establishment Panel provides elaborated information on company characteristics of about 12.000 German companies per year, including a detailed measure of (employer-provided) continuing training participation for different groups of employees. The Panel is based on a random sample selected from all German companies registered at the German Federal Employment Agency (BA). The data collection was done via oral interviews with employers or employer representatives based on a standardized questionnaire. The following analyses refer to the wave of 2011 because of its particular thematic focus on institutionalized HR practices. It was run in the aftermath of the global recession in 2008, a period of slow economic growth, stagnant incomes and limited job creation. The survey provides (retrospective) information on organizational innovations (with regard to products, services, or processes), investments in EDP and labor shortages. Information on training participation (in 2011) is used in order to observe the short- and long-term effects of the selected organizational and sectoral characteristics.

Following the definition of the German Institute for Employment Research (IAB) the focus is on employer-sponsored continuing training only. Thus, only training activities, which were (at least partly) funded by the employer in terms of investments of time and/or money are taken into account. The data give detailed information on training participation rates of low skilled workers. Yet, no information is provided on the intensity, length and type of training (e.g. in terms of rates of formal or non-formal training, fresh-up courses or advanced training).

All analyses are based on a sample of 6824 establishments from wave 2011 with at least one low skilled worker. Descriptive information on the sample is presented in Table A1 (see Appendix). According to the IAB questionnaire, low skilled workers are 'workers doing jobs that require no professional qualification'. This definition is based on the current job and not on the level of qualification of the employees.

Dependent variables

The first dependent (dummy) variables are training investments (yes/no) in low skilled workers in the first half of 2011. It refers to the question: 'was your establishment active in continuing vocational training in the first half of the year?' When the answer was 'Yes, working hours and/or financial resources were provided for continuing training' and 'low skilled workers' (at least one) participated in continuing training (in 2011) the establishment was considered to support the training of low skilled workers. The second dependent (metric) variable is the training participation rate of low skilled workers defined as the share of low skilled workers that received training in 2011.

Explanatory (independent) variables

The establishment's institutional social context is measured using four dummy variables.

Employee representation (at the firm level)

A dummy variable was created indicating whether or not there is a works council or other form of collective employee representation in the company: 'Does your establishment have' (1) 'a works or staff council elected in accordance with the Works Council Constitution Act or the Staff Representation Act?' or (2) 'another company-specific form of staff representation such as a staff spokesperson, round table conferences or something similar'. I expect that an employee representation in the company will contribute more information on the (training) preferences of the workers ('express what they value') and give more value to their training interests ('make it count') as assumed by the 'voice'-mechanism in the theory part.

Formalized HR practices

Whether or not the HR policies are institutionalized is measured by the question: 'Does your establishment work with': (1) 'written plans for staff development?', (2) 'formally

laid down procedures for appointments?', (3) 'job descriptions for the majority of jobs?', (4) 'written target agreements with employees?', (5) 'written evaluations of job performance?' The dummy variable for the formalization of HR policies is encoded with a value of 1 when at least three of the five items are answered with 'yes'. As assumed by the voice-mechanism in the theory section, I expect that these formalized HR procedures will make it more likely that managers recognize the actual work performance, training demands, training interests and capabilities of individual workers (in contrast to non-formalized settings where subjective perceptions and ascriptions by the management play a dominant role). E.g. when targets or plans for staff development are agreed with the workers (individually) and written down, workers have a higher chance to formulate and claim their training interests. This will be particularly the case when they have the support of employee representation.

Employee-oriented HR strategies

Differences in the orientation of HR policies are measured by the following indicator: 'How important are the following strategies for your establishment to meet future needs for skilled workers?' HR policies are classified as employee oriented (versus cost-cutting and out-sourcing strategies) when they conform highly to the following strategies: 'keeping older workers longer in the company', 'long-term personal development of employees', 'improving the reconciliation of family and working life', or 'creating attractive work conditions'. The dummy variable for an employee-oriented HR policy has a value of 1 when at least two of the four items are answered with 'yes'. In line with the 'voice'-mechanism in the theory section, I expect that the training interests and training demands of low skilled workers will receive more attention when HR strategies are in general more focused on workers' interests and long-term employability (and not only on minimizing training costs and maximizing returns to training),

Long-term employment relationships

When the company reports that all employees of the company have permanent employment contracts longer employment periods are assumed.

Other explanatory variables (related to technology and innovation) included in the analyses

Acute innovation introduced. To capture a possible demand for innovation-related upskilling, a dummy variable was created. It is based on the question if the company has improved an existing service or product, developed a new service or new product, or introduced (new) processes for the improvement of production or services in 2010.

Investment in computers, information and communication technology. A dummy variable indicates whether there were investments in 'computers, information and communication technology' in 2010.

Modern production or service technology. A dummy variable indicates whether or not the technical level of the equipment is 'up to date' (as compared with other companies in the sector).

Control variables

By building on previous studies (see for example Behringer & Käpplinger, 2008; Bellmann *et al.*, 2015; Bellmann & Leber, 2011) a number of standard control variables were included in the analysis.

Company size – four categories based on the number of employees.

Compound operation – is the company part of a corporate network?

Sector – 15 sectors, according to Bechmann *et al.* (2012, p. 94).

Workforce composition – metric variables for the proportion of women, part-time workers, older workers (50 years or older), low skilled workers and high skilled workers (holding a university degree).

Infrastructure for training – establishments conform to existing statutory requirements for the provision of initial vocational training.

Collective bargaining coverage – a collective agreement applies to the establishment.

Region – is the company located in the eastern or western part of Germany?

Expected employment development in the coming year ‘stable’ or ‘rising’.

Economic profitability – profitability in the last fiscal year (2010) was ‘very good’ or ‘good’.

Empirical findings

In the first step, logistic regression analyses have been carried out in order to study the role of different social and economic determinants on continuing training participation. In line with hypotheses *H1.1* and *H1.2*, the results of the logistic regression analysis (see Table 1) confirm that labor shortages, advanced technology, investments in EDP technology and recent innovations (of products, services, or work organization) are related to a higher probability that the firm invests in continuing training (Table 1, column 1) also for low skilled workers (column 2). The coefficients (average marginal effects) in the first two columns indicate the likelihood that the company has invested time or money in continuing training (for at least one worker) in the first half of 2011. When firms report labor shortages the probability of training investments increases by 8 per cent for the entire workforce and by 5 per cent for low-skilled workers (as compared to firms that do not have formalized HR practices).

However, when we look at training participation rates (the share of low skilled workers that received continuing training) only the effect of labor shortages remains significant. The share of low skilled workers that received training in 2011 (column 3) increases on average by 5 percentage points (when all other variables are kept constant). The effect of recent innovations is significant but only at a 10-per cent level. As training participation rates are a more substantial measure for a company’s training engagement, support for the (‘adaptation’) hypothesis *H1.2* on technology and innovation as drivers of training opportunities is weak and rather confirms the expectations derived from filter theory.

In line with filter theory and as stated with the ‘voice’ hypothesis *H2*, the analysis provides clear evidence that both the likelihood of training investments (Table 1, column 2) as well as the share of low-skilled workers who received training (column 3) is significantly higher when the company is characterized by employee representations (*H2.1*) or formalized HR practices (*H2.2*).

For firms with formalized HR practices the probability of training investments increases by 11 per cent for all workers and by 9 per cent for low-skilled workers (as compared to firms that do not have formalized HR practices). The share of low skilled workers that received training in 2011 (column 3) increases on average by 7 percentage points. For firms with an employee representation (works council or other) the probability of training investments for low skilled workers (at least one) is 6 percentage points higher, whereas the share of trained low-skilled workers increases by 6 per cent.

Employee-oriented HR policies (*H3.3*), however, are only related to a higher likelihood (of 2 percentage points) that the company invests in training for (at least one) low skilled workers. There is no evidence for a significant increase in the proportion of low skilled workers that received training. Also, the expectation that long-term employment is positively related to training participation of low skilled workers (*H2.4*) is not supported by the analysis. In contrast, companies with (exclusively) permanent employment contracts, even have a lower overall training probability, though training participation rates are not affected significantly.

The overall explained variance of the last analyses (Table 1, column 3) is low (4 per cent), indicating that the overall impact of company characteristics on training participation rates (the share of low skilled workers who received training) is limited. When

Table 1: Determinants of training participation (2011). Column 1 and 2: Logistic regression; average marginal effects; standard errors in parentheses. Column 3: OLS regression analysis; standardized coefficients, standard errors in parentheses

	Continuing training yes/no (logist. Regression)	Continuing training low-skilled workers yes/no (logist. Regression)	Share of low-skilled workers who received training (training participation rate) (OLS regression)
Explanatory variables			
Technology, innovation, labor shortages			
Labor shortages (skilled workers) (2010)	0.08** (0.01)	0.05** (0.01)	0.05** (0.02)
Recent innovation (2010)	0.05** (0.01)	0.04** (0.01)	0.02 (*) (0.01)
Modern technical equipment	0.04** (0.01)	0.03** (0.01)	0.02 (0.01)
Investment in EDP (2010)	0.07** (0.01)	0.03** (0.01)	0.02 (0.01)
Institutional embeddedness			
Formalized HR practices	0.11** (0.01)	0.09** (0.01)	0.07** (0.02)
Employee-oriented HR policies	0.03* (0.01)	0.02 (*) (0.01)	0.01 (0.02)
Long-term employment contracts	-0.01 (0.01)	-0.04** (0.01)	0.01 (0.01)
Works councils or employee representation	0.06** (0.01)	0.03* (0.01)	0.06** (0.02)
Control variables: company size, sector (15 dummies), business situation, employment development, workforce composition, training infrastructure, region (west/east), collective bargaining coverage (see Appendix, Table A1)			
Pseudo- / Adjusted R ²	Pseudo R ² : 0.39	Pseudo R ² : 0.19	Adjusted R ² : 0.04
n (establishments)	6824	6824	6824

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

(*)Significant on 10% level.

*Significant on 5% level.

**Significant on 1% level.

we look at the control variables that have been included in the analyses (in addition to our explanatory variables) (see Appendix Table A2), we find significant differences with regard to the employment development and region (East or West Germany). If companies are located in the western part of Germany or report a declining number of workers, training participation rates of low skilled workers are increasing. This might be a response to labor shortages and internal adjustment processes in these establishments. The share of low skilled workers in the company has a particularly large impact: although establishments with a large share of low skilled workers are characterized by a low degree of *overall* continuing training activity, the participation of low skilled workers is significantly higher. Moreover, training participation of low skilled workers is significantly higher in certain industries, like education, health, or social work.

In order to explore characteristic configurations of the four ('voice' related) context variables, a cluster analysis (single and complete linkage procedure) was carried out. Cluster analysis is an exploratory analysis to identify structures within data. It identifies cases (in our case companies) that are most similar with regard to the four selected institutional characteristics and groups them together in 'clusters'. Companies in the same group (called a cluster) are more similar to each other than to those in other groups (clusters). The results of the cluster analysis (complete linkage method) suggest that characteristics of institutional embeddedness occur in distinct constellations (Table 2). Plausible solutions are suggested for two clusters (Calinski/Harabasz pseudo-F index: 4007), four clusters (Calinski/Harabasz pseudo-F index: 2970) and eight clusters (Calinski/Harabasz pseudo-F index: 3749). The two-cluster solution provides good results and two sufficiently large groups of cases. The degree of cluster homogeneity is relatively high, as compared to the much more complex solutions with five or nine clusters. The two-cluster solution is, therefore, chosen as the starting point for the following analysis.

Overall we find two distinct configurations of institutional embeddedness. First, there is a big group of companies (cluster A: '*long-term contracts*'), in which most of the selected characteristics are not dominant. The majority of companies (66 per cent) are characterized by (exclusively) permanent employment contracts. Employee representations (21 per cent) and employee-oriented HR policies (18 per cent) are less often found. Formalized HR practices are completely absent.

Second, there is a relatively large group of companies (cluster B: '*voice*'), in which two of the institutionalized drivers for workers' '*voice*' are dominant. All operations of this cluster have formalized HR practices. Employee representations (68 per cent) are widespread. Permanent employment contracts (26 per cent) or employee-oriented HR policies (34 per cent) are rather rare. Overall, the companies in this cluster support workers' '*voice*' by employee organizations and formalized procedures.

In order to study the role of different configurations of '*voice*'-related factors in the training participation of low skilled workers, two dummy variables (one for each cluster) were defined and added to the logistic regression model instead of the single context characteristics (see Table 3). The reference category is cluster A ('*long-term contracts*'). The analysis provides evidence that the three identified configurations differ in both the likelihood that the company is active in continuing training as well as the likelihood that unskilled workers have been trained. Compared to cluster A, companies in cluster B ('*voice*') are more likely to provide continuing training to low skilled workers. Moreover, we can expect that the companies in this cluster give more room to training interests of workers (due to mechanisms of '*voice*'), in contrast to companies that are only characterized by rather market-oriented drivers of continuing training, like technology, recent innovations or labor shortages.

Additional analyses (not presented here) show evidence that the two identified clusters are not correlated strongly with other company characteristics. In this respect, they may be understood as a relatively independent determinant of continuing training participation. Nonetheless, companies in cluster B ('*voice*') are more often characterized by supportive company characteristics in terms of training participation, such as large size, compound operation, collective agreements, or sectors that are very active

Table 2: Two company clusters (mean values)

Cluster (share in %)	Formalized HR practices	Employee-oriented HR policy	Long-term employment contracts	Employee representation
A 'Long-term contracts' (<i>n</i> = 4158) (61%)	0.00	0.18	0.67	0.21
B 'Voice' (<i>n</i> = 2666) (39%)	1.00	0.34	0.26	0.68

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

Table 3: Effects of cluster differences (two-cluster solution) on training participation (2011). Column 1–2: Logistic regression; average marginal effects; standard errors in parentheses. Column 3: OLS regression analysis; standardized coefficients, standard errors in parentheses

	Continuing training yes/ no (logist. Regression)	Continuing training low-skilled workers yes/ no (logist. Regression)	Share of low-skilled workers who received training (training participa- tion rate) (OLS regression)
Explanatory variables			
Technology, innovation, labor shortages			
Labor shortages (skilled worker) (2010)	0.08** (0.01)	0.05** (0.01)	0.05** (0.02)
Recent innovation (2010)	0.05** (0.01)	0.05** (0.01)	0.03(*) (0.01)
Modern technical equipment	0.04** (0.01)	0.03** (0.01)	0.02 (0.01)
Investment in EDP technol- ogy (2010)	0.07** (0.01)	0.03** (0.01)	0.02 (0.01)
Institutional embeddedness			
Cluster A 'long-term con- tracts' (n = 4158)	Ref.	Ref.	Ref.
Cluster B 'voice' (n = 2666)	0.12** (0.01)	0.10** (0.01)	0.08** (0.02)
Control variables	Same variables as in Table 1		
Pseudo- / Adjusted R ²	Pseudo- R ² : 0.38	Pseudo- R ² : 0.19	Adjusted R ² : 0.04
n (establishments)	6824	6824	6824

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

(*)Significant on 10% level.

**Significant on 5% level.

***Significant on 1% level.

Table 4: Effects of cluster differences (two-cluster solution) with interaction terms. Column 1–2: Logistic regression; average marginal effects; standard errors in parentheses. Column 3: OLS regression analysis; standardized coefficients, standard errors in parentheses

	Continuing training yes/ no (logist. Regression)	Continuing training low-skilled workers yes/ no (logist. Regression)	Share of low-skilled workers who received training (training participa- tion rate) (OLS regression)
Explanatory variables			
Technology, innovation, labor shortages			
Labor shortages (skilled worker) (2010)	0.07** (0.01)	0.06** (0.02)	0.01 (0.02)
Recent innovation (2010)	0.05** (0.01)	0.06** (0.01)	0.03 (0.02)
Modern technical equipment	0.04** (0.01)	0.03** (0.01)	0.02 (0.01)
Investment in EDP technol- ogy (2010)	0.07** (0.01)	0.03** (0.01)	0.02 (0.01)
Institutional embeddedness			
Cluster A 'long-term con- tracts' (n = 3420)	Ref.	Ref.	Ref.
Cluster B 'voice' (n = 2611)	0.10** (0.02)	0.12** (0.02)	0.05(*) (0.03)
Interaction			
Labor shortages × Cluster B	0.05* (0.03)	-0.01 (0.02)	0.08** (0.03)
Recent innovation (2010) × Cluster B	0.02 (0.02)	-0.03 (0.02)	0.00 (0.03)
Control variables	Same variables as in Table 1		
Pseudo- / Adjusted R ²	Pseudo- R ² : 0.38	Pseudo- R ² : 0.19	Adjusted R ² : 0.04
n (operations)	6824	6824	6824

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

(*)Significant on 10% level.

*Significant on 5% level.

**Significant on 1% level.

in training. The cluster A (*'long-term contracts'*) is, however, less likely to be found in larger establishments.

In the last step, the interplay between institutional and non-institutional drivers of training participation is studied (see Table 4).

The analyses provide evidence that the positive effect of labor shortages (on training participation of low skilled) works only in the cluster *'voice'*. The main effect of labor shortages is not significant anymore, whereas the main effect of the cluster variable remains positive and significant. The effect of recent innovation on training participation is not significant anymore (neither the main effect nor the interaction effect). Summing up, the results of the regression analyses rather confirm hypothesis *H2* (on the role of institutional company characteristics) and do not support hypothesis *H1* (on the role of labor shortages, advanced technology, or innovations). They suggest that training opportunities for low skilled workers are driven by institutional determinants that support mechanisms of *'voice'*. This relationship is particularly strong when companies face labor shortages.

Conclusions and discussion

This study contributes to issues of social exclusion and inequality in coordinated market economies by exploring the role of institutional arrangements in continuing training participation of low-skilled workers. It addressed a major dilemma of low skilled workers in Europe: though continuing training forms a key measure to improve their capabilities and to cope with fundamental changes in the world of work (such as digitalization), their participation in continuing training remains very low. Often, particularly low and uncertain returns to training are attributed to low skilled workers. As a consequence, this group is included less often in company-provided continuing training.

Against this background, this study investigated under which conditions companies invest in training of low skilled workers. The focus was on the one hand on the impact of advanced technology, innovations and labor shortages that might increase the employers' need to train their low-skilled workforce. On the other hand, the role of the institutional company context and mechanisms of *'voice'* was studied. Crucial was the idea that institutional company characteristics are able to prevent statistical discrimination by strengthening low skilled workers' *'voice'* defined as the ability to express and claim their training interests. *'Voice'* was understood as a crucial mechanism to convert training opportunities into training outcomes (Subramanian & Zimmermann, 2017). It provides information on the (training) interests of the workers (*'express what they value'*) and increases the weight of low skilled workers in management decisions on training participation (*'make it count'*). In contrast to companies where continuing training is solely driven by technological or market-related determinants (like technology, recent innovations or labor shortages), structures and mechanisms of *'voice'* will give more room to the training interests and capabilities of workers. By following this idea, it was hypothesized that low skilled workers will receive more training due to mechanisms of *'voice'* when the firm has structures of employee representation, formalized HR procedures, employee-oriented HR strategies, or long-term employment contracts.

In line with findings from qualitative research (Wotschack & Solga, 2014), the analyses of data of the IAB establishment Panel (wave 2011) broadly confirm this expectation. They underline the correlation between the existence of institutional structures at the organizational level that supports low-skilled workers *'voice'* and their participation in continuing training (see also Wotschack, 2019). They show that employee representation through work councils and other forms of staff representation, as well as formalized HR practices, such as written plans for staff development, formally laid down procedures for vacant appointments, job descriptions, written target agreements, or written evaluations of job performance play an important role for the training participation of low skilled workers. Organizations with structures of employee representation and formalized HR practices show better outcomes regarding training participation of low skilled workers. In contrast to technical- or market-driven determinants, their effects are also more enduring (Wotschack, 2019).

For a large number of enterprises without employee representation and formalized HR policies substitute regulations and initiatives at the collective bargaining and state level are needed ('collective voice'). Germany, indeed, represents a prominent case of a coordinated market economy with a strong dual apprenticeship system, centralized collective bargaining and strong regulation of continuing training activities at the company level (Allaart *et al.*, 2009, p. 105; Rahner, 2014). Since the 1990s, coverage in collective bargaining has been shrinking, however, due to increasing dropouts of firms (particularly smaller ones) and an increasing number of precarious workers (particularly in the service sectors) (Sengenberger, 1987; Thelen, 2009, p. 482). Scholars from the comparative political economy have stressed the important role of inclusive unions and collective bargaining to overcome this dualism (Doellgast *et al.*, 2018; Thelen, 2014). However, the overall impact of collective bargaining on the training participation of low-skilled workers is low so far, underlining the need to incorporate more binding regulations (at the collective bargaining and state level) in order to commit companies to take care of the long-term employability of their workforce.

Moreover, measures should address the problem of low training participation of low skilled workers despite existing employer initiatives (Asplund, 2005; Oosterbeek, 1998), e.g. by providing appropriate forms of learning, tailored to individual learning abilities, or by giving support with the (temporal) organization of learning activities (Dobischat *et al.*, 2002).

Eventually, our study showed that independently from the institutional and organizational context, a number of economic and market-related factors influence the likelihood that low skilled workers receive in-firm training. The chance increases when the company faces labor shortages or reports recent innovations in terms of production, services, or work organization. In this respect, increasing labor and training demands due to demographic change or the digitalization of the work might increase the training opportunities for low skilled workers (Bellmann *et al.*, 2015). However, this study found evidence that labor shortages are only associated with a higher proportion of trained low-skilled workers when the company is characterized by 'voice'-related institutional company characteristics.

No positive effect on training participation was found for companies with permanent employment contracts. In contrast, low skilled workers in these companies have a significantly lower probability of training. One possible explanation relates to the indicator used in this study. Because of data limitations, the actual employment duration of low skilled workers was not considered. This might be problematic, because staff turnover can be high and prevent long-term employment relationships even when the establishment has (exclusively) permanent employment contracts. Another possible explanation refers to the long-term effects of permanent contracts. When companies with long-term employment relationships are more likely to train their unskilled workforce, these training investments might already have taken place in the past (as it is evidenced by qualitative firm-level case studies). As a result, the need to train this group is decreasing over time leading to a lower probability of training. Unfortunately, such long-term effects could not be studied within the cross-sectional design of the statistical analyses. A longitudinal study on the impact of the institutional company setting on training participation of low skilled workers would be a fruitful task for future research.

A final comment on the training indicators used in this study is required. The data that I used do not provide information on differences in terms of quantity and quality of courses nor on returns to training. Training participation rates are a rather rough and one-sided measure of training participation as they neglect differences in the length and importance of courses. As Green *et al.* (2016) have recently shown for the British case, the increase in training participation in recent times went hand in hand with a decrease in the volume of training. Next to training participation, the volume (e.g. hours spent on training), type of training (e.g. formal, non-formal, or informal training), freedom of choice (e.g. mandatory or desired training) and expected returns to training (e.g. promotion, increase of salary) are important additional indicators of stratification that should be considered in future research on 'voice', organizations and training participation.

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References

- Abramovsky, L., Battistin, E., Fitzsimons, E., Goodman, A. and Simpson, H. (2011), 'Providing employers with incentives to train low-skilled workers: evidence from the UK employer training pilots', *Journal of Labor Economics*, **29**, 1, 153–93.
- Acemoglu, D. and Pischke, J. (1998), 'Why do firms train? Theory and evidence', *Quarterly Journal of Economics*, **113**, 1, 79–119.
- Allaart, P., Bellmann, L. and Leber, U. (2009), 'Company-provided further training in Germany and the Netherlands', *Empirical Research in Vocational Education and Training*, **1**, 2, 103–21.
- Arrow, K. J. (1973), 'Higher education as a filter', *Journal of Public Economics*, **2**, 193–216.
- Arulampalam, W., Alison, B. and Bryan, M. (2004), 'Training in Europe', *Journal of the European Economic Association*, **2**, 2–3, 346–60.
- Asplund, R. (2005), 'The provision and effects of company training: a brief review of the literature', *Nordic Journal of Political Economy*, **31**, 47–73.
- Autorengruppe Bildungsberichterstattung. (2014), *Bildung in Deutschland 2014* (Bielefeld: Bertelsmann), pp. 1–357.
- Bechmann, S., Dahms, V., Tschersich, N., Frei, M., Leber, U. and Schwengler, B. (2012). Fachkräfte und unbesetzte Stellen in einer alternden Gesellschaft. *IAB-Forschungsbericht*, 13/2012. 1–105.
- Beckert, J. (1996), 'Was ist soziologisch an der Wirtschaftssoziologie?', *Zeitschrift für Soziologie*, **25**, 125–46.
- Beer, D. (1999), 'Betriebliche Weiterbildung für geringqualifizierte Arbeitnehmer', in D. Beer, B. Frickand and W. Sesselmeier (eds), *Die wirtschaftlichen Folgen von Aus- und Weiterbildung* (München und Mehring: Rainer Hampp Verlag), pp. 165–94.
- Behringer, F. and Käßlinger, B. (2008), 'Betriebliche Weiterbildungsabstinenz in Europa: Ergebnisse der Unternehmensbefragung CVTS3', *Report*, **31**, 57–67.
- Bellmann, L., Hohendanner, C. and Hujer, R. (2010). *Determinants of employer provided further training*. IZA discussion paper, 5257. IZA Discussion Paper No 5257. (Bonn: Institute for the Study of Labor (IZA)), pp. 1–17.
- Bellmann, L. and Leber, U. (2011), 'Betriebliche Weiterbildung Älterer als Strategie zur Sicherung des Fachkräftebedarfs', *Sozialer Fortschritt*, **8**, 168–75.
- Bellmann, L., Dummert, S., Ebbinghaus, M., Krekel, E. M. and Leber, U. (2015), 'Qualifizierung von Beschäftigten in einfachen Tätigkeiten und Fachkräftebedarf', *ZfW*, **38**, 287–301.
- Berger, K. (2012), 'Betriebsräte und betriebliche Weiterbildung', *WSI-Mitteilungen*, **5**, 358–64.
- BMBF. (2015), *Weiterbildungsverhalten in Deutschland 2014*. Ergebnisse des Adult Education Survey – AES Trendbericht (Bonn: Bundesministerium für Bildung und Forschung).
- Dengler, K. & Matthes, B. (2019), 'Digitalisierung in Deutschland: Substituierbarkeitspotenziale von Berufen und die möglichen Folgen für die Beschäftigung'. Dobischat, R., *Bildung 2.1 für Arbeit 4.0?* (Wiesbaden: Springer VS), pp. 49–62.
- Dieckhoff, M. and Steiber, N. (2011), 'A re-assessment of common theoretical approaches to explain gender differences in continuing training participation', *British Journal of Industrial Relations*, **49**, 1, 135–57.
- Dobischat, R., Seifert, H. and Ahlene, E. (2002), 'Betrieblich-berufliche Weiterbildung von Geringqualifizierten – Ein Politikfeld mit wachsendem Handlungsbedarf', *WSI-Mitteilungen*, **55**, 25–31.
- Doellgast, V., Lillie, N. and Pulignano, V. (eds.) (2018), *Reconstructing Solidarity: Labour Unions, Precarious Work, and the Politics of Institutional Change in Europe* (Oxford: Oxford University Press).
- Ellguth, P., Kohaut, S. and Möller, I. (2014), 'The IAB Establishment Panel - methodological essentials and data quality'. *Journal for Labour Market Research*, **47**, 1–2, 27–41.
- Eurofound. (2009), *Low-Qualified Workers in Europe* (Dublin: European Foundation for the Improvement of Working and Living Condition).
- Fischer, G., Janik, F., Müller, D. and Schmucker, A. (2009), 'The IAB Establishment Panel – things users should know', *Schmollers Jahrbuch. Zeitschrift für Wirtschafts- und Sozialwissenschaften*, **129**, 1, 133–148.

- Frazis, H., Gittleman, M. & Joyce, M. (2000), Correlates of training: an analysis using both employer and employee characteristics. *Industrial and Labor Relations Review*, **55**(3), 443–62.
- Gerner, H.-D. and Stegmaier, J. (2009), 'Unsicherheit und betriebliche Weiterbildung', *Zeitschrift für Betriebswirtschaft*, Special Issue 6, 135–63.
- Granovetter, M. (1985), 'Action and social structure', *American Journal of Sociology*, **91**, 481–510.
- Green, F., Felstead, A., Gallie, D., Inanc, H. & Jewson, N. (2016), The declining volume of workers' training in Britain. *British Journal of Industrial Relations*, **54**, 422–48.
- Grund, Ch. (2012), Determinants of further training: evidence for Germany. *International Journal of Human Resource Management*, **23**, 3536–58.
- Hirsch-Kreinsen, H. (2016), Digitalisierung und Einfachtarbeit. *WISO Diskurs* 12/2016. (Bonn: Friedrich-Ebert-Stiftung).
- IAB. (2017), Pressekonferenz, Betriebliche Weiterbildung des Instituts für Arbeitsmarkt- und Berufsforschung am 22. März 2017.
- Janssen, S. and Leber, U. (2015), 'Weiterbildung in Deutschland. Engagement der Betriebe steigt weiter', *IAB-Kurzbericht*, 1–8.
- Käpplinger, B. (2007), 'Welche Betriebe in Deutschland sind weiterbildungsaktiv?', *Zeitschrift für Berufs- und Wirtschaftspädagogik*, **103**, 382–96.
- Martin, A. and Rüber, I. E. (2016), 'Die Weiterbildungsbeteiligung von Geringqualifizierten im internationalen Vergleich – Eine Mehrebenenanalyse', *ZfW*, **39**, 149–69.
- McVicar, D., Wooden, M., Leung, F. and Li, N. (2016), 'Work-related training and the probability of transitioning from non-permanent to permanent employment', *British Journal of Industrial Relations*, **54**, 3, 623–46.
- Mohr, S., Troltsch, K. and Gerhards, C. (2016), 'Job tasks and the participation of low-skilled employees in employer-provided continuing training in Germany', *Journal of Education and Work*, **29**, 562–83.
- Mohrenweiser, J., Zwick, T. and Backes-Gellner, U. (2019), 'Poaching and firm-sponsored training', *British Journal of Industrial Relations*, **57**, 143–81. <https://doi.org/10.1111/bjir.12305>.
- Neubäumer, R., Kohaut, S. and Seidenspinner, M. (2006), 'Determinanten betrieblicher Weiterbildung', *Schmollers Jahrbuch*, **126**, 437–71.
- Oosterbeek, H. (1998), 'Unravelling supply and demand factors in work-related training', *Oxford Economic Papers*, **50**, 266–83.
- Osterman, P. (1995), 'Skill, training, and work organization in American establishments', *Industrial Relations*, **34**, 2, 125–45.
- Rahner, S. (2014), *Zukunftsaufgabe Weiterbildung* (Bonn: Friedrich-Ebert-Stiftung).
- Ramos, C. R. and Harris, R. (2012), 'Training and its benefits for individuals: what form, what for and for whom?', *The International Journal of Learning*, **18**, 371–82.
- Sanders, J. and de Grip, A. (2004), 'Training, task flexibility and the employability of low-skilled workers', *International Journal of Manpower*, **25**, 73–89.
- Sengenberger, W. (1987), *Struktur und Funktionsweise von Arbeitsmärkten*. (Frankfurt/New York: Campus Verlag).
- Subramanian, D. and Zimmermann, B. (2017), 'Voice in corporate French training: a critical issue in developing employee capability', *Economic and Industrial Democracy*, **43**, 3, 520–45.
- Thelen, K. (2009), Institutional change in advanced political economics. *British Journal of Industrial Relations*, **47**, 471–98.
- Thelen, K. (2014), *Varieties of liberalization and the new politics of social solidarity* (New York: Cambridge University Press).
- Williamson, O. E. (1985), *The economic institutions of capitalism* (New York: The Free Press-Macmillan).
- Wilkens, I. & Leber, U. (2003) Partizipation an beruflicher Weiterbildung. Empirische Ergebnisse auf Basis des Sozio-Ökonomischen Panels. *Mitteilungen aus der Arbeitsmarkt- und Berufsforschung*. **36**, 329–37.
- Wiseman, J. and Parry, E. (2017), *Continuing vocational training survey: CVTS 5*. Research Brief. United Kingdom, Department for Education, London.
- Wozny, C. and Schneider, M. (2014), 'A matter of degree: the continuing training gap for women in Europe', *Socio-Economic Review*, **12**, 353–79.
- Wotschack, P. and Solga, H. (2014), 'Betriebliche Weiterbildung für benachteiligte Gruppen. Förderliche Bedingungskonstellationen aus institutionentheoretischer Sicht', *Berliner Journal für Soziologie*, **24**, 3, 367–95.
- Wotschack, P. (2019), 'When do companies train low-skilled workers? The role of institutional arrangements at the company and sectoral level', *British Journal of Industrial Relations*, 1–30. <https://doi.org/10.1111/bjir.12503>.
- Zimmermann, B. (2020), 'Employee voice and lifelong education capabilities in France and Germany: two models of responsibility', *International Journal of Training and Development*, **24**.

Appendix

Table A1: Descriptives (weighted values in parentheses)

Variables	Mean	Std. Dev.	Min	Max
Investment in training (all workers) (2011)	0.70 (0.51)	0.46 (0.50)	0.00	1.00
Investment in training for low skilled workers (2011)	0.23 (0.13)	0.42 (0.33)	0.00	1.00
Company size >250 (2011)	0.13(0.01)	0.34(0.11)	0.00	1.00
Company size 50–249 (2011)	0.26 (0.07)	0.44 (0.25)	0.00	1.00
Company size 10–49 (2011)	0.35 (0.36)	0.48 (0.48)	0.00	1.00
Company size 1–9 (2011)	0.26 (0.56)	0.44 (0.50)	0.00	1.00
Share of women (2011)	0.46 (0.51)	0.30 (0.31)	0.00	0.97
Share of high skilled workers (2011)	0.08 (0.05)	0.15 (0.13)	0.001	0.96
Share of older workers (50+) (2011)	0.28 (0.27)	0.20 (0.24)	0.00	1.00
Share of part-time workers (2011)	0.28 (0.36)	0.26 (0.27)	0.00	1.00
Share of low-skilled workers (2011)	0.30 (0.37)	0.26 (0.25)	0.001	0.98
Region (West Germany) (2011)	0.70 (0.86)	0.46 (0.35)	0.00	1.00
Modern technical equipment (2011)	0.64 (0.60)	0.48 (0.49)	0.00	1.00
Business situation very good or good (2010)	0.41 (0.40)	0.49 (0.49)	0.00	1.00
Labor shortages (skilled workers) (2010)	0.50 (0.18)	0.50 (0.39)	0.00	1.00
Recent innovation (2010)	0.51 (0.40)	0.50 (0.49)	0.00	1.00
Investment in EDP (2010)	0.44 (0.30)	0.50 (0.46)	0.00	1.00
Collective agreement (2011)	0.46 (0.34)	0.50 (0.48)	0.00	1.00
Formalized HR practice (2011)	0.39 (0.16)	0.49 (0.37)	0.00	1.00
Employee-oriented HR policies (2011)	0.24 (0.20)	0.43 (0.40)	0.00	1.00
Long-term employment contracts (2011)	0.64 (0.39)	0.48 (0.49)	0.00	1.00
Works councils or employee representation (2011)	0.40 (0.18)	0.49 (0.38)	0.00	1.00

n = 6824

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

Table A2: Determinants of training participation (2011) with control variables. Column 1–2: Logistic regression; average marginal effects; standard errors in parentheses. Column 3: OLS regression analysis; standardized coefficients, standard errors in parentheses

	Continuing training yes/no (logist. Regression)	Continuing training low-skilled workers yes/no (logist. Regression)	Share of low-skilled workers who received training (training participa- tion rate) (OLS regression)
Explanatory variables			
Technology, innovation, labor shortages			
Labor shortages (skilled workers) (2010)	0.08** (0.01)	0.05** (0.01)	0.05** (0.02)
Recent innovation (2010)	0.05** (0.01)	0.04** (0.01)	0.02 (*) (0.01)
Modern technical equipment Investment in EDP (2010)	0.04** (0.01) 0.07** (0.01)	0.03** (0.01) 0.03** (0.01)	0.02 (0.01) 0.02 (0.01)
Institutional embeddedness			
Formalized HR practices	0.11** (0.01)	0.09** (0.01)	0.07** (0.02)
Employee-oriented HR policies	0.03* (0.01)	0.02 (*) (0.01)	0.01 (0.02)
Long-term employment contracts	-0.01 (0.01)	-0.04** (0.01)	0.01 (0.01)
Works councils or employee representation	0.06** (0.01)	0.03* (0.01)	0.06** (0.02)
Control variables			
Large company (>250 employees)	Ref.	Ref.	Ref.
Medium-sized company (50–249 employees)	-0.03 (0.03)	-0.04** (0.01)	0.04 (*) (0.02)
Small company (10–49 employees)	-0.09** (0.03)	-0.07** (0.02)	0.03 (0.03)
Very small company (<10 employees)	-0.18** (0.03)	-0.16** (0.02)	0.02 (0.03)
Compound operation (Continues)	0.02* (0.01)	0.04** (0.01)	0.04** (0.02)

Table A2: (Continued)

	Continuing training yes/no (logist. Regression)	Continuing training low-skilled workers yes/ no (logist. Regression)	Share of low-skilled workers who received training (training participa- tion rate) (OLS regression)
Business situation (2010) very good, or good	0.04** (0.01)	0.01 (0.01)	0.00 (0.01)
Stable employment development	0.02(*) (0.01)	0.00 (0.01)	-0.04* (0.02)
Proportion of women	0.02 (0.02)	0.01 (0.02)	0.02 (0.03)
Proportion of highly quali- fied workers	0.21** (0.05)	-0.08* (0.04)	-0.11* (0.05)
Proportion of older workers (50+)	-0.01 (0.02)	-0.07** (0.03)	-0.07* (0.03)
Share of part-time workers	-0.02 (0.02)	0.00 (0.02)	-0.01 (0.03)
Share of low-skilled workers	-0.18** (0.02)	0.35** (0.02)	0.10** (0.03)
Infrastructure and staff for vocational training	0.08** (0.01)	0.04** (0.01)	0.04* (0.02)
Region (West Germany)	0.01 (0.01)	0.01 (0.01)	-0.04** (0.01)
Collective agreement	0.02* (0.01)	0.02 (0.01)	0.01 (0.02)
Sectors (15 dummy variables)	Yes	Yes	Yes
Pseudo- / Adjusted R ²	Pseudo R ² : 0.39	Pseudo R ² : 0.19	Adjusted R ² : 0.04
n (operations)	6824	6824	6824

Source: IAB establishment Panel, wave 2011, own calculations (only companies with low-skilled workers).

(*)Significant on 10% level.

*Significant on 5% level.

**Significant on 1% level.