



IRLE WORKING PAPER  
#43-92  
May 1992

## Why Do Some Firms Pay More? An Empirical Investigation of Inter-Firm Wage Differentials

Erling Barth

Cite as: Erling Barth. (1992). "Why Do Some Firms Pay More? An Empirical Investigation of Inter-Firm Wage Differentials." IRLE Working Paper No. 43-92. <http://irle.berkeley.edu/workingpapers/43-92.pdf>



**Title:**

Why Do Some Firms Pay More? An Empirical Investigation of Inter-Firm Wage Differentials

**Author:**

[Barth, Erling](#), University of California, Berkeley

**Publication Date:**

05-01-1992

**Series:**

[Working Paper Series](#)

**Publication Info:**

Working Paper Series, Institute for Research on Labor and Employment, UC Berkeley

**Permalink:**

<http://escholarship.org/uc/item/7f18t2vt>

**Keywords:**

Barth, firms, pay, inter-firm wage differentials, investigation

**Abstract:**

The paper tests implications of efficiency wage theories, agency theories and union bargaining theory on Norwegian micro data. Firm specific means of individual characteristics as well as other firm characteristics are utilized to study the nature of high paying firms vs. lower paying firms. The study finds evidence in favor of all three types of non-market clearing models. Firms do not distinguish between workers with different levels of autonomy or union status in their wage setting. However, firms with a higher average level of employees' autonomy or union density pay better. Human capital effects, on the other hand, originate autonomy or union density pay better. Human capital effects, on the other hand, originate within firms. Wage enhancing mechanisms from each type of theory do not reinforce each other: higher wages may serve several purposes in any one firm.

**Copyright Information:**

All rights reserved unless otherwise indicated. Contact the author or original publisher for any necessary permissions. eScholarship is not the copyright owner for deposited works. Learn more at [http://www.escholarship.org/help\\_copyright.html#reuse](http://www.escholarship.org/help_copyright.html#reuse)



# WHY DO SOME FIRMS PAY MORE?

An Empirical Investigation of Inter-Firm Wage Differentials

by

Erling Barth<sup>1</sup>  
Institute of Industrial Relations,  
University of California at Berkeley  
and  
Institute for Social Research,  
Oslo, Norway

Berkeley, May 26th 1992

---

<sup>1</sup> This paper is part of the project "*Strategic manipulation of wage bargaining environments*". The project is initiated by Jon Elster and financed by NORAS over the LOS-program. Thanks to Karl O. Moene and Josef Zweimüller for comments on an earlier draft. The paper has benefitted from discussions at the Labor Market seminar at the Institute for Social Research, Oslo as well as the Micro Seminar at the Economics Department, University of Oslo. Most of the work with the paper was conducted during my stay at the University of California at Berkeley, and I would like to thank the Institute of Industrial Relations for its hospitality and support.

## Abstract

The paper tests implications of efficiency wage theories, agency theories and union bargaining theory on Norwegian micro data. Firm specific means of individual characteristics as well as other firm characteristics are utilized to study the nature of high paying firms vs. lower paying firms. The study finds evidence in favor of all three types of non-market clearing models.

Firms do not distinguish between workers with different levels of autonomy or union status in their wage setting. However, firms with a higher average level of employees' autonomy or union density pay better. Human capital effects, on the other hand, originate within firms. Wage enhancing mechanisms from each type of theory do not reinforce each other: higher wages may serve several purposes in any one firm.

## 1. Introduction

Two observations support a non-market clearing view of wage formation. The first is the existence of unemployment. The second is the fact that different firms or industries pay similar workers differently. This latter empirical fact has been clearly demonstrated.

Krueger and Summers (1988) and Dickens and Katz (1986) are the key references establishing industry differentials from micro wage data<sup>2</sup>. The method of establishing such differences is basically to estimate a micro wage equation including a host of human capital and working conditions variables and then observe significant and stable patterns of industry (or firm) differentials even when controlling for these variables. Brown and Medoff (1989) is a standard reference showing that larger firms pay similar workers better than do smaller firms.

Such differentials puzzle economists basically because they contradict the "law of one price". Thaler (1989) typically raises the issue of industry differentials in the *Anomalies* section of the Journal of Economic Perspective. The puzzle is: *Why do some firms pay more than they "have to"?*

Three theoretical frameworks to understand wage differentials among similar workers stand out; *agency theories, efficiency wage theories and bargaining theories*. These strands of theory are briefly discussed below. Their common feature is that they all predict wage differentials between similar workers in different firms. The theories are not exclusive. All three types of mechanisms may be at work at the same time.

The purpose of this paper is to add to the understanding of inter-firm wage differentials using the Norwegian Study of Organizations and Employees (NSOE). NSOE is particularly well suited for this purpose as it includes several firm specific variables in addition to employee-specific ones. As we have clustered observations from many firms, we are also able to establish and analyze interfirm wage differentials. I test implications from the three types of theories. The unit of observation is basically *the firm*. The basic question

---

<sup>2</sup> Arai (1990) establishes such differentials for Sweden, Barth and Zweimuller (1992) for Norway and Austria and Zanchi (1991) for Germany.

is the following. What are the characteristics of a high wage firm?

Separate analysis is done for firms without any collective agreements (non-bargaining firms) and for firms with collective agreements (bargaining firms). The idea is that the wage decision in non-bargaining firms is basically under management's discretion, while bargaining wages are affected also by union preferences and options.

I first estimate standard micro wage equations (dependent variable log hourly wage) with *individual characteristics* (human capital, job characteristics, worker's autonomy) from *within firm variation* only. This is done by introducing a dummy for each firm. In this way we obtain fixed-effect within-firm estimates for the coefficients of the individual-specific variables.

I then proceed by estimating a wage equation for the firms, using the firm's mean (log hourly) wage as dependent variable. Independent variables are the firm specific means of the individual variables as well as the following firm-characteristics: Bargaining regime (supplementary firm specific bargaining vs. centralized bargaining only), management ownership, firm size, the presence of a personnel officer, a regional dummy as well as the union density of the firm.

The difference between the coefficients from the wage equation for the firms and the wage equation for individuals reflects how the different variables affect the firms' wage premia. We may think of the firm specific pay premia as separate constant terms for each firm in the micro wage equation. If, for instance, the schooling variable turns out to have a significantly larger coefficient in the firm-equation than within firms, this means that the firm specific constant term is higher in firms with better educated employees. If this is the case, firms with a high average schooling among its employees pay all their employees better.

With regard to the individual specific variables, the following question arises. Does the effect of these variables originate within or between firms? Consider for instance employees' autonomy. According to efficiency wage theory, autonomous workers are paid more in order to induce effort. If employers are constrained by some kind of internal equity constraint, we would expect to find no wage effect within firms from autonomy. We might however, find that firms with a higher average level of autonomy pay all their workers

better. A similar reasoning may of course also apply to union membership. We expect union density of the firm to affect the wage level of the firm, but it is not a priori clear if there should be a within firm effect from union membership.

Utilizing the design of the NSOE I am thus able to test a possible implication from Akerlof and Yellen's (1990) fair wage-effort hypothesis, namely that autonomy and union membership effects arise between rather than within firms, while fairness considerations constrain the firms' ability to differentiate. This general problem has raised some controversy also over the observed positive tenure-wage effect in most micro studies. Abraham and Farber (1987) argues that the observed tenure-wage relationship is generated between firms as workers tend to stay longer in better paying firms. Topel (1991) on the other hand concludes that the tenure effect arises within firms, giving support to human capital theory. The control for firm-heterogeneity is, however, indirect. The present study, on the other hand, is able to distinguish clearly what part of the tenure effect is produced within firms as opposed to the between firm effect.

The paper is organized as follows. The next section briefly discusses the non-market clearing views of wage formation as well as some of previous evidence. The data and methodology are described in section 3 along with some preliminary statistics. The major results are presented in section 4. Some concluding remarks close the paper.

## 2. Theory and some previous evidence

Following Krueger and Summers (1988) there are two types of answers to the question of why some firms pay more. First, firms may not be profit maximizers, but rather act according to the manager's private agenda. We label this *agency theory* mechanisms. The second type of answers are based on the following: Firms may, for different reasons, find it unprofitable to reduce wages to market level. These are *efficiency wage* considerations. In Norway as in many other European countries, unions are prevalent and relatively powerful. *Union power* may also give rise to wage differentials across firms. The purpose of this section is briefly to discuss some implications of the different theories to be utilized in the empirical investigation below. I also discuss some existing evidence supporting these theories.

### *Agency theory and wage differentials.*

Agency theories describe situations where there is some delegation of power, some costs or difficulties in complete monitoring of the executives (agents) and the executives have some additional goals to profit maximization. In the present setting, the manager is given the power to set or negotiate wages. Agency problems arise if the manager has goals that directly or implicitly involves higher wages.

Clearly, the size and complexity of the organization is a factor increasing agency problems. The distance from owners to managers increases with the number of employees. *Firm size* will be used below as an indicator of the distance from owners to executives. Firm size captures both the fact that more decisions have to be made, which in itself forces owners to delegate, and the fact that the amount of information grows, keeping relatively more away from the owners. Managerial discretion grows with firm size.

The second factor behind agency problems are differences in objectives between owners and executives. Profit maximization is a reasonable goal for owners. The size of the organization, internal peace, loyal subordinates and pleasant working conditions may be additional goals for managers. Higher wages in the work force may contribute to managers



goals. One way of bringing managers objectives more in line with the owners is to let managers own. *Management ownership* will be utilized in the empirical analysis as an indicator of less agency problems.

If there is one person (or department) who deals particularly and mainly with personnel issues (personnel officer) and also sets or negotiates wages, agency problems may be higher than if the top manager sets wages. The conjecture is that internal peace, loyalty and the like is more important for personnel officers than for top managers, and that top managers are closer tied to profitability goals. If personnel officers are responsible for wage setting or negotiations, agency problems are more serious. This prediction is tested below, by checking if firms have a particular *personnel officer* or not.

Agency theory predicts positive wage differentials in firms where managerial discretion is high *and* managerial objectives also include (or imply) higher wages. Note that wage differentials arising from agency problems require some rent to be shared. If, particularly, capital markets are competitive, owners will require at least market return to stay with the firm. If product markets are competitive as well, it may not be possible for managers to capture any rent above market return to capital. An exception from the latter is if the factors behind the agency problem is inherent in the technology of the whole industry, in which case managerial rent may be thought of as necessary costs.

### *Efficiency wage theory and wage differentials*

In some instances it may be profitable to pay above market clearing wages. Consider an economy where firm  $i$ 's revenue depends on the workers' effort  $E_i$  times number of workers  $N_i$ . Firms set wages and employment. Firm  $i$ 's profit is given by:

$$\Pi_i = R_i[E_i N_i] - w_i N_i \quad (1)$$

where  $R$  is total revenue of firm  $i$  and  $w_i$  is the wage. Effort depends on the wage offered by own firm and alternative expected wages  $A$ :

$$E_i = E_i(w_i, A) \quad (2)$$

1st order conditions for  $\pi$ -max give:

$$\frac{\partial \Pi_i}{\partial w_i} = R' E_w' N_i - N_i = 0, \quad \frac{\partial \Pi_i}{\partial N_i} = R' E_i - w_i = 0, \quad (3)$$

$$\Rightarrow E_w' \frac{w_i}{E_i} = 1$$

where the latter equality is the "Solow condition".

*Wage differentials* among similar workers occur when the relationship between revenue and wages differs. To highlight this point, consider the following specification of the effort function (Summers, 1988):

$$E_i = (w_i - A)^{\omega_i} \quad (4)$$

where  $\omega_i$  is a firm specific constant elasticity of effort with respect to the difference between own wage and alternative pay. The Solow condition gives:

$$\frac{w_i - A}{w_i} = \omega_i \quad (5)$$

Let identical workers be defined as workers with identical alternative opportunities (A). According to (5) identical workers get different pay in different firms. If  $\omega_i = 0$  the workers are offered their alternative expected pay. As  $\omega$  increases, the wage mark up over alternative pay increases.

The firm specific differential depends particularly on the efficiency effects of the pay gap. This depends on the story behind the effort function<sup>3</sup> and are by and large very difficult to measure from survey data. In the empirical test below I thus use another property of most of the reasonable stories behind the efficiency wage effect: they require some autonomy on part of the worker.

---

<sup>3</sup> See eg Akerlof 1982, Stiglitz 1974 and Weiss 1991.

Only dimensions of effort that cannot easily be observed matter. To see this last point I follow Layard et al (1991) and note that when effort is perfectly and costlessly *observable*, the firm needs only offer a wage satisfying:

$$u(w_i, E_i) = A \quad (6)$$

When effort *is not observable*, however, firms know that workers choose  $E_i$  according to:

$$U'_E(w_i, E_i) = 0 \quad (7)$$

which for  $U''_{EE} > 0$  and  $U''_{EW} < 0$  gives an efficiency wage effect  $E'_w > 0$  to plug into the Solow condition (3). This is basically why *employee's degree of autonomy* is used as an indicator for efficiency wage effects in the empirical analysis below.

#### *Union bargaining and Wage Differentials*

In a unionized setting wages are negotiated. Assume that the local union cares about wages only, and that the bargaining solution may be represented by the subgame perfect equilibrium of a Rubinstein (1982) game of alternating offers. Assume furthermore that the union can credibly threaten to strike for  $\tau$  periods only. After period  $\tau$  their funds are exhausted, and they have to take their outside option rather than keeping on strikeing. In Barth (1991) I show that the outcome of the bargaining is:

$$w_i = (1 - e^{-r\tau}) \left[ \beta \frac{R_i}{N_i} + (1 - \beta) S_i \right] + e^{-r\tau} A \quad (8)$$

where  $\beta$  is the bargaining power of the union,  $R/N$  is revenue per worker,  $r$  the common discount rate,  $S$  strike support per worker and  $A$  the worker's outside option. The wage is a weighted average of the standard inside wage that would be the outcome of a game where the workers were able to keep on strikeing forever, and the outside option. Applying a right to manage assumption, we set:

$$\frac{R_i}{N_i} = \frac{w_i}{\epsilon_i} \quad (9)$$

where:

$$\epsilon_i = \frac{R_i' N_i}{R} \quad (10)$$

is the elasticity of revenue with respect to labor. Let  $s = S/A$ . Straightforward calculation gives:

$$\frac{W_i - A}{W_i} = (1 - e^{-\tau}) \frac{(1 - \beta)s_i - (1 - \beta/\epsilon_i)}{(1 - e^{-\tau})(1 - \beta)s_i + e^{-\tau}} \quad (11)$$

In a unionized economy, we thus expect wage differentials across firms for similar workers to be affected by union bargaining power, product market competitiveness and labor intensity (both from the elasticity of revenue w.r.t.labor), workers' strike support and their ability to sustain a lengthy conflict.

Indicators of union power and ability to sustain a conflict are *membership*, *coverage* of collective agreements as well as the *presence* of unions in the firm. Whether the bargaining firm has *local negotiations* on the company level after industry- or national bargains are struck, is used as a control variable.

### *Some previous evidence*

Firm size effects on wages are well documented. A thorough overview of the theoretical issues at stake are given in Brown and Medoff (1989) along with detailed evidence. Establishing a size-wage premium also among piece-rate workers, they argue that monitoring problems experienced by larger employers cannot be the correct explanation.

Rebitzer and Robinson (1991) use a switching regression model to estimate size effects in dual labor markets. They find such effects in both secondary and primary markets, however, they find a larger effect in primary jobs. There are few monitoring problems in

secondary markets. The fact that they find a positive size effect also in secondary markets, however, also suggests that monitoring difficulties is not the only explanation behind the firm size premium.

In the present paper I am able to make a direct test of the hypothesis that firm size premium originates as a result of internal monitoring problems. As I control for worker's autonomy in the equations, the firm size effect is measured for a given level of autonomy. This is also why I have chosen to put the firm size variable under the agency theory heading.

When introducing a dummy for personnel officer, I rely on the following piece of evidence: According to Olav Magnusson, manager of the Norwegian Association of Employers (NHO), the NHO launched an internal campaign in 1989 with the specific purpose of involving top managers rather than personnel officers in wage negotiations at the firm level. The reasoning was clearly of an agency theory type: Personnel managers deal with personnel questions all the time and are interested in peaceful relations, while the top managers are more responsible for company profits. The mere fact that NHO organized such a campaign is of course independent evidence of agency mechanisms in wage bargaining in Norway.

Krueger (1991) gives evidence that ownership matters. The study distinguishes between franchisee-owned restaurants and company-owned restaurants in the fast-food industry. He finds higher compensation in company-owned firms rather than the franchise firms, where owners get the surplus profits. The results are consistent with predictions from agency theories.

There is not much work done to get direct evidence of the presence of efficiency wage mechanisms. Efficiency wage theories are however, strongly supported by indirect evidence. Krueger and Summers (1988) gives evidence from the nature of industry differentials, ruling out most other explanations. Arai (1990) is an exception however, finding evidence supporting the efficiency wage model from regressing industry characteristics on the industry wage premia in Sweden. He finds a positive correlation between average autonomy of the workers and industry premia, also when controlling for average plant size.

Following the seminal work of Lewis (1963), there is a huge literature estimating the

union/non-union wage gap in different countries. Most studies find a significant and large union effect on wages. As noted by Agostino (1990), however, it is not clear if a union effect should arise in the Scandinavian countries, where most non-union workers benefit from the centralized agreements as well. Still she finds a significant albeit declining union effect for blue-collar workers in Sweden. In the present study I am able to control for both individual coverage as well as the bargaining regime of the firm. Meyer (1990) finds a positive wage gap associated with company level bargaining rather than industry level bargaining, and we may expect the same effect to show up in Norwegian data.

### *Competing theories?*

We have established that all three types of mechanisms may produce wage differentials between similar workers. *Agency theory differentials* occur in firm's where managers have different objectives and discretion over wages. *Efficiency wage differentials* occur where effort is unobservable and workers have autonomy over relevant dimensions of effort. *Union wage differentials* occur where unions have bargaining power, are able to sustain a conflict and there is rent to capture.

It is worth noting that even if differentials arise from different mechanisms, the theories are not exclusive but may all prevail within one firm, sector or economy. In that sense they are not competing theories, but rather theories competing with the paradigm of "one price".

Furthermore, it is not a priori obvious if the wage increasing mechanisms reinforce each other. If there is a positive interaction effect, autonomous workers would get even higher wages in larger firms or in firms with a strong union. On the other hand, a wage premium may serve several purposes, both satisfying the personnel manager's wish for peace as well as inducing effort on part of the workers. In the latter case we expect a negative interaction between the indicators. This question is also addressed in the empirical analysis below.

### 3. Data and Methodology

The data set (NSOE) consists of micro observations of both individual specific and firm specific variables. The firms are drawn from the register of companies in the Central Bureau of Statistics. Firms are stratified according to size, geographical location and industry. Firms are drawn proportional to the square root of the number of employees, and the number of employees is similarly drawn, so as to achieve national representativity at the employee level. Firms with less than two employees are excluded. Interviews are conducted during the fall of 1989.

The most important limitation of our data set is that it is cross sectional, and thus has no panel qualities.

The advantage of our set is that we have more than two persons from most firms, and are thus able to estimate firm-specific dummies (and fixed-effect within-firm estimates), and reliable data on the firm in which each person is employed. The firm specific data are collected from interviews with both top managers, personnel managers and union leaders in each firm.

In the present study, a private sector sample of employees is used. I have deleted observations with no information on bargaining regime (see below) and is left with a sample of 2006 employees from 490 firms. The bargaining structure in Norway is highly centralized. Both employers and employees are organized on a national level. Centralized bargaining, on either national or industry level is in many sectors succeeded by plant level negotiations. There are also firms without collective agreements. My sample is split into two: one sample of employees from *non-bargaining firms* and one from firms with *collective bargaining*. The distinction is based on information from the top manager of the firm.

Table 1 gives the summary statistics for the sample of individuals from these two groups of firms. Schooling is defined as years after required level of education. Experience is actual number of years worked, while tenure is number of years in present firm. Three dummies capture different job characteristics: Temporary employment equals one if the worker has a temporary contract only. Shift-work is work outside the range 7 am to 7 pm. The variable Merit Pay takes the value 1 if the employee is paid according to any other

schemes than fixed pay per unit of time.

**Table 1**  
**Sample means, Private sector employees**

	Employees in firms with:	
	No bargaining	Bargaining
LOG WAGE (hourly)	4.48	4.40
FEMALE	0.33	0.38
SCHOOLING (years after required)	2.79	2.01
EXPERIENCE (actual work experience)	15.22	17.92
EXP. SQUARED	343.44	464.19
TENURE (years in present firm)	6.13	9.65
TEMPORARY (temporary employment)	0.07	0.07
SHIFTWORK (other than 7am-7pm)	0.02	0.08
MERIT PAY (piece rate, bonus etc)	0.14	0.14
UNION MEMBER (individual membership)	0.21	0.62
COLLECTIVE COVERAGE (covered by collective agreement)	0.25	0.74
COV * AUT (interaction term)	0.22	0.62
SIZ. * AUT (interaction term)	92.75	360.21
AUTONOMY (employee autonomy, range:0 -3)	0.99	0.89
N	530	1476

Note: From private sector, non agricultural sample of employees in firms with data on bargaining regime.



Note that the union coverage variable refers to a question of whether an individual is covered by a collective agreement or not. In bargaining firms about 25 percent of the employees are not covered by the collective agreements. These are workers kept outside the negotiated contracts. In non-bargaining firms, almost 25 percent have answered that they are covered by a collective agreement. This should be interpreted as being paid according to the centrally negotiated pay schedules.

The autonomy variable is the sum of three dummy variables:

- 1 The first takes the value of 1 if the employee has reported that it is very difficult for its supervisor to measure the *amount of work* done.
- 2 The second is 1 if the worker reports that the *quality of work* is difficult to evaluate.
- 3 The third variable equals 1 if the employee reports that he can to a high degree *decide the tasks and order of work* himself.

The autonomy variable thus takes the values 0, 1, 2 or 3 and is increasing in worker's autonomy. The two remaining variables are multiplicative terms interacting autonomy with being covered by a collective agreement and the number of workers in the firm. Table 2 reports the frequencies for the autonomy variable.

**Table 2. Employee autonomy, frequency.**

	Employees in:	
	Non-bargaining firms	Bargaining firms
Autonomy = 0	32	39
Autonomy = 1	42	38
Autonomy = 2	18	18
Autonomy = 3	5	8
Sum :	100	100

### *Inter-firm differentials*

The first part of table 3 reports the coefficients from a micro regression on individual data. We note that there is a positive union membership effect in bargaining firms, a negative coverage effect and a positive but insignificant autonomy effect. There is a positive interaction between firm size and autonomy in both bargaining regimes. The human capital variables perform as expected, with the exception perhaps of the tenure variable having a larger effect in non-bargaining firms. There is a negative female differential of about .11 and .19, with the bargaining environment being relatively worse for women. In the next section we distinguish between effects of these variables arising within and between firms. The purpose of the present section, however, is mainly to establish inter-firm differentials and to present some preliminary data on the firms.

**Table 3**  
**Regression coefficients and some statistics from individual data.**

	Employees in firms with:	
	No bargaining	Bargaining
	$\beta$	$\beta$
CONSTANT	4.042	4.131
FEMALE	-0.110	-0.187
SCHOOL	0.059	0.057
EXPERIENCE	0.026	0.020
EXP.SQARED	-0.0005	-0.0004
TENURE	0.007	0.002
TEMPORARY	-0.032 <sup>z</sup>	-0.100
SHIFTWORK	-0.040 <sup>z</sup>	0.072
MERIT PAY	0.141	0.060
UNION MEMBER	0.020 <sup>z</sup>	0.068
COLL.COVERAGE	-0.109	-0.044
COV. * AUT	-0.030 <sup>z</sup>	-0.032
SIZ. * AUT	0.0001	0.00003
AUTONOMY	0.027 <sup>z</sup>	0.013 <sup>z</sup>
INDUSTRY DUMMIES	no	no
FIRM DUMMIES	no	no
N	530	1476
ADJ.R <sup>2</sup>	0.439	0.445

table 3 cont..

	No bargaining	Bargaining
<b>MODEL WITH INDUSTRY-DUMMIES:</b>		
Number of industry dummies	19	22
ADJ.R <sup>2</sup>	0.486	0.497
F-value, industry dummies	3.05	6.32
<b>MODEL WITH FIRM-DUMMIES:</b>		
Number of firm-dummies	182	306
ADJ.R <sup>2</sup>	0.589	0.605
F-value, firm dummies	2.84	3.01

---

Note: Dependent variable: log hourly wages. Coefficients from regression without firm dummies. A z means that the estimate is not significantly different from zero at a 5 percent level. The last part of the table gives statistics from an identical regression including also a dummy for each (but one) industry and firm. The F-statistics tests the specifications against the preceding one, thus the last F-value tests the hypothesis of equal pay across firms within each industry.

The second part of table 3 reports some statistics from running the same wage regression with and without industry and firm control. We reject an hypothesis of equal pay across industries, and we may also reject an hypothesis that all firms within the industry pay similar workers the same wage. Having thus established the existence of inter-firm differentials, I now turn to some summarizing statistics describing the firms.

Table 4 gives the sample means for the firms in each bargaining environment. The first list of variables (female - autonomy) are the firm specific means of individual characteristics. The firm specific variables are defined as follows:

Region is a dummy for Oslo, Akershus and Rogaland. These are for the most part urban areas. Local bargaining takes the value 1 if there are additional negotiations on the firm level after the centralized negotiations are closed. Union present is 1 if a union is represented at the firm. Firm size is number of employees at the plant. Personnel Officer equals 1 if there is a particular manager assigned to tasks involving personnel management only. Non-ownership is a dummy taking the value 1 if the top manger have no share of

ownership in the firm.

**Table 4**

**Sample means, private sector firms**

	<b>Firms with: No bargaining</b>	<b>Bargaining</b>
<b>Firm specific means of:</b>		
FEMALE	0.33	0.41
SCHOOLING	2.57	1.89
EXPERIENCE	15.55	17.29
EXP.SQUARED	360.67	439.47
TENURE	6.05	8.92
TEMPORARY	0.07	0.08
SHIFTWORK	0.02	0.06
MERIT PAY	0.13	0.12
UNION MEMBER	0.20	0.55
COLLECTIVE COVERAGE	0.23	0.71
COV * AUT	0.18	0.57
SIZ * AUT	54.69	220.45
AUTONOMY	0.94	0.86
LOG HOURLY WAGE	4.45	4.35
<b>Firm specific variables:</b>		
HIGH-PAY REGION (Oslo, Akershus og Rogaland)	0.53	0.35
LOCAL BARGAINING (Bargaining at plant level)	-	0.58
UNION PRESENT (Union present in firm)	0.31	-
FIRM SIZE (Number of employees)	42.86	237.39
PERSONNEL OFFICER (Personnel manager in firm)	0.17	0.32
NON-OWNERSHIP (Top manager has no ownership in firm)	0.58	0.61
<b>N</b>	<b>183</b>	<b>307</b>

Note: From sample of private sector, non-agricultural firms with more than one employee and data on bargaining regime.

Non bargaining firms are more often located in the high pay regions, are much smaller and have a more educated work force. The bargaining firms are larger, more often located outside the urban areas and have a more experienced work force.

Tables 1 a and b) in the appendix report the partial correlations of the firm-specific variables. I report these partial correlations for two reasons. There is reason to expect a fairly high correlation between some of the right-hand variables, and the partial correlations give a preliminary answer to the question of who pays more. Note that we are comparing firm specific variables, not the individual values.

There are strong positive correlations between the wage level and the average human capital of the firms. Schooling is also correlated with autonomy (.34) and firm size (.38). The correlation between autonomy and log wages is high (.43). A higher number of employees is associated with higher autonomy, the partial correlation being .23. Reasonably, large firms more often have personnel officers and unions present. Non-ownership is not strongly correlated with any of the other variables but personnel officer (.22). There is a positive correlation between log wages and union present, firm size, personnel officer as well as non-owner.

Table 1.b. in the appendix gives the correlations for bargaining firms. The pattern is very similar to that of non-bargaining firms. The association between autonomy and wages seems to be weaker while union membership are more strongly correlated. In bargaining firms, the relationship between autonomy and firm size is weak. Remembering that bargaining firms are considerably larger, this may suggest that autonomy increases with firm size in small firms, but is rather independent of firm size when the size is larger. Autonomy is still highly correlated with schooling. The correlation between firm size and personnel officer is also somewhat smaller for bargaining firms. Local bargaining is correlated negatively (-.33) with the fraction of females in the firm and positively with the fraction on merit pay (.21).

We have thus established the existence of inter firm differentials as well as given some preliminary evidence in favor of the non-market clearing theories discussed above. The next subsection briefly considers the method used to test the impact of the different variables on the firm specific pay premium.

## Methodology

The following model captures the idea that different firms pay similar workers differently:

$$\begin{aligned} W_{if} &= \alpha + \alpha_f + X'_{if}\beta + U_{if} & i=1, \dots, N \\ \alpha_f &= \phi + \bar{X}'_f\delta + Z'_f d + \epsilon_f & f=1, \dots, F \end{aligned} \quad (12)$$

Where  $X'$  is a vector of individual characteristics,  $Z'$  a vector of firm characteristics.  $\alpha_f$  is firm  $f$ 's pay premia relative to a reference firm.  $U$  and  $\epsilon$  are error terms assumed in the following to be independent.

We are interested in the  $\delta$ 's and the  $d$ 's. Inserting the  $\alpha_f$ 's into the wage expression and taking the mean, we get:

$$\bar{W}_f = \alpha + \phi + \bar{X}'_f(\beta + \delta) + Z'_f d + (\bar{U} + \epsilon) \quad f=1, \dots, F \quad (13)$$

Let  $b = \beta + \delta$ . Using OLS with a dummy for each firm we obtain a BLUE estimate,  $\hat{\beta}$  from within-firm variation only. OLS on (13) gives the BLUE between estimators  $\hat{d}$  and  $\hat{b}$ . Our estimators of the  $\delta$ 's are given by:

$$\hat{\delta} = \hat{b} - \hat{\beta} \quad (14)$$

The within and between variation is orthogonal to each other, and we may thus simply calculate the variance of the  $\delta$ 's by:

$$\text{var}(\hat{\delta}) = \text{var}(\hat{b}) + \text{var}(\hat{\beta}) \quad (15)$$

Note that the error term in (13) consists of the sum of two independent variables. The first is the firm specific mean of the individual error terms. In order to correct for the fact that I have a different number of observations from each firm, I have weighted the observations

in the regression by the square root of the number of observations per firm<sup>4</sup>.

---

<sup>4</sup> Assuming that the individual wage relation given in (12) is homoskedastic with a fixed standard error  $\sigma$ , the standard deviation of the error term in (13) is given by:

$$\sigma_{v+\epsilon} = \sqrt{\frac{1}{n}\sigma^2 + \text{var}(\epsilon)} \quad (1)$$

The weighing procedure thus seems reasonable from the U-term, and would be efficient under the assumption of heteroskedasticity of the following form in the firm specific part of (12):

$$\text{st.err}(\hat{\theta}) = \frac{1}{\sqrt{n}}\sigma_{\epsilon} \quad (2)$$

It seems reasonable to assume that the variance may be decreasing with firm size, simply because the larger firm would be more often in the labor market, have more information and better informed employees and unions. In addition to the weighing, I have also used the standard deviations corrected for heteroskedasticity below (from the ACOV option in SAS).

#### 4. Results

Separate regressions were run for firms with only individual agreements and for firms with collective agreements. Dependent variables are log hourly wage (within firm estimates) as well as the firm specific mean of log hourly wage in each firm (between firm estimates). Tables 5 and 6 report the coefficients and their standard error for non-bargaining and bargaining firms respectively. Where percentages are used in the text, they are calculated as  $(e^{\beta} - 1)$ . As discussed in the previous section, the difference between the between and within estimators gives the effect of the firm-specific mean of a variable on the firms pay premium. For instance is the difference in the gender dummy -7.0 for firms with collective agreements. This means that an all-male firm pays identical employees 7,25 percent more than an otherwise identical but all-female firm<sup>5</sup>.

The presence of a personnel officer has a significant positive impact on the wage level of the firm. This evidence gives support to agency theories. We find, however, no significant effect of either firm size nor managerial ownership in bargaining environments.

The sign of the autonomy variable is positive with a negative interaction with union coverage and a positive one with firm size. The effects are, however, not significant. The point estimates indicates that an increase in average autonomy by one, increases the overall wage level of an average bargaining firm (collective coverage .71, no. of employees 237) by 4.2 percent. There is no effect of autonomy within firms: the firms do not distinguish between autonomous and non-autonomous workers in their agreed wages.

Union density increases the firms' wages by about 1 percent per decile. This supports the hypothesis that union power increases wages in Norway. Note, however, that while the average union membership affects the firm's pay premia, it does not affect individual wages within the firms. Non-members are not given lower wages within the firm. The positive union membership effect given in table 3 is thus a result of higher wages in firms with more union members rather than higher wages for union members.

---

<sup>5</sup> See Barth and Mastekaasa (1992) for an analysis of the impact of inter-firm and inter-industry differentials for the male-female wage gap.



Table 5.

Regression coefficients and standard error.  
Between - and within firm estimates as well as the difference between them.

BARGAINING FIRMS

	b <sub>betw.</sub>	St.err.	$\beta_{within}$	St.err.	$\delta=b-\beta$	St.err.
CONSTANT	3.973	0.047	4.139*	0.142	-0.166	0.149
FEMALE	-0.207	0.028	-0.138*	0.015	-0.070*	0.032
SCHOOL	0.059	0.008	0.045*	0.004	0.014	0.009
EXPERIENCE	0.027	0.005	0.015*	0.002	0.012*	0.006
EXP.SQARED	-0.0005	0.0001	-0.0003*	0.0000	-0.0003*	0.0001
TENURE	0.001	0.002	0.003*	0.001	-0.002	0.002
TEMPORARY	-0.096	0.053	-0.078*	0.027	-0.018	0.060
SHIFTWORK	-0.073	0.114	0.081*	0.024	-0.154	0.117
MERITPAY	0.077	0.034	0.025	0.021	0.052	0.040
UNIONMEMBER	0.099	0.039	0.010	0.017	0.089*	0.043
COLL.COVERAGE	-0.036	0.052	-0.078*	0.023	0.042	0.057
COV.* AUT	-0.053	0.034	-0.004	0.016	-0.049	0.037
SIZ.* AUT	0.0001	0.0001	-0.0000	0.0000	0.0001	0.0001
AUTONOMY	0.052	0.032	-0.000	0.015	0.052	0.035
REGION	0.065	0.016			0.065*	0.016
LOCAL.AGREEMENT	0.038	0.018			0.038*	0.018
FIRMSIZE	-0.0001	0.0001			-0.0001	0.0001
PERS.OFFICER	0.093	0.028			0.093*	0.028
NON-OWNER	-0.004	0.017			-0.004	0.017
Firmdummies			yes			
N	307		1476			
adj.R <sup>2</sup>	0.625		0.605			

Note: Dependent variable: Log hourly wage. The between estimates are from a regression of the firm specific mean of the log wage on the means of individual characteristics as well as the firm specific variables in the list. The within estimates are from a regression of log hourly wages for each individual including a dummy variable for each firm. The difference gives the effect of the firm specific variables on the firms pay premia (measured in log hourly wages). See text. The standard error of the difference is calculated as the  $\text{SQRT}((\text{st.err}_b)^2 + (\text{st.err}_w)^2)$  as the within and between variation is orthogonal and the coefficients thus independent. An \* means that the difference is significantly different from zero at a 5 percent level.

The between estimates are from a weighted regression with the square root of the number of observations in each firm as weights. The standard errors are corrected for heteroskedasticity.

The significant and negative within-firm effect of collective coverage is offset by a positive (but not significant) effect on the firms' pay gap. This indicates that those not covered by the collective framework are kept outside in order for the firm to give them higher wages. Average coverage, on the other hand, has a positive (if any) effect on the firm specific wage level. The observed negative effect in standard micro wage equations, (see table 2) of collective coverage is thus not at odds with standard bargaining theory. The effect simply originates within the firms.

Also the schooling and tenure effects both arise within the firms. This is consistent with human capital theory (see Topel, 1991). Heterogeneity among firms should thus not pose any significant problem for the analysis of these variables in standard micro wage equations, as suggested by Abraham and Farber (1987).

The next table gives the results from non-bargaining firms. Management ownership seems to discipline the wage setting in non-bargaining firms. The effect is however not significant on a 5 percent level. The point estimate indicates that managers not owning a share in the company pays their employees almost 5 percent more than their colleagues with ownership. The firm size effect is positive and significant. This is evidence of agency mechanisms in non-bargaining firms.

There is also a positive effect of average autonomy on the firm's pay gap. I take this as evidence of the presence of efficiency wage mechanisms in non-bargaining sectors. The firm size and autonomy effects are, however, offset by a significant negative interaction term. There is also a negative, albeit not significant, point estimate for the (autonomy X coverage) term. The point estimate for the average non-bargaining firm (size 43, coverage .23) indicates a 2.3 percent wage increase per unit of autonomy. The similar estimate for the firm size effect for the average firm (autonomy .99) is a 7,3 percent wage increase per 100 employee.

Again it is clear that the autonomy effect works between and not within firms. The management do not favor autonomous employees within any one firm. However, firms with higher average autonomy pay better. My interpretation of this finding is the following: Because of internal fairness constraints, the firms do not distinguish workers according to autonomy. However, in firms with many highly autonomous workers, efficiency wage

Table 6

Regression coefficients and standard error.  
Between - and within firm estimates as well as the difference between them.

NON-BARGAINING FIRMS

	$b_{\text{betw.}}$	St.err.	$\beta_{\text{within}}$	St.err.	$\delta=b-\beta$	St.err.
CONSTANT	3.963	0.075	3.754*	0.132	0.209	0.152
FEMALE	-0.154	0.044	-0.113*	-0.032	-0.041	0.054
SCHOOL	0.059	0.011	0.044*	0.007	0.015	0.013
EXPERIENCE	0.019	0.006	0.029*	0.004	-0.009	0.008
EXP.SQUARED	-0.0003	0.0001	-0.0006*	0.0001	0.0003	0.0002
TENURE	0.006	0.002	0.006*	0.002	0.000	0.003
TEMPORARY	-0.037	0.068	0.086	0.058	-0.123	0.089
SHIFTWORK	-0.108	0.069	0.135	0.127	-0.243	0.144
MERITPAY	0.110	0.042	0.181*	0.041	-0.071	0.059
UNIONMEMMBER	-0.013	0.039	0.042	0.037	-0.054	0.053
COLL.COVERAGE	-0.057	0.055	-0.181	0.046	0.124	0.072
COV.* AUT	-0.024	0.054	0.058	0.032	-0.081	0.063
SIZ.* AUT	-0.0007	0.0003	-0.0000	0.0001	-0.0007*	0.0003
AUTONOMY	0.070	0.031	-0.001	0.019	0.071*	0.036
REGION	0.075	0.030			0.075*	0.030
UNIONPRESENT	0.077	0.031			0.077*	0.031
FIRMSIZE	0.0014	0.0006			0.0014*	0.0006
PERSOFFICER	-0.020	0.051			-0.020	0.051
NON-OWNER	0.048	0.028			0.048	0.028
Firmdummies			yes			
N	183		530			
adj.R <sup>2</sup>	0.544		0.589			

Note: Dependent variable: Log hourly wage. The between estimates are from a regression of the firm specific mean of the log wage on the means of individual characteristics as well as the firm specific variables in the list. The within estimates are from a regression of log hourly wages for each individual including a dummy variable for each firm. The difference gives the effect of the firm specific variables on the firms pay premia (measured in log hourly wages). See text. The standard error of the difference is calculated as the  $\text{SQRT}((\text{st.err}_b)^2 + (\text{st.err}_w)^2)$  as the within and between variation is orthogonal and the coefficients thus independent. An \* means that the difference is significantly different from zero at a 5 percent level.

The between estimates are from a weighted regression with the square root of the number of observations in each firm as weights. The standard errors are corrected for heteroskedastisity.

considerations lead to a higher general wage level for all employees.

In non-bargaining firms, all human capital effects originate within firms. The tenure effect is larger than in bargaining firms. Ten years of experience in one single firm gives 32 percent higher wages, where 6 percentage points arise from tenure. The similar figures for bargaining firms are 15 and 3 percent.

Having a union present in the non-bargaining tends to increase the pay premium by 8 percent. This may be considered a union threat effect. Collective coverage displays a high and significantly negative effect on within-firm wage differentials. Workers paid according to the centrally negotiated framework are paid less than otherwise similar colleagues. The between-firm effect is positive but not significant. Also the union membership effect takes a different sign within and between firms, but is not significant in any case. Remember that we have also included a dummy for union presence. This variable captures the union threat effects in stead of the union density: there seems thus to be a shift at zero members and little effect from membership size.

#### *Firm Differentials within Industries*

I have also run the between firms regressions with control for 2-digit (ISIC) industries. This is done by introducing a dummy for each (but one) of the industries. It turns out that we may reject an hypothesis of equal firm premia across industries even when controlling for the firm specific variables. The adj  $R^2$  of the between regressions are .574 and .627 compared to the .544 and .589 from the regressions without industry dummies (see table A1 and A2). Industry affiliation adds to the explanation of firm premia.

Table 9 reports the difference between the between- and within firm estimates with industry control. The coefficients should thus be interpreted as the *within industry effects* of the firm specific variables on the firms' pay premia. It turns out that within industries, the ratio of male and females do not play a significant role in determining the firms' wage premia. The male female gap between firms thus seems to arise largely from different industry affiliation between the sexes. The percentage of collective coverage now turns out to have a significant positive effect on non-union firm premia. The point estimate is also larger for the bargaining firms, but still not significant.

Table 9.

**Coefficients from regressions with industry dummies**  
**Between- minus within firm coefficients**

---

	Non Bargaining firms		Bargaining firms	
	$\delta$	st.err	$\delta$	st.err
CONSTANT	0.1821	0.1498	-0.2408	0.1509
FEMALE	-0.0170	0.0564	-0.0203	0.0372
SCHOOLING	0.0041	0.0131	0.0105	0.0082
EXPERIENCE	-0.0150*	0.0071	0.0101	0.0056
EXP.SQ.	0.0004*	0.0002	-0.0002*	0.0001
TENURE	-0.0005	0.0035	-0.0007	0.0024
TEMPORARY	-0.1615	0.0902	-0.0046	0.0561
SHIFTWORK	-0.1940	0.1540	-0.1659	0.1327
MERIT PAY	-0.0689	0.0656	0.0157	0.0430
UNION MEMBER	-0.0826	0.0546	0.0831	0.0433
COLL.COVERAGE	0.1783*	0.0744	0.0627	0.0550
COV. * AUT	-0.0950	0.0633	-0.0733*	0.0369
SIZ. * AUT	-0.0013*	0.0006	0.0001	0.0001
AUTONOMY	0.0780*	0.0356	0.0723*	0.0344
REGION	0.0527	0.0293	0.0636*	0.0170
UNION PRESENT	0.0621*	0.0303		
LOCAL AGREEM.			0.0222	0.0179
FIRM SIZE	0.0019*	0.0008	-0.0001	0.0001
PERS. OFFICER	-0.0155	0.0512	0.0895*	0.0279
NON-OWNER	0.0480	0.0273	0.0014	0.0164
NUMBER OF INDUSTRY DUMMIES INCLUDED IN THE BETWEEN ESTIMATES:	19		22	

---

Note:  $\delta$  is the difference between the between coefficients (from the firm specific means) also with industry dummies, and the within coefficients (with firm dummies). The standard errors are calculated as the root of the sum of the variances of the two coefficients. See text. Coefficients marked with an \* are significantly different from zero on a 5 percent level.

The autonomy of the employees is even more important once we control for industry affiliation. In both environments, we have significant coefficients above .7. This means that fully autonomous firms pay about 1/5th better than identical firms with non-autonomous workers only. The effect is, however, significantly reduced in bargaining firms with high coverage and larger non-bargaining firms. I view this as rather strong evidence of the presence of efficiency wage mechanisms in Norway.

The coefficient for non-ownership in non-bargaining firms stays at its original point estimate of 4.8 but is now only significant at a 10 percent level. The coefficient for local agreements drops from 3.8 to 2.2 and ceases to be significantly different from zero. This either means that industry affiliation is the relevant feature, or that industries and bargaining regimes are too closely connected to make any clear distinction.

Experience shows up with a negative influence on non-bargaining firms. Also the coefficients for tenure take a negative sign in both bargaining environment. The effect of tenure is, however, far from significant. It seems thus clear that the tenure effect originate within firms.

## 5. Conclusion

This paper gives evidence of the presence of efficiency wage mechanisms, agency mechanisms as well as union bargaining effects in the Norwegian labor market. Agency theories are supported by the observation of a positive firm-size effect among non-bargaining firms as well as of a wage enhancing effect of having a personell officer present in bargaining firms. In both bargaining environments firms with more autonomous employees pay better. The autonomy effect is significant and rather large. This is evidence of the presence of efficiency mechanisms. Union density has a positive impact on bargained wages. Even in non-bargaining firms, having a union present causes higher wages.

The within firm pay structure differs from the between firm structure, particularly in the following manner. Union coverage has a negative impact within firms, but a positive impact between firms. Firms do not distinguish between workers with different levels of autonomy, but different levels of average autonomy affects the firms' premia. Also, union density effects arises between and not within bargaining firms. Both observations supports a notion that it is difficult for any employer to distinguish between workers on these accounts. It seems reasonable to attribute this fact to some sort of internal fairness constraints. I view this as support to Akerlof's (1990) fair-wage hypothesis. The observation is also consistent with the evidence of eg Dickens and Katz (1987) that industry premia are highly correlated across narrowly defined occupational groups.

The effects of human capital variables, on the other hand, by and large arise within firms. Particularly, there is no evidence of a positive correlation between firm specific seniority and pay premia neither in bargaining nor non-bargaining settings. The tenure effect arises within the firms, and is larger among the non-bargaining firms. This observation supports the more indirect evidence given in Topel (1991).

Industry affiliation has a significant impact on firm specific wage levels, even when controlling for several firm specific variables. This suggests that we have not exhausted the sources of wage variation between firms with our variables. The between firm models do however, perform quite well, explaining around 60% of the variation in average wages across firms (judged by the adj.  $R^2$ ).

The explanations suggested in the theoretical section all give clues as to why some firms pay more. They all seem to play a significant role in the Norwegian labor market. As they are complementary rather than substitute theories, this is not unreasonable. The evidence given, however, seems to indicate that the reasons for paying more do not augment each other. Both the wage increasing effect of higher union coverage and autonomy, as well as firm size and autonomy, are both diminished by negative (albeit not always significant) interaction terms. This suggests that higher wages for one reason is often sufficient to fulfill other purposes a wage premium might have.

Together with the evidence of highly correlated industry premia across countries even with very different bargaining regimes (Barth and Zweimuller (1992)) the evidence presented here adds to the growing body of international evidence supporting non-market clearing theories of wage behavior.



## References

Abraham, K. and Farber, H. (1987), "Job Duration, Seniority and Earnings", *American Economic Review*, June 87, Vol 77:3, 278-97.

Agostino, H.D. (1990), "Wage Differentials Between Union and Nonunion Members in Sweden", Manuscript, Swedish Institute for Social Research, University of Stockholm.

Akerlof, George (1982), "Labor Contracts as Partial Gift Exchange, *Quarterly Journal of Economics*, 97, 543-69.

Akerlof, G. and Yellen J. (1990), "The Fair Wage-Effort Hypothesis and Unemployment" *Quarterly Journal of Economics*, Vol CV, pp 255-84.

Arai, Mahmood (1990), "Industry Wage Premiums and Efficiency Wages: A Study of the Industry Wage Structure in Sweden", Swedish Institute for Social Research, Dissertation Series No 15, University of Stockholm.

Barth, Erling, (1991), Disagreement Points in Wage Bargaining, Working paper # 36, Institute of Industrial Relations, University of California, Berkeley.

Barth, E. and Mastekaasa, A. (1992), The Male-Female Wage Gap, The importance of firm and industry differentials, Working Paper #. xx, Institute for Social Research, Oslo.

Barth, E. and Zweimüller, J. (1992), Labor Market Institutions and the Industry Wage Distribution: Evidence from Austria, Norway and the US, Manuscript, Institute of Industrial Relations, University of California, Berkeley.

Brown, C. and Medoff, J (1989), The Employer Size-Wage Effect, *Journal of Political Economy*, 97, 1027-59.

Dickens, W. T. and Katz, L. F. (1986), Inter-Industry Wage Differences and Industry Characteristics, in Lang, Kevin and Leonard, Jonathan (eds), Unemployment and the Structure of Labor Markets, Basil Blackwell, Oxford.

Krueger, Alan B. (1991), "Ownership, Agency, and Wages: An Examination of Franchising in the Fast Food Industry", Quarterly Journal of Economics, Vol 106, pp. 75-101.

Krueger, A.B. and Summers, L. H. (1988), Efficiency Wages and the Inter-Industry Wage Structure, *Econometrica* 56:259-293.

Krueger, Alan B. and Summers, Lawrence H. (1986), Reflections of the Inter-Industry Wage Structure, in Lang, Kevin and Leonard, Jonathan (eds), Unemployment and the Structure of Labor Markets, Basil Blackwell, Oxford.

Layard, Richard, Nickell, Stephen and Jackman, Richard (1991), Unemployment, Macroeconomic Performance and the Labor Market, Oxford University Press, Oxford.

Lewis, Gregg (1963), Unionism and Relative Wages in the United States. Chicago: University of Chicago Press.

Rebitzer, J. and Robinson, M. (1991), Employer Size and Dual Labor Markets, Working Paper 3587, National Bureau of Economic Research, Cambridge MA.

Rubinstein, A. (1982), Perfect Equilibrium in a Bargaining Model, *Econometrica* 50, 97-109.

Shapiro, C. and Stiglitz, J.E., (1984), Equilibrium Unemployment as a Worker Discipline Device, *American Economic Review*, 74(3): 433-44.

Topel, R. (1991), Specific Capital, Mobility and Wages: Wages Rise With Job Seniority, *Journal of Political Economy*, vol. 99 no.1 pp 145-76.

Zanchi, Luisa (1991), Inter-Industry Wage Differentials and Institutional Conditions for Wage Bargaining: Empirical Evidence for Germany Using Micro data and a Comparison with the U.S. and Sweden, mimeo, European University Institute, Florence.

Weiss, Andrew, (1991), *Efficiency Wages*, Princeton University Press.

Table 1 a.

APPENDIX

Partial correlations, Firm specific variables,  
Non-Bargaining Firms.

	Female	Schooling	Experience	Tenure	Temporary empl.
Female	1.00	-0.03	-0.31	-0.15	0.26
School	-0.03	1.00	-0.07	-0.05	-0.11
Exper	-0.31	-0.07	1.00	0.52	-0.16
Expsq	-0.29	-0.09	0.96	0.50	-0.12
Tenure	-0.15	-0.05	0.52	1.00	-0.09
Temp.w	0.26	-0.11	-0.16	-0.09	1.00
Shiftw	-0.02	0.06	-0.07	-0.03	-0.06
Meritp	-0.11	0.02	-0.02	-0.02	-0.02
Unionm	0.02	0.28	0.06	0.05	-0.09
Colcov	-0.05	-0.11	0.06	0.12	0.12
Colaut	-0.09	0.06	0.06	0.12	-0.04
Sizaut	-0.02	0.38	-0.03	0.04	-0.10
Autono	-0.22	0.34	0.12	0.08	-0.19
Region	0.06	0.21	-0.04	0.04	-0.11
Local	0.01	0.21	0.11	0.07	-0.18
Fsize	0.01	0.38	-0.03	0.06	-0.11
Persof	0.10	0.14	-0.06	0.08	-0.03
No-own	0.12	0.02	-0.00	0.07	-0.13
<b>LOG W</b>	<b>-0.30</b>	<b>0.54</b>	<b>0.30</b>	<b>0.26</b>	<b>-0.27</b>

  

	Shiftwork	Merit pay	Union member	Collective coverage	Autonomy
Female	-0.02	-0.11	0.02	-0.05	-0.22
School	0.06	0.02	0.28	-0.11	0.34
Exper	-0.07	-0.02	0.06	0.06	0.12
Ex sq	-0.07	-0.01	0.09	0.05	0.11
Tenure	-0.03	-0.02	0.05	0.12	0.08
Temp.w	-0.06	-0.02	-0.09	0.12	-0.19
Shiftw	1.00	-0.05	0.20	-0.06	-0.16
Meritp	-0.05	1.00	0.06	-0.02	-0.05
Unionm	0.20	0.06	1.00	0.20	-0.08
Colcov	-0.06	-0.02	0.20	1.00	-0.09
Covaut	-0.05	-0.03	0.19	0.74	0.21
Sizaut	-0.01	-0.06	0.13	0.12	0.28
Autono	-0.16	-0.05	-0.08	-0.09	1.00
Region	0.01	0.01	-0.09	-0.04	0.21
Unionp	0.00	-0.09	0.44	0.27	0.03
Fsize	0.02	-0.03	0.14	0.14	0.23
Persof	-0.06	-0.04	0.10	0.14	0.15
No-own	0.11	0.03	0.08	-0.04	0.10
<b>LOG W</b>	<b>-0.04</b>	<b>0.12</b>	<b>0.13</b>	<b>-0.07</b>	<b>0.43</b>

Table 1 a cont.

Partial correlations, Firm specific variables,  
Non-Bargaining Firms.

---

	Region	Union present	Firm Size	Personnel officer	Non-owner
Female	0.06	0.01	0.01	0.10	0.12
School	0.21	0.21	0.38	0.14	0.02
Exper	-0.04	0.11	-0.03	-0.06	-0.00
Exp sq	-0.05	0.12	-0.05	-0.06	0.02
Tenure	0.04	0.07	0.06	0.08	0.07
Temp w	-0.11	-0.18	-0.11	-0.03	-0.13
Shiftw	0.01	0.00	0.02	-0.06	0.11
Meritp	0.01	-0.09	-0.03	-0.04	0.03
Unionm	-0.09	0.44	0.14	0.10	0.08
Colcov	-0.04	0.27	0.14	0.14	-0.04
Covaut	0.04	0.29	0.24	0.19	0.01
Sizaut	0.21	0.26	0.98	0.48	-0.00
Autono	0.21	0.03	0.23	0.15	0.10
Region	1.00	0.04	0.24	0.32	0.15
Unionp	0.04	1.00	0.28	0.31	0.17
Fsize	0.24	0.28	1.00	0.55	0.04
Persof	0.32	0.31	0.55	1.00	0.22
No-own	0.15	0.17	0.04	0.22	1.00
<b>LOG W</b>	<b>0.29</b>	<b>0.25</b>	<b>0.33</b>	<b>0.20</b>	<b>0.15</b>

---

Note: Number of firms: 306. Weighted with the square root of the number of observations in each firm.

Table 1 b

APPENDIX

**Partial correlations, Firm specific variables,  
Bargaining Firms.**

	Female	Schooling	Experience	Tenure	Temporary empl.
Female	1.00	-0.15	-0.31	-0.16	0.12
School	-0.15	1.00	-0.06	-0.01	-0.15
Exper	-0.31	-0.06	1.00	0.66	-0.15
Exp sq	-0.32	-0.11	0.96	0.61	-0.07
Tenure	-0.16	-0.01	0.66	1.00	-0.22
Temp w	0.12	-0.15	-0.15	-0.22	1.00
Shiftw	-0.07	0.03	-0.01	0.02	0.02
Meritp	-0.21	-0.12	0.05	0.06	-0.13
Unionm	-0.18	0.22	0.32	0.31	-0.32
colcov	0.05	0.08	0.22	0.23	-0.08
colaut	-0.05	0.29	0.10	0.10	-0.12
Sizaut	-0.17	0.19	0.05	0.12	-0.10
Autono	-0.15	0.33	0.03	-0.01	-0.10
Region	-0.05	0.18	-0.03	-0.09	-0.09
Local	-0.31	0.06	0.07	0.05	-0.10
Fsize	-0.17	0.14	0.03	0.10	-0.11
Persof	-0.11	0.20	0.11	0.13	-0.06
No-own	0.05	0.04	0.04	0.02	-0.01
<b>LOG W</b>	<b>-0.51</b>	<b>0.50</b>	<b>0.33</b>	<b>0.26</b>	<b>-0.33</b>

  

	Shiftwork	Merit pay	Union member	Collective coverage	Autonomy
Female	-0.07	-0.21	-0.18	0.05	-0.15
School	0.03	-0.12	0.22	0.08	0.33
Exper	-0.01	0.05	0.32	0.22	0.03
Exp sq	-0.01	0.07	0.27	0.19	-0.01
Tenure	0.02	0.06	0.31	0.23	-0.01
Temp W	0.02	-0.13	-0.32	-0.08	-0.10
Shiftw	1.00	-0.00	0.09	0.04	-0.00
Meritp	-0.00	1.00	0.11	-0.01	-0.07
Unionm	0.09	0.11	1.00	0.55	0.13
colcov	0.04	-0.01	0.55	1.00	0.00
colaut	-0.03	-0.07	0.41	0.56	0.69
Sizaut	0.14	0.04	0.18	0.08	0.13
Autono	-0.00	-0.07	0.13	0.00	1.00
Region	0.00	-0.01	0.03	-0.11	0.19
Local	0.02	0.21	0.06	-0.12	0.06
Fsize	0.14	0.07	0.17	0.09	0.06
Persof	0.16	-0.01	0.28	0.16	0.01
No-own	0.01	-0.03	0.08	0.17	-0.04
<b>LOG W</b>	<b>0.02</b>	<b>0.13</b>	<b>0.39</b>	<b>0.06</b>	<b>0.28</b>

Table 1 b cont.

**Partial correlations, Firm specific variables,  
Bargaining Firms.**

---

	Region	Local bargaining	Firm size	Personnel officer	Non-owner
Female	-0.05	-0.31	-0.17	-0.11	0.05
School	0.18	0.06	0.14	0.20	0.04
Exper	-0.03	0.07	0.03	0.11	0.04
Exp sq	-0.03	0.09	0.02	0.09	0.06
Tenure	-0.09	0.05	0.10	0.13	0.02
Temp w	-0.09	-0.10	-0.11	-0.06	-0.01
Shifw	0.00	0.02	0.14	0.16	0.01
Meritp	-0.01	0.21	0.07	-0.01	-0.03
Unionm	0.03	0.06	0.17	0.28	0.08
colcov	-0.11	-0.12	0.09	0.16	0.17
colaut	0.07	-0.06	0.10	0.12	0.09
Sizaut	0.31	0.07	0.97	0.40	0.03
Autono	0.19	0.06	0.06	0.01	-0.04
Region	1.00	0.10	0.32	0.18	0.14
Local	0.10	1.00	0.11	0.15	-0.01
Fsize	0.32	0.11	1.00	0.43	0.04
Persof	0.18	0.15	0.43	1.00	0.10
No-own	0.14	-0.01	0.04	0.10	1.00
<b>LOG W</b>	<b>0.26</b>	<b>0.27</b>	<b>0.24</b>	<b>0.35</b>	<b>0.00</b>

---

Note: Number of firms: 183. Weighted with the square root of the number of observations in each firm.