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Works Councils, Training Activities and Innovation: A Study of German Firms

Ipsita Roy
Friedrich Schiller University Jena
Department of Economics
ipsitaroy.eco@gmail.com

Uwe Cantner
Friedrich Schiller University Jena
Department of Economics
uwe.cantner@uni-jena.de

Wolfgang Gerstlberger
University of Southern Denmark
Department of Marketing and Management
woge@sam.sdu.dk

Abstract

Building on the notion of general and specific human capital proposed by Becker (1962), the paper focuses on the role of employee representation system in understanding the nexus between human capital investments in firms and their innovative capabilities. Using establishment data on various aspects of human-resource training practices and works councils at the establishment and firm level in Germany, the paper examines human capital composition in firms and finds provision of general-organizational and managerial training for employees to be significantly and positively correlated with the presence of works councils. Not only is investment in general human capital correlated with works councils; the paper also finds support that firms encouraging such investment have a higher probability of innovating. Furthermore as anticipated, for majority of firms having an employee representation, involvement of works councils is found to be quite low in product and service innovation and highest for organizational and process innovation. Counter to our expectations, however, no significant relation is found between training practices and radical innovativeness of firms.

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Uwe Cantner[1], Wolfgang Gerstlberger[2], Ipsita Roy[*+]

(Working Paper)

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Building on the notion of general and specific human capital proposed by Becker (1962), the paper focuses on the role of employee representation system in understanding the nexus between human capital investments in firms and their innovative capabilities. Using establishment data on various aspects of human-resource training practices and works councils at the establishment and firm level in Germany, the paper examines human capital composition in firms and finds provision of general-organizational and managerial training for employees to be significantly and positively correlated with the presence of works councils. Not only is investment in general human capital correlated with works councils; the paper also finds support that firms encouraging such investment have a higher probability of innovating. Furthermore as anticipated, for majority of firms having an employee representation, involvement of works councils is found to be quite low in product and service innovation and highest for organizational and process innovation. Counter to our expectations, however, no significant relation is found between training practices and radical innovativeness of firms.

Keywords: human-resource training practices; human capital composition; works councils; innovation; radical innovation

JEL classification: J5, M53

[1] Friedrich Schiller University Jena, Faculty of Economics and Business Administration, Carl-Zeiss-Strasse 3, D-07743 Jena, e-mail: uwe.cantner@uni-jena.de and University of Southern Denmark, Department of Marketing and Management, Associate Professor Management Science, Campusveij 55, DK-5230 Odense M,

[2] University of Southern Denmark, Department of Marketing and Management, Associate Professor Management Science, Campusveij 55, DK-5230 Odense M, e-mail: woge@sam.sdu.dk

[*] Corresponding author

[+] Graduate College "The Economics of Innovative Change" (DFG-GK-1411), Friedrich Schiller University Jena, Department of Economics, Bachstrasse 18k, 07743 Jena (Germany), e-mail: ipsitaroy.eco@gmail.com

1. Introduction [3]

In the innovation literature the importance of human capital investment in technological innovation and economic growth is widely acknowledged. Prior research has identified the amount and quality of schooling, investments in tertiary and vocational education, and more recently, investments in on-the-job training to be the most common indicators of human capital. This paper particularly focuses on some aspects of knowledge management (Delaney and Huselid, 1996; Lu and Bjorkman, 1997), specifically training and HRM practices, firms undertake that allow employees to draw on knowledge and competencies inside and outside the firm in an efficient way and the influence of works councils on these programs. These programs are aimed at developing the competencies and human capital of employees with the ultimate aim to increase their creativity, their abilities to cooperate and exchange knowledge (absorptive capacity) as well as productivity. This engagement in training and education programs contributes to firms' competitiveness and success not primarily in the short-run but with a focus on a long-term sustainable development.

Although the link between human capital investment and technological innovation has been extensively examined, more remains to be understood about the importance of human capital composition in determining firm performance and innovation. Standard theory on human capital composition in establishments (Becker 1962; Davenport & Prusak 1998; Nahapiet & Ghoshal 1998) suggests that private establishments are almost always path-dependent in nature and therefore invest in technical training that allows the employees to understand routinized complex production processes. However, investments in general vocational skills are suboptimally lower (Acemoglu 1997). In-line with this theory, previous researchers (Loewenstein and Spletzer 1998a) argue that if employers and employees are able to coordinate efficiently by using long-term contracts, then firms might agree to invest in general vocational training of the employees. But in the absence of long-term contracts, there is a high risk of labor turnover and therefore firms might not be willing to invest in general human capital.

However, a major research gap is found in the fact that although prior studies have established a close link between on-the-job and off-the-job training, investments in intellectual capital, social capital and human capital (Subramaniam and Youndt 2005; Dakhli and Clercq 2004) and various firm performance indicators, very few studies have actually

[3] We wish to thank Hans Böckler Foundation for financial support of the research project „Innovation, Participation and Co-Determination of Employees“ which provided the data for this paper.

distinguished between the different forms of human capital investments firms undertake and how that affects their innovative capabilities. Huselid (1995), in his seminal study on the impact of high performance work practices on organizational performance, categorized human-resource-management (henceforth HRM) practices into two categories: those that mainly influence employees' abilities and those that mainly influence employees' motivation. Building on this broad categorization of HRM practices (see also Laursen & Mahnke, 2001), in our paper, we categorize firm-sponsored training practices into firm-specific and general-organizational where the former relates to training in production, technical and IT related practices while the latter corresponds to training for improving competency, communication, leadership and problem-solving skills in employees.

Usually decisions on implementing tools of knowledge management (herein HRM practices) require an involvement of the employees themselves and their intra-firm representatives. In our paper, we investigate the role of labor market institutions like works councils in promoting HRM practices in establishments and subsequently examine their importance in firm innovativeness. Works councils correspond to a well-established system of employee representation at the establishment and firm level which gives workers a number of rights to information, consultation, and co-determination on company decisions. However, although the study of works councils has become quite popular in Europe and in the United States in the last two decades, there is still limited research about their economic effects. Recent literature on labor market institutions has investigated the impacts of works councils on employee productivity, employment dynamics, firm performance and productivity, and investments in physical capital. Much research has also focused on the direct links between works councils and innovation (Addison et al. 2001; Dilger 2002; Jirjahn and Smith 2006; Blume and Gerstlberger 2007; Allen and Funk 2008; Jirjahn 2010). However no studies have so far examined the role of works councils in determining the composition of human capital in firms and how that subsequently affects firm performance and innovation. Building on arguments first proposed by Williamson (1985), , this paper suggests to distinguish between the different forms of human capital investments (firm-specific and general-organizational) undertaken by private sector firms and innovation practices they engage in and conditions that on the existence of works councils.

The remainder of the paper is organized as follows: Section 2 gives an exhaustive review of literature and discusses our research questions and hypotheses in more detail. Section 3 introduces the data, along with some descriptive statistics and the empirical strategy

used to test our hypotheses. Section 4 presents the empirical results and section 5 concludes the paper with some policy implications and steps for further research.

2 Literature review and research question

Labor economists, since the last few decades, have extensively discussed various types of human capital investments in firms by considering components such as skill structure and education of workforce, training and apprenticeship, organizational learning and then related them to various economic variables such as employment growth, labor dynamics, earnings, profitability, economic growth, and innovation (Nelson and Phelps 1966; Acemoglu and Pischke 1996; Acemoglu 1997; Barrett and O'Connell 2001; Blundell et al. 2005; Scicchitano 2010; Gallie and Legros 2011; Hatch and Dyer 2004). Most of these studies have verified a positive relationship between investments in human capital on the one side and employment, economic growth and innovation on the other.

There also is a growing literature on the impact of labor market institutions viz. works councils and collective bargaining agreements on productivity, innovative activities, personnel fluctuations and performance of firms (Addison et al. 2001; Dilger 2002; Hübler and Jirjahn 2003; Frick and Möller 2003; Addison et al. 2004; Schank et al. 2004; Blume and Gerstlberger 2007; Allen and Funk 2008; Pfeifer et al. 2012). The economic analysis of works councils had been first introduced by Freeman and Lazear (1994) in their seminal paper that examined the operation of works councils 'as a means of improving social output by creating more cooperative labor relations'. They argue that employee rights to consultation and co-determination in company decisions not only improve enterprise surplus but also social well-being. They further stress that this increased communication opportunity between the management and employees also urges the workers to put in greater effort in bad times that would not occur absent such institutions. Addison et al. (2001) empirically test the relationship between works councils and labor productivity in Germany and find that greater employee involvement is associated with higher worker productivity, reduced labor fluctuations, higher wages but lower firm profitability. However, they find no significant influence of works councils on the introduction of product or process innovation. Dilger (2002) verifies the findings of Addison et al. (2001) in terms of reduced labor fluctuations and lower establishment performance, but finds a statistically significant relationship between product innovation and presence of works councils, however only when interacted with the presence of a collective bargaining regime. Hübler and Jirjahn (2003) investigate the interaction between establishment-level works councils and industry-level collective

bargaining in Germany and find different results in terms of productivity and rent seeking activities for establishments covered both by works councils and collective bargaining compared to establishments within the uncovered industrial regime. Allen and Funk (2008) examine the role of works councils and collective bargaining arrangements in supporting radical, incremental and mimetic innovation in Germany. This paper finds that works councils may help to promote all three forms of innovation, while sectoral collective agreements have a statistically significant and negative relationship with radical and incremental innovation, but no link with mimetic innovation. They also investigate the interaction between works councils and collective bargaining and find statistical significance only in case of radical innovation. Pfeifer et al. (2012) take into account the effects of works councils on apprenticeship training in Germany and find that firms with works councils make significantly higher investments in training than firms without works councils. Consistent with prior literature, they also find that all works councils effects are much more pronounced for firms covered by collective bargaining agreements.

The literature mentioned above certainly addresses the impact of works councils on firm performance and here even innovative activities. However, the very mechanisms by which this is accomplished have not been identified yet. What is so far discussed in the literature is that the worker's representation and the collective bargaining power lead to higher wages and therefore to more effort which in turn leads to higher firm performance measured among others in terms of innovations. This may be one channel, another one may work through the abilities and competencies of the employees and any measures that improve on these. Taking this into consideration and given the fact that greater investment in human capital increases the likelihood of successful product and process innovation, firms' human resource training programs are a point in case and the involvement of the works council in the decision to and how to run these programs (type, content, intensity, time etc.) is an interesting aspect. Therefore, in this paper, we examine the role of works councils in different aspects of firm-sponsored training and knowledge management and subsequently look at how that affects innovation.

To empirically investigate this relationship, we split our analysis into two steps: In the first step, we examine whether there is a significant difference in the types of training establishments with works councils provide to their employees vis-à-vis establishments without works councils. Specifically, we argue that, given the intrinsic motivation of firms to provide path-dependent firm-specific training to their employees, there might not be a

significant difference between establishments with and without works councils regarding the provision of technical task-related training. This is because not pursuing training that draws in specific competencies and specific competitiveness is detrimental for the firm itself and therefore is generally always provided to production and other regular workers without any intervention from worker unions. But for workers belonging to the R&D department or strategy department, pure technical task-related training is not enough. Therefore it is important also to provide general training to employees that allows for their systematic career and personal development. We propose that this is where the role of works councils lies and presence of works councils should have a positive and significant correlation with the provision of general-organizational training. Furthermore, it is also important to consider the qualification structure of the employees of the establishments, e.g. the percentage of employees with academic or professional education etc. so as to have an account of the heterogeneity in employee backgrounds.

Extending previous literature which has found a positive correlation between training expenditure and innovative propensity; in the second step, we examine the relationship with regard to training-types and intensities and the likelihood of introducing an innovation to the market. We argue here that, provision of general-organizational and technical training to the employees should have a positive impact on employee productivity and creativity and this might lead to higher firm performance, measured in terms of innovation. However, since it is highly plausible that there exists a 'reverse-causality' between firm-sponsored training and innovation or a potential omitted variable bias in our model; we construct a total-training index based on the prior-mentioned training variables and conduct IV analysis where we instrument this total-training index by the presence of a works council and examine the relationship with respect to incremental and radical innovativeness. Finally, we look at these training variables separately in order to find their individual characteristics with respect to innovation and conduct similar IV estimation. In this regard, we also examine the role of works councils in undertaking product and process innovation; if in practice works councils are involved more in product innovation thereby ensuring higher job security of the employees, or if they are more involved in process innovation in order to reduce production costs.

Based on the above arguments, we propose five hypotheses regarding the relationship between works councils and types of training, and then between training-types and innovative activities of firms.

H1: Provision of general-organizational training is significantly and positively correlated with the presence of works councils.

H2: Provision of firm-specific training is not correlated with the presence of works councils.

H3a: Both organizational training and firm-specific training have significant and positive correlation with firm innovation.

H3b: Overall training has a positive and significant correlation with the likelihood of introducing an innovation in firms, when instrumented by the presence of works councils.

H4: Organizational training has a positive and significant correlation with the likelihood of introducing an innovation in firms, when instrumented by the presence of works councils.

H5: Organizational training has a significant and positive correlation with the radical innovativeness of firms, when instrumented by the presence of works councils.

3 Data and empirical approach

3.1 Variables and Descriptive Statistics

For our investigation, data from two representative German establishment surveys, one for all private sector establishments and one only for establishments with works councils corresponding to 62% of the total number, have been employed. The total number of firms who were sent the questionnaire was 17567, out of which 837 responded with a filled in questionnaire. The data for the first survey has been collected in personal interviews with the managers or CEO of the establishments, and the second survey involved interviews with the chairman of the employee representation. The overall response rates were around 5% and 21% respectively. The public sector is excluded due to specific rules for employee participation and works councils; we also provide results for a sample of medium sized firms, with more than fifty employees, for which the analysis of works council's role is more appropriate. The analysis comprises cross-sectional data for the year 2011 and includes questions on knowledge management, human resource practices in general and in particular training and education approaches for different employee groups and interactions between management and works councils for a period of three years (2008-2010).

To investigate the topics mentioned above (knowledge management, HR practices), established scales are used, with very few exceptions. The unique nature of the questionnaire employed in this project is that, rather than providing only information just on training expenditures accrued by firms, it covers unique questions about types and intensity of training and some aspects of knowledge management techniques provided by firms and therefore

provides a more detailed description of these issues. For example, training variables corresponded to questions like (1) how frequently courses/seminars, training on production; technical and IT-related topics (2) teamwork and communication, leadership and problem-solving skills were provided to the different groups of employees; with and without managerial responsibility. The questions asked make it possible to distinguish between firm-specific and general-organizational training. Examples for firm-specific training are, for instance, training in machine-operations, technical instructions, new software solutions, and routines used when performing operational duties within the firm. However, contrary to the classic definition of general training used by Becker (1962) which corresponded to training in general computer knowledge and language courses, in our paper, general-organizational training refers to provision of sales workshop, leadership and managerial workshops, training for improving teamwork and communication, training on topics related to problem-solving skills and on topics that employees can freely choose from and not necessarily related to designated tasks; and therefore relates more to Huselid's categorization of HRM training practices. It should be noted here that, in our sample, almost all firms with and without works councils are found to invest both in firm-specific technical training and general-organizational training. However, from the data descriptives it is evident that in establishments with works councils, the intensities for both types of investment and especially general-organizational training investment are much higher than in establishments without one. Further, we find that training with respect to production, task-related and IT-related topics is given mostly to regular employees; whereas training with respect to problem solving, analytical and managerial skills, provision of leadership workshop correspond mostly to the team/department leaders. Table 1 presents the mean values of the training variables as well as other variables used in our estimation strategy and delivers a comparative analysis between establishments with and without a works council foundation (WC).

Variable	Means for firms with WC	Means for firms without WC	p-value	Method
Establishment size	5.6561	4.6059	0.000**	t-test
Establishment type	0.8327	0.5027	0.000**	t-test
Inv. in software, IPR-product innovation	2.0852	2.561	0.0002**	t-test
Inv. in software, IPR-service innovation	3.1786	2.748	0.000**	t-test
Inv. in software, IPR-process innovation	1.9675	1.9066	0.5387	t-test
Manufacturing	0.5822	0.3776	0.000**	Pr-test
Services	0.2727	0.5	0.000**	Pr-test
Transport and ICT	0.1451	0.1223	0.440	Pr-test
Share of employees with university degree	16.9821	16.3274	0.7695	t-test
Share of workers having an industrial title	11.2657	13.5386	0.0435*	t-test
Share of apprentices	0.04817	0.04533	0.6979	t-test
General tariff agreement	0.6356	0.2295	0.000**	Pr-test
External relationships	3.8661	3.2586	0.0148*	t-test
Remuneration bonus	4.6726	3.1293	0.0000**	t-test
Technical training	4.3097	3.6783	0.000**	t-test
General Organizational training	3.3274	2.3043	0.000**	t-test
Innovation	0.762	0.6149	0.0003**	Pr-test
Radical innovation	0.6142	0.5049	0.0504	Pr-test

Table 1: Firms with a works council versus firms without a works council

Method: Two-sample mean tests, *p <0.05, **p<0.1

Establishment size is defined as the natural logarithm of total workforce. Establishment type is a binary variable taking the value 1 if establishment is part of a multi-establishment and 0 otherwise. Investments in software, IPR and tangible assets related to product, service and process innovation are given by categorical variables ranging from 1 to 4 denoting the relative importance of each of them during 2008-2010. Sector dummies correspond to manufacturing, services, and transport and ICT industries. The share of employees with university degrees and industrial titles as well as the share of apprentices in the total workforce are measured in percentages. The importance of introduction of new external relationships is given by a categorical variable ranging from 0 to 7. Incentive schemes provided to employees correspond to a categorical variable with a scale of 0-6, given in terms of remuneration bonus for improvements through employee idea/suggestion systems or continuous process improvement systems. Training-types (technical and general organizational) are given by ordinally scaled variables ranging from 0 to 6. Innovation and radical innovation denote whether there has been an introduction of significantly improved or completely new products/services to the market during 2008-2010, and are given by dummy variables. Pr-test has been used to test the equality of proportions and have been used for the dummy variables. For all other variables, two-sample t-tests have been used.

The table above gives early insight to the mean differences between various firm characteristics depending on the presence or absence of a works council. For example, we find that works councils, on average, are established more in larger firms and firms which are part of a multi-establishment. We also find significant mean differences between investments in tangible assets, software and IPR related to product and service innovation in firms with works councils as against firms without works councils. Firms in the manufacturing and service sectors are relatively more sensitive to the introduction of works councils than firms in other sectors. Significant mean differences are found with respect to the provision of incentive schemes to employees in establishments with works councils and without. However, the most interesting results are obtained from our key variables, viz. aspects of training. According to the t-test results, establishments with works councils tend to invest more in training, technical as well as general-managerial. This finding is consistent with the theoretical relationship between training activities and presence of works councils and allows for further investigation into the role of works councils in the provision of different types of training. We also observe highly significant mean differences between innovation and radical innovation between firms with and without works councils. However, it is important to note here that although the results from the bivariate analysis provide some interesting insight, it is only possible to draw definite conclusions from the estimation results, which are presented in the next section.

3.2 Econometric methodology

To empirically test the first two hypotheses relating to the relationship between presence of works councils and provision of technical and organizational training, we use bivariate ordered probit regressions (bioprobit) for the categorical dependent variable training, analyzing simultaneously for technical training and general-organizational training. We do not consider training investments for a single period; rather we focus on the intensity of training activities conducted during the years 2008-2010. It should be mentioned here that the choice of the econometric model, bivariate ordered probit, for examining the provision of different types of training and HRM practices and the role of works councils therein stems from the fact that the two categories of HRM practices are highly correlated (correlation of 0.41). This might imply that, in establishments, the decision of implementing one type of training is correlated with the decision of implementing the other type (see **Appendix** for more). In order to account for this correlatedness issue between training-types, we run a bivariate estimation.

Regarding workplace representation, we construct a dummy for works councils (1 if a works council is present, 0 otherwise). In addition to these key variables, we take into account

a range of firm-level and industry-level characteristics. It is intuitive that a larger share of highly-skilled workers is associated with a higher provision of training. Therefore, in our estimation, we include educational background of the employees (one variable denoting the percentage of employees having university degree or higher and the other denoting the percentage of employees having an advanced industrial title (e.g. “Meister”, “Techniker”). It is also likely that higher the share of apprentices in the total labor workforce, higher the intensity of training. General tariff agreements, also called collective labor agreements between the management and the works councils “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” (Stegmaier 2010). Therefore, we include a dummy variable taking the value 1 for presence of a collective labor agreement and 0 otherwise. We also control for establishment size (natural log of total number of employees), establishment status (dummy variable taking the value 1 if part of a multi-establishment, 0 otherwise), manufacturing, services and ICT sectors (sectoral dummies).

To test the final four hypotheses, we start by using Simple Logistic regressions for the binary dependent variable innovation and radical innovation. A measure for innovative activities in firms has been given by whether or not a firm introduced new or significantly improved products/services to the market during the entire period of analysis (2008-2010). For measuring radical innovativeness, firms have been asked whether there were products/services amongst the introductions that were completely new to the market at the point of introduction, again for the entire period of analysis. Apart from the key training variables, we also take into account other firm-level characteristics that might affect innovativeness of firms; establishment size, sectoral dummies, presence of union contracts, share of apprenticeship in total workforce, share of higher-skilled workers in total workforce, the importance of introduction of new forms of external relationships in the form of alliances, cooperation or customer relationship management; incentive schemes provided to the employees (profit sharing or remuneration bonus to the employees and provision of job-rotation) and human capital investments in the form of firm-sponsored training.

In order to account for the ‘reverse-causality’ between training and innovation (in the sense that there might be need to train employees in newer technologies), or potential omitted variable bias, we apply Instrumental Variable (IV) technique to tackle the problem. We start off by clustering both types of HRM training practices into ‘bundles’ and then examining the relationship with respect to innovation and radical innovation. It is important to note here that

establishment of works councils might be endogenous and might depend on firms' profits (Addison 1996), economic environment, optimal establishment size (Beckmann and Kräkel 2012) etc. But, given the German Works Constitution Act (1952), we can safely assume that in our context existence of works councils can be treated as an exogenous variable. In the next step, we look at the differential impact of each training-type on innovation and radical innovation, again controlling for all other firm and industry-specific characteristics. In the final step, Table A (see **Appendix**) presents the correlation matrix for all variables included in our estimation.

4. Preliminary Findings

The objective of the first part of the empirical analysis is to build upon the Beckerian theory of underinvestment in general human capital and to identify the role of works councils in the provision of general-organizational human capital (defined as training for improving competency, communication, leadership and problem-solving skills) to the employees. We argue that given the intrinsic motivation of firms to provide path-dependent firm-specific training to their employees, there is bound to be underinvestment in general-organizational training for employees (Becker, 1962). Under such circumstances, employee representation systems in establishments might play a significant role in encouraging higher provision of general-organizational training for their employees. However, as already mentioned before, given a high correlation between the two types of training activities, we use a bivariate ordered probit estimation. Table 2 summarizes the estimation results.

Dependent variable: General-organizational Training			
Independent variables	Model 1 (base)	Model 2	Model 3
Size (Log of employees)	.286963*** (.0494706)	.2134852*** (.0582779)	.1724099*** (.0603461)
Establishment status	.3622645*** (.1133727)	.3675057*** (.1236881)	.3124805** (.1300694)
Manufacturing sector	-.0626466 (.1458622)	-.0810024 (.159997)	-.0657494 (.1652862)
Service sector	.1893985 (.1613617)	.1363957 (.1759655)	.1867608 (.1828094)
Share of employees with university education		.0014478 (.0027658)	.0008203 (.0029017)
Share of high-skilled employees		.0070231 (.0052149)	.005558 (.0053926)
Share of apprentices		2.11518* (1.170879)	2.2992* (1.182039)
Collective labor agreement		.0697774 (.1177859)	.0045345 (.1254229)
Presence of Works councils			**.4025504***** **(.1469312)**
Dependent variable: Firm-specific technical Training			
Independent variables	Model 1 (base)	Model 2	Model 3
Size (Log of employees)	.1856612*** (.0495044)	.136039** (.058531)	.1115379* (.0607514)
Establishment status	.1482022 (.1138733)	.1809004 (.1244317)	.1527196 (.131108)
Manufacturing sector	.2944476** (.1480326)	.2092322 (.1624583)	.2213636 (.1677563)
Service sector	.091478 (.1629849)	-.0459712 (.1778767)	-.0201325 (.1846535)
Share of employees with university education		.0047756* (.0027963)	.0045512 (.0029327)
Share of high-skilled employees		.0044171 (.0052947)	.0034445 (.0054758)
Share of apprentices		3.532934*** (1.198937)	3.357775*** (1.209399)
Collective labor agreement		-.0081035 (.119145)	-.0910737 (.1267983)
Presence of Works councils			**.2726467*** **(.1481642)**
Athrho Constant	.4561882*** (.0507986)	.435795*** (.0560184)	.4207457*** (.0572497)
Wald Chi2	56.75***	41.48***	48.73***
N	469	386	370
LR test of independent equations:	chi2(1) =79.42***	chi2(1) = 59.61***	chi2(1) = 53.25***

Bivariate Probit estimation, Standard errors in parentheses; *p <0.1; **p<0.05; ***p<0.01

Table 2: Bivariate estimation for training-types and presence of works councils

As anticipated, establishment size is found to be positively related both to general-organizational training and firm-specific technical training, implying that larger establishments, on average, tend to invest more in employee training. For general training, establishment status tend to play a role suggesting that establishments belonging to a group or

concern or are part of a multi-establishment tend to invest more in organizational and managerial training.

However, no significant effect of establishment status is found with respect to technical training. The share of apprentices in the total workforce is found to be significantly and positively correlated with both kinds of training, however strongly with respect to technical training. Intuitively, this result might suggest that a higher share of apprentices in the workforce is related to a higher probability that firms invest in apprenticeship training which is mostly technical and specific in firm-technologies. With regard to our main variable of interest, our bivariate results confirm the presence of works councils to be very weakly but positively correlated with the provision of firm and task-specific training (significant at 10%); and strongly and positively correlated with the provision of general managerial training (significant at 1%). These two findings confirm our first two hypotheses that firm with a works council foundation, on average, tends to invest more in employee training as compared to firm without one. However, the effect is more significant with respect to general-organizational and managerial training for employees which is often found to be highly underinvested, therefore suggesting that one effective way of encouraging provision of general training might be through works councils. Interestingly and contrary to previous findings, we do not find any effect of the strength of works councils, given by an interaction term of works councils and presence of a collective labor agreement, on the provision of general-organizational and managerial training; and therefore have not included these estimates in the table of final estimation results.

Our data descriptives (not included here) also verify the notion that the presence of works councils is often associated with an open exchange of information and knowledge sharing between management and employees. However, we do not know how the long-term learning process of the employees is influenced, if at all, by the works councils; which can be an avenue for further research. In the majority of the firms, accounting to almost 90%, the works councils are actively involved in the regular working of the firms as well as in the development and introduction of technological or organizational innovative projects. So, although innovation projects are very rarely initiated by works councils, consultation and co-determination activities are quite common in the majority of firms.

Regarding the type of innovative activities, establishments were asked to evaluate the four innovation areas on the involvement of the works councils on a scale of 1-4 with 1 being highest involvement and 4 being the lowest. From the data descriptives, we have found that for majority of firms (around 80%) having an employee representation, involvement of works councils is quite low in product and service innovation and highest for organizational and process innovation. Confirming this finding, the results from the bivariate analysis (Table 3) also show that not only changes in training programs related to work procedures and processes within the establishment have to be confirmed with the works council, but the co-design of process innovation is also found to be a major business of the works councils.

Paired t-test				
Variable	Obs.	Mean	Std. Err.	Std. Dev.
Product and Services	492	3.098577	0.0246655	0.5471068
Process and Organizational	492	1.901423	0.0246655	0.5471068
Diff.	492	1.19715	0.49331	1.094214
Mean (diff) = mean (Product and Services - Process and Organizational)				t = 24.2678
Ho: mean (diff) = 0				degrees of freedom = 49
Ha: mean (diff) < 0		Ha: mean (diff)! = 0		Ha: mean (diff) > 0
Pr (T<t) = 1.0000		Pr (|T|>|t|) = 0.0000		Pr (T> t) = 0.0000

Table 3: Mean difference between product-service and process-organizational innovation with respect to the involvement of works councils

One reason might be that it is still a very rare innovation practice in private German establishments that works councils actively start initiatives for product innovation projects or formulate own proposals for new products, while this is already quite common in the area of technical and non-technical process innovation. This might also be due to the fact that process innovation is usually labor-saving, and therefore works councils whose one of the major roles is to protect workers' job security, are particularly more interested in monitoring process innovation. However this might also signify differences in relative strengths of works councils, which we have to take into consideration.

Following our procedure outlined in section 1 in order to examine the relationship between types of training and innovation, we start estimating our third hypothesis (3a) using simple Logistic models with innovation and radical innovation respectively as binary dependent variables respectively. As the main independent variables of interest we use organizational human capital investments and firm-specific human capital investments,

controlling for firm-level, industry-level and other organizational characteristics. Here we do not take into account any endogeneity issue that might exist between innovation and training-types. Table 4 presents the results.

Dependent variable: Innovation				
Independent variables	Model 1(base)	Model 2	Model 3	Model 4
Size (Log of employees)	.2526496** (.1011748)	.104612 (.1431074)	.0021494 (.1497542)	-.0119004 (.1517033)
Manufacturing sector	1.329629*** (.2644998)	1.516899*** (.3594629)	1.612683*** (.3793018)	1.545927*** (.385092)
Service sector	.2440808 (.2706424)	.4973801 (.3712897)	.3750386 (.3861396)	.4291247 (.3949727)
Collective labor agreement	-.2845247 (.1952144)	-.0977167 (.2862249)	-.2378597 (.2971319)	-.2372591 (.3013303)
Percentage of employees having university education		.0087713 (.0065366)	.0079553 (.0066729)	.0059662 (.006798)
Percentage of employees having industrial degree		.0278916** (.0139051)	.0283289** (.0143345)	.0280346** (.0145609)
Share of apprentices		5.409543* (3.117019)	4.870439 (3.132673)	4.499627 (3.173579)
External relationships		.11294** (.0553797)	.0926514 (.0569514)	.0774286 (.0582882)
Remuneration bonus		.1112519** (.0517988)	.0909468* (.0543571)	.0692174 (.0560656)
General-Organizational Training			.3117459*** (.0923513)	.2193884** (.099483)
Technical training				.3187608*** (.1085376)
Constant	-1.004829* (.5761249)	-1.95978** (.813951)	-2.081275 (.8385343)	-2.802904*** (.8928506)
LR chi2	54.46***	59.00***	70.62***	79.53***
Pseudo R2	0.0728	0.1351	0.1636	0.1842
N	624	378	373	373

Standard errors in parentheses; *p <0.1; **p<0.05; ***p<0.01
Models are Simple Logistic estimation

Table 4: Logit estimation for training-types and firm-innovation

Model 1 represents the base model which includes only the control variables viz. establishment size, sectors and presence of a collective labor agreement. As expected, we find a positive and significant correlation between establishment size and manufacturing sector and innovativeness, implying that large firms belonging to the manufacturing industry, on average, have a higher probability of coming up with an innovation. The subsequent models include all other explanatory variables, along with the controls, and Model 4 presents the final estimation specification. The findings confirm the importance of both types of training on a firm's innovative propensity, although suggesting that for every one unit change in the

provision of technical training, the log odds of introducing an innovation in the market increases by 0.32 while for that of general-organizational training, it increases by 0.22. We also find that for every one unit change in the share of high-skilled employees in establishments, (employees with an industrial degree or higher) the mean probability of innovation increases by 0.03, although surprisingly, we do not find any significant relationship between innovation and presence of an external relationship, strategic alliances and incentive schemes for employees in establishments. We also find no significant effect of establishment size on firm innovativeness; the reason might be that it is already accounted for in the estimation when we include the training variables. Therefore, we do not include establishment size in our estimation specifications henceforth. Contrary to previous findings, we also do not find any significant effect of presence of a general tariff agreement on firm-innovativeness. Conducting similar IV analyses with respect to radical innovativeness and employee training does not yield significant result; therefore they have not been reported here.

In the next step, we correct for any potential omitted variable bias or reverse-causality problem (in the sense that there could be a necessity to train employees in newer innovative technologies), and subsequently apply IV methods to examine the unbiased effect of training-types on firm's innovative propensity (Hypothesis 3b). We start off by clustering both types of HRM training practices into 'bundle' and then examining the relationship with respect to innovation and radical innovation. For the choice of a relevant and significant instrument, from the results of the first two hypotheses, we see that the presence of works councils shows a strong positively significant correlation with the provision of general training and marginally with that of technical training. Therefore, we use works councils as a valid and relevant instrument for total training in the IV estimation. Table 5 presents the estimation results.

Dependent variable: Innovation		
Independent variables	Model 1(base)	Model 2
Total Training	.2284901** (.115451)	.3444523** (.1630015)
Establishment Size	-.0358038 (.0439938)	-
Manufacturing sector	.3140088*** (.0667395)	.3004165*** (.0828489)
Service sector	.0923229 (.073034)	.1085272 (.0907638)
Collective labor agreement	-.0542156 (.0464471)	-.101006 (.0689693)
% employees with university education		-.0002202 (.0017395)
% employees with industrial degree		.001164 (.0029807)
Share of apprentices		.0892639 (.7089378)
External relationships		-.0063465 (.0169566)
Remuneration bonus		-.0133234 (.0206013)
Constant	-.1332111 (.2558736)	-.6707458 (.452635)
Wald Chi2	51.43***	49.96***
N	435	360

Models are Instrumental Variable estimation ; Standard errors in parentheses; *p <0.1; **p<0.05; ***p<0.01

Table 5: IV estimation for overall training and firm-innovation

As anticipated, we find that establishments belonging to the manufacturing sector, on average, are more likely to come up with innovations as compared to establishments belonging to other industries. However, we do not find any significant correlation between innovativeness and workforce education structure and skill levels, incentive schemes or presence of external relationships. Analyzing our main variable of interest, we find that the effect of overall training on firm innovativeness, when instrumented by presence of works councils, is highly significant with a coefficient value of 0.34. Therefore, our results confirm the fourth hypothesis that overall training has a positive and significant correlation with the innovative propensity of firms, when instrumented by the presence of works councils.

Until this point, we have investigated the relationship between a firm's overall training practices and its innovative activities. Given our interest in the composition of human capital and HRM practices in establishments, it is worthwhile for us to investigate if different training practices, on average, have significantly different impact on innovativeness. Therefore, in the final section, we examine individual impact of each training type (general-organizational and firm-specific) on firm innovativeness. For this, we use the results from the first two hypotheses and instrument general-organizational training by presence of works councils and subsequently conduct similar IV estimation. In this regard, a cause for concern is

that one might include technical training as an explanatory variable in the model, since it might also have an influence on firm innovativeness. However firm-specific technical training might still suffer from a reverse-causality problem. One way to deal with this would be to use a relevant instrument for technical training and run IV estimation with two independent instruments. It would also be then possible to examine the individual effect of technical training practices on innovation. However, in the absence of a relevant instrument for technical training, we specify an alternate IV specification where we consider only general-organizational training instrumented by works councils and include technical training just as an explanatory variable. Result from this specification only weakly supports our fifth hypotheses. We also run similar analysis for investigating radical innovative propensity of establishments and the role of organizational training therein, the results of which are presented in Table 6.

Dependent variables: Innovation (Model 1), Radical Innovation (Model 2)		
Independent variables	Model 1	Model 2
General training	.2435207* (.1341896)	.1446235 (.1734376)
Manufacturing sector	.341675*** (.0919363)	.1826318 (.151664)
Service sector	.0439048 (.0907013)	-.0191112 (.1252911)
Collective labor agreement	-.1203199 (.0779356)	.0422138 (.0738899)
% employees with university education	.0007061 (.0014719)	.0031768* (.00183)
% employees with industrial degree	.0017345 (.0028413)	.0001192 (.0030981)
Share of apprentices	.3424767 (.6235834)	.2135782 (.7935558)
External relationships	.004774 (.0129684)	.0032259 (.0160483)
Remuneration bonus	-.0022656 (.0150387)	.0032259 (.0160483)
Technical training	-.0312258 (.0589858)	-.027636 (.0892623)
Constant	-.0803273 (.1414266)	.0168473 (.2276832)
Wald Chi2	60.17***	14.54
N	360	264

Standard errors in parentheses; *p <0.1; **p<0.05; ***p<0.01
Models are Instrumental Variable estimation
Instrumented: General training

Table 6: IV estimation for general-organizational training and firm-innovation

The first column of Table 6 throws some light onto our theoretical understanding of the role of works councils as an instrument for providing general-organizational training, which is found to have a weakly significant and positive correlation with a firm's innovative propensity. This is in-line with our fifth hypothesis that labor market institutions like works councils allow for higher investment in general-organizational training, even in the presence of positive externalities and therefore clarifies to some extent the existing debate regarding underinvestment in general training by firms. As before, we find that establishments belonging to the manufacturing sector have a higher likelihood of introducing an innovation to the market while no significant effect is found with respect to radical innovation. Surprisingly, we do not find any significant correlation between the provision of general training to employees and a firm's propensity to introduce completely new products/services to the market. We only find that a higher share of university-qualified employees in the total workforce has a weakly significant correlation with radical innovativeness. One reason for the surprising result, as pointed out by Heblich et al. (2009), might be that firms, in order to increase the radical innovative propensity, have to take into account other factors "such as creativity, skill and genius of their workers, as well as their willingness to cooperate in teams, all of which might require outside-the-box-thinking" and not just training. This kind of qualitative factors is almost impossible to observe in our data, and therefore might be a scope for future research.

5. Conclusion and Further Research

The goal of the paper is to examine the nexus between firm-sponsored training and the likelihood of introducing an innovation in establishments by investigating the role of employee representation therein. In doing so, we disentangle the human capital composition and training in firms and look at differential effects of these on innovativeness via the regulating role of the works councils. For the first part of our analysis, we argue that, given the intrinsic motivation of firms to provide path-dependent firm-specific training to their employees, there might not be a significant difference in the provision of technical training in establishments with and without works councils. However, given the standard Beckerian theory of suboptimally lower investment in general organizational training, one way to encourage investment in general organizational training might be through works councils. To test this relationship empirically, we find support for our hypotheses that indeed provision of general organizational training is significantly and positively correlated with the presence of

works councils. We also find that works councils are involved more in process and organizational innovation, rather than product and service innovation. For the second part of our analysis with regard to innovative propensity, we find that both firm-specific technical training and general-organizational training increase a firm's propensity to innovate. However, given a potential reverse-causality between training types and innovation or an omitted variable bias, we use instrumental variable estimation instead to examine the relationship. We use the presence of works councils as an instrument for provision of general-organizational training and consequently find support that investment in vocational and organizational training positively influences innovative propensity in establishments. Our results are also verified when we cluster our training variables into 'bundles' and conduct similar IV analysis. However, our results do not confirm any significant correlation between general training and radical innovativeness of firms.

Our study highlights the importance of employee representation systems in the provision of basic general training for skill formation in employees, and therefore has an important policy implication. Although the cross-section results that we have so far do not allow us to examine the dynamics of the relationship between different aspects of firm-sponsored training and innovation, this might be the first step towards identifying the role of employee representation systems in firm performance through investment in human capital.

However, our study has several limitations. For the first part of our analysis, we do not have information on the share of part-time or fixed-term workers and more detailed information on workforce gender structure which might also have an effect on training activities. For the latter part, we do not have information on physical capital investments, detailed information on R&D expenditure related to new product and services development, staff and wage structure of employees that might also play a role in firm innovation and radical innovation. Finally, as mentioned before, our data lacks information on a relevant instrument that can be used to investigate the relationship with respect to firm-specific technical training and innovation.

As a next step, we plan to use credit-constrainedness of firms as an instrument for technical training. One possible extension of the IV analysis might be to employ a non-parametric bounds approach on treatment effects for firm-sponsored training using works council and credit-constrainedness as monotone instrumental variables used by Manski where,

unlike in IV estimation where mean response in constant across subpopulations, one assumes that mean response varies weakly monotonically across subpopulations in the sample. We also plan to incorporate a longer time frame in order to examine the causal relationship between human capital composition and innovation and also consider other firm characteristics and performance indicators (e.g. sales, labor turnover, employee value added etc). Finally, it might also be worthwhile to focus on the questionnaire survey conducted for the works councils (answered by managers of works councils for each establishment) in order to highlight other specific organizational and HRM practices of works councils.

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APPENDIX:

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Establishment size	1															
2. Establishment type	0.2381	1														
3. Manufacturing	0.2274	0.0345	1													
4. Services	-0.2466	-0.1215	-0.7485	1												
5. Transport and ICT	0.0073	0.1145	-0.4268	-0.2802	1											
6. University education	0.0885	0.0991	-0.156	0.1164	0.0709	1										
7. Industrial title	0.1078	0.0612	0.0279	-0.0489	0.0253	0.1445	1									
8. Share of apprentices	-0.0275	-0.0158	0.038	-0.0096	-0.0432	-0.11	0.0539	1								
9. General tariff agreement	0.3593	0.1395	0.0743	-0.0314	-0.0651	-0.2048	-0.0091	-0.0224	1							
10. Works councils	0.4381	0.3341	0.1812	-0.2132	0.0291	0.0143	0.0983	0.0192	0.3612	1						
11. External relationships	0.192	0.097	0.1273	-0.1221	-0.0214	0.0534	0.1176	0.0957	0.0823	0.1146	1					
12. Remuneration bonus	0.1142	0.1665	0.1403	-0.128	-0.0333	-0.0999	0.0641	-0.0269	0.1083	0.2695	0.2423	1				
13. General Organizational training	0.2888	0.2178	-0.0287	0.0007	0.0412	0.0831	0.1229	0.0407	0.1719	0.2822	0.2211	0.244	1			
14. Technical training	0.2236	0.1112	0.1724	-0.1454	-0.0557	0.0979	0.1087	0.0624	0.0439	0.2019	0.2529	0.2548	**0.4197**	1		
15. Innovation	0.1311	0.1493	0.2737	-0.1966	-0.1306	0.0587	0.1124	0.0465	-0.014	0.1443	0.2115	0.1553	0.179	0.3005	1	
16. Radical innovation	0.2314	0.1128	0.1293	-0.1154	-0.0369	0.0969	0.0324	0.0425	0.024	0.0936	0.0662	0.1054	0.1496	0.1578	0.0769	1

Mean VIF= 1.50

Table A: Correlation matrix

Correlations greater than or equal to 0.097 are significant ($p < 0.05$)