

Hübler, Olaf; Jirjahn, Uwe

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Olaf Hübler
Uwe Jirjahn

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Olaf Hübler

University of Hannover and IZA, Bonn

Uwe Jirjahn

University of Hannover

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IZA

P.O. Box 7240
D-53072 Bonn
Germany

Tel.: +49-228-3894-0
Fax: +49-228-3894-210
Email: iza@iza.org

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ABSTRACT

Works Councils and Collective Bargaining in Germany: The Impact on Productivity and Wages^{*}

This paper investigates the interaction between establishment-level codetermination and industry-level collective bargaining in Germany. Based on a simple bargaining model we derive our main hypothesis: In establishments covered by collective bargaining agreements works councils are more likely to be engaged in productivity enhancing activities and less engaged in rent seeking activities than their counterparts in uncovered firms. Using data from German manufacturing establishments, our empirical analysis confirms this hypothesis. The presence of works councils exerts a positive impact on productivity within the covered industrial relations regime but not within the uncovered industrial relations regime. In contrast, the presence of works councils has a positive effect on wages within the uncovered industrial relations regime but not to the same degree within the covered industrial relations regime.

JEL Codes: D23; J24; J31; J51; J53

Keywords: Dual industrial relations; bargaining; efficiency; rent seeking; correlated double selection

Olaf Hübler
Institute of Quantitative Economic Research
University of Hannover
Königsworther Platz 1
30167 Hannover
Germany
Tel.: +49 511 762 4794
Fax: +49 511 762 3923
Email: huebler@mbox.iqw.uni-hannover.de

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I. Introduction

The German system of industrial relations is characterized by a dual structure of employee representation through works councils and unions. Works councils provide a highly developed mechanism for establishment-level participation while collective bargaining agreements are negotiated between unions and employers' associations on an industrial level. The basic question addressed in this paper is: Does the impact of works councils on productivity and wages differ between establishments covered by collective bargaining agreements and establishments not covered by collective bargaining agreements?

Empirical evidence and a theoretical analysis how codetermination and collective bargaining interact in the process of the creation and distribution of economic rents, are extremely scarce. Almost all of the somewhat sparse econometric studies examine the isolated impact of works councils on firm performance. This little knowledge is unsatisfying for at least two reasons: First, German councils have attracted considerable attention in the United States as an alternative form of worker participation to promote industrial democracy and economic performance. Also in Germany there is a recent discussion on the role of works councils because the German government plans to strengthen their participatory rights. However, the economic effects of works councils depend on other parameters of the industrial relations system such as collective bargaining. Policies to encourage councils should take into account these factors. Second, there is an ongoing discussion on the economic effects of centralised bargaining. One claim is that centralised bargaining is not sufficiently responsive to local conditions (Freeman and Gibbons 1995, Lindbeck and Snower 1997). However, the interaction between codetermination and collective

bargaining, considered in this paper, sheds light on an indirect effect of centralised bargaining that may contribute to increased firm performance. Even if productivity-enhancing work practices must be negotiated on the establishment level between management and works councils, these changes are more easily negotiated, when substantial distributional conflicts are moderated on a central level by unions and employers' associations. The literature to date has not well recognised this aspect.

In a model by Freeman and Lazear (1995) the works council is a mechanism for building trustful industrial relations and for improving the information flow between workers and management. Without explicitly analysing the effects within a bargaining framework, Freeman and Lazear also recognise that codetermination may strengthen workers' bargaining power. FitzRoy and Kraft (2000) extend this model to the system of board-level co-determination.

In our paper the two faces of works councils are incorporated in a bargaining model. On the one hand, works councils foster trust and cooperation. They provide a mechanism for negotiating productivity-enhancing work practices. On the other hand, councils can use their codetermination rights to hinder decisions if management and the workforce fail to reach an agreement. Codetermination weakens the management's disagreement position. The presence of councils may result in both the creation and the redistribution of economic rents. We argue that the management's disagreement position is less weakened in establishments covered by collective bargaining agreements. Comparing covered and uncovered firms, the presence of councils should have a more substantial impact on productivity and a less intense impact on wages in the covered industrial relations regime.

Our empirical analysis is based on German establishment data from the 'Hannover Panel'. Applying a double-selection approach, we take into account the endogeneity

of the two central variables: The presence of a works council and the coverage by a collective bargaining agreement. The results confirm our hypothesis. The presence of works councils exerts a positive impact on productivity within the industrial relations regime covered by collective bargaining agreements but not within the uncovered industrial relations regime. In contrast, the presence of works councils exerts a positive impact on wages within the uncovered industrial relations regime but less within the covered industrial relations regime. These results complement our studies about the determinants of pay-for-performance schemes, which obtain a positive impact of councils on the use of performance pay and profit sharing in the covered regime but not in the uncovered regime (Heywood, Hübler and Jirjahn 1998; Heywood and Jirjahn 1999).

A related question has been investigated by FitzRoy and Kraft (1990). In their study the interaction of works councils with union density exerts a negative impact on the firm's innovative activities. However, the focus of our approach is not on the interaction of works councils with the proportion of the firm's employees who are union members. Rather, the basic hypothesis of this paper is that the impact of works councils on firm performance depends on the moderation of substantial distributional conflicts by unions and employers' associations. Therefore, we investigate the interaction of works councils with the coverage by collective bargaining agreements.

Our results also provide a counterpoint to empirical studies with Anglo-Saxon data, which examine the interaction effects between decentralised collective bargaining and methods of employee involvement such as consultative committees or teams. For the United States Cooke (1994) finds that teams contribute substantially more to value added in unionised firms than in non-union firms. Although comparing the effects of worker participation in Britain and Germany, Addison, Siebert, Wagner

and Wei (2000) investigate interaction effects only with the British data. They obtain positive effects of employee involvement on productivity only in non-union plants.

The plan of the article is as follows. In section II we present a non-technical discussion of the dual industrial relations system. Section III develops a formal model. Section IV describes the data source and the econometric methods. Section V presents the results. Section VI concludes.

II. Economic Effects of the Dual Industrial Relations System

The rights of the works councils are laid down in the Works Constitution Act (WCA). The WCA was introduced in 1952 and reformed in 1972 and 1989. Councils shall be elected by the whole work force of establishments with five or more permanent employees. However, their creation depends on the initiative of the establishment's employees. Hence, councils are not present in all eligible firms. Council presence depends on factors such as firm size, firm age and the gender composition of the work force (Addison, Schnabel and Wagner 1997). The powers of the works councils can be quite broad. They have full codetermination rights on a set of issues, including the introduction of new payment methods, the fixing of job and bonus rates, the allocation of working hours, the introduction and use of technical devices designed to monitor employee performance, and up- and down grading. In these areas management cannot take action without the agreement of the works council. The councils have less strong consultation rights in matters such as changes in equipment and working methods that affect job requirements. Their participation rights in financial and economic matters cover information provision.

The WCA ties work councils to the general obligation to co-operate with management ‘in a spirit of mutual trust . . . for the good of the employees and of the establishment’. This calls for an economic explanation: How can codetermination enhance joint firm surplus? First, in Germany works councils may exert a collective voice role (FitzRoy and Kraft 1987; Frick and Sadowski 1995). Many working conditions are workplace public goods (Freeman and Medoff 1984). Works councils communicate worker preferences to management helping to optimise the provision of those public goods. Second, workers will withhold effort and cooperation when an employer cannot credibly commit to take into account the workers’ interests. For example, workers fearing job loss due to technological change do not reveal information about potential productivity-enhancing innovations. Another well known example is the ratchet effect. Workers, receiving pay for performance, will withhold effort when they anticipate that the employer will alter the future terms of the payment scheme in light of the workers’ past performance. Providing works councils with codetermination rights is one mechanism for protecting the interests of the workforce (Smith 1991; Freeman and Lazear 1995). Hence, codetermination may foster the workers’ cooperation with the introduction of efficiency-enhancing work practices, including pay for performance and training for employees.

There may be other solutions to the commitment problem. Under some circumstances reputation concerns induce an employer to act honestly (Bull 1987). However, the reputation mechanism fails if an employer overly discounts the future loss of trust and co-operation.¹ In this situation a council with veto rights can protect the workers’ interests. Moreover, the reputation mechanism fails if workers have not enough information to verify whether an employer behaves honestly or not (Kreps 1990). This suggests that the comprehensive information rights of the works council

and the reputation mechanism may be complementary. Finally, even if the owners of the firm care about their reputation, the objectives of the managers and superiors do not necessarily coincide with the owners' interest in building trustful and cooperative relationships with the employees. Recent literature has stressed the role of rent-seeking activities of supervisors (Prendergast 1999). Councils may be an alternative mechanism for restricting superiors' favouritism and influence activities. They foster the introduction of general rules for performance evaluation and promotion.

In sum, there are reasonable arguments that the presence of councils can enhance joint firm surplus. This raises the question why not all firms take the initiative to establish works councils. There are several answers to this question.² First, establishing work councils involves costs. The employees have to spend time and effort to introduce a council. The employer has to bear expenses such as the release time of works councillors. Second, councils may not only have an impact on the size but also on the distribution of firm surplus. Co-determination may strengthen the bargaining power of the workforce. The owners of a firm will informally resist to establish councils if the redistribution of surplus dominates. Moreover, there will be resistance by rent-seeking supervisors if they lose power due to co-determination.³

The aim of the WCA clearly is to restrict distributional conflicts on the establishment level. Works councils are subject to a general peace obligation. They do not have the right to strike. If council and management fail to reach an agreement, they may appeal to an internal arbitration board or to the labour court. Moreover, wage negotiations between councils and management are not authorised by law. However, formal or informal establishment-level negotiations play an important role.

First, the introduction of potential productivity-enhancing work practices must be negotiated when there are conflicting interests over how these practices are

established. For example, the reorganisation of work may require additional effort of the workforce to improve productivity. In this case workers want to be compensated for the increased disutility from working. Additionally, they want to share the increased rents of the firm. Even if codetermination rights would not increase the workers' bargaining power, a positive impact of works councils on wages or fringe benefits due to the increased surplus can be expected.

Second, codetermination may enhance the workers' share in a given surplus. Councils can use their codetermination rights on social or personnel matters to obtain employer concessions on issues where they have no legal powers. As Müller-Jentsch (1995, p. 60) puts it, 'For example, the council can hold up decisions on staff movements where it has veto rights, or it can withhold consent on overtime where it has co-determination rights, in order to obtain concessions on other issues'. Codetermination weakens the management's disagreement position. If management and works council fail to reach an agreement in the wage negotiations, the council can threaten to be uncooperative in areas where its consent is necessary. Even if these negotiations are informal, the outcome can be binding for the negotiating parties. The council may commit to co-operate with management by signing work agreements on issues where it has legal rights. Management may commit to pay higher wages by placing workers in higher wage groups.⁴ Indeed, most of the somewhat sparse econometric studies find a positive impact of councils on the wage level (Jirjahn and Klodt 1999) and a negative effect on the wage differential between skilled and unskilled workers within establishments (Hübler and Meyer 2000). The last result suggests that unskilled workers gain disproportionately through their assignment to higher wage groups. In sum, there are reasonable arguments that codetermination results in a redistribution of firm surplus. Moreover, the workers' increased

bargaining power makes the impact of councils on work practices ambiguous. On the one hand, councils foster the trust that is necessary for establishing productivity-enhancing work practices. On the other hand, they may use their bargaining power to negotiate less productive work practices that require less effort.

Codetermination will more likely result in higher productivity and in less intense wage increases when the councils are less engaged in rent-seeking behaviour. One crucial factor, that has an impact on the negotiations between works councils and management, is the coverage by a collective bargaining agreement. Collective agreements are usually negotiated between unions and employers' associations on an industrial level. Hence, firms are typically covered that are members of an employers' association. Freeman and Lazear (1995, pp. 31-32) argue that councils and management maximise joint surplus when there exists an exogenously fixed sharing scheme that divides the surplus. Codetermination fits better to an industrial relations system where distributional conflicts are moderated outside the firm. However, collective bargaining does not provide a surplus-sharing scheme for dividing firm surplus. It fixes a certain wage level and general working conditions.

In this paper we offer an alternative approach: The employers' associations support management with expertise in case that there are questions of law or lawsuits. Therefore, the opportunities for a council to obtain employer concessions on wages by withholding co-operation in areas where it has codetermination rights are more restricted in covered establishments. Moreover, not only employers' associations but also unions are interested in preventing councils from rent seeking activities. First, establishment-level bargaining undermines the unions' power and status and contributes to dispersed earnings across firms. Second, the unions' interests transcend those of the workforce in an individual firm. Because of the centralised system of

collective bargaining unions are interested in the industry- or nation-wide employment level. Svejnar (1982) goes so far to assume that the unions' influence changes the objective function of the works councils. However, even if the councils only represent the interests of the insiders within the establishments, unions can impose restrictions on the councils' activities. A union may provide a council with expertise to strengthen the council's position against an opportunistic employer but it will prevent rent seeking activities. In sum, we expect that the management's disagreement position is less weakened due to codetermination when the establishment is covered by a collective bargaining agreement. Therefore, works councils are more likely to have a positive impact on productivity and a less strong effect on wages in establishments covered by collective agreements.

III. A Model of the Dual Industrial Relations System

Our model illustrates three points: First, council presence and coverage by a collective agreement are endogenous. Second, councils have an impact on the creation and distribution of rents. Third, the outcome of the establishment-level negotiations depends on the coverage by a collective agreement.

1. The Model

We consider a firm with N identical workers. Employer and workers play a three-stage game. At the first stage the employer decides on the membership in an employers' association. Membership in an employers' association imposes costs C_B on the employer. The employer has to pay a membership fee. Moreover, the coverage

by a collective bargaining agreement may impose inflexible restrictions. At the second stage workers decide on establishing a works council after observing the employer's decision. The creation of a council imposes costs C_W on the work force.⁵ The election of a council requires co-ordination and communication among the workers. Additionally, workers have to overcome the informal resistance of rent-seeking supervisors. Finally, at the third stage, bargaining may take place and output is produced. The general form of the production function is given by

$$(1) \quad Q(e, \alpha, N) = \begin{cases} (1+e)F(N) & \text{if there is an agreement,} \\ \alpha F(N) & \text{if there is a conflict.} \end{cases}$$

where $F(\cdot)$ denotes the basic technology, e is our term for work practices and α , $0 \leq \alpha \leq 1$, is related to the council's opportunities to hinder decisions. With this production function we capture the two faces of works councils and combine two strands of the literature.

Following McCain (1980), we assume that bargaining over both work practices and wages is only possible when a works council is present.⁶ Without a council workers will not co-operate with the introduction of new work practices because they fear employer opportunism. Therefore, e is equal to zero. However, the presence of a works council fosters trust and co-operation. The introduction of new work practices can be negotiated. In this case e may be nonzero. If e is positive, this term represents productivity-enhancing work practices. We also allow for the case that e is negative. In this case the firm introduces work practices that result in lower productivity. Employees may prefer work practices that improve occupational health or reduce environmental pollution affecting their families (Askildsen, Jirjahn and Smith 2000).

In models of wage drift α captures work-to-rule actions in case that employer and union fail to reach an agreement (Moene, Wallerstein and Hoel 1993, pp. 100-103). In our model this term is related to the council's opportunities to hinder decisions if management and works council cannot reach an agreement. A small α represents a situation where a council has a strong power to disrupt production. In particular we assume

$$(2) \quad \alpha = \begin{cases} 1 & \text{if no council is present,} \\ 0 & \text{if a council is present in an uncovered establishment,} \\ \tilde{\alpha} \text{ with } 0 < \tilde{\alpha} < 1 & \text{if a council is present in an covered establishment.} \end{cases}$$

Codetermination increases the workers' bargaining power by weakening the employer's position in case of a disagreement.⁷ For convenience we normalise α to be equal to zero if there is a council in an establishment not covered by a collective bargaining agreement. The arguments discussed in section II suggest that the opportunities to hinder decisions are more limited if the establishment is covered by a collective bargaining agreement. This is captured by $0 < \tilde{\alpha} < 1$.

At the third stage, each worker's utility function has the Stone-Geary form

$$(3) \quad U(e, w) = (\theta - e)w$$

where w denotes the wage. Workers clearly like wages. A negative value of e increases utility due to the improvement in occupational health. A positive value of e decreases utility because productivity enhancing work practices require more effort. The parameter θ is the reference level for productivity-enhancing work practices above which the worker does not wish to work. On the one hand, it depends on the worker's personal characteristics. On the other hand, also general firm characteristics

are important.⁸ In this respect we may say that favourable conditions for investing in work practices are represented by a large θ .

In case of a disagreement the firm employs the workers by paying them their reservation utility. Each worker's reservation utility is normalised to be equal to zero. Consequently, the firm's profit at the second stage is

$$(4) \quad \pi(e, \alpha, N, w) = \begin{cases} (1+e)F(N) - wN & \text{if there is an agreement} \\ \alpha F(N) & \text{if there is a conflict} \end{cases}$$

2. Bargaining at the Third Stage

In case that no council is present we have $\alpha = 1$ and $e = 0$. If the firm does not invest in work practices it can employ the workers by paying them a wage equal to zero. Of course, workers are interested in higher wages. However, the employer does not benefit from paying higher wages. Workers neither can hinder decisions nor can achieve a higher utility by leaving the firm. Moreover, new work practices cannot be negotiated due to the lack of trust and co-operation. In sum, this situation is no bargaining situation. The outcome is the same for a covered firm and an uncovered firm. We have $w^* = 0$ and $e^* = 0$.

In contrast, if a works council is present we have a bargaining situation.⁹ First, the council can threaten to hinder decisions in case of a conflict. Second, works council and employer can negotiate both wages and work practices. The Nash product

$$(5) \quad \Omega = [(\theta - e)wN] \cdot [(1+e)F(N) - wN - \alpha F(N)]$$

is maximised by choosing w and e . We obtain

$$(6a) \quad w = \frac{F(N)}{3N}[\theta + (1 - \alpha)]$$

$$(6b) \quad e = \frac{1}{3}[2\theta - (1 - \alpha)]$$

The term e for work practices is increasing in θ . Obviously, the parties invest more in the improvement of work practices if the conditions are favourable. Moreover, the wage rate w is increasing in θ . The council has an impact on wages due to the increased firm surplus. Consider the case $\alpha = 1$. Even if codetermination would have no impact on the workers' bargaining power we would observe higher wages in establishments with a works council because productivity enhancing work practices are introduced. However, codetermination increases the workers' bargaining power. The term $(1 - \alpha)$ captures this effect. The wage rate w is increasing in $(1 - \alpha)$. Codetermination results in higher wages by strengthening workers' bargaining power. Moreover, the impact of council presence on work practices is ambiguous. If $0.5(1 - \alpha) > \theta$ we obtain $e < 0$. If $0.5(1 - \alpha) < \theta$ we obtain $e > 0$. In sum, e is decreasing in $(1 - \alpha)$ and w is increasing in $(1 - \alpha)$. We will observe a more substantial impact of councils on productivity and a less intense impact on wages if the councils' opportunities to hinder decisions are restricted.

Let us consider the case that the firm is not covered by a collective bargaining agreement. Inserting $\alpha = 0$ into (6a) and (6b) yields

$$(7a) \quad w^{**} = \frac{F(N)}{3N}[\theta + 1]$$

$$(7b) \quad e^{**} = \frac{1}{3}[2\theta - 1]$$

In case that the establishment is covered we have $\alpha = \tilde{\alpha}$ with $0 < \tilde{\alpha} < 1$. This yields

$$(8a) \quad w^{***} = \frac{F(N)}{3N}[\theta + (1 - \tilde{\alpha})]$$

$$(8b) \quad e^{***} = \frac{1}{3}[2\theta - (1 - \tilde{\alpha})]$$

Comparing (7) with (8), the presence of a works council results in an increase of the wage rate that is more pronounced if the firm is not covered by a collective agreement. A positive impact of work councils on productivity is more likely in a covered firm. In case of an uncovered firm codetermination results in productivity-enhancing work practices if $\theta > 0.5$. In case of a covered firm co-determination results in productivity-enhancing work practices if $\theta > 0.5(1 - \tilde{\alpha})$.

3. Presence of a Works Council and Coverage by a Collective Agreement

At the first stage the employer's decision to become a member of an employers' association depends on C_B and on the impact of the coverage on the establishment-level negotiations. After observing the employer's decision the creation of a works council by the workers depends on the costs C_W and on the work practices and wages negotiated at the second stage. Since the works council's opportunities to hinder decisions are more restricted in an establishment covered by a collective agreement the work force can obtain a larger utility by creating a council if the employer is no member of an employers' association. The employer anticipates that the council's bargaining power is reduced in a covered establishment. The structure of the game and the payoffs are shown in Figure 1. It depends on C_B , C_W , $F(N)$, θ and $\tilde{\alpha}$ which strategy pair, (COLLECT = 0, WOCO = 0), (COLLECT = 1, WOCO = 0), (COLLECT = 0, WOCO = 1) or (COLLECT = 1, WOCO = 1), is the subgame-perfect

equilibrium. The conditions are shown in Table 1. The Figures 2.a-c illustrate the equilibria for various parameter constellations.

(COLLECT = 0, WOCO = 0): The interpretation of the conditions for this case is straightforward. Even if the establishment is not covered by a collective agreement the workers' gains from establishing a works council are smaller than the costs C_W . The costs of creating a council are not offset by the increase in utility due to a higher wage rate. Since the employer anticipates that the workers will not create a works council there is no reason to become a member of an employers' association.

(COLLECT = 1, WOCO = 0): This strategy pair is a subgame-perfect equilibrium if it pays for the employer to discourage the workers from creating a council. The workers would only create a council in case that the establishment is not covered by a collective agreement. By bearing the costs C_B of a coverage the employer avoids higher wages and possibly less productive work practices because it does not pay for the workers to create a council in a covered establishment. Note that this equilibrium is only possible for a small θ ($\theta < 2$).

(COLLECT = 1, WOCO = 1): This strategy pair is a subgame-perfect equilibrium if the employer cannot discourage workers from creating a works council. However, it pays for the employer to reduce the council's bargaining power by becoming the member in an employer's association.

(COLLECT = 0, WOCO = 1): This strategy pair is a subgame-perfect equilibrium in two different situations. In the first situation, workers will create a council even if the establishment is covered by a collective agreement. For the employer it does not pay to reduce the council's bargaining power because the costs C_B are too large. In the second situation, workers will elect a council only if the establishment is not covered

by a collective agreement. Again, the costs C_B discourage the employer from the membership in an employers' association. Hence the workers create a works council.

The interpretation of these results is straightforward. Workers will only elect a works council if the costs of establishing a council are offset by the increase in utility due to a higher wage rate. On the one hand, the wage rate increases because workers' bargaining power is strengthened. On the other hand, the wage rate increases when the rent that can be distributed increases. Large firm size N as well as large output $F(N)$ and favourable conditions θ for productivity-enhancing work practices make a council more likely whereas high costs of election C_W make them less likely. The employer will be the member of an employers' association if the costs of the coverage by a collective agreement are offset by the advantage of discouraging the creation of a council or restricting rent seeking behaviour of a works council. Hence establishments are more likely to be covered by a collective agreement if $\tilde{\alpha}F(N)$ is large and the costs C_B imposed by the collective agreement are low. In sum, council presence and the coverage by a collective bargaining agreement are endogenous and depend on establishment characteristics, worker characteristics and the institutional framework of the industrial relations system.

As shown in Table 1 each strategy pair can be characterised by the corresponding wage rate, productivity and profitability. To make the predictions of the model clear let us consider four establishments that only differ in C_B and C_W . The subgame-perfect equilibrium for the first firm is (COLLECT = 0, WOCO = 0), for the second (COLLECT = 0, WOCO = 1), for the third (COLLECT = 1, WOCO = 0) and for the fourth (COLLECT = 1, WOCO = 1). We can now derive our hypotheses about the effects of works councils in covered and uncovered establishments. The presence of a works council increases the wage. The impact is more pronounced in the

establishment not covered by a collective bargaining agreement. Depending on θ the presence of a works council may result in a decreased or increased productivity. Similarly, the presence of a council may result in smaller or larger profitability. However, a positive impact on productivity and profitability is more likely in the establishment covered by a collective bargaining agreement.

We stress that the focus of our model is on the indirect effect of collective bargaining. Coverage by a collective bargaining agreement has no direct effect but an indirect impact on wages by restricting rent seeking activities of works councils. Fitzenberger and Franz (1999) note that the outcome of collective negotiations is usually extended to the overwhelming number of employees in an industry. So we may expect that centralised collective bargaining has an impact on wages at the industry level while there are not necessarily wage differentials between covered and uncovered establishments within an industry. Indeed, empirical studies with establishment data usually do not find a significant impact of the coverage by collective agreements on establishment wages (Jirjahn and Klodt 1999).

IV. Data and Econometric Methods

Our empirical investigation is based on the Hannover Panel (Brand, Carstensen, Gerlach and Klodt 1996), a four wave panel with data from manufacturing establishments in Lower Saxony with 5 or more employees. The first questionnaire was completed in autumn 1994. The number of establishments taking part in the study declined from 1,025 (1994) to 849 (1995), 721 (1996) and 709 (1997). The sample is stratified according to firm size and industry. The data were collected in face to face interviews with firms owners or top managers. The questionnaire covered various

aspects of firm structure, firm behaviour and firm performance with an emphasis on issues relating to personnel.

The objective of our empirical study is to determine the effects of works council presence (WOCO) and the coverage by a collective agreement (COLLECT) on productivity and wages. As wage variable (WAGE) we use wages and salaries per employee and year in an establishment. Productivity (PROD) is measured by sales per year minus the cost of raw material, consumables and supplies and of purchased merchandise divided by the number of employees. Information on profits is not available from the Hannover Panel. We use the employer's quasi rent (QRENT) determined by $(\text{sales} - \text{raw material etc.} - \text{wages})/\text{number of employees}$ as a proxy for profit. The information on our central variable WOCO is only available from the first and the third wave for the years 1994 and 1996. Therefore, the analysis is restricted to those years. Information on WAGE, PROD and QRENT are available for 1994 and 1996 from the second and the fourth wave. The analysis is based on the pooled data for both years.

Addison, Schnabel and Wagner (1998) and Addison, Siebert, Wagner and Wei (2000) have also used parts of this data. Our paper differs in several respects from those study about works councils. Using only the first wave of the Hannover Panel, those studies examine the isolated impact of works councils on firm performance. In contrast, this paper analyses the interaction of works councils with collective bargaining for both years. Moreover, in our analysis we take into account the endogeneity of our central variables WOCO and COLLECT. Finally, our specifications are model-based.

We start with OLS estimates of wage equations where $\text{WOCO} =: d_1$ and $\text{COLLECT} =: d_2$ are included as dummies

$$(9) \quad y_1 = \text{WAGE} = x_1' \beta_1 + d_1 \gamma_1 + d_2 \gamma_2 + u_1.$$

Analogously, the productivity function (PROD) can be estimated

$$(10) \quad y_2 = \text{PROD} = x_2' \beta_2 + d_1 \gamma_1^* + d_2 \gamma_2^* + u_2.$$

In the next step we test whether the WOCO on the one hand and COLLECT on the other hand are correlated with the disturbance term (u). If unobserved determinants of WOCO and COLLECT ($v(\text{WOCO}) =: v_1$, $v(\text{COLLECT}) =: v_2$), respectively, are partially the same as in our objective function (9) and (10), respectively, the estimated effects of the two variables in which we are interested are inconsistent. It is assumed that the densities $h_1(v_1, u_1)$ and $h_2(v_2, u_1)$, respectively, are bivariate normal. Then $E(u_1 | \text{WOCO}, \text{COLLECT}, x)$ is nonzero but can be determined by probit estimates of WOCO and COLLECT. Based on the following latent models for the WOCO and COLLECT decision

$$(11) \quad I_1 = z_1' \alpha_1 - v_1$$

$$(12) \quad I_2 = z_2' \alpha_2 - v_2$$

the dummies WOCO and COLLECT are defined by

$$(13) \quad d_1 = \text{WOCO} = \begin{cases} 1 & \text{if } I_1 > 0 \\ 0 & \text{otherwise} \end{cases}$$

$$(14) \quad d_2 = \text{COLLECT} = \begin{cases} 1 & \text{if } I_2 > 0 \\ 0 & \text{otherwise} \end{cases}$$

We have to distinguish between two cases. Either we assume that v_1 and v_2 are independent or a correlation is allowed. In the first case as the conditional mean of u_1 follows

$$(15) \quad E(u_1 | d_1, d_2, x_1) = \\ \sigma_{v_1 u_1} [d_1 (-\varphi(z_1' \alpha_1 / \sigma_{v_1}) / \Phi(z_1' \alpha_1 / \sigma_{v_1})) + (1-d_1) (\varphi(z_1' \alpha_1 / \sigma_{v_1}) / (1-\Phi(z_1' \alpha_1 / \sigma_{v_1}))] + \\ \sigma_{v_2 u_1} [d_2 (-\varphi(z_2' \alpha_2 / \sigma_{v_2}) / \Phi(z_2' \alpha_2 / \sigma_{v_2})) + (1-d_2) (\varphi(z_2' \alpha_2 / \sigma_{v_2}) / (1-\Phi(z_2' \alpha_2 / \sigma_{v_2}))] \equiv \\ \delta_1 \lambda_1 + \delta_2 \lambda_2.$$

An extension of equation (11) and (12) relaxes the restriction that v_1 and v_2 in the index functions for WOCO and COLLECT decisions are independent. This seems empirically plausible if some unobserved determinants of the WOCO and COLLECT decision are the same. Fische/Trost/Lurie (1981) and Tunali (1986) consider such a type of a model with correlated error terms. In this case (15) has a more complicated form:

$$(16) \quad E(u_1 | d_1=1, d_2=1, x_1) \\ = d_1 d_2 (\sigma_{u_1 v_1 | v_2} \lambda_{11} + \sigma_{u_1 v_2 | v_1} \lambda_{12}) + d_1 (1-d_2) (\sigma_{u_1 v_1 | v_2} \lambda_{21} + \sigma_{u_1 v_2 | v_1} \lambda_{22}) \\ + d_2 (1-d_1) (\sigma_{u_1 v_1 | v_2} \lambda_{31} + \sigma_{u_1 v_2 | v_1} \lambda_{32}) + (1-d_1) (1-d_2) (\sigma_{u_1 v_1 | v_2} \lambda_{41} + \sigma_{u_1 v_2 | v_1} \lambda_{42}) \\ =: d_1 d_2 (\delta_{11} \lambda_{11} + \delta_{12} \lambda_{12}) + d_1 (1-d_2) (\delta_{21} \lambda_{21} + \delta_{22} \lambda_{22}) + d_2 (1-d_1) (\delta_{31} \lambda_{31} + \delta_{32} \lambda_{32}) \\ + (1-d_1) (1-d_2) (\delta_{41} \lambda_{41} + \delta_{42} \lambda_{42}) \\ \equiv \delta_1 \lambda_1 + \delta_2 \lambda_2,$$

where $\sigma_{\cdot, \cdot}$ are conditional covariances between u_1 and v_1 (v_2) under the condition of v_2 (v_1),

$$\delta_j \lambda_j \equiv d_1 d_2 \delta_{1j} \lambda_{1j} + d_1 (1-d_2) \delta_{2j} \lambda_{2j} + d_2 (1-d_1) \delta_{3j} \lambda_{3j} + (1-d_1)(1-d_2) \delta_{4j} \lambda_{4j}, \quad j = 1, 2,$$

$$(17) \quad \lambda_{ij} = (1 - 2d_j) [\varphi(Z_j) \Phi[(1 - 2d_{3-j})Z_{3-j}^*]/P_i] \quad i=4-2d_j-d_{3-j}; j=1,2$$

with

$$Z_{3-j}^* = [Z_{3-j} - \rho Z_j]/(1 - \rho^2)^{1/2},$$

$$P_i = \Phi[(1 - 2d_j)Z_j, (1 - 2d_{3-j})Z_{3-j}, (1 - 2d_j)(1 - 2d_{3-j})\rho].$$

So we can determine the sign of λ_{ij} . Under (15) as well as under (16) equation (9) has to be extended by

$$(18) \quad y_1 = x_1' \beta_1 + d_1 \gamma_1 + d_2 \gamma_2 + \delta_1 \lambda_1 + \delta_2 \lambda_2 + u_1^*,$$

where the meaning of λ_1 and λ_2 differs in both approaches. However, (18) can be estimated consistently by OLS. Analogously, the productivity function (10) has to be modified.

The theoretical model predicts that the effects of WOCO should differ between covered and uncovered establishments. This should be modelled in the empirical specification. A very crude procedure is the incorporation of an interaction term between WOCO and COLLECT. However, usually this method cannot catch the total impact. Also a saturated interaction model is not satisfying, because the unobserved determinants should also vary between the different cases. Therefore, we consider separated regressions for COLLECT=1 and COLLECT=0. In both cases the WOCO effects are incorporated by a dummy variable.

This model with two switch regressions makes it necessary to test whether we have to correct for a sample selection bias. The basic idea is that the employer rationally

decides on the membership in an employers' association and hence on the coverage by a collective agreement. As in the model profits are described by quasi-rents (QRENT) and profit maximisation is assumed, the decision is based on

$$(19) d_2 = \text{COLLECT} = \begin{cases} 1 & \text{if } (\text{QRENT}|\text{COLLECT} = 1) - c_2 > (\text{QRENT}|\text{COLLECT} = 0) \\ 0 & \text{otherwise} \end{cases}$$

where $c_2 = C_B$ is the cost of the membership in an employers' association. If quasi-rents are determined by

$$(20) y_{3k} = (\text{QRENT}|\text{COLLECT} = k) = x_3' \beta_{3k} + u_{3k} \quad k=0,1$$

the latent index function to decide on collective bargaining is

$$(21) I_2 = y_{31} - c_3 - y_{30} = x_3' (\beta_{31} - \beta_{30}) - x_{3c}' \beta_{3c} + (u_{31} - u_{30} - u_{3c}) \\ = z_2' \alpha_2 - (u_{20} + u_{2c} - u_{21}) \equiv Z_2 - v_2$$

where $c_3 = x_{3c}' \beta_{3c} + u_{3c}$. The error term u_{3c} is assumed uncorrelated with u_{31} and u_{30} .

The employer chooses $\text{COLLECT} = 1$ if the employer's quasi-rent under collective bargaining minus coverage costs is larger than the quasi-rent in case of no coverage.

The decision depends on observable (x_3, x_{3c}) and unobservable attributes (u_{31}, u_{30}, u_{3c}) .

The probability that $I_2 > 0$ is given by

$$(22) P(I_2 > 0) = P(v_2^* < Z_2^*) = \Phi(Z_2^*)$$

where $v_2^* = v_2 / \sigma_2$, $\sigma_2^2 = \text{var}(u_{31} - u_{30} - u_{3c})$, $Z_2^* = (z_2' \alpha_2) / \sigma_2$. Φ is the standard normal distribution function because we assume that u_{31} , u_{30} and u_{3c} are normal distributed.

Then it follows analogously to equation (15)

$$(23) E(y_{31} | x_3, I_2 > 0) = x_3' \beta_{31} + \sigma_{v_2 u_{31}} (\lambda_2 | d_2 = 1)$$

$$(24) E(y_{30} | x_3, I_2 \leq 0) = x_3' \beta_{30} + \sigma_{v_2 u_{30}} (\lambda_2 | d_2 = 0).$$

As $(\lambda_2|d_2=1)=-\varphi(Z_2^*)/\Phi(Z_2^*)<0$ and $(\lambda_2|d_2=0)=\varphi(Z_2^*)/[1-\Phi(Z_2^*)]>0$, we should expect that $\delta_{21}=\sigma_{v_2u_31}<0$ and $\delta_{20}=\sigma_{v_2u_30}>0$, if employers decide under the QRENT criterion. The parameters δ_{21} and δ_{20} follow from the extended versions of (20) to avoid a sample selection bias

$$(25) \quad y_{3k} = x_3 \beta_{3k} + \delta_{2k} (\lambda_2 | d_2 = k) + u_{3k}^* = \mu_{3k} + \delta_{2k} (\lambda_2 | d_2 = k) + u_{3k}^*$$

where $k=0,1$. In practice, (25) has to be estimated by a two-step procedure. In the first step the arguments of conditional λ_2 variables (Z_2^*) will be determined via (12) and (14) by probit estimates. In the second step (25) can be estimated by OLS where λ_2 is substituted by $\hat{\lambda}_2$.

Not only the latent model of the COLLECT decision but also the WOCO decision has to be considered in model (25) as we have argued in model (18). The mean of the disturbance term in (25) is not zero if the WOCO decision is (partially) determined by variables which are also relevant for QRENT. Observed and unobserved determinants of wages are candidates. They have influence on both, QRENT - see (4) - and the worker's UTILITY - see (3). This means equation (25) has to be extended in the same way as (18).

We should also determine the wage (WAGE) and the productivity (PROD) function in this way, separately for COLLECT=1 and COLLECT=0. The arguments for the wage function follow directly. Also, productivity correlates positively with QRENT. Furthermore, productivity and worker's utility are connected. Consequence of increasing effort is higher productivity. And high effort may have two opposite effects on worker's utility. On the one hand, effort means usually disutility for the workers. On the other hand, effort can be compensated by higher wages and this effect enlarges the utility.

V. Empirical Results

Table 2 shows the percentage of establishments for each of the four industrial relations regimes analysed in our theoretical model. The sample makes obvious that all four situations are empirically relevant. Uni- and bivariate estimates of the WOCO and COLLECT decision function are presented in Table 3. The results are used to determine the artificial regressors λ_1 and λ_2 in (20). Except the coefficient for the proportion of women and that for the proportion of skilled blue-collar in the COLLECT function workers the uni- and bivariate estimates are altogether very similar. As the estimated correlation coefficient between the error terms in (11) and (12) is highly significant with $\rho=0.43$, we prefer the bivariate approach.

Table 4 presents the estimates of the effects of works councils and the coverage by collective agreements on wages and productivity for all establishments. In column [1] the WOCO effect on wages is positively significant.¹⁰ The significance holds also for heteroscedasticity-consistent estimates (White 1980) presented in brackets. In column [2], we consider possible correlations between unobserved determinants in (11) or (12) and (9). Correlations between the disturbance terms in (11) and (12) are allowed. Here, we find higher WOCO and lower COLLECT effects with larger t-statistics than in the case of uncorrelated error terms¹¹, while the absolute λ -effects are lower. As the t-values exceed those under (15) and the assumption that v_1 and v_2 are uncorrelated has to be rejected (see Table 3), we prefer approach (16). In both estimates the COLLECT effect on wages is insignificant. And we find the same for the productivity estimates – Table 4, column [3]. An exception is [4] where the COLLECT effect is

negatively significant. One explanation might be that collective bargaining imposes restrictions on the establishments' flexibility.

Tables 5 – 7 present separate estimates for establishments with and without coverage by a collective bargaining agreement ($\text{COLLECT}=1$ and $\text{COLLECT}=0$) for the wage (WAGE), productivity (PROD) and quasi-rent (QRENT) function.¹² A possible correlations between unobserved WOCO determinants and the disturbance term of those functions is taken into account by λ -WOCO. The sample selection bias induced by the COLLECT decision is corrected by λ -COLLECT.

We start with the discussion of the results in Table 5. Comparing [1] with [1a] and [2] with [2a], the most striking result is that the impact of works councils on wages is smaller in covered establishments than in uncovered establishments. This finding is in accordance with the hypothesis derived from the bargaining model.

Furthermore, the model predicts that the impact of works councils on productivity should be larger in covered establishments than in uncovered establishments. The estimates presented in Table 6 are in accordance with this prediction. In the benchmark model as well as in the extended model where correlated errors are taken into account the impact of works councils on productivity is larger for the establishments covered by collective bargaining agreements. Moreover, for the uncovered firms the effect of works councils on productivity is insignificant.

We also note that many of the other coefficients in both specifications differ between establishments with and without collective bargaining. The λ -WOCO and λ -COLLECT coefficients in Table 5 and 6 are all insignificant. Nevertheless, we should incorporate these correction variables. The comparison between column [1], [2] and [1a], [2a], respectively, in Table 5 and 6 show that the λ variables have an impact on the other coefficient estimates.

The major result of the QRENT estimates in Table 7 is that works councils have altogether no impact on the quasi rent of an establishment, neither for firms with collective bargaining nor for other firms. This result holds for all investigated specifications. But the WOCO coefficients are larger under collective bargaining. These results accord with our theoretical predictions in section III where we concluded that the presence of a works council may result in smaller or larger profits but that a positive influence on profitability is more likely in covered establishments. In the latter case, the outcome $\delta_{21} < 0$ and $\delta_{20} > 0$ – see equation (27) – speaks in favour of rational COLLECT decisions of the firms under the QRENT criterion. In sum, all these results provide evidence that we should estimate separately for COLLECT=1 and COLLECT=0. Our investigation shows the impact of works councils in a new, more differentiated light than up to now. The interaction with the bargaining situation cannot be neglected.

VI. Concluding Remarks

Previous economic studies had the focus either on centralised collective bargaining or on codetermination but not on the interaction effects between both components of the dual industrial relations system in Germany. The theoretical analysis and the empirical findings in this paper suggest that examining these interaction effects contributes substantially to our understanding of the impact of industrial relations on economic performance. There is an important indirect effect of centralised collective bargaining. Centralised collective bargaining reduces distributional conflicts on the establishment level. Our empirical results show that the impact of works councils on

wages is less strong in covered establishments compared to uncovered establishments. Moreover, our theoretical model predicts that productivity enhancing effects of works councils are more likely in covered establishments. We also found evidence for this hypothesis. This evidence is in accordance with our previous findings that there is a positive impact of councils on pay-for-performance schemes in covered but not in uncovered establishments (Heywood, Hübler and Jirjahn 1998; Heywood and Jirjahn 1999). However, examining the interactions effects of works councils with collective bargaining on other specific work practices such as innovations, training and the reorganisation of work stands as important future research now.

Notes

1. Bertrand (1999) presents empirical evidence that firms that are subject to more product market competition are more likely to renege on implicit risk sharing agreements with their employees.
2. See Levine and Tyson (1990) for a discussion of additional market failures in employee decision making participation.
3. For the United States Klein (1984) presents empirical evidence that supervisors fear the loss of status and power due to employee involvement programs.
4. Each wage group specifies a certain wage level. Therefore, a worker's remuneration depends on the assignment to a particular wage group. The assignment to a wage group usually is based on the difficulty of the job and on the required skills.
5. The WCA provides that expenses of the works council apparatus are borne by the employer. However, it is reasonable to assume that especially the informal costs are borne by the employees.
6. Models of bargaining over work practices and wages have also been used by Haskel (1991), Nickell, Wadhvani and Wall (1992), and Nickell and Nicolitsas (1997). However, these models do not consider the case that bargaining over particular work practices is only possible when there is some form of employee representation.
7. It is well known that the disagreement point in Nash's bargaining solution should be identified with the impasse point of Rubinstein's alternating-offers model (see Muthoo 1999). In this sense $\alpha F(N)$ is the employer's payoff obtained in case of perpetual disagreement.
8. Milgrom and Roberts (1992, p. 222) illustrate a similar interpretation of the worker's personal cost function: The incentive effects of a pay-for-performance scheme depend on the organisation of work. For a worker working under a fixed rate production line it is difficult or impossible to increase his own output in response to a piece-rate scheme. Consequently, workers are more willing to co-operate with introduction of a piece-rate scheme when they have some discretion about the pace of work.
9. Since wage negotiations between managers and councils usually are not authorised by law these negotiations may be characterised as informal.
10. As Addison, Siebert, Wagner and Wei (2000) have restricted their estimates also on middle size firms we have replicated this approach extended by the COLLECT effect. Quantitatively, the WOCO effect is a little bit larger than in Table 4, [1]. The COLLECT effect is smaller and has the expected sign in both estimates but the impact is insignificant. The estimates of the other coefficients as well as those where a random effects estimator is used differ only slightly from Table 4, [1]. The latter specification does not incorporate industries dummies because otherwise the estimator does not converge and a comparison with fixed effects estimators is difficult. As the industry effect cannot be neglected, in the following we focus our investigations on pooled data with all establishments but without specific panel estimates.
11. The latter estimates are not presented in the Tables.

12. As the German government plans to strengthen the participatory rights of councils in smaller establishments separate estimates for firm size classes would be interesting. However, our sample is too small to obtain valid results.

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Appendix: Figures and Tables

FIGURE 1: Game tree

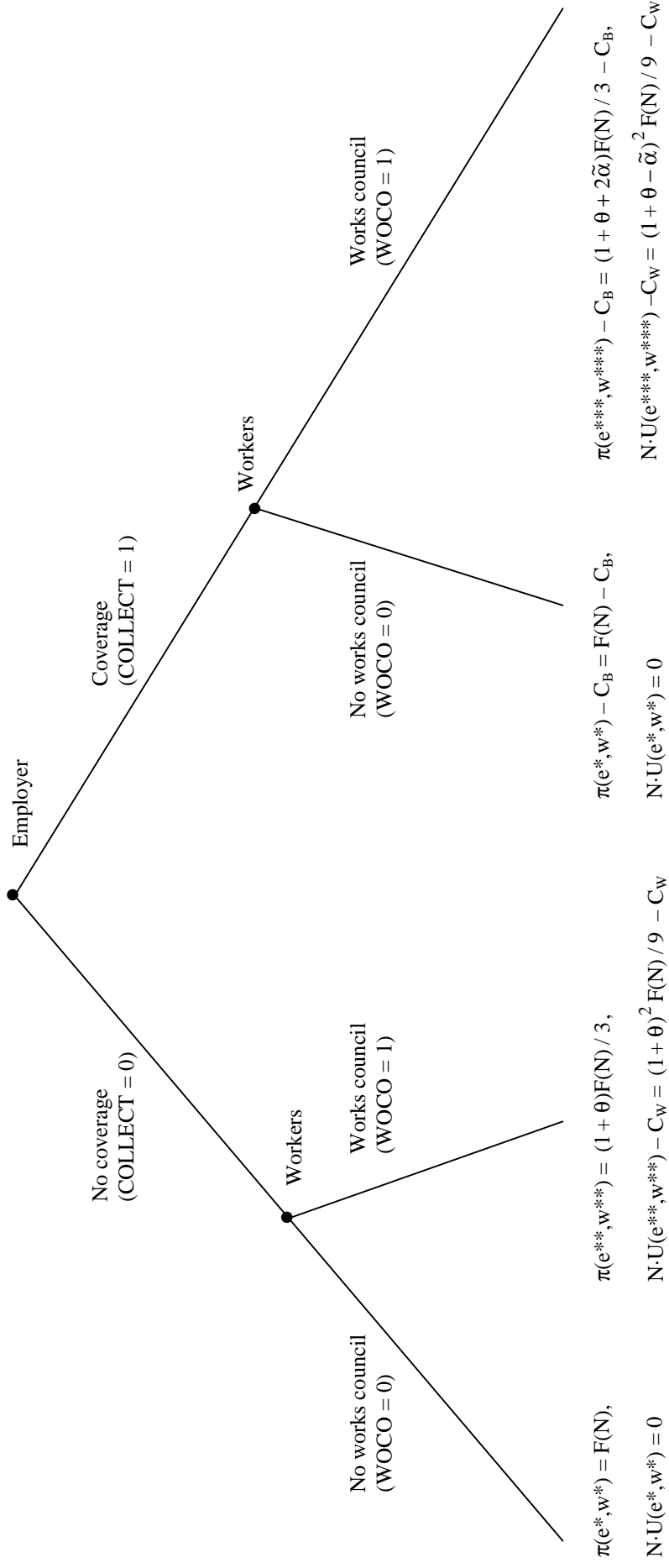


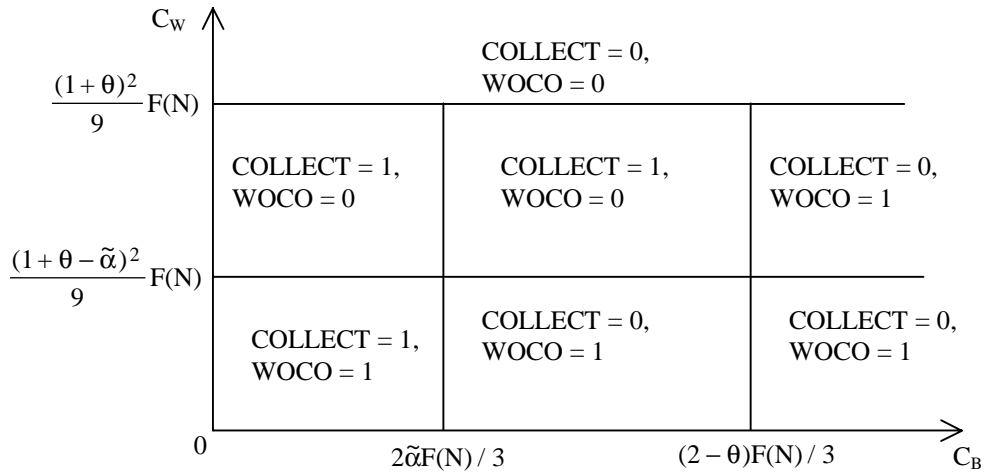
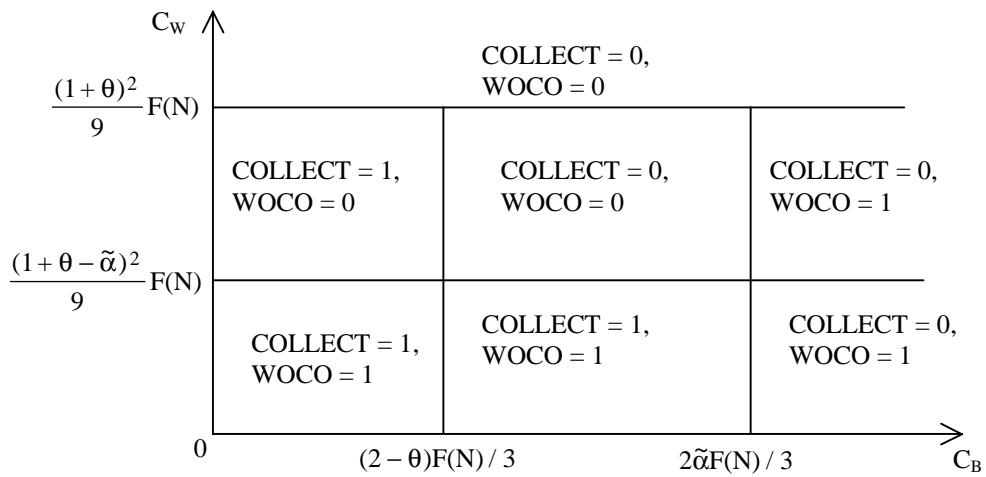
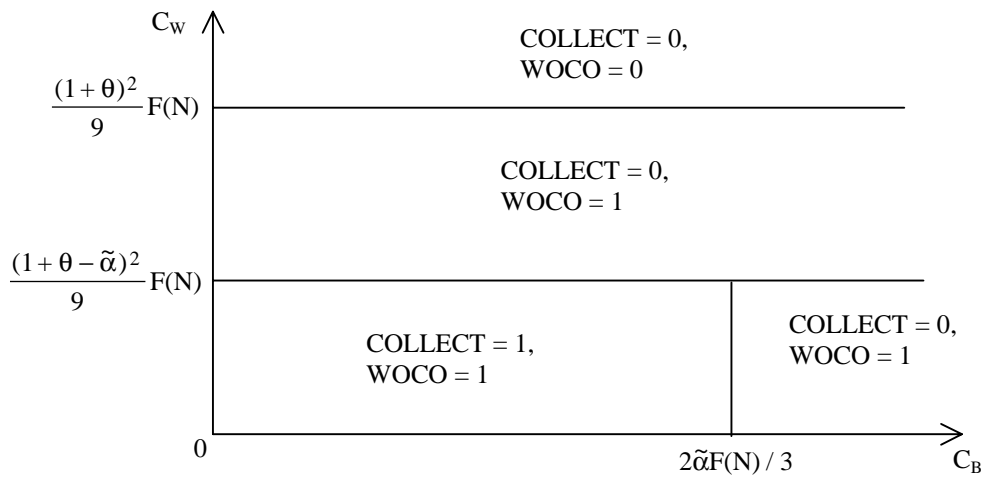
Figure 2.a: $0 < \theta < 2 \cdot (1 - \tilde{\alpha})$ **Figure 2.b:** $2 \cdot (1 - \tilde{\alpha}) < \theta < 2$ **Figure 2.c:** $2 \leq \theta$ 

TABLE 1: Subgame-perfect equilibrium, wage rate, productivity and profitability per head

| Strategy pair | Conditions for a subgame-perfect equilibrium | Wage rate W | Productivity (1+e)F(N)/N | Profitability per head [(1+e)F(N)-wN]/N |
|----------------------|--|---|---|--|
| COLLECT=0, WOCO=0 | $C_B > 0,$ $C_W > (1 + \theta)^2 F(N) / 9$ | 0 | $F(N)/N$ | $F(N)/N$ |
| COLLECT=0, WOCO=1 | $C_B > 2\tilde{\alpha}F(N)/3,$ $C_W < (1 + \theta - \tilde{\alpha})^2 F(N) / 9$ or $C_B > (2 - \theta)F(N) / 3,$ $(1 + \theta)^2 F(N) / 9 > C_W >$ $(1 + \theta - \tilde{\alpha})^2 F(N) / 9$ | $(1 + \theta) \frac{F(N)}{3N}$ | $(1 + \theta) \frac{2F(N)}{3N}$ | $(1 + \theta) \frac{F(N)}{3N}$ |
| COLLECT=1, WOCO=0 | $C_B < (2 - \theta)F(N) / 3,$ $(1 + \theta)^2 F(N) / 9 > C_W >$ $(1 + \theta - \tilde{\alpha})^2 F(N) / 9$ | 0 | $F(N)/N$ | $F(N)/N$ |
| COLLECT=1, WOCO=1 | $C_B < 2\tilde{\alpha}F(N),$ $C_W < (1 + \theta - \tilde{\alpha})^2 F(N) / 9$ | $(1 + \theta - \tilde{\alpha}) \frac{F(N)}{3N}$ | $(1 + \theta + 0.5\tilde{\alpha}) \frac{2F(N)}{3N}$ | $(1 + \theta + 2\tilde{\alpha}) \frac{F(N)}{3N}$ |

TABLE 2: Empirical distribution of establishments across industrial relations regimes
(Percent of establishments)

| | <i>COLLECT = 1</i> | <i>COLLECT = 0</i> |
|----------|--------------------|--------------------|
| WOCO = 1 | 47.6 | 10.6 |
| WOCO = 0 | 18.4 | 23.4 |

TABLE 3: Probit ML estimates of works councils and coverage by collective bargaining agreement, absolute t statistics in parentheses

| <i>Variable</i> | <i>WOCO</i> | | <i>COLLECT</i> | |
|---|--------------------------|-------------------------|--------------------------|-------------------------|
| | <i>Univariate</i> [1] | <i>Bivariate</i> [2] | <i>Univariate</i> [3] | <i>Bivariate</i> [4] |
| Constant | -1.7436(7.12) | -1.7242(6.15) | 0.1406(0.65) | 0.1034(0.47) |
| Firm size (number of employees) | 0.0104(12.96) | 0.0104(21.32) | 0.0031(6.74) | 0.0032(6.85) |
| Firm created before 1960 | 0.6164(6.08) | 0.5902(5.35) | 0.6504(7.49) | 0.6634(7.40) |
| Single firm (no subsidiaries) | -0.6344(4.87) | -0.6041(4.14) | -0.2595(2.77) | -0.2511(2.62) |
| Wages above industry agreement | 0.2494(2.41) | 0.2460(2.17) | 0.3619(4.05) | 0.3648(3.93) |
| Use of piece rates | 0.6901(4.59) | 0.6858(4.30) | 0.2925(2.40) | 0.2932(2.42) |
| Proportion of women | -0.8745(2.98) | -0.8265(2.45) | -0.6386(2.68) | -0.6610(2.49) |
| Flexible working time arrangements | 0.2188(2.20) | 0.2240(2.14) | | |
| Use of newest production technology | -0.3726(3.63) | -0.3701(3.34) | -0.2200(2.44) | -0.2170(2.29) |
| Team work for blue collar workers | -0.2781(2.92) | -0.2589(2.53) | | |
| Proportion of skilled blue collar workers | | | 0.3838(2.06) | 0.4543(2.47) |
| Employer provided further training | 0.3424(3.42) | 0.3307(3.22) | | |
| Proportion of part-time workers | -1.6694(3.34) | -1.6342(3.10) | | |
| 15 Industry dummies | | + | + | + |
| ρ | | 0.4351(7.75) | | |
| χ^2 | 734 | | 261 | |
| Log-likelihood | -585 | -1051 | -614 | |
| N | 1276 | 1258 | 1276 | 1258 |

TABLE 4: Wage and productivity estimates with respect to works councils and coverage by collective bargaining agreement effects in all establishments, absolute t statistics in parentheses, heteroscedastic-consistent estimates in brackets

| | <i>WAGE</i> | | <i>PROD</i> | |
|--|-------------------------|--------------------------|--------------------------|---------------------------|
| | <i>[1]</i> | <i>[2]</i> | <i>[3]</i> | <i>[4]</i> |
| Works council (WOCO) | 4.1439 (3.36) [2.10] | 4.3961 (2.63) [1.60] | 15.6197 (2.65) [2.50] | 23.0383 (2.61) [2.68] |
| Coverage by a collective agreement (COLLECT) | 1.3108 (1.15) [1.00] | 1.3808 (0.63) [0.72] | -8.4982 (1.45) [1.42] | -35.2500 (3.06) [2.81] |
| λ -WOCO | | -0.2276 (0.25) [0.27] | | -4.6825 (0.84) [1.00] |
| λ -COLLECT | | -0.4797 (0.42) [0.45] | | 10.0413 (1.69) [1.90] |
| R ² | 0.288 | 0.288 | 0.255 | 0.283 |
| N | 910 | 910 | 816 | 732 |

Control variables: All variables listed in Table 5 are included in the wage regression. All variables listed in Table 6 are included in the productivity regression.

TABLE 5: Wage estimates with respect to works councils in firms with and without coverage by collective bargaining agreements, absolute t statistic in parentheses, heteroscedastic-consistent estimates in brackets

| | <i>COLLECT=1</i> | | <i>COLLECT=0</i> | |
|-------------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | [1] | [2] | [1a] | [2a] |
| Constant | 48.9933 (5.55) [6.07] | 48.8906 (5.37) [6.01] | 44.2142 (3.95) [4.08] | 36.6803 (2.42) [2.51] |
| Firm size (number of employees) | 0.0021 (1.19) [2.00] | 0.0021 (0.76) [1.14] | -0.0071 (0.49) [0.63] | -0.0122 (0.63) [0.88] |
| Single firm (no subsidiaries) | -3.3746 (1.86) [2.26] | -3.1644 (1.63) [1.97] | -2.7209 (1.31) [1.42] | -1.6615 (0.54) [0.67] |
| Use of newest production technology | 1.5604 (1.15) [1.22] | 1.2800 (0.92) [0.91] | 2.1775 (1.29) [1.36] | 3.4325 (1.52) [1.64] |
| Proportion of women | -19.7172 (5.03) [6.81] | -19.7496 (4.86) [6.31] | -21.9068 (4.69) [4.94] | -20.4599 (3.12) [3.52] |
| Team work for blue collar workers | -1.1661 (0.92) [0.87] | -1.0172 (0.77) [0.76] | -1.9409 (1.22) [1.32] | -2.2340 (1.09) [1.23] |
| Tenure of the work force | 0.0745 (2.66) [2.09] | 0.0755 (2.64) [1.99] | -0.0326 (0.93) [0.97] | -0.0987 (2.13) [2.20] |
| Proportion of part-time workers | -14.1879 (1.81) [2.43] | -13.4781 (1.61) [2.18] | -20.7583 (3.10) [2.86] | -15.4382 (1.71) [1.62] |
| Overtime hours | 0.5917 (1.76) [1.81] | 0.5610 (1.62) [1.66] | 0.7711 (2.32) [2.59] | 0.5246 (1.05) [1.28] |
| Shiftwork | 6.2139 (4.17) [3.15] | 5.8048 (3.56) [2.46] | 2.3687 (1.18) [1.39] | 0.2984 (0.11) [0.15] |
| Proportion of university graduates | 12.5120 (0.81) [1.00] | 16.2128 (1.00) [1.31] | 30.0091 (1.97) [1.61] | -4.6444 (0.23) [0.26] |
| Time dummy 1996 | 1.7745 (1.43) [1.42] | 1.6708 (1.31) [1.26] | -0.4791 (0.31) [0.33] | 0.9655 (0.46) [0.51] |
| Works council (WOCO) | 3.9894 (2.39) [1.31] | 5.8530 (2.00) [1.47] | 5.8970 (2.86) [2.83] | 7.2398 (2.52) [2.84] |
| λ -WOCO | | -1.6627 (0.90) [1.04] | | 0.3266 (0.23) [0.27] |
| λ -COLLECT | | 1.3895 (0.60) [0.50] | | 0.0937 (0.05) [0.06] |
| 15 industry dummies | + | + | + | + |
| R ² | 0.325 | 0.324 | 0.321 | 0.301 |
| N | 682 | 663 | 359 | 247 |

TABLE 6: Productivity estimates with respect to works councils in firms with and without coverage by collective bargaining agreements, absolute t statistics in parentheses, heteroscedastic-consistent estimates in brackets

| | <i>COLLECT=1</i> | | <i>COLLECT=0</i> | |
|-------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| | [1] | [2] | [1a] | [2a] |
| Constant | 168.0142 (7.56) [7.17] | 163.4020 (7.44) [6.74] | 223.5868 (6.65) [6.23] | 239.5144 (4.76) [4.76] |
| Firm size (number of employees) | 0.0045 (0.97) [1.74] | 0.0024 (0.55) [1.27] | 0.1508 (2.21) [1.19] | 0.2070 (2.38) [1.16] |
| Firm created before 1960 | -10.4713 (1.48) [1.09] | -2.9556 (0.37) [0.28] | -19.3712 (2.01) [2.16] | -9.3392 (0.73) [0.85] |
| Single firm (no subsidiaries) | -4.7430 (0.76) [0.71] | -7.3937 (1.17) [1.05] | -16.0460 (1.49) [1.56] | -19.9792 (1.57) [1.59] |
| Limited company (legal form) | 10.3839 (1.60) [1.48] | 10.4852 (1.69) [1.52] | 9.4716 (0.88) [0.99] | 17.5947 (1.38) [1.36] |
| Use of newest production technology | 23.7848 (3.78) [3.71] | 21.3918 (3.53) [3.54] | 28.5686 (2.94) [3.27] | 32.8590 (2.79) [2.78] |
| Market share of the firm | 0.5005 (3.14) [2.83] | 0.4756 (3.14) [2.71] | 0.0061 (0.02) [0.03] | -0.4452 (1.41) [1.56] |
| Proportion of women | -67.5055 (3.67) [3.91] | -67.6881 (3.81) [4.18] | -6.0548 (0.21) [0.21] | -34.6184 (1.02) [0.95] |
| Team work for blue collar workers | -8.1836 (1.31) [1.39] | -6.6949 (1.12) [1.18] | -21.3465 (2.33) [2.45] | -11.2683 (1.05) [1.24] |
| Proportion of part-time workers | -34.2368 (0.90) [1.06] | -30.3267 (0.83) [0.95] | -116.5645 (2.75) [3.01] | -81.2745 (1.76) [2.04] |
| Proportion of university graduates | 105.9964 (1.47) [1.66] | 88.7520 (1.29) [1.39] | 115.2669 (1.46) [1.34] | 159.8195 (1.48) [1.55] |
| Proportion of blue collar workers | -12.5543 (0.55) [0.53] | -26.8247 (1.24) [1.21] | -65.5652 (2.29) [2.23] | -67.4491 (1.82) [1.88] |
| Proportion of apprentices | -231.4640 (3.76) [4.72] | -240.7144 (4.13) [4.72] | -192.6515 (2.53) [3.43] | -186.7010 (2.02) [2.55] |
| Profit sharing for employees | -2.1179 (0.26) [0.30] | 2.8917 (0.37) [0.43] | 33.4227 (2.84) [3.04] | 33.6692 (2.57) [3.04] |
| Time dummy 1996 | 13.2468 (2.21) [2.27] | 11.2035 (1.97) [2.02] | 1.0359 (0.11) [0.12] | 5.5428 (0.49) [0.55] |
| Works council (WOCO) | 20.3769 (2.55) [2.51] | 27.6394 (2.49) [2.66] | 12.3770 (1.03) [0.87] | 5.8622 (0.29) [0.26] |
| λ -WOCO | | -8.3151 (1.17) [1.52] | | 0.0787 (0.01) [0.01] |
| λ -COLLECT | | 3.7280 (0.31) [0.44] | | 10.3473 (0.86) [1.02] |
| 15 industry dummies | + | + | + | + |
| R ² | 0.258 | 0.273 | 0.385 | 0.486 |
| N | 566 | 555 | 258 | 177 |

TABLE 7: Quasi-rent estimates with respect to works councils in firms with and without coverage by collective bargaining agreement, absolute t statistics in parentheses, heteroscedastic-consistent estimates in brackets

| | <i>COLLECT=1</i> | | <i>COLLECT=0</i> | |
|----------------------|--------------------------|--------------------------|-------------------------|--------------------------|
| | [1] | [2] | [1a] | [2a] |
| Works council (WOCO) | 10.2706 (1.28) [1.26] | 15.7507 (1.40) [1.51] | 4.5160 (0.39) [0.31] | -0.8770 (0.04) [0.04] |
| λ -WOCO | | -6.68 (0.94) [1.28] | | -4.2923 (0.36) [0.41] |
| λ -COLLECT | | 3.7495 (0.31) [0.44] | | 7.0068 (0.60) [0.70] |
| R ² | 0.221 | 0.228 | 0.386 | 0.518 |
| N | 503 | 490 | 211 | 130 |

Control variables: All variables listed in Table 6 are included.

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