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The impact of industrial relations and wage structures on repayment agreements for employer-financed training

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Abstract

Firms can use repayment agreements in order to protect their training investments in case a worker leaves the firm after training took place. In this empirical research note, I use linked employer-employee data to estimate the impact of industrial relations and wage structures on the probability that German firms make such repayment agreements with workers. Main findings are that firms with works councils are more likely to use repayment agreements, whereas union bargained collective contracts do not have significant effects. Moreover, firms with a larger intra-firm wage dispersion and higher mean wages are more likely to use repayment agreements.

1. Introduction

Firms might underinvest in workers' human capital if they fear that trained workers quit so that they cannot generate returns from their human capital investments. A solution to this problem can be repayment agreements (contractual payback clauses) in order to protect investments in employer-financed continuous training, or at least in order to recoup part of the undertaken investments. Whereas the analysis of training investments and the division of costs and returns between workers and firms has received much attention in the economic literature (e.g., Becker, 1962; Acemoglu and Pischke, 1999; Leuven, 2005), few studies analyze repayment agreements for training, which are mostly discussed in the context of legal issues such as the enforcement of repayment agreements (e.g., Alewell, 1998; Leber, 2000; Alewell and Koller, 2003; Bassanini et al., 2005; Long, 2005; Sloof et al., 2007).

In this empirical research note, I use linked employer-employee data from Germany to estimate the impact of industrial relations and wage structures on the probability that firms make repayment agreements with trained workers. Almost half of all profit-maximizing training firms in my estimation sample use such repayment agreements. One channel, through which industrial relations might affect the use of repayment agreements, is that works councils and unions are positively correlated with employment stability. This function of industrial relations has been often discussed in the context of the exit-voice hypothesis (e.g., Freeman, 1980; Pfeifer, 2011). If works councils and collective contracts decrease firms' labor turnover and especially workers' quit intentions, the necessity to make repayment agreements should also decrease. A related channel is that works councils are often associated with improving mutual trust and reciprocal behavior between management and workers (e.g., Freeman and Lazear, 1995). If firms believe in trained workers' willingness to stay in the firm after training, the necessity to make repayment agreements should be rather low. Once we control for firms' differences in labor turnover, we should however still expect effects of industrial relations on repayment agreements, which are driven by representation of worker interests in the context of rent protection.

Works councils and unions represent worker interests and might in principal both be critical towards repayment agreements as firms benefit from them, while workers are potentially disadvantaged, at least if they leave the firm after training. A difference between both institutions in Germany is, however, that unions usually bargain broader worker interests within industries and regions, whereas works councils are concerned with workers inside a given firm and with insider rent protection (Müller-Jentsch, 1995; Jirjahn, 2009). If a worker leaves the firm, he cannot be seen as an insider anymore. Because departures of trained workers extract rents from the firm, they are also to the disadvantage of staying insiders so that works councils might encourage the management to use repayment agreements and might help to overcome workers' resistance against repayment agreements in order to protect insider rents. Unions are, on the other hand, less concerned with workers inside a specific workplace because they represent their members' interests, who usually work in different firms. Moreover, the German Works Constitution Act ("Betriebsverfassungsgesetz") grants works councils an explicit role in firms' training practices (e.g., Stegmaier, 2012). Following the above line of reasoning, we should expect that firms with works councils are more likely to make repayment agreements with trained workers due to an interest in protecting insider rents and the explicit codetermination rights with respect to training, whereas no such effect is expected for the existence of a union bargained collective contract in which broader worker interests are represented that might even lead to a

lower probability of using repayment agreements in order to prevent potential burdens for trained workers who switch between firms.

Wage structures might affect the existence of repayment agreements through a rent capturing channel. Firms with lower wage dispersion (more compressed wage structures) and lower mean wage levels might be able to capture faster rents after training (e.g., wage increases smaller than productivity increases after training). The chance to capture rents after training increases firms' incentives to invest in workers' human capital (e.g., Acemoglu and Pischke, 1999). Faster rent capturing further implies that firms can recoup the training costs faster, which would make the use of repayment agreements less necessary. Thus, we should expect that firms with more compressed wage structures and lower mean wage levels are less likely to make repayment agreements with trained workers.

The remainder of the paper is structured as follows. The next section informs about the data and the estimation strategy. Section 3 presents the results of the regression analysis. The paper concludes with a short summary in Section 4.

2.   Data and Estimation Strategy

The used data are the cross-sectional models of the German linked employer-employee data set of the Institute for Employment Research (LIAB) (Alda et al., 2005). The LIAB links employer-side information from the IAB Establishment Panel with employee information from process-produced data. The IAB Establishment Panel contains data on establishments from all sixteen German federal states ("Bundesländer") and all industries. Every year more than 15,000 firms with at least one employee covered by social security are interviewed in an unbalanced panel design survey. The sample is stratified according to ten establishment sizes and sixteen industries, with oversampling of larger firms. The observational unit is the establishment, i.e., the local unit in which major activities of an enterprise are carried out.[1] Main concern of the survey is to gain insights into the firm's most important parts of operation, decision-making, and more specifically employment.

The process-produced employee data stem basically from the notification procedure for unemployment, pension, and health insurances. Employers must notify the social security agencies about all employees who are covered by social security at the start and at the end of an employment relationship as well as on the last day of each year. These process-produced employee data include socio-demographic characteristics and also individual daily gross wages of workers (in Euros), which are used to generate variables for firms' wage structures. Disadvantages of the data are that no information about working hours are available and that wages are censored at the upper earnings limit for social security contributions. Due to the absence of working hours in the data, meaningful aggregate wage variables at the firm-level can only be computed for full-time workers (with the exclusion of apprentices, trainees etc.). The wage censoring leads to a downward bias when proxies for intra-firm wage dispersion and mean

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[1] In this paper, the terms establishment and firm are used interchangeably.

wages are generated, because we observe too low wages (wages equal the social security contribution limit) for high wage workers (wages above the social security contribution limit).

For the purpose of this study, I use the waves 2005 and 2007, because they contain questions about repayment agreements. Due to the interest in firms' profit maximizing rationales for human capital investments, the sample is restricted to profit-maximizing firms from the private sector that have trained at least one worker in the first half of a survey year. The sample is further restricted to firms with at least 21 workers in order to generate consistent variables for firms' wage structures and because works councils and collective contracts are less wide spread in smaller firms. As only full-time workers are considered for the generation of wage variables at the firm-level, the additional restriction is imposed that firms have at least 10 workers in the data from whom the firm-level wage information are generated. At last, only firms without missing values in the used variables are considered. Overall 3926 firms for the year 2005 and 3752 firms for the year 2007 remain in the sample for the subsequent empirical analysis. 2099 of these firms are part of both waves, i.e., in 2005 as well as in 2007 (balanced panel).

In order to analyze firms' determinants of using repayment agreements, a binary variable has been generated (*REPAY*), which takes the value one, if a firm states that it makes repayment agreements to protect training investments in case a worker leaves the firm after the firm has paid for his training. Such repayment agreements exist in more than 40 percent of the firms in the sample. Because of the binary dependent variables, Probit models are estimated as specified in equation (1).

$$\Pr\left(REPAY_{jt}=1\right)=\Phi\left(\alpha+\beta_1 WOCO_{jt}+\beta_2 UNION_{jt}+\beta_3 WDISP_{jt}+\beta_4 WMEAN_{jt}+\gamma X_{jt}\right) \quad (1)$$

Φ denotes the standard normal cumulative density function. Greek letters denote the parameters to be estimated. *j* is a firm index and *t* is a time index. The explanatory variables of interest are the existence of a works council (*WOCO*) and of a union bargained collective contract (*UNION*)[2] as well as the intra-firm wage dispersion (*WDISP*) and the mean wage in the firm (*WMEAN*). Industrial relations are important in this context, because unions and works councils are often associated with interests in more training for workers, in protecting insider rents, and also with more compressed wage structures and higher wages (e.g., Acemoglu and Pischke, 1999; Dustmann and Schönberg, 2009).

Firms' wage structures are accounted for in the estimates by including the mean log daily wages (*WMEAN=logW_MEAN*) and the conditional intra-firm wage dispersion of full-time workers in a given firm in a given year. In order to generate the conditional wage dispersion measure I follow the approach of Winter-Ebmer and Zweimüller (1999), who analyzed the effect of intra-firm wage dispersion on firm performance. Exploiting the nature of the linked employer-employee

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[2] I use an aggregated dummy variable for union bargained collective contracts at the firm-level and at the industry/region-level. Estimates with separate dummy variables for union bargained collective contracts at the firm-level and at the industry/region-level did not reveal noteworthy differences between both types. The separate variable for union bargained collective contracts at the firm-level has also the disadvantage that most firms with such contracts are very large and have a works council, which would lead to extremely high multicollinearity in the Probit regressions.

data set, log-linear Mincer earnings functions for full-time workers (i) are estimated separately for every firm (j) in a given year (t), as specified in equation (2).

$$\log WAGE_{ijt} = \alpha_j + \beta_1 AGE_{ijt} + \beta_2 AGE_{ijt}^2 + \beta_3 TENURE_{ijt} + \beta_4 TENURE_{ijt}^2$$
$$+ \beta_5 APPRENTICESHIP_{ijt} + \beta_6 UNIVERSITY_{ijt} + \beta_7 FEMALE_{ijt} + \varepsilon_{ijt} \tag{2}$$

The dependent variable is the log of daily wages. The explanatory variables include age, squared age, tenure, squared tenure, highest qualification categories (no job qualification as reference group, apprenticeship degree, university degree), and a female dummy. Based on the results for a firm's earnings function, the standard error of the regression is then generated as a proxy for the conditional intra-firm wage compression. In order to account for the censoring problem, I generate the conditional wage dispersion measure ($WDISP=logW\_SERT$) based on Tobit regressions with different upper earnings limits for East and West Germany as well as for the years 2005 and 2007. The standard error of the regression in a firm j can be interpreted as the standard deviation of workers' individual error terms in an estimated earnings function for that firm in year t, as shown in equation (3). A larger standard error of the regression indicates a larger conditional intra-firm wage dispersion and consequently lower intra-firm wage compression.

$$logW\_SERT_{jt} = SER_{jt}^{TOBIT} = \hat{\sigma}_{jt} = \sqrt{\text{sum of squared residuals}/\text{number of observations}} \tag{3}$$

The Probit regressions in equation (1) further control for important differences between firms that might affect training related decisions as well as wage structures (X: number of hirings, number of layoffs, number of quits, number of workers, three firm age categories, state of the art of production technology, profit situation, share of women, share of part-time workers, share of qualified workers, 16 federal state dummies, 15 sector dummies). Table I presents definitions and descriptive statistics for the variables of interest and the control variables. A caveat of the data is that no information about the type of training in a firm (e.g., firm-specific vs. general human capital) is available so that an omitted variable bias might occur, if unions and works councils as well as wage structures are correlated with a certain type of training. Moreover, the data comprise only aggregated information about training at the firm-level and no information about training of single workers so that heterogeneity between workers in a firm has to be neglected in the subsequent analysis.

Equation (1) for the determinants of repayment agreements is estimated using binary Probit models for the separate cross-sections 2005 and 2007 as well as a random effects Probit model for a balanced panel. The random effects model serves mainly as a robustness check in order to account for within-firm variance, because a likelihood ratio test rejects the hypothesis that the within-firm variance does not significantly contribute to the total variance. The random effects model is chosen over fixed effects models for several reasons. At first, no consistent fixed effects estimators exist for Probit or Logit models in short panels due to the incidental parameter problem. Fixed effects linear probability models are also no feasible estimation strategy, because repayment agreements, wage structures, and industrial relations are structural firm characteristics based on strategic decisions so that within-firm variance is very low for most variables of interest in my data.

Table I: Definitions and descriptive statistics for variables of interest and control variables

Variables	Definitions	Year 2005 (n=3926)		Year 2007 (n=3752)		Balanced panel (n=2*2099=4198)	
		Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Dependent variable:							
REPAY	Firm uses repayment agreements to protect training investments (dummy)	0.4236	0.4942	0.4512	0.4977	0.4414	0.4966
Industrial relations variables:							
WOCO	Firm has a works council (dummy)	0.6373	0.4808	0.5981	0.4904	0.6429	0.4792
UNION	Firm is bound to union bargained collective contract (dummy)	0.6864	0.4640	0.6327	0.4821	0.6717	0.4696
Wage structure variables:							
logW_SERT	Intra-firm standard error of log daily gross wage regressions for full-time workers obtained from Tobit	0.2067	0.0803	0.2076	0.0787	0.2070	0.0770
logW_MEAN	Intra-firm mean log daily gross wages of full-time workers	4.4317	0.3228	4.4330	0.3358	4.4531	0.3198
Control variables (*X*):							
Hirings	Number of hirings during first half of survey year	10.6393	41.5449	14.5464	55.2612	11.6663	43.7346
Quits	Number of quits during first half of survey year	2.3051	10.0347	3.0096	12.1514	2.4807	9.9580
Layoffs	Number of layoffs during first half of survey year	2.4738	12.5399	2.0586	10.4980	2.2813	12.4907
Workers	Number of workers at June 30th / 1000	0.3727	1.4083	0.3400	1.4134	0.3768	1.5543
Firm age <6 years	Firm younger than 6 years (dummy, reference)	0.0647	0.2460	0.0586	0.2350	0.0381	0.1915
Firm age 6-15 years	Firm age between 6 and 15 years (dummy)	0.3044	0.4602	0.1906	0.3928	0.2444	0.4298
Firm age >15 years	Firm older than 15 years (dummy)	0.6309	0.4826	0.7508	0.4326	0.7175	0.4503
Production technology	State of the art of the production technology (0-5; 0: newest, 5: outdated)	2.0502	0.7313	2.0115	0.7200	2.0026	0.7062
Profit situation	At least good profit situation (subjective perception) in last business year (dummy)	0.4002	0.4900	0.5626	0.4961	0.4974	0.5001
Share women	Share of female workers	0.3423	0.2537	0.3462	0.2572	0.3328	0.2465
Share part-time	Share of part-time workers	0.1221	0.1690	0.1353	0.1828	0.1188	0.1643
Share qualified	Share of qualified workers (at least apprenticeship or college degree)	0.7413	0.2372	0.7565	0.2310	0.7570	0.2258

3. Regression Results

Table II contains the main results of the Probit regressions for the probability that a firm uses repayment agreements to protect training investments (*REPAY*). It can be seen that union bargained collective contracts (*UNION*) have no significant effects throughout all regressions, whereas works councils (*WOCO*) increase the probability that a firm uses repayment agreements by approximately 15 percentage points (p<0.0001) in the cross-section Probit models for the year 2005 and for the year 2007, and by 23 percentage points (p<0.0001) in the random effects Probit model for the balanced panel. Thus, it seems as firm-level codetermination is more influential in this context than union bargaining. In order to check for a potential interaction effect between union bargained collective contracts and works councils, I have re-estimated the regressions with an additional interaction term (*UNION×WOCO*) which has however no significant effect.

Table II: Probit regressions for existence of repayment agreements (variables of interest)

	Year 2005 Cross-section Probit	Year 2007 Cross-section Probit	Balanced panel Random effects Probit
WOCO	0.1531	0.1502	0.2302
	(0.0205)	(0.0210)	(0.0440)
	[<0.0001]	[<0.0001]	[<0.0001]
UNION	0.0119	0.0037	0.0182
	(0.0206)	(0.0203)	(0.0397)
	[0.5654]	[0.8546]	[0.6464]
logW_SERT	0.5927	0.5397	0.9544
	(0.1129)	(0.1154)	(0.2150)
	[<0.0001]	[<0.0001]	[<0.0001]
logW_MEAN	0.1198	0.1701	0.3258
	(0.0396)	(0.0383)	(0.0845)
	[0.0025]	[<0.0001]	[0.0001]
Control variables (*X*)	Yes	Yes	Yes
Pseudo R² (McFadden)	0.0872	0.0972	
Number observations	3926	3752	4198
Mean dependent variable	0.4236	0.4512	0.4414

Notes: Marginal effects at the means of all covariates on the probability of the existence of repayment agreements in a firm (*REPAY*); binary Probit regressions for 2005 and 2007; random effects Probit regression for balanced panel. All regressions include control variables (*X*) for number of hirings, number of layoffs and quits, number of workers, three firm age categories, state of the art of production technology, profit situation, share of women, share of part-time workers, share of qualified workers, 16 federal state dummies, and 15 sector dummies. The random effects Probit regression further includes a dummy variable for the year 2007. Standard errors (robust for cross-section Probits) in parentheses. P-values for statistical significance in squared brackets. The complete estimation results can be found in Table A.I in the Appendix.

The wage structure variables are also significant determinants of repayment agreements. The estimated marginal effects for the conditional intra-firm wage dispersion variable (*logW_SERT*) have the expected positive signs, i.e., firms with more compressed wage structures are on average

significantly less likely to use repayment agreements. The estimated wage dispersion effects are slightly larger for the year 2005 than for the year 2007 and larger in the random effects Probit model than in the separate cross-sections. The mean daily wage level (*logW_MEAN*) is also positively correlated with the existence of repayment agreements. The estimated wage level effects are larger for the year 2007 than for the year 2005 and larger in the random effects Probit model than in the separate cross-sections. An interpretation for these findings might be that firms with larger intra-firm wage dispersion and larger wage levels find it harder to capture rents from training so that they have incentives to make repayment agreements in order to protect their training investments.

The Probit regressions indicate few further significant determinants of repayment agreements other than works councils and the wage structure variables (see Table A.I in the Appendix for the complete results). The only marginal effects, which are at least significant at the ten percent level in all three regressions, have been estimated for the number of layoffs that seem to increase the probability of using repayment agreements. Moreover, the results indicate that firms, which are older than six years, and firms with a more qualified workforce are more likely to use repayment agreements. In order to check the sensitivity of the overall results with respect to firm size, I have re-estimated the Probit regressions for firms with at least 100 workers. As the results did not change noteworthy, they are not presented at this place.

4.   Concluding Remarks

The main finding of my econometric analysis with German linked employer-employee data is that the existence of a works council is positively correlated with repayment agreements, whereas union bargained collective contracts have no significant effects on repayment agreements. Hence, codetermination at the firm-level seems to be more important than union bargaining when it comes to employer-provided continuous training, which accords with the insider rent protection function of works councils and the explicit role of works councils in firms' training practices, which is stated in the German Works Constitution Act ("Betriebsverfassungsgesetz"). The positive impact of works councils on the use of repayment agreements is an example that employers can benefit from institutionalized worker codetermination, because it might be easier to overcome workers' resistance that is mitigated by a works council. Moreover, firms with more compressed wage structures and lower mean wage levels are less likely to have repayment agreements, which might be explained by faster rent capturing after training. Compressed wage structures and wages below workers' marginal product are indicators of imperfect labor markets, in which firms can exploit monopsony power that makes the use of repayment agreements less necessary (e.g., no or bad outside options for workers).

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Appendix Table A.I: Probit regressions for existence of repayment agreements (complete results)

	Year 2005 Cross-section Probit	Year 2007 Cross-section Probit	Balanced panel Random effects Probit
WOCO	0.1531	0.1502	0.2302
	(0.0205)	(0.0210)	(0.0440)
	[<0.0001]	[<0.0001]	[<0.0001]
UNION	0.0119	0.0037	0.0182
	(0.0206)	(0.0203)	(0.0397)
	[0.5654]	[0.8546]	[0.6464]
logW_SERT	0.5927	0.5397	0.9544
	(0.1129)	(0.1154)	(0.2150)
	[<0.0001]	[<0.0001]	[<0.0001]
logW_MEAN	0.1198	0.1701	0.3258
	(0.0396)	(0.0383)	(0.0845)
	[0.0025]	[<0.0001]	[0.0001]
Hirings	-0.0003	0.0001	0.0003
	(0.0003)	(0.0003)	(0.0004)
	[0.3760]	[0.8266]	[0.4500]
Quits	0.0008	0.0016	-0.0004
	(0.0012)	(0.0015)	(0.0019)
	[0.5042]	[0.2850]	[0.8431]
Layoffs	0.0016	0.0018	0.0033
	(0.0008)	(0.0011)	(0.0017)
	[0.0367]	[0.0923]	[0.0455]
Workers	0.0071	0.0007	0.0089
	(0.0094)	(0.0077)	(0.0123)
	[0.4470]	[0.9264]	[0.4730]
Firm age 6-15 years	0.0651	0.0336	0.1345
	(0.0378)	(0.0403)	(0.0757)
	[0.0853]	[0.4041]	[0.0758]
Firm age >15 years	0.0983	0.0326	0.1145
	(0.0342)	(0.0361)	(0.0749)
	[0.0040]	[0.3670]	[0.1265]
Production technology	-0.0123	0.0197	0.0245
	(0.0115)	(0.0121)	(0.0217)
	[0.2868]	[0.1033]	[0.2596]
Profit situation	0.0198	0.0045	0.0183
	(0.0172)	(0.0178)	(0.0288)
	[0.2504]	[0.8015]	[0.5250]
Share women	-0.0288	-0.0324	-0.0288
	(0.0503)	(0.0525)	(0.1064)
	[0.5663]	[0.5367]	[0.7869]
Share part-time	-0.0532	-0.0181	-0.0190
	(0.0653)	(0.0646)	(0.1329)
	[0.4153]	[0.7796]	[0.8863]
Share qualified	0.0683	0.0597	0.1179
	(0.0407)	(0.0430)	(0.0828)
	[0.0931]	[0.1654]	[0.1546]
Year 2007			0.0520
			(0.0227)
			[0.0219]
Controls for federal states (16) and industries (15)	Yes	Yes	Yes
Pseudo R² (McFadden)	0.0872	0.0972	
Number observations	3926	3752	4198
Mean dependent variable	0.4236	0.4512	0.4414

Notes: Marginal effects at the means of all covariates on the probability of the existence of repayment agreements in a firm (*REPAY*); binary Probit regressions for 2005 and 2007; random effects Probit regression for balanced panel. Standard errors (robust for cross-section Probits) in parentheses. P-values for statistical significance in squared brackets.