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Key Words

Minimum Wages; Collective Bargaining; Wage Dispersion; Strategic Interaction.

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DISPERSION: THE SPANISH CASE^(*)

by

Juan J. Dolado^a, Florentino Felgueroso^b, Juan F. Jimeno^c

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1. INTRODUCTION

The Minimum Wage is a controversial policy. And all the more so in Spain a country which holds the dubious honour of having the largest unemployment rate in the OECD, namely, 22.9% in 1996 and where 2,2 million jobs were destroyed between 1974 and 1985. Together with other labour market rigidities (generous unemployment benefits, high firing costs, etc.) minimum wages are singled out as one of the culprits of this unfortunate outcome.

The current system of minimum wages in Spain, the Salario Mínimo Interprofesional (SMI) was introduced in 1963, replacing an earlier system in which minimum wage varied by region and age. It is a statutory minimum wage set by the government in consultation with trade unions and employer organisations. It currently sets one rate for workers aged 18 or over and for those aged 16-17, though prior to 1990 it had set different rates for 16 year olds, with special rates for homeworkers and casual/temporary workers. At the start of 1994, apprenticeship contracts were introduced for workers under the age of 25 which could pay below the minimum wage. The percentage of workers at or close to the minimum was about 5% in 1994 and about 2% of workers were in schemes paying below the SMI. Although this proportion may not look sizeable, a number of welfare benefits are linked to the minimum wage.

The Kaitz indices are nowadays about 35% and 55% for adult and youth minimum wages, respectively and have been trending downwards along the sample period¹ (see Fig. 1). An exception is the change in youth rates in 1990 which produced a very large rise in the minimum wages for teenagers, with an 83% increase for 16 year olds and a 15% for 17 year olds. A detailed analysis of this episode and the overall employment effects of minimum wages since their introduction can be found in Dolado et al. (1996). As in many other European countries, a major difficulty with assessing the impact of the minimum wage on Spanish employment is that there is a national minimum wage that has not varied much in relation to average earnings. In any case, it is difficult to argue that the minimum wage is responsible for the high level of Spanish unemployment since, as far as the adult rate is concerned, the Kaitz index is currently at a historical minimum.

In Dolado et al. (1996) we exploit the minimum wage variation over time and study its relative impact on low-wage/high-wage industries and regions. We find, in particular, that the rise of the youth minimum in 1990 reduced the employment of youths and increased slightly overall employment. The most plausible explanation for the employment effect on older workers is substitution of employers away from younger workers who had become relatively more expensive and, on top of that, some monopsonistic effects. In spite of the fact that results are in line with the recent evidence on the effects of minimum wages across the Atlantic², it is natural to try to reconcile them with the results of Card (1992) who found a weakly positive effect of the rise in the federal minimum wage in the US in the early 1990s on teenage employment. This is so since the rise in the Spanish youth minimum led to a rise in the Kaitz index from slightly over 0.3 to 0.55 whereas the change in the US was from 0.75 to 0.85. One possible explanation is that whereas the minimum wage is virtually the only wage floor for teenage workers in the US, it has an important influence on higher wage floors in Spain. Some evidence supportive of this view comes from the survey "Collective Bargaining in Large Firms" for 1985 and 1994. The ratio of the wage of labourers (the lowest skill category) to the wage of workers aged 16 and 17 fell from 1.83 in 1985 to 1.31 in 1994. As these negotiated wages are generally above the minimum, this suggests that the rise in the relative wages of youths may have had a considerable impact on the wages of young workers paid above the minimum.

In this paper we want to tackle this issue in greater depth. Specifically, we want to analyze how collective wage bargaining in Spain, by fixing minimum wages above the statutory ones, affects the overall wage structure³. Since these wages are only minimum wages at the provincial industrywide level, and informal agreements between firm and worker are legally recognised, we expect these facts to limit the union's expected compression of the earning distribution, giving rise to higher wages even for those workers not directly affected by the guaranteed minimum wages.

The rest of the paper is structured as follows. In section 2, we develop a simple model with monopsonistic features where firms' interaction in the product market, resulting in externalities in wage-setting, may give rise to wider wage dispersion than that implied by the introduction of minimum wages. In section 3, we use information on the guaranteed and reported hourly wages for a cross-section of workers in 1990 to empirically test the previous conjecture, by means of the

approach advocated by Meyer and Wise (1983 a, b). Finally, section 4 draws some concluding remarks.

2. A MODEL OF WAGE DISPERSION WITH MONOPSONISTIC FEATURES

We now present a simple model of monopsonistic competition where firms with different characteristics compete for workers who evaluate wage offers differently⁴. There are two types of firm competing in a single market for a homogenous product. Some firms are of type H, having high productivity, while others are of type L, having low productivity. The firm's output is given by the production function:

$$Y_i = A_i L_i^\alpha, \quad (i = H, L) \quad (1)$$

where Y_i = output, L_i = labour, A_i = index of technical progress and $0 < \alpha < 1$. The number of firms is fixed and capital has been eliminated from (1), assuming a given price and interest rate, by means of the first order condition of profits with respect to capital. Workers' labour supply is given by:

$$L_i = (W_i / \bar{W})^\gamma \bar{W}^\psi \quad (2)$$

where W_i = wage and \bar{W} = reservation wage. Equation (2) can be interpreted as jobs in different firms having some non-wage characteristics, e.g. distance, giving each employer some monopsonistic power. If the labour market is perfectly competitive then $\gamma=0$. If $\psi=0$, although an individual firm can raise its labour supply by raising its wage, this is entirely at the expense of other firms. We will assume in what follows that $\gamma > \psi > 0$.

Firms act as price takers in the product market, facing a price which is normalised to unity, and choose W_i to maximise profits:

$$\Pi_i = Y_i - W_i L_i \quad (3)$$

The first order condition with respect to the wage, yields the following firm i's optimal wage as a function of \bar{W}

$$w_i = c_i + d \bar{w} \quad (4)$$

with

$$c_i = [\ln \alpha + a_i - \ln (1 + \gamma) / \gamma] / [1 + \gamma(1 - \alpha)]$$

$$d = (1 - \alpha) (\gamma - \psi) / [1 + \gamma (1 - \alpha)]$$

where small letters denote logs of capital ones and $0 < d < 1$. Notice that, since $a_H > a_L$, $c_H > c_L$ and H type firms pay higher wages than L type firms. Thus, the firm's optimal wage is an increasing function of the reservation wage. Next, we assume that the reservation wage is a weighted combination of the optimal wages w_H and w_L , namely,

$$w_H = c_H + d [\lambda w_H + (1 - \lambda) w_L] \quad (5)$$

$$w_L = c_L + d [(1 - \lambda) w_H + \lambda w_L] \quad (6)$$

with $0 < \lambda < 1$. The interpretation of (5) and (6) is that H type (L type) firms compete with a given proportion of L type (H type) firms. In this way, we encompass two extreme cases. When $\lambda = 1$, firms only compete with those of their own class (*no interaction*), whilst $\lambda = 0$ implies that firms only compete with those of the other class (*full interaction*). Notice that wages in both types of firm are *strategic complements* in the standard terminology introduced by Bulow et al. (1985). Nash equilibrium wages are given by:

$$w_H^* = [(1 - d\lambda) c_H + d(1 - \lambda) c_L] / \Omega \quad (7)$$

$$w_L^* = [d(1 - \lambda) c_H + (1 - d\lambda) c_L] / \Omega \quad (8)$$

where $\Omega = (1 - d\lambda)^2 - d^2(1 - \lambda)^2 > 0$. Notice that the higher is λ , the higher is w_H^* and the lower is w_L^* , so that wage dispersion, measured by the wage differential, becomes:

$$(w_H^* - w_L^*) = (1 - d) (c_H - c_L) / \Omega \quad (9)$$

which is an increasing function of λ , i.e. it is larger under *no interaction* ($= (1 - d)^{-1} (c_H - c_L)$) than under *full interaction* ($= (1 + d)^{-1} (c_H - c_L)$), an effect which stems from the strategic complementarity between firms in setting wages.

As regards employment, substituting the reservation wage into (2) yields

$$l_H = \gamma w_H + (\gamma - \psi) [\lambda w_H + (1-\lambda) w_L] \quad (10)$$

$$l_L = \gamma w_L + (\gamma - \psi) [(1 - \lambda) w_H + \lambda w_L] \quad (11)$$

so that as λ increases l_L increases and l_H decreases. Notice, however, that total employment, given by the sum of l_H and l_L , is independent of λ , namely:

$$l = (1-d)^{-1} \psi (c_H + c_L) \quad (12)$$

Now, consider the introduction of a minimum wage (w_m) starting at w_L^* . On the one hand, under *no interaction* the wage paid by L type firms increases one-for-one whereas the wage paid by H type firms, for which w_m is not binding, does not raise. On the other hand, under *full interaction*, the same happens with L type firms, but now H type firms increase their wages by an amount d , according to their reaction function (5). So, in both cases there is a reduction in wage dispersion, but to a smaller extent under *full interaction*. Thus, the smaller is λ , the smaller will be the reduction in wage dispersion as a consequence of the introduction of a minimum wage which only binds for L-type firms.

Finally, it is easy to prove that minimum wages hurt the profits of both types of firm. The fall in profits for L type firms is larger the larger is λ and the fall in profits for H type firms is larger the lower is λ . Hence, under *full interaction* both types of firm see their profits fall because H type firms suffer a decrease in their labour supply due to a rise in their competitors' wages. Obviously, the assumption of a given number of firms is not harmless since, as profits fall, entry and exit will surely affect the degree of interaction between firms and the employment effects of minimum wages. However, a formal analysis of these issues is beyond the scope of this paper.

3. EMPIRICAL RESULTS

3.1. The Data

In order to examine the consequences of minimum wages on wage dispersion, we use a subsample of the *Class Structure, Consciousness and Biography Survey*, which provides information about work conditions for 6632 individuals between December 1990 and March 1991. We have been able to obtain a final subsample including 491 wage earners who reported both their labour earnings and enough

information about their professional status, and for whom we could determine their minimum agreed wages in collective bargaining at the sector-level which were in force in November 1990.

For those individuals we have information on two types of agreed wages. So, the "guaranteed hourly wage" (hereafter GHW) can be defined as the guaranteed minimum wage for all individuals with a particular professional status in an ordinary working day. Besides, the "guaranteed hourly wage according to seniority and overtime work" (hereafter GHWSO) includes seniority premia and overtime work rewards⁵. Finally, the quoted survey gives us information about the "reported hourly wages" (hereafter RHW). The chosen subsample corresponds to six major industrial sectors and the construction sector, industries where about 90% of workers are covered by a collective agreement.

In Table 1, means and coefficients of variation of GHW, GHWSO and RHW are reported by levels of skill and professional status. The most important observation is that agreed minimum wages are not binding for the highly skilled and skilled workers, whereas the relative gap between RHW and GHWSO reported in the last column is very low. Furthermore, GHW and GHWSO dispersions are positively related to the category level, which again can be interpreted as a signal that the standard-rate policy is more significant for the low and semi-skilled workers than for the higher skilled workers and for blue-collar than for white-collar workers. It is also noticeable that the mean agreed wages for the lower skill categories is about 65% above the national statutory minimum wage. However, given the size of the coefficients of variation for the lower skill categories, there is also evidence of frequent non-compliance among semi-skilled and unskilled workers. In this respect, using evidence on the determinants of agreed and reported wages, Felgueroso (1995) shows that one of the most important factors behind the "black labour market" segment is the extension of the daily work journey without being paid.

3.2. Estimation of Wage Gains

Once we have presented evidence favouring the hypothesis that agreed wages are mostly binding for the lower skill and professional categories, we consider their impact on wages using the concept of "wage gain" due to sectoral agreements. According to Lewis' (1986) terminology, the "wage gain" in this context would be

defined as the difference between the current wage and the one the worker would receive in a hypothetical economy with no industrywide bargaining.

Given that only cross-sectional data are available, we follow a variant of the approach developed by Meyer and Wise (1983 a,b) to study the US minimum wage effects on wage and employment distributions. This procedure will enable us to compare expected earnings of individuals, had not there been sectoral agreements, with their actual reported earnings.

Suppose that, in the absence of sectoral minimum wages, the hourly wage that the i -th individual would receive is W_{ni} . This underlying market wage is not observable and is assumed to be determined by

$$\ln W_{ni} = \alpha_0 + X_i \alpha_1 + u_i \quad (13)$$

where X_i is a vector of individual and labour market characteristics. As regards the error term, we use a heteroskedastic version of the Meyer and Wise' model thereby assuming that

$$\text{Var}(u_i) = \sigma_i^2 = (\gamma + Z_i \delta)^2 \quad (14)$$

where Z_i is vector of variables determining the variance of u_i . Next, let us assume that the employment status in the underlying market is defined by

$$\tilde{I}_i = \beta_0 + X_i \beta_1 + \epsilon_i \quad (15)$$

where \tilde{I}_i is an indicator function such that $\tilde{I}_i > 0$ if the i -th individual is employed and $\tilde{I}_i = 0$ otherwise. The error term ϵ_i is assumed to be i.i.d (0,1).

Now suppose that a minimum wage is set for the i -th individual in industrywide bargaining at level W_{mi} and that firms take it as exogenous. Some workers, who in the absence of the minimum wage would be paid a wage below, are presumed to receive W_{mi} with probability P_1 . Others, with probability P_2 , shall continue to be paid below W_{mi} because of noncompliance. The remaining subminimum workers are presumed to lose their job with probability $1-P_1-P_2$.

Further assumptions are that labour supply is constant, that u_i and ϵ_i are uncorrelated and that there are not spillovers on wages perceived by workers with an underlying market wage above W_{mi} . Moreover, in practice we consider that the minimum wage corresponding to each worker belongs to a small interval $[W_{mi},$

W_{m2i}]. Then, we can classify each individual in the sample into one of the following four groups: [1] individuals for whom the observed wage (W_i) is larger than W_{m2} , i.e., $W_i > W_{m2i}$; [2] equal to minimum, i.e., $W_{m1i} \leq W_i \leq W_{m2i}$; [3] lesser than the minimum, i.e., $W_i < W_{m1i}$; and [4] individual is unemployed, i.e., $W_i = 0$.

Defining the normalised variates

$$\omega_i = (\ln W_i - \alpha_0 - X_i \alpha_1) / (\gamma + Z_i \delta)$$

and

$$\omega_{mji} = (\ln W_{mji} - \alpha_0 - X_i \alpha_1) / (\gamma + Z_i \delta), j = (1, 2)$$

where ϕ and Φ are the standardised normal density and cumulative functions, respectively, and taking only data for employed individuals into account, the observed wages can be classified into three classes in terms of their underlying wage distribution, with the following probabilities:

$$h_1(W_i) = \frac{P_r [1]}{1 - P_r [4]} = \frac{1}{\sigma_i} \frac{\phi(\omega_i)}{D} \quad \text{if } W_i > W_{m2i}$$

$$h_2(W_i) = \frac{P_r [3]}{1 - P_r [4]} = \frac{\Phi[\omega_{m2i}] - \Phi[\omega_{m1i}]}{D} (1 - P_2) \quad \text{if } W_{m1i} \leq W_i \leq W_{m2i}$$

$$h_3(W_i) = \frac{P_r [2]}{1 - P_r [4]} = \frac{1}{\sigma_i} \frac{\phi(\omega_i) P_1}{D} \quad \text{if } W_{m1i} < W_i$$

where $D = 1 - \Phi[\omega_{m1i}] (1 - P_1 - P_2)$ is a common denominator which can be interpreted as the probability that an individual employed in the underlying market remains employed after the introduction of minimum wages. The numerators, in turn, represent the probability a worker initially employed has an observed wage above, equal or below the minimum wage, respectively.

Using a maximum likelihood procedure we can obtain estimates for α_0 , α_1 , γ_0 , γ_1 , P_1 and P_2 by maximising the log-likelihood function:

$$L = \sum_{i=1}^{n_1} \ln h_1(W_i) + \sum_{i=n_1+1}^{n_2} \ln h_2(W_i) + \sum_{i=n_2+1}^N \ln h_3(W_i) \quad (16)$$

From these estimates the "wage gain" due to industrywide minimum wage for the i -th employed worker is defined by:

$$G_i = [\exp(\hat{\omega}_i) / \exp(\hat{\omega}_{ni})] - 1 \quad (17)$$

where $\hat{\omega}_{ni} = E[\ln \hat{W}_{ni}] = \hat{\alpha}_0 + X_i \hat{\alpha}_1$ and $\hat{\omega}_i = E[\ln \hat{W}_i]$ which is obtained through weighting the predicted wage in each segment by their corresponding probabilities h_i 's.

3.3. Results

Estimates of the parameters in the previous model are shown in Table 2, using job tenure and its square and dummies for skill levels, gender, sector and professional category as the elements of X_i , and schooling as the only element of Z_i ⁶. Column (1) reports the OLS estimates of the observed wage function (RHR). Column (2) presents the homoscedastic version of the model with $\delta=0$. Finally, column (3) reports estimates from the heteroskedastic version. A simple LR test for the null hypothesis $\delta=0$ rejects homoskedasticity at very low significance levels⁷. Thus, comparing columns (1) and (3), as expected, the estimated returns to skill level, job tenure, as well as inter-industry wage differences and the relative wage of white-collar workers would be higher in the underlying market. On the other hand, the estimated variance of underlying wages is larger than that of observed wages, a result which is consistent with the expected earning compression stemming from industrywide bargaining.

The estimates of P_1 and P_2 indicate that the probability that an individual with an underlying market wage below the corresponding minimum wage will lose his job is very small in the homoskedastic version of the model and about 10% in the heteroskedastic one. This probability, however, is higher for workers with low job tenure, a result which is consistent with the slightly negative effects on youth employment discussed in the Introduction⁸.

The estimated industrywide "wage gains" are presented in Table 3. They tend to be higher for lower skill workers, blue-collar and low tenure workers. However, consistently with the prediction of the model in section 2, higher skill and white-collar workers still get substantial increases, weakening the "sword of justice" effect (wage compression) of unions in Spain.

4. CONCLUSIONS

This paper presents evidence on the consequences of sectoral bargaining agreements on minimum agreed wages in the Spanish industry. For this purpose, individual reported hourly wages have been compared with those agreed in sectoral bargaining for a subsample of workers taken from a Spanish labour force survey in 1990. We find that agreed wages are binding, in general, only for semi-skilled and unskilled workers. Furthermore, the classification of workers into three groups (regarding whether their reported wages are greater, equal or lesser than their corresponding agreed wages) allows us to estimate industrywide bargaining "wage gains" for different groups of workers, following Meyer and Wise' approach. In agreement with our theoretical predictions, we find that 'wage gains' are larger for unskilled and semi-skilled workers but they are also sizeable for higher skill workers. Furthermore, agreed wages are well above the statutory minimum wages for the lower categories. Both features may well jeopardise the employment prospects of youth and weaken the "sword of justice" effect of trade unionism in Spain.

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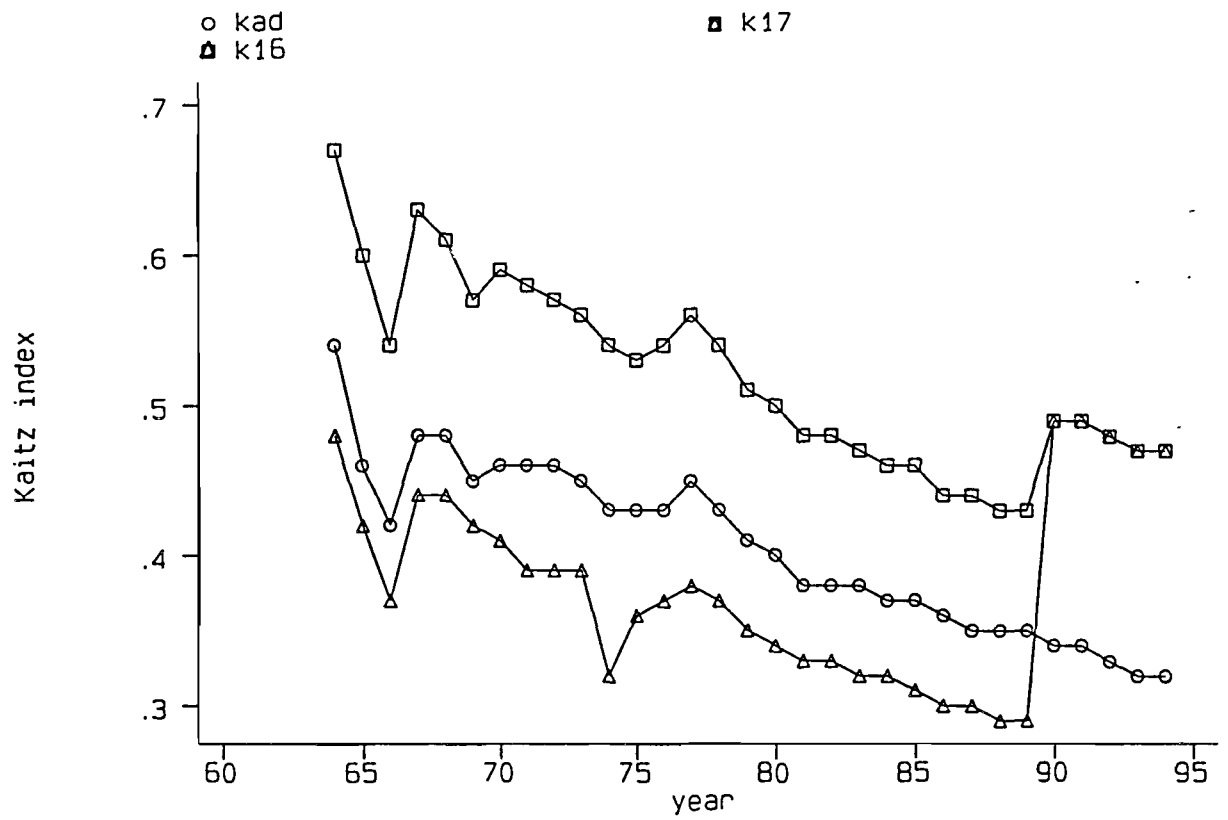
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Notes

1. The Kaitz index is defined as the ratio between the minimum wage and the corresponding average wage in each age bracket.
2. See, *inter alia*, Card and Krueger (1995) and Dolado *et al.* (1996).
3. See, e.g. Jimeno and Toharia (1994) and Lorences *et al.* (1995) for further details on the characteristics of the Spanish collective bargaining structure.
4. After completing this draft of the paper, V. Bhaskar made us aware that Bhaskar and To (1966) contained some similar theoretical results. They adopt a model of horizontal differentiation assuming that the job characteristic space is a circle of unit circumference.
5. Other premia, as complements of productivity, risk or night work, are excluded due to lack of information. However, these complements constitute only a residual clause in sectoral agreements since they are decided at the firm-level.
6. The sectoral classification is as follows. Sector 1: Food and drink; Sector 2: Construction; Sector 3: Paper and paper products; Sector 4: Timber and wooden furniture; Sector 5: Chemicals; Sector 6: Textile, footwear and clothing; and, Sector 7: Metal industry.
7. The LR test yields a value of 24.8 distributed as a chi-square with 1 d.f.
8. The Meyer and Wise' approach, however, has been criticised by Dickens *et al.* (1994) who claim that the employment effects estimated through this method are very sensitive to the functional form assumed for the underlying wage distribution.

Figure 1

Kaitz Indices for Different Age Groups in Spain



Notes

1. kad is the adult Kaitz index; k17 the Kaitz index for 17 year-olds and k16 the Kaitz index for those aged less than 17.

TABLE 1
Guaranteed and Reported Hourly Wages

	GHW		GHWSO		RHW		(RHW/GHWSO) - 1
	avg. (pts.)	c.v. (%)	avg. (pts.)	c.v. (%)	avg. (pts.)	c.v. (%)	avg. (%)
All workers	546.2	23.4	583.0	24.8	733.2	57.7	22.5
High skilled	724.5	21.0	791.4	20.7	1245.3	51.2	57.3
Skilled	536.3	14.5	573.3	14.2	717.9	35.6	25.2
Semi-skilled	476.2	12.0	497.7	14.0	497.7	28.9	0.4
Unskilled	462.7	12.0	482.8	13.5	480.3	26.5	0.3
White-collar	645.8	24.3	690.2	25.5	1021.4	58.2	45.0
Blue-collar	503.4	15.0	537.0	17.0	606.1	35.3	12.4

Note: avg. = mean; c.v. = coefficient of variation.

TABLE 2
Parameter Estimates

Variables	O.W.F. (OLS)	U.W.F. (I) (MLE)	U.W.F. (II) (MLE)
Constant	6.11 (0.09)	6.43 (0.07)	6.40 (0.07)
High-skilled	0.46 (0.06)	0.66 (0.07)	0.57 (0.07)
Skilled	0.18 (0.05)	0.29 (0.06)	0.27 (0.05)
Unskilled	-0.19 E-02 (0.06)	-0.27 E-02 (0.07)	-0.01 (0.06)
Tenure	0.03 (0.01)	0.04 (0.02)	0.04 (0.02)
Tenure (**2)	-0.20 E-02 (0.13 E-02)	-0.23 E-02 (0.19 E-02)	-0.23 E-02 (0.19 E-02)
Gender	-0.22 (0.04)	-0.22 (0.05)	-0.20 (0.05)
Sector 1	-0.16 (0.07)	-.19 (0.08)	-0.21 (0.08)
Sector 2	-0.08 (0.04)	-0.17 (0.05)	-0.15 (0.04)
Sector 3	-0.05 (0.06)	-0.22 (0.07)	-0.16 (0.07)
Sector 4	-0.26 (0.06)	-0.39 (0.08)	-0.33 (0.06)
Sector 5	-0.02 (0.05)	-0.04 (0.06)	-0.02 (0.06)
Sector 6	-0.21 (0.07)	-0.24 (0.08)	-0.26 (0.10)
Blue-collar	-0.32 (0.04)	-0.26 (0.05)	-0.26 (0.05)
P1	--	0.44 (0.09)	0.39 (0.07)
P2	--	0.55 (0.16)	0.49 (0.10)
Variance Equation Constant	--	--	0.19 (0.03)
School	--	--	0.02 (0.33 E-02)
$\hat{\sigma}$	0.311	0.346	0.339
Log-lik.	--	-367.4	-355.0
No. obs.	491	491	491

Note: O.W.F.: observed wage function; U.W.F. (I): underlying wage function (homoskedastic version; U.W.F. (II) : underlying wage function (heteroskedastic version). Standard errors (in parenthesis) are computed from covariance of analytic first derivatives.
OLS: ordinary least squares; MLE: maximum likelihood estimation.

TABLE 3
Industrywide Bargaining Wage Gains

Worker	Wage Gain
All workers	6.21
Highly skilled	2.55
Skilled	8.01
Semi-skilled	12.32
Unskilled	11.67
White-collar	3.65
Blue-collar	7.55
High tenure	5.13
Low tenure	9.76

Note: The wage gains have been computed using parameter estimates of model U.W.F. (II).