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No.500

WARWICK ECONOMIC RESEARCH PAPERS

THE UNIVERSITY OF WARWICK

DEPARTMENT OF ECONOMICS

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No.499

January 1998

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Abstract

We exploit rare information on the union status of both individual employees and of their workplaces to address two related issues. First, we find a positive effect of workplace trade union density on the level of the individual's pay. Second, we find that the individual's union membership status loses its significance when we control for establishment-level union density. The union wage effect is therefore a pure public good, with individual membership conveying a positive wage externality.

JEL Class. No: J5, J3.

The authors are grateful for helpful comments on previous versions of the paper from Mark Stewart and Sverre Kittelsen.

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1. Introduction

In this paper, we exploit a matched employee-employer dataset for Norway to address two related questions concerning the effects of trade unions on bargained wages. First, we consider how the level of trade union density at the workplace affects the individual's level of pay. We are able to control for both workplace and individual worker characteristics.[1] Second, we examine how the inclusion of establishment-level union density affects the estimate of any individual union membership wage premium. This acts as a test of the hypothesis that the estimated wage premium accruing to union members, generally found in studies using data at the individual-level only, arises from omitted establishment-level variables which are correlated with individual membership, such as establishment-level density.

In the union sector, the bargained wage potentially has the characteristics of a collectively provided good. Accordingly, an individual worker's wage level is likely to be affected by the extent of any union influence over wages at the individual's workplace. Establishment-level union density is potentially an important determinant of local union influence. We present a theoretical motivation where the union density effect on wages appears because collective membership determines the ability of workers to inflict loss on the firm during industrial action. If the local membership density affects the wages of all workers in an establishment, this implies that the individual's membership decision is characterised by a wage externality as well as by the well-known free-rider problem.

Previous studies using individual-level data typically rely on industry-level data as the best proxy for the extent of union presence. Thus, for example, Green (1988) finds for the UK that industry unionisation affects the union wage premium. For the US,

[1] The data provide very rare information both on workplace union density and on the worker's personal attributes, including individual membership status. Green (1988) uses a matched dataset for the UK which has information on union density, but only at the industry-level. His information set on establishment-level bargaining includes only the recognition status of any workplace union, not the level of membership density. For the UK, individual-level micro-data sources on earnings/wages (BSAS, GHS, BHPS and LFS) typically do provide information on both coverage and recognition status for individual workers. In addition, the NES has information on coverage by major agreements, though individual wage data are not in the public domain. From establishment-level sources, such as WIRS, one can obtain information on plant-level density, but not individual wages or personal characteristics. Currently, there is no UK data which provide information both on the individual's wage and membership status and contains information on the level of union density at the individual's workplace. The forthcoming WIRS 1997 will alter this and offer the possibility of a comparison with our results.

Hirsh and Neufeld (1987) also find that industry union density has an important role in wage-setting. Similarly, Curme and MacPherson (1991) using the Current Population Survey, find that regional union density positively affects union, as well as non-union wages.

Plant-level union density effects have been studied in the UK only on data which are exclusively establishment-level. Metcalf and Stewart (1992), for example, use 1984 Workplace Industrial Relations Study (WIRS) data and find that, in the absence of a closed shop, unions are able to establish a pay premium over nonunion workplaces only when union density is at least 95 per cent. Booth and Chatterji (1995), using 1990 WIRS data, report a continuous density effect: they estimate that a 1 per cent increase in union density at the establishment causes manual wages to increase by 0.12. Lucifora and Corneo (1994) and Reilly (1991) find significant density effects in Italy and Canada, respectively. Studies which are exclusively establishment-based typically control only for a limited number of average workforce characteristics. Thus, data which are either exclusively individual-level or wholly establishment-level present natural difficulties when trying to estimate the effects of establishment-level union density on wages.

In the current paper, we are able to exploit a matched employer-employee dataset which provides information not merely on union recognition/coverage or on industry density, but on union density at the establishment itself, with controls for the effects of personal characteristics on the individual's wage. The advantage of our matched dataset is that it provides a richer and more precise set of controls for personal characteristics when estimating wage effects of workplace union membership density. This is important as membership density is likely to be correlated with a wide variety of worker characteristics.

Our data also offer an opportunity to investigate the commonly-estimated wage premium associated with individual union membership, see e.g. Blanchflower (1996). The wage effect of union status of the individual is open to a number of interpretations. First, notwithstanding the public good nature of the union wage, it might be that, on average, union members are favoured *vis-a-vis* non-members with respect to promotion or allocation to higher-paying positions. Controls for observable personal characteristics such as seniority and human capital attributes are unlikely to account fully for such differences.

A second interpretation of the individual membership premium is that union status is correlated with unobserved personal characteristics which also affect the wage, see e.g. Lewis (1986). As the membership decision is far from random, there may exist important unobserved wage-explanatory variables which also influence individuals' decisions to become union members. Much of the analysis of union membership wage effects, especially for the US (see, for example, Robinson (1989)), has concentrated on identifying as full a set of controls as possible and on developing techniques to reduce the bias induced by selectivity.

A third interpretation of the individual membership wage premium is that it arises from the omission of *workplace characteristics* not precisely observed in individual-level data. Surprisingly little attention has been paid to this possibility. Yet there is a strong argument that, in the presence of bargaining, a worker's wage is likely to depend more on the characteristics of the workgroup and of the workplace than of the individual him or herself. This relates to the discussion in the previous sub-section of the paper. Given that the bargained wage is a collectively-provided good, paid to members and non-members alike, one would expect that the individual's union status is likely to be less important than the workers'collective (union) bargaining power as a determinant of the individual's wage level.

In the current paper, we are able to estimate union membership wage effects using individual-level data on employees and then examine what happens to the estimated effects as we introduce successively more information on the characteristics of the individual's workplace. This has been done previously by Green (1988) for the UK, but without the benefit of information on the level of union density in the establishment which, we argue, is likely to be an important determinant of the bargained wage.[2] Green uses individual-level data which contains information on whether a union is recognised at the individual's place of work. He finds that including this information reduces the size of the estimated individual membership effect, but that it is still statistically significant. Green also finds that the membership wage gap decreases monotonically with union density of the industry, but again remains positive and statistically significant. As Green observes, it is likely that industry-level union density does not provide sufficiently disaggregated information on the extent of establishment-level

[2] The evidence for the UK is that mere recognition is not sufficient for establishment-level unions to be able to obtain a statistically significant wage mark-up, see Stewart (1987).

union bargaining power. This is the information we are able to exploit for the case of Norway. The next WIRS (UK) will contain matched employer-employee data and it will be interesting to be able to compare results from new UK data with our findings.

The rest of this paper is organised as follows. In Section 2 we present the theoretical motivation which underlies our empirical analysis of the union density effect on wages. In Section 3 we offer a brief description of the wage setting institutions in Norway and the relevance of studying union wage effects by means of Norwegian data. This section also contains a description of our data. In Section 4 we present the results concerning the effect of establishment-level density on wages. We find that the level of union density at the establishment is a significant determinant of the wage in private sector establishments. In Section 5, we establish the result that there is an individual membership effect only when controls for establishment-level union density are excluded. This implies that, for Norway, the union wage effect is a pure public good within the establishment. Section 6 closes the paper with conclusions and further remarks.

2 Theoretical motivation

Our focus is the effect of union membership on the wage which workers obtain in establishment-level bargaining. Previous literature has offered alternative explanations. One class of models, deriving from Grossman (1983), predicts that the union's chosen wage will be decreasing in membership as, under a member-biased firing rule, the median member will be more vulnerable to wage-induced redundancy as membership grows. In contrast, our model predicts a positive relationship between density and wages. A positively-sloped wage-density curve is also predicted in Booth and Chatterji (1995). In that model, as density rises the median union member places a lower value on a union-provided private good. As the utility associated with this good is conditional on the member's employment status, the lower valuation is associated with a higher relative preference for wages in the union's utility function. Hence, the union's preferred wage is increasing in membership density. This section presents an alternative micro-foundation for this relation, based on the idea that union density affects the bargaining power of the workers rather than union preferences.

The essential mechanism of our model is that a higher union density, defined as the fraction of the workforce organised, renders an industrial action more effective. Greater membership means that more workers are likely to take part in actions which reduce the firm's payoff during a conflict. The theoretical framework is a standard Nash bargaining model where the disagreement payoffs reflect the parties' payoffs during a conflict, see Binmore et al. (1986). The model is based on the idea that production occurs under the terms of the existing contract when wage bargaining takes place at the establishment level, recently referred to as *holdout* bargaining (see, for example, Cramton and Tracy (1992)). Typically, these bargaining models predict that the outcome will be equal to the old going wage, adjusted for the costs the parties may inflict upon each other during a conflict. If a conflict is more costly to the firm than to workers, the bargaining will raise the nominal wage (see Holden (1994), for example).

It is a common assumption in wage bargaining models that all workers participate if an industrial action takes place. Implicitly or otherwise, the standard models assume a closed shop trade union. In the case of an open shop union with less than complete membership a certain level of union density may be necessary to inflict

sufficient loss on the employers and, moreover, the magnitude of the firm's revenue loss may depend on the extent of union membership.[3]

The wage, W, is the maximum of the going, predetermined wage determined by negotiations at the central level and previous bargaining in the firm, W_0, and the outcome of the local bargaining, W_B;

(1) $W = max[W_0, W_B]$

The outcome of the local bargaining is given by

(2) $W_B = \arg\max_W (W-\omega)^{1-\beta}(\Pi-\pi)^{\beta} = \beta\frac{f(L)}{L} + (1-\beta)\omega - \beta\frac{\pi}{L}$

The outcome of this Nash bargain, W_B, depends on profit after the contract is signed (Π) and the parties' disagreement payoffs (ω and π), as well as on the bargaining power parameter, β. Profit is given by revenue (f) minus labour costs (WL), $\Pi = f(L) - WL$. Our focus is on how union density affects the wage through the conflict payoffs, where work-to-rule practices represent the credible threat which the union can use in the local wage dispute. The union cares about the income of each single member and this is primarily determined by the central agreement and previous bargaining outcomes. However, a conflict will reduce the wage below the going predetermined wage, W_0. Even if the action does not involve any go-slow with reduction in pay, workers are likely to lose bonuses, overtime premia etc. Therefore, $\omega = \sigma W_0$, with $0 < \sigma < 1$.

A conflict means that a fraction, λ, of the predetermined workforce, L_0, participates and reduces effort. The "conflict participation rate", λ, is assumed to be non-decreasing in union density (μ);

(3) $\lambda = \lambda(\mu), \ \lambda' \geq 0 \ and \ 0 \leq \lambda \leq 1.$

The predetermined workforce is split between conflict labour, $L^c = \lambda L_0$, and non-conflict labour, $L^{nc} = (1-\lambda) L_0$. The size of the conflict labour force influences the firm's profit during a conflict. By inserting the expressions for ω and λ into the firm's conflict revenue function, $F(L^c, L^{nc})$, and assuming that conflict-breakers are paid the full going wage, the bargained wage can be written as

[3] In this theoretical discussion we focus in the effect of density on wages, taking the density level as given. Other papers have considered the simultaneous determination of wages and density, see Booth and Chatterji (1995) and Naylor and Raaum (1993).

(4)

$$W_B = \beta\frac{f(L)}{L} + (1-\beta)\sigma W_0 - \beta\frac{F[\lambda(\mu)L_0,(1-\lambda(\mu))L_0] - W_0 L_0 + (1-\sigma)\lambda(\mu)W_0 L_0}{L}$$

Employment is assumed to be determined unilaterally by the firm after the wage is fixed,

(5) $f'(L) = W_B$

The wage-employment outcome is then determined by (4) and (5), for given values of L_0, W_0 and μ.

The impact of higher union density on wages is, for given L, L_0 and W_0, given by

(6) $$\frac{\partial W_B}{\partial \mu} = \frac{\partial \lambda}{\partial \mu}\frac{\partial W_B}{\partial \lambda} = \frac{\partial \lambda}{\partial \mu}\frac{\beta L_0}{L}\left[F_{nc} - F_c - (1-\sigma)W_0\right]$$

Thus, the density effect on the wage is related to

(i) the *participation effect* ($\partial\lambda/\partial\mu$), i.e. to what extent union density causes a higher fraction of the workforce to take part in an action,

(ii) the *revenue loss*, F_{nc} - F_c , i.e. the impact of an extra worker joining the action and

(iii) the *wage loss to workers* during a conflict, $(1-\sigma)W_0$.

The wage is increasing in μ if the conflict profit is decreasing in union density, provided that membership affects the propensity to participate in an industrial action. Conflict profit declines if an action is more harmful to the firm than to the workers (i.e. F_{nc} - F_c > $(1-\sigma)W_0$). Assuming that the two kinds of labour are perfect substitutes and conflict labour reduces effort (θ) below the normal level (at which θ=1), we find that the marginal effect on the conflict profit, say A, is positive under reasonable assumptions; A= $(F_{nc} - F_c) - (1-\sigma)W_0 = (1-\theta)F'(\theta L^c + L^{nc}) - (1-\sigma)W_0$. The theory predicts that any wage increments which workers obtain in the local bargain will depend on union density, provided that the outcome of the bargain exceeds the going wage, W_0. Thus, we may expect that unions with low membership do not possess the power to obtain a local mark-up on the pre-determined or centrally determined wage.

3 Wage formation in Norway and the relevance of Norwegian data when estimating wage effects of union membership

Cross-country studies typically classify Norway among the most co-ordinated and centralised of developed economies, see Table 1 based on OECD (1997).

Table 1. Trade union density, bargaining coverage, centralisation and co-ordination. Norway's position in a ranking of 19 OECD countries. Source: OECD 1997 Employment Outlook.

Year	Union density	Bargaining coverage	Centralisation	Co-ordination
Norway				
1980	5 (57%)	11 (75%)	8 [2]	4 [2.5]
1984	4 (56%)	11 (75%)	1 [2+]	4 [2.5]
1994	4 (58%)	11 (74%)	1 [2+]	4 [2.5]
Average (un-weighted) 19 OECD countries				
1980	46%	72%		
1984	40%	70%		
1994	40%	68%		

Note: For union density and coverage, percentage of the employed in brackets. For centralisation and co-ordination, numbers in brackets indicate a value on a cardinal scale from 1 (centralised/highly co-ordinated) to 3 (decentralised/no co-ordination).

Consequently, one might argue that firm-specific factors, like establishment union density, should have negligible effects on wages. Empirical studies on the effects of insider forces shows that such firm- or industry-specific factors are (as expected) less important than in other countries, see Holmlund and Zetterberg (1991), Wulfsberg (1997), Johansen (1996), Dyrstad and Johansen (1996). Although Norwegian studies typically find a low weight for insider forces, firm-, industry- and region-specific factors *do* affect wages. Norway has a more compressed wage structure than countries like the US and UK, but the industry wage premia are highly correlated with that of other countries (Zweimuller and Barth, 1994). This indicates that the mechanisms behind these differentials are similar regardless of bargaining regime. Also, Albæk et al (1997) report employer size-wage effects for Norway of a magnitude similar to that of the US and UK.

A closer look at the Norwegian wage bargaining institutions may explain why firm-specific factors influence individual wages. First, union membership is far from universal. For several years, union density has been stable at just under 60 per cent, which is above the un-weighted OECD-average, but far below the figures of the other Nordic countries where membership is linked to unemployment insurance eligibility.

Secondly, collective agreement coverage is *not* particularly high by OECD standards, indicating that wage determinants at the local level might play a role. Thirdly, wage bargaining in the Norwegian private sector typically takes place at two levels. An annual collective agreement between a union and an employers' association is signed at the central level. This central bargain is highly co-ordinated across industries covered by the LO confederation of unions and typically involves a fixed wage increment for all workers of a specific category[4]. In the private non-service sector, the majority of workers have a right to negotiate additional local wage increments at the firm or establishment level. During the 60s, 70s and early 80s, this local wage bargaining, or 'wage drift', became increasingly important. Wage drift constituted more than half of the wage increments paid to workers under LO coverage in that period, see Rødseth and Holden (1990).

Local wage bargaining takes place within the contract period during which strikes and lockouts are prohibited. Illegal strikes occur only rarely. However, a variety of actions or threats which reduce productivity are available to the union, see Moene and Seierstad (1990). Go-slow, work-to-rule practices and overtime bans are commonly considered as credible threats in local wage bargaining.[5]

Trade union density, collective bargaining coverage and the widespread existence of local bargaining indicate that Norway is *not* an extreme country as far as wage setting institutions are concerned. To the extent that Norway, nevertheless, has a relatively centralised bargaining system our data provide a strong test of the hypothesis that local bargaining conditions, such as union density, influence wages.

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[4] LO consists of craft and industry unions and is the dominant labour organisation, organising practically all blue-collar union members in the private non-service sector. The unions outside LO are mainly professional, organised 23 per cent of all employees in 1985 and have tended to join one of the two confederations outside LO, called AF and YS.

[5] In our data, 63 per cent of managers reported that the most likely reaction to an unacceptable wage offer would be a go-slow, work-to-rule or overtime ban as against 21 per cent who indicated that they would expect strike action. Information on *actual* conflicts in 1985-89 also reveal that in establishments with local bargaining go-slow, work-to-rule practices and overtime bans are more common than strikes/lockouts. In some sectors, the central agreements even acknowledge the workers' right to go slow, with a proportional reduction in pay, during a conflict. Even if such a formal right does not exist, lower effort can be implemented by the union without giving the firm any evidence of "sabotage" in court. The strict regulations of the working environment also give a local union an opportunity to organise effective work-to-rule practices *if* it has sufficient backing from the workforce.

The data are taken from the 1989 Norwegian Survey of Organizations and Employees (NSOE), see appendix for more details. The sample is restricted to employees *in private sector establishments with collective agreements* to be consistent with our theoretical framework. To be precise, employees in establishments where the personnel manager said that, "Wages are completely or partly determined by collective agreements" are included. With these restrictions, 1,237 employees from 305 establishments are left in our sample.[6] We have also excluded the employees in the highest ranked occupational group as these typically are professionals or a part of the management or leadership of the establishment.

The data contain standard human capital variables, occupational status and job characteristics to account for working conditions. The wage variable is constructed from self-reported wage per hour information.

Turning to the union variables, information on union membership is provided by the employee. Union density measures the total number of union members, per employee in the establishment, and this information is provided by the personnel manager. In each establishment we know the number of union members in each of the three major national confederations of unions. Usually, these three groups of unions bargain separately, and to be consistent with the theoretical model they should be treated separately. However, the wage settlements for the dominating group almost always act as the key bargain, having a major influence on the other workplace negotiations.

Other establishment variables used are the total number of employees (size) and industry dummies[7]. In order to control for differences in regional labour markets, a local unemployment rate is included. According to the wage curve literature, the regional unemployment rate is supposed to measure the employment opportunities of labour force participants. Our measure builds on the registered unemployment rate of the municipality in which the individual lives, defined as the percent of the municipality population aged 16-64 registered as full-time unemployed by the local employment service. As Norway is divided into 435 municipalities, we consider the municipality rate to be an imprecise measure, neglecting the fact that many employees travel to

[6] Individuals with missing values on personal characteristics are left out. So are those working in firms where no information on wage bargaining or coverage is available.

[7] Industry dummies are at the 2 digit ISIC level.

work outside their home municipality. Therefore, the regional unemployment rate attributed to individuals living in municipality i, u_i, is constructed by a weighting procedure which adjusts for commuting across municipalities;

$$u_i = \sum_j e_{ij} u_j$$

where e_{ij} is the share of the employees working in municipality i who live in municipality j.[8]

4 Union density and wages

The union density effect is studied by means of a standard wage equation and the first column of Table 2 shows results from the OLS regression with the individual (log) hourly wage as the dependent variable. Union density enters directly, implying that the wage effect of a one percentage point rise in density is independent of the density level.[9] Controlling for a host of individual characteristics, such as human capital variables, occupational dummies, status variables, working conditions and individual union membership as well as establishment characteristics such as industry (2-digit), establishment size and size squared in addition to the local unemployment rate, we obtain a coefficient for union density of .075. Union density squared did not turn out significant and we do not report such a specification.

In the second column, we report the results from a less restrictive specification. Four dummy variables, each with a 20 per cent band, are included, with the low union density as the reference case. The point estimates of the dummy variables are monotonically increasing and support the linear specification. A simple comparison of the two models on the basis of the adjusted R^2 also favours the linear model.

8 The matrix of weights is constructed from the 1990 Census by means of individual information on the municipality of residence and the municipality of the work place. Thanks to Kåre Johansen at the Department of Economics, NTNU in Trondheim, who did the calculations.

9 Booth and Chatterji (1995) use log density, i.e. a constant elasticity, implying that the wage effect is decreasing in union density. It seems unlikely, however, than changing density from 9 to 10 per cent should have the same impact on wages as an increase from 90 to 100 per cent.

Table 2. The union density effect on wages. Private sector employees in establishments with collective agreements.

	Individuals			Establishments		
	OLS	OLS	2SLS	OLS	OLS	2SLS
Union density	0.0754**		0.2182**	0.0817**		0.2002**
	(0.0259)		(0.0475)	(0.0318)		(0.0631)
Union density dummies						
< 20		-			-	
[20-40)		0.0280			0.0414	
		(0.0280)			(0.0385)	
[40-60)		0.0390			0.0509	
		(0.0252)			(0.0359)	
[60-80)		0.0590**			0.0563*	
		(0.0237)			(0.0338)	
80+		0.0653**			0.0710**	
		(0.0219)			(0.0302)	
Adj. R^2	0.495	0.493	0.489	0.546	0.544	0.535
Adj. R^2 first stage density regression			0.441			0.360
Basmann test, p-value			0.098			0.861
Hausman test, t-value			-3.44			-2.27
Number of observations	1237	1237	1237	305	305	305

** (*) indicates significance at 5% (10%).

Note: The regressions for individuals also include the human capital variables (HC): education, experience, experience square, seniority and gender as well as four dummies representing occupational status, leadership status and the number of subordinates, 13 dummy variables representing working conditions (noise, vibrations, heat, cold temperature, chemical exposure, dust, light, fumes, solvents, working posture, temporary employment and shift work), industry dummies (2digit ISIC) establishment size and its square and the log of the local unemployment rate. The regressions for the establishment include the average of the HC variables as well as industry, size and size square and the log of the local unemployment rate. The instruments in the 2SLS regressions are the same for individuals and establishments and include three variables reflecting types of pay in the establishment, five variables reflecting bargaining issues other than wages, two variables reflecting conflicts, one dummy for subdivision, a dummy reflecting multi-bargaining as well a dummy reflecting manager-reported good relations between management and the local union. All regressions at the establishment level are weighted with the square root of the number of observations from each workplace. The weighted OLS linear specification is tested against heteroscedasiticy using the SPEC-option in SAS which produces a White (1980) test. The test does not reject the hypothesis of homoscedasticity.

As indicated in the theoretical section we may encounter endogeneity problems if union density is in some way affected by the wage level. In Booth and Chatterji (1995), concavity of the individual worker's utility function ensures that membership is increasing in the bargained wage. With concavity, the utility loss incurred by paying a given membership fee is decreasing in the wage. Hence higher wages induce membership even from individuals who place a relatively low valuation on the union-provided private good. We may also think of other mechanisms. First, there may be some unobserved selection of individuals into high density establishments. Second, there may be an influence of the wage level on union density. There might for instance be more investments in organizational recruitment in establishments where there is more rent to share in the first place. This could give a positive correlation between wage levels and union density. On the other hand, if the firm gives high wages for some other reason (efficiency wages, pre-empting unionism against 'threat effects', or some other form of rent sharing), the local union may not find it worthwhile to put efforts into organizational moves simply because the firm "delivers the goods" anyway. In this latter case, we would expect to find a negative correlation between the unobserved wage premium and the union density of the establishment.

In order to check for this possible endogeneity, we have estimated the wage equation by a standard two-stage least-squares procedure. The instruments include organizational variables like bargaining arrangements, bargaining issues, pay arrangements and conflict experience (see appendix for a precise description). The results are as follows. The union density effect on individual wages rises to .22. There is thus no reason to suspect that our OLS result is upwards biased due to endogeneity problems. Indeed, it appears that the bias in OLS is downward. The Hausman-test reported is simply the t-value for the density residual in an expanded regression including union density as well as the residual from the first stage regression of union density. There is a significant negative relationship between the residual of the union density equation and the log wage equation. The Hausman-test thus indicates endogeneity producing a downward bias in the OLS estimate. This suggests that factors such as threat effects on wages are pre-empting union formation in some high-paying establishments. This is also consistent with the argument of Blanchflower

(1997) for the US that employers are likely to fight hardest against unions that have the most potential for raising wages.

The 2SLS estimate relies on the assumption that our instruments can be excluded from the wage equation. As we can construct bargaining theories which predict wage effects for all the instrumental variable candidates in our data, the 2SLS procedure needs to be justified by empirical testing of the restrictions. The Basmann test cannot reject the hypothesis that the instruments are not to be included in the wage equation at a 5 percent level. However, it is rejected at the 10 percent level.

Since our main variable is specific to each workplace rather than to the individual, however, our results are susceptible to the Moulton (1990) critique and the estimated standard errors of the coefficients may be biased downwards. To correct for this possibility, we have estimated workplace specific regression models. For these models, which are reported in the last three columns of Table 2, we have calculated the average values of the individual specific wages, and variables characterising gender and human capital in the equations for each establishment. We are left with 305 observations of workplaces, consisting of establishment means of the individual characteristics in the sample as well as the establishment specific variables. Since we have an unbalanced panel of establishments, each observation is weighted with the square root of the number of individuals who comprise the means in order to obtain homoscedasticity.

The results from the establishment specific regressions confirm the results from the analysis on the individuals. The OLS-estimate of the union density effect is 0.082 and significant at a 1 percent level. The dummy-variable specification displays a fairly linear pattern and is not preferred to the linear specification according to the adjusted R^2.

The two-stage least square coefficient is 0.20. This is again larger than the OLS estimate, indicating that the estimate of .082 from the OLS regression is too small rather than too large. The Hausman-test rejects the hypothesis of exogenous union density and confirms the result that there is a negative correlation between the error terms in the two equations producing a downward bias in the OLS estimate. The

Basmann test clearly indicates that the instruments are valid. The hypothesis that the instruments should not be included in the wage equation is far from being rejected.[10]

We have found a positive relationship between establishment-level union density and the wage level. The 2SLS model suggests that an increase in union density of 10 percentage points increases wages by about 2 percent. Comparing a completely unionised workplace with one without union members would produce a wage premium of 20 percent on the part of the unionised establishment. The OLS estimate indicates a wage effect of 0.8 per cent, but the tests clearly indicate that this is biased downwards. Given both the standard errors of the estimates and the difficulty of finding theoretically valid instruments that can be excluded from the wage equation, the exact density effect is not very precisely determined. It is re-assuring, however, that the estimates from the workplace specific regressions mirror so closely the results with individual information.

5. Can workplace characteristics explain why union members have higher wages?

The wage effects of unions are typically studied by means of data on individuals where the pay difference between members and non-members, conditional on *observed characteristics*, is the basis for the estimated impact of unions. This approach is based on the idea that the pay of non-members is a relevant estimate of the counterfactual for union members, i.e. what members would have had if they quit the union. In most Western countries, union members are typically better paid than non-members, see e.g. overview in Blanchflower (1996). These union membership premia are at odds with the idea of the union wage as a public good to employees who have formed a recognised bargaining group. If the union wage premium is a public good, there is no wage gain from joining the union.

Supporting the collective good idea, we found the individual membership coefficient to be zero in the previous section of this paper, i.e. the estimate 0.005 with a t-value of 0.303. In contrast, both Blanchflower (1996) and Colbjørnsen and Kalleberg (1988) have found a significant individual membership pay premium, using

10 This conclusion holds as we vary the set of instruments. The estimated union density coefficient is in the interval from 0.17 to 0.24, and is always significantly different from zero.

Norwegian individual-level data for 1989-93 and 1982, respectively. One might hypothesise that these results differ because previous studies look at (grouped) earnings data rather than the hourly wage, or because the surveys differ with respect to information about personal characteristics. However, we are able to demonstrate in this section that the differences between our result and those of previous studies, do not stem from differences in the wage variable or information on personal characteristics. Rather, it emerges that it is the absence of information on *workplace characteristics* - and, in particular, on *workplace union membership density* - which explains why previous studies estimate statistically significant individual membership effects.

Table 3. Wage effects of individual union membership. Estimates with "unobserved" individual and establishment characteristics.

Controls	Individual membership coefficient (t-value)	Adj. R^2
Gender, schooling, experience, seniority	0.073 (4.765)	0.3798
+ occupational group (4 dummies)	0.064 (4.156)	0.4117
+ working conditions (15 dummies)	0.054 (3.450)	0.4444
+ local unemployment rate	0.052 (3.322)	0.4522
+ 22 industry dummies	0.034 (2.092)	0.4817
+ establishment size and size squared	0.029 (1.794)	0.4915
+ union density at the establishment	0.005 (0.303)	0.4947

By adding one (set of) control variable (s) at a time, we get an idea of how frequently-unobserved characteristics might explain the estimated individual membership effect. The controls in the first row of Table 3 are very similar to that of Blanchflower (1996) and it is quite remarkable that the estimated premium is identical (0.073 compared to 0.074 obtained by Blanchflower).[11] Adding individual characteristics like occupation and working conditions does reduce the individual membership coefficient, but the wage premium is still above 5 per cent and significant. Controlling for local labour market conditions has a negligible influence

[11] See Blanchflower (1996), p. 87. His model for Norway includes age, age^2, schooling, gender, log hours, and dummies for self-employment, public sector and supervisor as controls.

on the individual membership coefficient.[12] Establishment characteristics are more important. Industry dummies reduce the coefficient from 0.052 to 0.034. With the size of the establishment included as well, the estimated premium falls to about 3 per cent with a t-value of 1.794.

The major change appears when establishment union density is included. The wage difference between members and non-members, conditional on collective membership, drops to zero, as can be seen from the final row in Table 3.

It is commonly acknowledged that union wage effects based on individual data are likely to be biased upwards (see, for example, Blanchflower (1996), (1997)). Our example confirms that the estimates may indeed be misleading. The Norwegian evidence clearly demonstrates that individuals gain nothing in terms of wages, from joining the union at the workplace. However, our results should *not* be interpreted as evidence of a negligible wage effect of union membership. The wage effect of union membership operates through collective membership. Union members are better paid than non-members because they work in establishments with higher union density.

6 Conclusions

Using a Norwegian dataset that combines information on both individuals and their workplaces, including particularly valuable information on bargaining variables, we have found that union density at the establishment where the individual is employed is an important determinant of the individual's wage. From the 2SLS estimation, we find that a 10 percentage point increase in union density at the establishment leads to an increase in the wage of about 2 per cent. The OLS estimate is 0.8 per cent, but the tests clearly indicate that this is biased downwards.

Furthermore, we have found that individual union membership is associated with a wage gap only in the absence of controls for workplace union density. When establishment-level union density is included, individual membership status ceases to have any significant effect on the wage. These findings are consistent with a theoretical framework in which the bargained wage is a public good which is increasing in union density. Our results are also supportive of the hypothesis that the estimated

[12] The wage effect of the local unemployment rate is, however, sensitive to the number of other variables included in the model. The unemployment elasticity is -0.096 (t-value 4.279) with those in Table 3, but falls to -0.047 (t-value 1.941) in the complete model.

member/non-member wage gap reported in studies using exclusively individual-level data may be explained by the unobserved variation in union density across establishments.

The establishment-level externality which follows from the nature of the density effect on the collective wage has implications for studies of the aggregate impact of unionism. If union membership affects wages through collective membership, then individual-level data are not sufficient for capturing the effects of declining union membership on wage inequality.

We believe that evidence for Norway is likely to be of wider significance. Unlike other Scandinavian economies, Norway is not characterised by particularly high levels of union density or collective bargaining coverage. Furthermore, there is evidence of substantial wage bargaining at the local level. Nevertheless, it would be interesting to be able to compare our results with evidence from other countries. As UK-WIRS97 will provide matched employee-establishment level data, it will give an opportunity to confirm our result that establishment characteristics, and union density in particular, explain the union-nonunion membership differential.

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Appendix

The NSOE Data

The survey was conducted by the Central Bureau of Statistics in the fall of 1989. About 4,500 employees from 1,010 establishments were interviewed. The establishments were picked out from registers, with the probability of a draw being proportional to the square root of the number of employees at the establishment. Employees were similarly drawn so as to be representative at the employee level. Establishments with less than two employees are excluded.

Our sample consists of private sector employees in establishments *with collective agreements.* With these restrictions, 1,237 employees from 305 establishments are included.

The wage variable is constructed from self reported wage per hour, fortnight or month (optional), divided by the self reported number of hours worked in the appropriate time period.

Variables in the union density equation

The instrument variables included in the first stage estimations of union density, but not in the second stage wage equation. 11 dummy variables are constructed based on the following information from the top managers of the establishment.

Pay arrangements	1	Individual piece rates or bonuses are used in the establishment
	2	Group bonus or piece rates are used in the establishment
	3	Profit sharing is utilized in the establishment
Working relations	4	Union representatives and management share a common understanding of the the establishment's situation
Bargaining issues	5	There has been bargaining over manning rules at some point during the last 3 years
	6	Bargaining over new employment (last 3 years)
	7	Bargaining over working time (last 3 years)

Bargaining arrangements

8	Different unions bargain separately with the establishment
9	Strike is the most likely potential outcome in case of a conflict during bargaining
10	The establishment has experienced a strike at least once during the last 5 years
11	The establishment is a branch of a larger company