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**LABOR MARKET INSTITUTIONS AND THE INDUSTRY WAGE DISTRIBUTION:
EVIDENCE FROM AUSTRIA, NORWAY AND THE U.S.**

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Abstract

The paper compares the industry wage structures of Austria, Norway, the union sector of the U.S. as well as the non-union sector of the U.S. We make comparable regressions for each country, and are thus able to compare the sectoral earnings patterns controlling for the usual individual characteristics. Our results confirm the hypothesis that the patterns of the inter-industry pay structure is largely independent of labor market institutions: High paying industries in a non-union environment tend to pay high wages also in regimes where bargaining is very centralized and coordinated.

This, however, does not mean that collective bargaining does not matter. The influence is mainly on the amount of wage dispersion: We find considerably lower industry pay gaps in centralized Austria and Norway than in decentralized US. Within the US, pay differentials within the union sector slightly exceed those of the non-union sector.

The results give support to non-competitive explanations of the labor market. If efficiency wage mechanisms were the reason for wage differentials we would expect central bargainers to internalize these effects. Competitive explanations, on the other hand, would predict no difference between the non-union outcome and a central agreement with the aim of achieving full employment.

1. Introduction

The existence of persistent wage differentials across industries is a stylized fact. This has been well documented in the economic literature since a long time (Slichter, 1950). From the point of view of standard textbook economics, this observation is at odds with economic theory: wage differentials for workers with equal skills should only be a transitory phenomenon, equalized by market forces in the long run.

There are essentially two approaches to reconcile competitive labor market theory with reality. The first refers to unobserved productivity. The argument is simply, that the researcher observes only part of actual abilities of workers; unobservable characteristics would account for unexplained differentials. The second explanation refers to unobservable characteristics of jobs rather than workers. In this story, wage inequality arises from compensating wage differentials: employers have to pay higher wages for unpleasant jobs in order to attract workers.

If these explanations can account for the differences in pay across industries, there is no problem. In either case workers are paid their marginal product, and the wage reflects the employees' marginal disutility of work: the labor market clears.

Two recent studies cast serious doubts on both of these explanations. Krueger and Summers (1988) showed that workers who move from one industry to another experience wage changes quite similar to the differential on the aggregate: an observation, which is in sharp contradiction to an explanation relying on unobserved abilities. Furthermore, Dickens and Katz (1987b) found that the same occupations - secretaries, unskilled workers, etc. and even managers - are compensated very differently across industries. A fact, which makes it hard to believe that the underlying mechanism are compensating wage differentials.

More promising approaches seem to be the non-market clearing theories, i.e. efficiency wage and bargaining models of the labor market. Efficiency wage models postulate some relationship between the productivity of a worker and the wage rate. If this relationship differs across industries the result will be wage inequalities between equally able workers employed in different sectors. Bargaining models rely on the existence of some worker power in the determination of wages. Some industries will pay higher wages than others, because

the firms' higher ability to pay. Although this mechanism does not necessarily depend on the existence of unions, it is obvious that bargaining institutions should play an important role.

We argue in another paper (Barth and Zweimüller, 1992) that efficiency wage and bargaining theories are likely to be complementary rather than competing explanations of actual existing wage patterns. In the present paper we will address this question from an empirical point of view and focus on two dimensions of wage differentials:

- (i) the pattern of the inter-industry wage structure and
- (ii) the degree of wage dispersion

across countries with very different bargaining regimes: Austria, Norway and the U.S..

It is often claimed that the wage structure is very similar across countries (Krueger and Summers, 1987) and that it is largely independent of specific institutions. Most evidence, however, relies on aggregate statistics, and does not control for labor quality characteristics. Wagner (1990) who controls for individual characteristics, finds no case for similarities in the wage structure across 6 countries. Comparing the relatively homogenous Nordic countries, Arai et al (1992) report very similar industry wage patterns. In comparing Sweden and the U.S. Edin and Zetterberg (1992) show that aggregate statistics considerably overestimate the correlations. Our paper adds to this discussion.

A comparison of Austria, Norway and the U.S. is particularly interesting because of their large differences in the institutions of wage determination. This allows us not only to discuss the similarities of the wage structure, but also how different bargaining institutions influence the degree of wage dispersion under different bargaining regimes.

There is some evidence (Freeman, 1988) that Austria displays as high an industry dispersion as the U.S, while Norway and the other Scandinavian countries have a more compressed industry wage structure. Again, these figures are obtained from aggregate sources. In the analysis below, we use regression analysis to derive industry wage variation, which corrects for worker heterogeneity and therefore produces more reliable results.

We have taken particular care to make our empirical analysis comparable across countries. Our estimates rely on the same sample restrictions, identical specifications of the empirical model and so escape one of the objections international comparisons are usually confronted with. Our data also allow us to focus on some deeper structural characteristics of industry pay differentials which might be important, i.e. international differences in the industry pay structure among manual and non-manual workers as well as between women and men.

Much of both theoretical and empirical work on bargaining institutions has been concerned with macro-economic performance (see eg Moene and Wallerstein 1991 and Layard et al 1991). It should be evident, however, that the issue of industry wage differentials is an important determinant of the performance of an economic system as well. For homogenous workers, higher wages in some sectors than others lead to efficiency losses. There will be too high employment in low-wage industries and vice versa. In this sense, a system which produces lower industry wage dispersion performs better and promotes a more efficient allocation of labor.

Section 2 deals with institutional aspects of wage determination. We describe wage setting in the U.S. and compare it to the very centralized and coordinated bargaining structures in Austria and Norway. Although the two latter countries show many similarities (compared to the U.S.), there are significant differences between them, which ought to be important determinants of the industry pay structure. Section 3 relates the institutional aspects to the theoretical arguments mentioned above and develops some hypotheses. A description of the data, the possibilities and limitations of its comparability as well as a discussion of some methodological issues follows in Section 4. The results are presented in Section 5. We begin by discussing the importance of industry affiliation as a source of wage variation relative to other (e.g. human capital) explanatory variables. We then proceed by assessing the similarity in the pay structure as well as by comparing the degree of wage dispersion. Section 6 concludes the paper.

2. Labor Market Institutions in Austria, Norway and the U.S.

That wage setting institutions are important determinants of labor market outcomes has been increasingly recognized in the economics literature (for an overview see Moene and Wallerstein, 1991). However, the question how bargaining institutions and wage inequality are connected to each other is only weakly understood¹. In order to be able to derive some hypotheses which are empirically testable we first describe the institutions of wage determination in the countries under consideration.

The role of unions in the private sector of the United States has been strongly declining during the past decades and union density has reached a low of 12.5 % in 1989. Unionism in the U.S. has become relatively unimportant. In addition wage negotiations are very decentralized and most wage bargaining occurs at the firm level between a single trade union and a single employer.

Austria's and Norway's bargaining systems are completely different from those in the U.S. First, in both countries most workers who are not union members are covered or strongly affected by the national wage negotiations. Union membership as a determinant of wages is important mainly because of supplementary negotiations at the firm level. Second, wage negotiations occur along industry lines, and are highly coordinated with other groups of the union movement.

In Austria, the umbrella association of trade unions, the "Österreichischer Gewerkschaftsbund" (ÖGB) organizes all unions within the country. The ÖGB has a very strong position within the Austrian union movement: it appoints union secretaries, controls the funds of the single unions, and determines the timing of the wage negotiations. This considerable power of the central organization is even enhanced by an indirect election system of unions representatives which isolates top union leaders from the pressure of the union

¹ Among the few papers dealing with this issue theoretically are Wallerstein (1990) and Barth and Zweimüller (1992). The model of Calmfors and Driffil (1988) implicitly determines wage dispersion across industries; their focus, however, is on the average real wage rather than on relative wages across sectors. Edin and Zetterberg (1992) and Zanchi (1991) address the problem from an empirical point of view.

members, inhibiting pressure group behavior of single unions and facilitating the cooperation with the employer federation². Coordination is not only high among unions but also among employer associations. There is forced membership in the "Kammer der gewerblichen Wirtschaft", so that all employers are represented in the negotiations.

The bargaining structure in Norway³ is also characterized by high centralization. Both employers and employees are organized on a national level. Most large employers are members of the "Næringslivets Hovedorganisasjon" (NHO). The largest union federation "Landsorganisasjonen i Norge" (LO), organizes most blue-collar workers and completely dominates mining, manufacturing, construction and transport. The other two confederations "Yrkesorganisasjonenes Sentralforbund" (YS) and "Akademikernes Fellesorganisasjon" (AF) also bargain on a national level, but are considerably smaller and organize to a larger extent white-collar workers and professionals. The LO-NHO negotiations are key bargains followed by subsequent settlements. From time to time nationwide bargaining is replaced by industry-wide negotiations. Centralization still is the dominating feature of the Norwegian system.

In both countries, centralized bargaining is succeeded by plant level negotiations. In Norway, these local bargains are mainly conducted without the right to strike, however, as the parties already have agreed upon a central settlement. In Austria works councils at the firm level are strongly integrated in the trade unions, so that there is coordination also at this level.

In view of this two-tier system, one might of course ask whether the central agreements matter at all, or if only the last and local bargain determines the settlement. However, the local bargain cannot offset the central one as the central bargainers may both influence the outcome of local bargaining through their settlement, and are able to foresee the outcome locally (Holden 1990). It is thus correct to view our two bargaining cases as highly centralized countries with respect to wage formation.

There are at least three differences in the bargaining structures of Austria and Norway

² See Pollan (1982) for a survey of the institutional framework of wage policy in Austria.

³ See Rødseth and Holden (1990) for an overview of the institutional structure of wage bargaining in Norway.

which might be important for the industry wage structure. The first concerns the definition of what is meant by "solidaristic wage policy" by the trade union movement. In Austria, wage solidarity means that all unions should have the same wage increases; i.e. the idea that economy-wide rather than industry-specific productivity gains should determine wage increases. Redistribution issues are not addressed in the bargaining process, but rather left to legislation. Norwegian "solidaristic wage policy" on the other hand, stresses "equal pay for equal work" and also give high priority to low-wage groups. Through the last decades, particular wage increases have been assigned to firms with a low average wage within its industry.

A second important difference is the degree of coordination within the trade unions movement. The Austrian ÖGB has very strong constitutional authority. The Norwegian unions are more fragmented, especially between white and blue collar workers. In addition, decentralization seems to be a growing trend (see Kalleberg and Colbjornsen, 1990)⁴.

A third point is the treatment of workers not covered by central agreements. In Austria centrally negotiated agreements basically covers all workers, whereas in Norway, wages in firms not included in the centralized bargain are set locally either by the firm or through local negotiations. The collective bargained wages affect the wages of uncovered workers, but mostly they act as a "floor" to the settlement in non-bargaining firms (Barth 1992).

⁴ Recent developments suggest that there occurs some fragmentation between unions in Austria as well. High wage unions managed to agree a reduction in the standard working week whereas low wage unions did not (Pollan, 1990).

3. Theoretical Issues

From a theoretical point of view, it is argued that high-paying industries may pay better because of efficiency wage, rent sharing considerations or because of rent extraction on part of the workers.

Efficiency wage theories predict higher wages where workers are autonomous and difficult to monitor (Shapiro and Stiglitz, 1984), where workers are heterogeneous and difficult to screen ex ante (Weiss, 1990) or where turnover costs are high (Schlicht, 1975).

Rent sharing theories assume that effort and cooperation of employees depends on the wage relative to the firm's profit (Akerlof, 1982, Frank, 1985). If the firm has a hard time, the workers accept lower pay. If the firm is doing well, workers expect to benefit from higher profits.

Rent extraction occurs when the workers are able to capture a part of the firm's rent by the threat of collective action. Bargaining theory deals with wage formation in firms where wages are determined through negotiations between workers' representatives and the firm. Union threat theory predicts that also employers in non-bargaining firms will have to pay their workers according to their potential bargaining power were they to organize (Dickens, 1986).

What is the role of collective bargaining institutions? One institutional dimension is the question of who actually sets the wages. Efficiency wage as well as rent sharing theories are mainly designed for situations where employers unilaterally set wages. Bargaining theory applies to negotiated wages, but represents a generalization of wage setting theories as the unilateral determination of wages on part of employers is a special case (where the union's bargaining power approaches zero).

Another important aspect is the degree of centralization. When comparing industry differentials in Austria, Norway and the U.S., we compare the extreme cases. Austria and Norway are highly centralized bargaining economies, while the U.S. non-union sector is characterized by the absence of institutionalized wage determination.

It is often claimed that the *pattern of industry wages* is very similar across countries. If we confirm this also in our analysis below, the underlying mechanisms behind high wage

premia are the same across widely different institutional frameworks. What gives rise to wage premia in a centralized bargaining economy, also promotes higher wages in a decentralized market economy.

If we find similarity in the wage patterns, we may conclude that wage extraction in the form of union bargaining cannot be the whole story. In this case we predict the industry differences to vanish as bargaining power approaches zero. If bargaining theory does a good job in predicting bargained wages, there must be elements of union threat or rent sharing in the non-bargaining economy.

Similarly, if efficiency wage considerations are important in the non-bargaining case, the same mechanisms must be at work also in the bargaining society. The technological or sociological mechanisms driving efficiency wages are the same across countries.

The second question we address below is that of *industry wage dispersion*. According to standard theory, industry wage dispersion for similar workers should be zero in the non-bargaining case. We should expect lower variation in industry wages in the competitive economy.

Efficiency wage theories, on the other hand, would predict lower dispersion in the centralized bargaining case (Barth and Zweimüller, 1992). Two mechanisms are at work. First, the bargained wage is a weighted outcome of efficiency wage considerations and bargaining power. With equal bargaining power across unions, we get a more equal distribution of wages the higher the union's bargaining power. Secondly, centralization tends to internalize the efficiency wage effects. This gives a lower overall wage level.

If rent sharing or rent extraction are the most important factors behind wage differentials in a market economy, we would expect industry variation to be fairly similar across bargaining regimes. Industries with less product market competition would tend to pay better. Again, centralization might lead to lower wage dispersion through the internalization of external effects across industries (eg price effects, see Wallerstein 1990 and Calmfors and Driffil 1989).

4. Data and Methodology

To determine the effect of industry affiliation on the wage rates we use cross-sectional micro data. The data sets are the 'current population survey' (CPS) 1983 for the U.S., the Norwegian 'survey of organizations and employees' 1989, and the Austrian 'microcensus' 1983. We restricted all samples to non-agricultural employees with complete observations⁵. We ended up with 109,735 observations and 25,193 observations in the U.S. non-union and union sample respectively. The Austrian sample contains 10,184, the Norwegian 2,561 observations.

Our empirical approach follows the standard procedure to run wage regressions of the following form

$$\log w_i = X_i b + I_i c + u_i \quad (1)$$

where w_i denotes the measure of the wage rate, X_i is a vector of covariates and I_i is a unit vector of industry dummy variables. u_i is a random error term which we assume to be normally distributed. b and c are the vectors of coefficients we want to estimate.

The dependent variable in our subsequent regressions is the log of the hourly wage rate. To calculate this variable we used information on usual weekly working hours as well as on normal monthly (or weekly and hourly) earnings, which were available in all samples. There is one main difference between the Austrian and the two other data sets; the former reports net income whereas the latter ask for gross earnings. This causes problems because of the progressivity of the tax system (not because of taxes per se), since we would expect the redistributive effects of the tax system to cause more wage equality.

We use two-digit industry fixed effects to measure the differences in wages across industries. The industry classification available in the Austrian microcensus reports affiliation

⁵ There was a large number of people refusing to answer the question on income in the Austrian survey. This raises the question of the existence of a sample selection problem. In Zweimüller (1992) it is shown for a sample of women that non-response selectivity may be a problem. However, biases affected only the constant term but not the slope coefficients.

to one of 25 industries. In order to assure comparability of the data sets we had to aggregate the Norwegian and U.S. data which were available on a much deeper level of aggregation. Starting with the Austrian classification scheme and (i) excluding workers in the agricultural sector, and combining (ii) clothing with leather and footwear industry and (iii) paper with printing and publishing industry we ended up with 22 industries. The classification schemes for each country are reported in table A1 in the appendix.

Inter-industry wage differentials are given by the c -coefficients in equation (1). We measure the degree of wage dispersion by the standard deviation of the coefficients, which is given by:

$$STD(c) = \left[\frac{1}{J} \sum_{j=1}^J (c_j - \frac{1}{J} \sum_{j=1}^J c_j)^2 \right]^{\frac{1}{2}} \quad (2)$$

where $j=1, \dots, J$ indexes industries. This simple measure suffers from two biases which might be important. First it assumes that employment is equally distributed across industries. We therefore define a "weighted standard deviation", $WSD(c)$, which is given by

$$WSD(c) = \left[\sum_{j=1}^J (e_j c_j - \sum_{j=1}^J e_j c_j)^2 \right]^{\frac{1}{2}} \quad (3)$$

This measure weights each industry dummy by its corresponding employment share e_j . The second source of bias stems from the fact that the c -coefficients are estimated rather than "true" coefficients. Although c_j is unbiased, $WSD(c)$ is not. A third measure, the "weighted adjusted standard deviation", $WASD(c)$, takes this into account (see Krueger and Summers, 1988):

$$WASD(c) = [WSD(c)^2 - \sum_{j=1}^J e_j \sigma_j^2]^{\frac{1}{2}} \quad (4)$$

where σ_j is the estimated standard error of the industry coefficients obtained from a regression of equation 1. Equation (4) ignores the covariances between the estimated coefficients (see Krueger and Summers, 1988).

The covariates introduced in the regression analysis are (i) human capital variables (schooling, experience and their squares), (ii) 6 occupational dummies⁶ and (iii) sex (and race for the U.S. and citizenship for Austria), marital status and a dummy for agglomeration areas. All explanatory variables were allowed to vary between men and women. Marital status (as well as race and citizenship in the U.S. and Austrian regressions) were interacted with human capital variables. For complete regression results see table A3 in the Appendix.

5. Results

We present our results in three steps. In order to assess the importance of industry wage differentials we first compare the part of overall wage variation explained by industry dummies to other possible sources which are likely to create pay differentials: human capital and occupational variables. Next, we present results on industry dummy variables, estimated from regressions both with and without covariates. We show the similarity in the industry wage structure between countries by taking a closer look at the correlations of wage inter-industry wage patterns. Finally, we show how the degree of wage dispersion differs across different bargaining regimes. Since we focus on bargaining regimes rather than countries, we will provide separate evidence for the union and for the non-union sector in the U.S..

Before starting this exercise, it might be useful to take a look at overall wage variation.

⁶ Table A2 in the appendix reports the occupational classification used from each country to make comparable groups in the analysis.

We measure this simply by the standard error of log wages. This is shown in Table 1.

Table 1 **Wage Inequality across countries.**

	Std.Dev. of log Wages
Austria	0.40
Norway	0.32
U.S. union	0.44
U.S. non-union	0.55

Wage dispersion in the U.S. is high and low in Norway. Within the U.S., pay differentials are higher among employees in the non-union sector. This is no surprise and reproduces a fact found in other studies (e.g. Freeman, 1982, for the U.S. and Freeman and Blanchflower, 1992 for 6 different countries). However, also the wage distribution in Austria seems to be very unequal. This is even more so, once we recognize that this figure is obtained from net rather than gross wages. Wage inequality in Austria may be closer to the distribution in the U.S. than to the distribution in Norway. This may well be the result of union policy: as mentioned above Norwegian trade unions are very much concerned with distributional issues, which is not the case for the Austrian trade union movement. In the following we take a closer look at the role of inter-industry pay variation.

4.1. Sources of Wage Dispersion

We next show the importance of industry affiliation relative to other potential candidates of sources of wage dispersion: human capital variables and occupations. We use R squared as a measure for the contribution of one group of variables to overall wage variation. If all variables of one group were orthogonal to the remaining variables, the R squared obtained from a regression including only this group would be the correct statistic. However, regressors are correlated among each other, so that this measure serves as an upper bound. The lower limit is given by the R squared reduction resulting from excluding the respective group of regressors from the complete model. Table 2 presents the results.

Table 2 Sources of Wage Dispersion.

R ²	Full model	Industry	Human Capital	Occupations
Austria	0.49	0.01 - 0.11	0.08 - 0.31	0.04 - 0.12
Norway	0.51	0.03 - 0.16	0.10 - 0.34	0.03 - 0.22
US Union	0.40	0.08 - 0.21	0.05 - 0.12	0.02 - 0.10
US Non U.	0.53	0.04 - 0.19	0.06 - 0.30	0.05 - 0.28

Note: The table reports the reduction in the R² from the full model *without* the respective group of variables (lower bound) and the R² from regressions including *only* the respective group of variables (upper bound).

In Austria industry affiliation does not seem to be very important. Between 1 and 11 % of the total variance is attributable to the industry dummies. In Norway the corresponding figures are somewhat higher, but still considerably lower than the U.S.. In the U.S., particularly in the union sector, industry affiliation is much more important. Human capital variables and occupations seem to play a smaller role in the union sector of the U.S.. Occupations also explain less of wage variation in Austria. The human capital variables, on the other hand seem to be of equal relative importance in Austria, Norway and the non-union sector of the U.S..

4.2. Industry Wage Differentials

Tables 3 and 4 display the industry wage differentials obtained from regressions without and with controlling for covariates. The tables show that clothing and leather industries which pay the lowest wages in Austria, tend to pay low also in Norway and in the U.S.. The same tends to hold on the other end of the scale (construction, mining, electricity\gas\water supply, manufacturing of paper, chemicals and mineral products).

It is worth noting that the general picture remains once the other covariates are controlled for. However, the coefficients of the industry dummy variables tend to be considerably lower. Again, this is in line with the findings in other studies. (Krueger and Summers, 1988, Zancchi, 1991, Edin and Zetterberg, 1992).

Table 3. Wage Differences by Industry.
Without controlling for individual characteristics.

	Austria	Norway	US Union	US Non-U
EL.\GAS\WATER SUPPL.	0.24	0.02	0.19	0.49
OIL EXTR. AND MINING	0.16	0.23	0.22	0.48
MANUF.FOOD\BEVERAGES	0.02	-0.09	-0.07	0.04
MANUF.TEXTILES	-0.14	-0.08	-0.36	-0.10
MANUF.WEAR.\LEATHER	-0.37	-0.27	-0.55	-0.26
MANUF.WOOD\FURNITURE	-0.08	-0.15	-0.18	-0.02
MANUF.PAPER\PRINTING	0.15	0.18	0.03	0.13
MANUF.CHEMICALS\OIL	0.11	0.10	0.03	0.36
MANUF.MINERAL PROD.	0.12	0.08	-0.03	0.15
MANUF.METALS\MACHINERY	0.06	0.10	0.04	0.30
CONSTRUCTION	0.10	0.06	0.31	0.12
HOTELS AND RESTAURANTS	-0.25	-0.32	-0.49	-0.49
TRANSPORT\COMMUNICATION	0.05	0.06	0.18	0.24
FINANCIAL INSTITUTION	0.16	0.06	-0.18	0.17
REAL ESTATE\BUSINESS	0.09	0.18	-0.17	0.06
SANITARY AND SIMILAR	-0.29	-0.14	-0.40	-0.25
RECREATION\ CULTURE	0.17	0.16	-0.00	-0.23
MEDICAL\HEALTH\WELF.	-0.05	-0.06	-0.19	0.03
EDUCATION\RESEARCH	0.13	0.15	-0.06	-0.01
PUBL.ADM.\PRIVATE ORG	0.05	0.01	0.01	0.08
PERSON.AND HOUSEHOLD	-0.30	-0.11	-0.01	-0.37
WHOLE.\RETAIL TRADE	-0.10	-0.11	-0.17	-0.12

Note: The coefficients for industry dummies minus employment weighted mean. From regressions with industry dummies only. Industry classifications are given in table A1 in the appendix.

**Table 4. Wage Differences by Industry.
With controlling for individual characteristics.**

	Austria	Norway	US Union	US Non-U
EL.\GAS\WATER SUPPL	0.07	0.01	0.12	0.27
OIL EXTR. AND MINING	0.04	0.04	0.15	0.32
MANUF.FOOD\BEVERAGE	-0.01	-0.04	-0.04	0.05
MANUF.TEXTILES	-0.02	0.01	-0.25	-0.01
MANUF.WEAR.\LEATHER	-0.08	-0.14	-0.34	-0.08
MANUF.WOOD\FURNITURE	-0.06	-0.10	-0.15	-0.01
MANUF.PAPER\PRINTING	0.07	0.12	-0.01	0.04
MANUF.CHEMICALS\OIL	0.06	0.07	-0.00	0.19
MANUF.MINERAL PROD.	0.01	-0.02	-0.03	0.06
MANUF.METALS\MACHINERY	0.01	0.03	-0.01	0.14
CONSTRUCTION	0.03	0.04	0.25	0.11
HOTELS AND RESTAURANTS	0.02	-0.07	-0.28	-0.18
TRANSPORT\COMMUNICATION	-0.01	0.02	0.15	0.14
FINANCIAL INSTITUTION	0.05	0.01	-0.13	0.09
REAL ESTATE\BUSINESS	0.01	0.06	-0.14	0.01
SANITARY AND SIMILAR	-0.08	0.05	-0.29	-0.04
RECREATION\ CULTURE	0.04	-0.03	-0.04	-0.10
MEDICAL\HEALTH\WELF.	-0.04	-0.08	-0.15	0.03
EDUCATION\RESEARCH	0.02	-0.17	-0.24	-0.17
PUBL.ADM.\PRIVATE ORG	-0.05	-0.09	-0.09	-0.11
PERSON.AND HOUSEHOLD	-0.05	-0.07	-0.05	-0.18
WHOLE.\RETAIL TRADE	-0.01	-0.04	-0.05	-0.07

Note: Coefficient minus employment weighted mean for the industry dummies from a regression also including schooling, schooling squared, experience, experience squared, 6 occupational groups, race/citizenship and a regional (urban) dummy. All covariates are interacted with gender. Schooling and experience is interacted with marital status and race as well. Coefficients for the covariates are reported in tables A3.1-A3.4.

Inter-industry wage patterns between Austria, Norway and the U.S. are similar. This is shown by the correlation matrix in Table 5. The coefficients lie within a range of 0.48 (Austria, U.S.-union) and 0.68 (U.S. union and non-union). It is worth noting that the estimated correlations are lower than those usually obtained from aggregate statistics. This is not surprising, since we might expect that correlations in the aggregate are partially due to correlation in the distribution of covariates across industries.

**Table 5 Similarity of Industry Wage Patterns.
Unweighted correlations of industry premia.**

	Austria	Norway	US Union	US Non-U
Austria	1.00	--	--	--
Norway	0.51	1.00	--	--
US Union	0.52	0.49	1.00	--
US Non-Union	0.49	0.63	0.68	1.00

Note: Partial correlations of industry premia with control for individual characteristics (table 4).

In order to check if these similarities in wage patterns remain on a deeper level of aggregation, we have made similar analysis for blue- and white collar workers in each country (Table 6).

The correlations vary more strongly at this level, ranging from .16 (Norwegian and Austrian non-manual workers) to .74 (within U.S., non-manual). Industry wage premia are correlated across countries with very different wage setting institutions. From a theoretical point of view, efficiency wage theories which rely on technological factors are in line with these observations. But also gift exchange mechanisms may be at work, as we would expect

**Table 6 Industry Wage Patterns for White- and Blue Collar Workers.
Correlations across countries.**

	Nonmanual workers			Manual workers		
	Austria	Norway	US U	Austria	Norway	US U
US Non-U	0.16	0.65	0.68	0.61	0.54	0.74
Austria	1.00	0.24	0.31	1.00	0.27	0.45
Norway	..	1.00	0.45	..	1.00	0.32

Note: Correlations of industry premia with control for individual characteristics (see table 4) from separate regressions for each group in each country.

such norms to be similar across countries. The results are against a simple bargaining story, relying on the mere existence of unions as a disturbing force in wage determination. If bargaining power is behind the industry pattern, union threat effects or rent sharing must be important in the non-bargaining case. The industry wage pattern is quite similar irrespective of the bargaining regimes as well as of the presence of unions, as correlations with the U.S. non-union sector show. The same underlying factors seem to be at work, regardless of institutional framework.

4.3. The Degree of Wage Dispersion

While bargaining institutions may not be the underlying force behind the pattern of industry wages, they may very well influence the degree of wage dispersion. Table 7 shows the various

measures of the amount of industry dispersion which were introduced in the previous section.

Table 7. Variation in Industry Wage Premia.

	Controlling for individual characteristics			Without control	
	STD	WSD	WASD	STD.	WASD
Austria	0.0448	0.0362	0.0320	0.1702	0.1307
Norway	0.0712	0.0580	0.0529	0.1452	0.1268
US Union	0.1509	0.1419	0.1414	0.2190	0.2016
US Non-union	0.1347	0.1191	0.1189	0.2523	0.2401

Note: Variation in industry premia with control for individual characteristics (see note to table 4). STD is the standard deviation of the coefficients. WSD is the employment weighted standard deviation of the coefficients. WASD is the employment weighted standard deviation adjusted for sampling error, see previous section for precise definitions.

The unadjusted Austrian industry variation is relatively high, and is not too far apart from that of the US. (.17 vs. .25 and .22) This result is in line with the findings of Freeman (1988) using aggregate statistics. Adjusting for employment structure and random estimates, however, makes this result becomes clear.

Once we control for individual characteristics, Austria turns out to have the lowest differentials across industries⁷. In Norway, pay differentials are only slightly higher. Again, we should note that the results for Austria are based on net rather than gross wages. This is likely to bias the Austrian results downwards, but it seems hard to believe that differences in average tax rates across industries are so high that they would fundamentally change the picture.

Accepting this appraisal, we are led to conclude that a centralized bargaining structure tends to reduce industry wage dispersion. The results for Sweden, another outstanding 'corporatist' economy support this conclusion: Edin and Zetterberg (1992) and Arai (1991) estimate WASD's equal to 0.026 and 0.013 with Swedish data.

It is worth noting that the findings provide some support for an efficiency wage explanation of the inter-industry wage structure. The reason is this: corporatist countries have (or at least had for a long time) the declared intention to ensure full employment. This fact will force unions to accept a wage structure which does not deviate too much from wage dispersion created by market forces. In a market clearing framework with a wage dispersion arising, say, from compensating wage differentials we would expect wage dispersion in a corporatist country to approach the non-union case - which produces the wage structure compatible with full employment. I.e. we would expect differentials in the non-union sector U.S. to be comparable to Austria and Norway, which is of course in sharp contradiction to the evidence presented above.

If efficiency wage mechanisms are the underlying force of pay differentials, this is not the case. In fact, we show in Barth and Zweimüller (1992) that central bargainers will tend to internalize efficiency wage effects and agree on lower relative wages than an unconstrained efficiency wage mechanism would produce. The results here are in line with such a framework.

We have calculated the variation in industry wages also for the following sub-samples: Manual and non-manual workers as well as for women and men. Table 8 reports the figures.

⁷ Using a different sample restriction, Winter-Ebmer (1992) gets slightly higher wage premia.

The only group having a different variation than the gross measures are again Norwegian blue-collar workers, showing a WASD which lies between Austrian and U.S. figures. This is somewhat puzzling, but probably indicates that industry specific factors, like product market rent or capital intensity, are more important for blue-collar workers. It is noteworthy that manufacturing and construction are among the industry groups with the highest level of both blue collar workers and local bargaining in Norway. Within these groups supplementary firm-level bargaining is of particular importance, with wage drift as a result.

**Table 8 Variation in Industry Wage Premia for Different Groups.
Weighted Standard Deviation Adjusted for Sampling Error.**

	Non-manual	Manual workers	Male	Female
Austria	0.025	0.040	0.037	0.029
Norway	0.053	0.069	0.055	0.051
US Union	0.138	0.149	0.124	0.118
US Non U	0.125	0.111	0.123	0.126

Note: Calculated as the employment weighted standard error adjusted for sampling error (see text) of the industry wage premia from a model with control for individual characteristics (see table 4).

6. Conclusions

We draw five conclusions. Two are more general, and refer to the discussion of the theoretical arguments which are usually stressed to account for industry pay differentials. Three points are more specific. They refer to individual countries and tie up with the institutional features of the countries we considered. We present them in turn.

(i) The inter-industry pay structure is rather similar, even across very different regimes of collective bargaining: High wage sectors in Austria tend to pay high wages in Norway, the U.S.-union and the U.S. non-union sector. There is no particular pattern in the correlations, which would suggest any systematic differences according to differences in labor market institutions. In all cases the correlations are around 0.50. This figure is consistent also with other studies (Edin and Zetterberg, 1992). This result also suggests, that it is not unionism per se, which creates differences in pay across industries. The underlying mechanisms promoting wage premia seem to be at work regardless of wage setting institutions. This finding adds generality to previous empirical studies showing that firm size (Brown and Medoff 1989), the capital-labor ratio (Dickens and Katz 1987a) or average autonomy of the workers (Arai 1990 and Barth 1992) are correlated with industry and firm wage premia.

(ii) Although labor market institutions do not seem to be the underlying reason of industry wage dispersion, they do influence the degree of dispersion: centralized bargaining produces less sectoral wage inequality. This is further evidence against competitive explanations of pay differentials which rely on unobserved ability and/or compensating wage differentials. In this case we would expect centralized bargainers (which try to achieve full employment) to accept a wage variation which is similar to that obtained in a non-union environment. It is, however consistent with efficiency wage considerations. In that case, centralization will tend to internalize efficiency wage effects and thus produce lower wage dispersion. Our results may also conform with rent sharing and rent extraction theories. We may reject, however, a notion that unionism and bargaining institutions are the only factors behind wage differentials.

(iii) It is sometimes claimed that Austria has a very high degree of wage inequality compared to countries with equal union power. This would also be reflected in the interindustry wage structure. Our data confirm this claim: Overall wage dispersion is comparably high, as is industry wage dispersion, as long as we do not control for individual characteristics. However, this picture vanishes once we control for labor quality and other individual characteristics: The industry wage variation for employees with identical characteristics is very small in Austria. The result of high wage inequality remains; this is attributable - among other things - to higher differentials in the returns to human capital, especially a steeper wage/experience profile, as well as higher differences between men and women than in Norway.

(iv) Overall wage variation in Norway is much lower than in the other countries we analyzed. This is likely to be the effect of solidaristic wage policy, which has a long tradition in the Nordic countries. Industry wage differentials in Norway are, however, slightly higher than the Austrian results. They are also somewhat higher than recent estimates obtained for Sweden. (see Arai, 1991 as well as Edin and Zetterberg, 1992). The results confirm well with the figures obtained in Arai et al (1992) comparing industry wages within the Nordic countries.

(v) The results for the U.S. reproduce the estimates of Dickens and Katz (1987), albeit on a higher level of aggregation of industries. This, however, does not seem to make very much difference. The bulk of the industry differentials seems to be visible even at a very crude level of aggregation.

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Table A 1. INDUSTRY CLASSIFICATION

APPENDIX

INDUSTRY:	ASIC	ISIC	USIC
ELECTRICITY, GAS AND WATER SUPPLY	II	41-42	460-470 472
OIL EXTR., MINING AND QUARR.	III	21-29	40-50
MANUFACTURING OF FOOD BEVERAGES AND TOBACCO	IV	31	100-130
MANUFACTURING OF TEXTILES	V	321	132-150
MANUFACTURING OF WEARING APPAREL, LEATHER AND FOOTW.	VI,VII	322-24	151-152 220-222
MANUFACTURING OF WOOD, FURNITURE AND OTHERS	VIII	33,39	230-242 390
MANUFACTURING OF PAPER, PRINTING AND PUBLISHING	IX,X	34	160-172
MANUFACTURING OF CHEMICALS, OIL, COAL, RUBBER AND PLASTIC	XI	35	180-212
MANUFACTURING OF MINERAL PRODUCTS	XII	36	250-262
MANUFACTURING OF METALS, MACHINERY AND EQUIPMENT	XIII	37-38	270-382 391-392
CONSTRUCTION	XIV	50	60
WHOLESALE AND RETAIL TRADE, STORAGE AND WAREHOUSING	XV	61-62,	500-640 642-691
OPERATION OF HOTELS AND RESTAURANTS	XVI	63	641
TRANSPORT AND COMMUNICATION	XVII	71-72	400-442
FINANCIAL INST. AND INSURANCE	XVIII	81-82	700-711

INDUSTRY:	ASIC	ISIC	USIC
REAL ESTATE AND BUS. SERVICES	XIX	83	712-742
SANITARY AND SIMILAR SERVICES	XX	92	771-781 471
RECREATION AND CULTURE	XXI	94	800-802
MEDICAL, HEALTH SERVICES AND WELFARE INSTITUTIONS	XXII	933-934	812-841 862
EDUCATION AND RESEARCH	XXIII	931-932	842-861 891
PUBLIC ADMINISTRATION AND PRIVATE ORGANIZATIONS	XXIV	91, 935-39	870-890 892
PERSONAL AND HOUSEHOLD SERVICES	XXV	95	750-760 782-791 891

Note: ASIC is the Austrian System of Industry Classification from which the Austrian dummies are constructed. ISIC is the International System of Industry Classification used in the Norwegian sample. USIC is the System for Industry Classification used in the US.

Table A2 CLASSIFICATION OF OCCUPATIONS

OCCUPATIONAL GROUP:	AOCC	NOCC	USOCC
MANAGERS, PROFFESIONALS AND TECHNICIANS OCC 1	70-72,74- 76,79-80,82- 99,60-70	1-44,50-54,60- 72, 79-91,93- 201,531, 661-664	0-199, 303-306, 203-235, 258
SALESPERSONS OCC 2	40-41	301-339	243-257, 259-285
CLERCS OCC 3	45,77-78	92,202- 299,670- 692,699	307-347, 358-389, 348-357
SERVICE OCCUPATIONS OCC 4	50-59,73, 81	45-49,59,73, 901-999	403-469, 484-487, 498-499, 863-889
MANUAL WORKERS OCC 5	10-39	501-530 599,701-891	503-799
TRANSPORTATION OCC 6	42-44, 46-48	600-655, 693,	803-862

Note: AOCC is the Austrian Occupational Index from which the Austrian dummies are constructed. NOCC is the Norwegian Occupational Codes used in the Norwegian sample. USOCC is the System for Occupational Classification used in the US-CPS 1983.

Table A3. Regression Coefficients of Covariates

	AUSTRIA		NORWAY		US UNION		US NON-UNION	
	coeff.	std.dev.	coeff.	std.dev.	coeff.	std.dev.	coeff.	std.dev.
Constant	3.3674	0.1299	3.9714	0.0372	1.6117	0.0647	1.2678	0.0301
Male	0.1752	0.1724	0.0311	0.0412	0.0376	0.0744	-0.0759	0.0373
Female Coefficients								
Schooling	-0.0147	0.0230	0.0450	0.0127	-0.0225	0.0092	-0.0323	0.0041
(Schooling) ²	0.0031	0.0010	0.0003	0.0017	0.0024	0.0004	0.0028	0.0001
Experience	0.0347	0.0018	0.0208	0.0028	0.0166	0.0012	0.0160	0.0004
(Experience) ²	-0.0006	0.0000	-0.0003	0.0001	-0.0003	0.0000	-0.0003	0.0000
Occ1	0.3117	0.0233	0.0779	0.0317	0.2194	0.0167	0.3440	0.0074
Occ2	0.0451	0.0194	-0.1538	0.0304	-0.0955	0.0167	0.0175	0.0075
Occ3	0.1936	0.0163	-0.0701	0.0288	0.0241	0.0127	0.1176	0.0067
Occ4	0.0215	0.0223	-0.0914	0.0317	-0.0470	0.0135	-0.1124	0.0071
Occ6	0.1301	0.0586	-0.0868	0.1074	0.0980	0.0386	0.0465	0.0237
Forgn/nonwhite	0.2099	0.2057	n.a.		-0.0215	0.0721	0.0634	0.0339
*Schooling	-0.0214	0.0217	n.a.		-0.0009	0.0047	-0.0063	0.0022
*Experience	-0.0015	0.0039	n.a.		-0.0008	0.0009	0.0005	0.0004
Married	0.1609	0.0589	0.0617	0.0349	-0.0011	0.0588	-0.1300	0.0222
*Schooling	-0.0103	0.0058	-0.0095	0.0084	-0.0041	0.0039	0.0053	0.0015
*Experience	-0.0077	0.0011	-0.0024	0.0018	0.0023	0.0007	0.0034	0.0003
Agglomeration	0.0763	0.0113	0.0926	0.0164	0.0465	0.0088	0.0818	0.0034
Male Coefficients								
Schooling	0.0121	0.0197	0.0541	0.0077	0.0201	0.0056	0.0113	0.0031
(Schooling) ²	0.0004	0.0008	-0.0001	0.0008	0.0006	0.0002	0.0015	0.0001
Experience	0.0354	0.0014	0.0241	0.0019	0.0198	0.0009	0.0298	0.0005
(Experience) ²	-0.0006	0.0000	-0.0004	0.0000	-0.0003	0.0000	-0.0005	0.0000
Occ1	0.2638	0.0155	0.0644	0.0164	0.1317	0.0104	0.2166	0.0052
Occ2	0.0506	0.0177	-0.0295	0.0215	-0.0958	0.0166	0.0511	0.0059
Occ3	0.0807	0.0139	-0.0335	0.0278	-0.0849	0.0118	-0.0668	0.0076
Occ4	-0.0616	0.0237	-0.0989	0.0411	-0.1612	0.0080	-0.2111	0.0053
Occ6	-0.0111	0.0146	-0.1076	0.0269	-0.0559	0.0081	-0.1227	0.0071

Forgn/nonwhite	-0.1465	0.1031	n.a.		-0.0404	0.0529	-0.0051	0.0302
*Schooling	0.0133	0.0100	n.a.		-0.0036	0.0034	-0.0046	0.0020
*Experience	-0.0006	0.0022	n.a.		-0.0010	0.0007	-0.0010	0.0004
Married	0.1160	0.0475	0.1137	0.0308	-0.3140	0.0432	-0.0470	0.0194
*Schooling	0.0191	0.0046	-0.0096	0.0060	0.0099	0.0029	-0.0065	0.0013
*Experience	-0.0052	0.0010	-0.0034	0.0012	0.0060	0.0005	0.0015	0.0003
Agglomeration	0.0311	0.0100	0.0999	0.0120	0.0331	0.0054	0.0787	0.0033

F-statistic	6.831	6.750	165.293	417.075
IndustryDummies				
N (observations)	10,184	2,561	25,193	109,735
R squared(adj.)	0.491	0.498	0.402	0.552
