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DO TRADE UNIONS CARE ABOUT EMPLOYMENT? Reduced-form test results from the Finnish paper and textile industries*

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This study reports the results of testing the seniority model of trade union behaviour using data on two Finnish industries. We found that; (i) the empirical results do not support the idea that the aim of trade unions is merely to push their members' wages as high as possible; (ii) the relationship between the real consumption wage and aggregate unemployment is non-linear in such a way that the unemployment elasticity of the real consumption wage rises in absolute terms with the unemployment rate; and (iii) the unemployment elasticity of the real consumption wage differs significantly across the industries studied.

1. Introduction

Recent work on trade union behaviour has mainly focused upon two alternative models. According to the first model, generally termed the *monopoly union model,* wages are determined by a process in which the trade union maximizes its objective function given the demand curve for its members' labour. This traditional view of the economics of the trade union has its roots in Dunlop (1944). Since then the approach has been applied in studies too numerous to be listed here (cf. surveys by Oswald (1985), Pencavel (1985) and Farber (1987) for further references). The second is the *efficient bargain model* where the firm and the union negotiate over both wages and employment. This approach is usually associated with the work of Leontief (1946) and it has recently been discussed in McDonald and Solow (1981), among others. The main difference between the approaches is that the latter generates a wage-employment outcome which is Pareto efficient, in contrast to the outcome of the monopoly union model. The efficient bargain model predicts that the level of employment may be higher than that which firms would otherwise be willing to set and thus trade unions tend to create jobs rather than reduce employment.

A variant which blends some of the features of the efficient bargain model as well as the monopoly union model is that of Nickell and Andrews (1983). Their so-called *right-to-manage model* assumes that both firm and union bargain over wages but it is the firm who decides on the level of employment, i.e. the firm retains the right to set employment

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unilaterally, in contrast to the efficient bargain model. Although this formulation does not run counter to casual observations about how the labour market seems to function, it clearly begs the question of why employment is omitted from negotiations. Two different explanations exist. First, it can be argued that the asymmetrical treatment of wages and employment is not due to the union *per se* but rather its inability to negotiate over employment. This view is (implicitly) adopted in Nickell and Andrews (1983) (cf. also Manning 1987 and Tyrväinen 1988). According to this view the right-to-manage model can be regarded as a generalized version of the monopoly union model: when the union's ability to control wage negotiations increases, the model produces a wage-employment outcome which approaches the outcome generated by the monopoly union model. However, according to the alternative view, the asymmetrical treatment of employment and wages by the bargainers can only be justified by appealing to the union's objectives: employment is omitted from the negotiations simply because it does not enter the union's objective function. This leads to the *seniority model* popularised by Oswald (1987) which assumes that the union indifference curves are locally flat because the median worker has job security due to the *last in — first out* redundancy principle and therefore the union aims solely to push wages up along the demand curve for labour.

Although recent years have witnessed a remarkable growth in the number of theoretical studies of labour union behaviour, the number of empirical applications where competing models are tested is limited.[1] This study, which examines empirically the objectives of trade unions in the context of two Finnish manufacturing industries, is an attempt in that direction. In this study, we take the seniority model as the point of departure. In addition to allowing us to shed light on the question so often raised in public discussion as to whether trade unions care about (un)employment, there are two other good reasons for taking this model as the maintained hypothesis.

First, in spite of the extreme assumption of the model that the union is (locally) indifferent to the level of employment amongst its junior members, the model has some empirical as well as theoretical appeal and hence is worth taking seriously. In fact, the assumptions underpinning the proposition of flat indifference curves, including democratic unions (majority voting) and redundancies by inverse seniority, do not run counter to casual observations about how the labour market seems to function. In addition, the seniority model resolves the puzzle of efficient contracts first raised in Leontief (1946), for when the union indifference curves are locally flat, efficient contracts are in fact on the labour demand curve and thus the observation that wages and employment are generally treated asymmetrically by bargainers is no longer so puzzling. This can be seen from Figure 1 which shows that in the seniority model the labour demand schedule and contract curves coincide.

The second issue, which is equally important, concerns the prediction, already raised

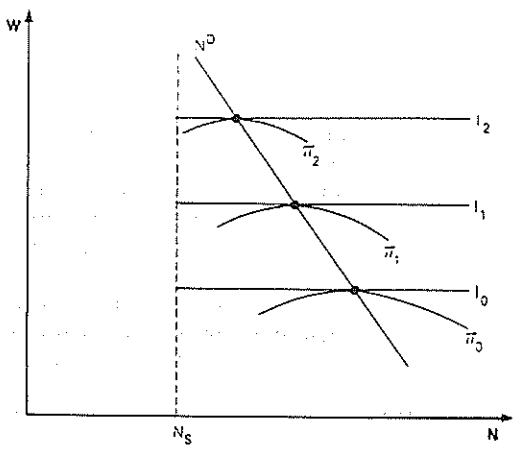

Figure 1. The seniority model.

Notes: N_s is the median voter's seniority position; I_i is the iso-profit countour; I_i the union indifference curve; and N^D is the labour demand curve.

[1] *Tests that aim to discriminate between the efficient bargain model and the monopoly union model have been devised in Dertouzos and Pencavel (1981), Brown and Ashenfelter (1986), and MaCurdy and Pencavel (1986). See e.g. Brown and Ashenfelter (1986) for a short account of the testing methodology. Other empirical studies focusing the trade-off between real wages and employment in trade union objectives include Farber (1978), Pencavel (1984, 1985) and Carruth and Oswald (1985). In Carruth et al (1987), the seniority model is tested against the monopoly union and efficient bargain models.*

above, that in the seniority framework the monopoly union model and the efficient bargain model are observationally equivalent in terms of their employment implications. Therefore it is important to test between these two classes of models with contrasting assumptions, rather than between models belonging to the same broader group. In other words, a test between the monopoly union and efficient bargain models without a-priori information about the rejection of the seniority model may be incorrect if the underlying data is in fact generated by the seniority model.

The remainder of this paper is organized as follows. Section 2 discusses the testing methodology. We address the question of the objectives of trade unions by examining data on two Finnish industries, namely on the textile, clothing and leather industry and the pulp, paper and graphical industry.[2] The empirical results of the economic analysis are reported in Section 3. Section 4 concludes the study.

2. *Framework for analysis*

Consider a labour market model where the union and the firm choose wage rate W and employment level N so as to maximize the generalized Nash product

$$(1) \quad \max_{W,\,N} \Gamma = [V(.) - V_0]^{\beta}\,[\Pi(.) - \Pi_0]^{1-\beta},$$

$$(2) \quad s.t.\ \Pi(.) \geq \Pi_0,$$

$$(3) \quad V(.) \geq V_0,$$

where $V(.)$ and V_0 are the union's utility function and its »fall-back» level specifying the union's utility level in the case of agreement and in the case where no agreement is reached, respectively. Analogously, $\Pi(.)$ and Π_0 are the firm's profit function and its »fall-back» level. β is an (exogeneous) measure of the union's bargaining power. Provided that β lies between zero and one, the formulation describes the well-known *efficient bargain model* where the firm and the union negotiate over both wages and employment. Assuming that only wages are subject to negotiations and that the firm operates on its labour demand schedule rather than its iso-profit curves, three other trade union models emerge from this general setup. First, if $0 < \beta < 1$, the formulation is consistent with the *right-to-manage-model* where only wages are determined by the bargaining process, employment being set unilaterally by the firm. If $\beta = 1$, i.e. the union is capable of setting the wage, the model reduces to the *monopoly union model.* The seniority model emerges in this framework as a special case: when union objective function $V(.)$ omits employment and β lies between zero and one, the formulation is consistent with the *seniority model* of trade union behaviour.

In order to set up a formal test for the seniority model we must first specify the determinants of the firm's and the union's objective functions (Π, V) as well as the determinants of their fall-back levels (Π_0, V_0). We begin with the firm's objectives. Suppose that the firm's preferences are summarized by the assumption of profit maximization. Define real profits as

$$(4) \quad \Pi(.) = R(N, K, M, T) - W_p N - K_p K - M_p M - F,$$

where $R(.)$ is the revenue function with labour N, materials M, capital K, and technical progress T as its arguments. W_p is the real product wage, K_p the real rental price of capital and M_p the real price of (imported) materials, while F refers to the level of total fixed costs, all measured in terms of the firm's output deflator P_p. Assuming that labour input, materials and capital are chosen optimally, the maximum (restricted) profit function can be defined as

$$(5) \quad \max_{N,\,M,\,K} \Pi = \Pi^*\,(W_p, M_p, K_p, T, F).$$

The corresponding labour demand curve is given by

$$(6) \quad \frac{\partial \Pi^*}{\partial W_p} = N^d = N(W_p, M_p, K_p, T, F).$$

We consider two specifications of the firm's fall-back profit level.

[2] *These industries were chosen because they represent not only some of the features typical of Finnish manufacturing but at the same time, to a certain extent, the opposite ends of it. This issue is taken up in Section 3.*

(7) $\Pi_0 = -F,$

(8) $\Pi_0 = \alpha\Pi_{t-1},$

where F stands for total fixed costs as before while α ($0 < \alpha < 1$) is a fraction of the normal productivity which prevails when negotiations are suspended and the workers, for instance, behave according to the *work-to-rule* principle. Although the specifications differ considerably regarding the consequences of a failure in wage negotiations they do not, however, imply differences in reduced-form employment and wage equations unless the factors determining α are modelled explicitly.[3]

In both the monopoly union model and the efficient bargain model the union is concerned not only about the welfare of those union members who have jobs but also of those without jobs. The idea that the union cares about the level of employment amongst its members can be captured by a utilitarian objective function[4]

(9) $V(.) = \underset{(+)}{u(W_c)}N + \underset{(+)}{u(B)}\,(L-N),$

where $u(.)$ is the concave utility function of an individual union member. Partial derivatives with respect to real consumption wage W_c and real unemployment benefit B are given in parentheses below the equation. L is the union membership, assumed fixed, and N union employment. A generalized version of (9) can be written as

(10) $V(.) = \underset{(+)\ (-)}{u(W_c, W^r)}\,N + (1-\mu)\,(U)$
$(L-N)\,\underset{(+)}{u\,(B)} + \mu(U)\,(L-N)\,\underset{(+)}{u\,(W^a)}$

which differs from the basic formulation by the assumption that some unemployed union members find a job at W^a, where W^a is an alternative wage rate. μ, the proportion of unemployed union members who find other jobs, is assumed to be a function of the aggregate unemployment rate, denoted by U.[5]

Furthermore, the utility function includes a reference (comparison) wage rate W^r as an additional argument. This formulation captures the idea that a union member cares about how his pay compares with the wage rates earned by other people.[6] As above, the partial derivatives are given in brackets.

Next, we consider the seniority model of trade union behaviour. If the *last in — first out* firing and redundancy principle is the rule rather than the exception, then the typical (median) worker is insulated from (moderate) falls in employment and hence locally indifferent to the total level of employment. Under majority voting and known lay-off ordering, the wage of the median worker is the priority and the union objective function is simply

(11) $V(.) = \underset{(+)\ (-)}{u(W_c, W^r)},$

which states that the union cares only about the wage rate received by the median union member and the wage paid elsewhere. A simplified version of (11) in which no weight is placed on the wage paid elsewhere simply omits W^r.

As far as the union's fall-back level is concerned, we consider the following alternatives.

(12) $V_0 = V_0(W_{c,\,t-1}),$

(13) $V_0 = V_0(W^a,\ U,\ B)$

The first formulation treats the fall-back point as a »delay» utility level, i.e. there is a delay in negotiations and the old wage agreement is effective.[7] The second formulation treats the fall-back point as a utility level in the case where the workers (or some of them) are made redundant and V_0 depends on job/wage opportunities elsewhere in the economy, assumed to be determined by the alternative wage rate W^a, aggregate labour market conditions U, and the level of real unemployment benefits B.

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[3] *See Holden (1989) who introduces an inventory variable which enters the analysis via α. It might be worth noting here that equation (8) offers a justification for the inclusion of dynamic elements in empirical analysis.*

[4] *See e.g. Oswald (1985).*

[5] *See e.g. Andrews and Nickell (1983).*

[6] *See e.g. Carruth and Oswald (1985) and Blanchflower et al (1987).*

[7] *See e.g. Holmlund & Skednger (1988). Note that $W_{c,\,t-1}$ stands for W_{t-1}/P_t where W_{t-1} is the nominal wage level in the previous period and P_t is the appropriate (consumption) price deflator. A variant of the theme is obtained by assuming that the fall-back utility level is determined by the level of strike allowances.*

Consider the case where the union is capable of setting the wage unilaterally, i.e. the case of a monopoly union where $\beta = 1$. If $V(.)$ is given by (10) and V_0 by (13), the reduced-form wage and employment equations of the system are given as follows[8]

$$(14)\quad W = W(W^r, W^a, M_p, K_p, T, F, U, B, L, P_c, P_p, \tau_1, \tau_2),$$

$$(15)\quad N = N(W^r, W^a, M_p, K_p, T, F, U, B, L, P_c, P_p, \tau_1, \tau_2),$$

where the wedge between the real consumption wage and the real product wage is accounted for by augmenting the reduced-form equations with two tax variables, namely the payroll tax rate τ_1, the income tax rate τ_2, and two appropriate price deflator, P_p and P_c.[9]

The efficient bargain model assumes that the firm and the union bargain over both wages and employment. A Pareto-efficient wage-employment outcome which maximizes joint profits implies reduced-form wage and employment equations of the following form[10]

$$(16)\quad W = W(W^r, W^a, M_p, K_p, T, F, U, B, L, P_c, P_p, \tau_1, \tau_2, \beta),$$

$$(17)\quad N = N(W^r, W^a, M_p, K_p, T, F, U, B, L, P_c, P_p, \tau_1, \tau_2, \beta),$$

The efficient bargain specification differs from the monopoly union specification by the fact that it includes a measure of the union's bargaining strength β. Since it is rather easy to sketch a case where β is a function of the aggregate unemployment rate and the level of real unemployment benefits, these two models cannot be empirically discriminated by the means of a reduced-from test.[11]

By definition, the senior workers are not threatened with redundancy.[12] If $V(.)$ is given by (11) and V_0 by (12), the reduced-form wage and employment equations are given by

$$(18)\quad W = W(W^r, M_p, K_p, T, F, L, P_c, P_p, \tau_1, \tau_2, \beta),$$

$$(19)\quad N = N(W^r, M_p, K_p, T, F, L, P_c, P_p, \tau_1, \tau_2, \beta),$$

while the simplified version of the seniority model which ignores the wage paid elsewhere excludes W^r from the reduced-form equations. The specification of the seniority model differs from that of the efficient bargain (monopoly) model, described by equations (16)−(17) ((14)−(15)) by the fact that it excludes the variables affecting the utility level of a laid-off union member. The seniority model is rejected if it can be shown that these variables significantly enter the reduced-form wage and employment equations. The validity of these restrictions implied by the seniority model is examined in the subsequent empirical analysis.

Before turning to the empirical part of the study, two remarks concerning the applicabil-

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[8] *If $V(.)$ and V_0 are given by (9) and (12) rather than (10) and (13), we obtain reduced-form specifications for wages and employment where the union's concern over employment is captured only by the unemployment benefit variable. This formulation is not, however, plausible in the case where union shows concern over the employment possibilities of its members. In fact there are at least three distinct routes which predict the appearance of the unemployment term in the reduced-form wage and employment equations, namely; (i) the probability of finding a job elsewhere depends on U; (ii) the alternative wage rate W^a depends on U; and (iii) the union status quo utility level V_0 is a function of U. Nevertheless the use of (9) instead of (10) implies that the reference wage variable drops out of the analysis. This formulation, which bears some empirical interest, will be taken up in the subsequent analysis.*

[9] *The wedge between the real consumption wage and the real product wage is given by $[(P_p/P_c)(1-\tau_2)/(1+\tau_1)]$ which can also be written as $ln(1+\tau_1) + ln(1-\tau_2) + ln(1+\tau_3) + \beta ln(P_m/P_p)$ where τ_3 refers to indirect tax rate and β is the share of imports to GNP. If $P_m/P_p = M_p$, i.e. the real price of imported goods equals the real price of imported raw materials, the last term drops out of the reduced-form equations.*

[10] *As above, if $V(.)$ is given by (9) instead of (10), we obtain reduced-form wage and employment equations which omit the reference wage variable.*

[11] *For instance, it is quite plausible that bargaining strength reflects the ability to impose costs on one's opponent whilst causing only small costs to oneself. In this case β is an increasing function of the union's fall back level (V_0) and a declining function of the firms's fall back level (Π_0).*

[12] *There is disagreement in the literature about this argument. This study assumes insulation in line with Carruth et al (1986), Blanchflower et al (1987), and Oswald (1987). See, however, also Grossman (1983) who presents a seniority model which does not allow for insulation.*

ity of the testing methodology must be mentioned. First, the basic assumption underlying the seniority model that senior workers are insulated from redundancy and hence no weight is placed on the welfare of those (junior) members threatened with redundancy is extreme. Although this assumption can be regarded as plausible in a static setting (in the case of a myopic union), the degree to which it is realistic certainly raises doubts in a dynamic framework which takes the endogeneity of the union membership into consideration. Secondly, the test for the seniority model is based solely upon the exclusion restriction that the unemployed union member's utility and hence its determinants do not show up in the reduced-form wage and employment equations. The fact that the utility level of an unemployed union member cannot observed directly but must be proxied introduces uncertainty into the robustness of the results.

3. *Results of the reduced-form wage equations*

This section reports the results of testing the seniority model of trade union behaviour using data on two Finnish industries. The industries to be examined were the pulp and paper industry and the textile, clothing and leather industry, hereafter referred as to the paper industry and the textile industry, respectively. These industries were chosen because they represented not only some of the features typical of Finnish manufacturing but at the same time, to a certain extent, the opposite ends of it. While the common features include collective bargaining, a high unionization rate and openness to foreign competition, differences between the industries concern the general structure of the industry, wage rates, and the composition of labour force.[13]

Before turning to the empirical results, there are certain issues concerning the modelling strategy as well as the measurement of the dependent/independent variables which must be noted. In particular two assumptions which simplify the analysis considerably must be stated explicitly. First, only the reduced-form wage equations were estimated. The reasons for this were theoretical as well as practical. In particular, two points are worth emphasizing: (i) the interpretation of an employment equation which includes the aggregate unemployment rate as an explanatory variable is somewhat awkward compared to a wage equation in which the concept of the unemployment elasticity of real wages is meaningful; and (ii) it is quite plausible to assume that the objectives of trade unions are reflected more accurately in the wage equation than in the employment equation. Hence a dramatic change in the qualitative results could not be expected had we also estimated the reduced-form employment equations.[14]

Second, this study makes no distinction between negotiated wages and wage drift but simply applies data on total earnings.[15] This procedure is justified by arguing that wage drift is fully accounted for in the central level wage bargaining and hence there is no need for a separate analysis of wage drift and negotiated wages in order to understand movements in total earnings. Although this commonly-used simplification is subject to criticism, it has gained some empirical support

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[13] *The textile industry is largely made up of small firms compared to the paper industry where, in 1985, the average establishment had 250 workers with a gross production value of about FMK 250 million. The number of establishments in the textile industry in 1985 was 880 and the average plant had 77 workers with a gross production value of about FMK 10 million. Also the cost structures of the industries differ quite dramatically: while the share of wages and salaries is only about 10 per cent of the gross value of production in the paper industry, in the textile industry the corresponding figure is nearly 30. The wage rate in the paper industry has on average been about 20 per cent above the average hourly wage rate in manufacturing, while in the textile industry the average worker earns only about 77 per cent of the average hourly wage in manufacturing. Accordingly, the paper industry can be regarded as a high-wage industry and the textile industry a low-wage industry. Regarding the composition of the work force, in the textile industry women comprise 72 per cent of the total work force whereas the corresponding figure in the paper industry is only about 30 per cent.*

[14] *The dropping of the reduced-form employment equations from the analysis requires that the error terms of the reduced-form wage and employment equations are not cross-correlated. In particular, we assume that* $\varepsilon_i \sim (0, \sigma_i^2)$, $\varepsilon_j \sim (0, \sigma_j^2)$ *and* $E(\varepsilon_i\varepsilon_j) = 0$. *It should be emphasized that results are conditional upon this assumption being correct.*

[15] *Industry-specific data on wage drift was available only from 1975 onwards.*

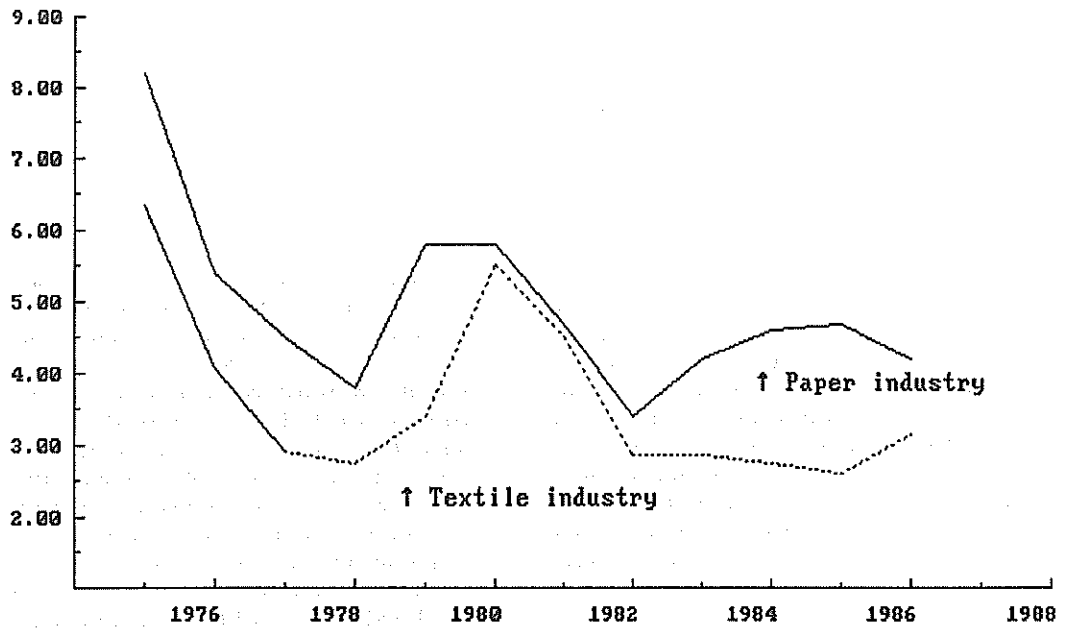

Figure 2. Wage drift in the paper industry (solid line) and in the textile industry (dotted line).*

* STK's estimates. The classification of the industries does not fully correspond to that of TOL.

in a recent study by Eriksson et al (1989). The second point which implies that the consequences of neglecting the wage drift component from the analysis might not be so severe concerns the pattern of wage movements in both industries. As Figure 2 suggests, the claim that differentials in total earnings across the industries are borne out by different experiences of wage drift and hence that industry-specific factors generating wage drift should be taken into consideration can, at least to some extent, be dismissed in the case of the paper and textile industries. Figure 3 which depicts the development of total earnings in both industries suggests similar conclusion.[16]

As far as the measurement of the dependent/independent variables is concerned, there are three points which must be noted. First, we used the real consumption wage as the dependent variable in the wage equation. The reason is straightforward though not undebatable:[17] trade unions are concerned about the real post-tax wage, not the nominal wage or the real product wage. The recent tax reform/income policy package which is designed to deliver a fixed real consumption wage increase is a case in point. Second, the definition and measurement of the reference wage (comparison wage/minimum acceptable contract wage) posed a problem. Depending on the degree of disaggregation, the comparison wage has been proxied by different measures of *average earnings elsewhere in the economy.*[18] In our case the average wage rate in manufacturing is an obvious candidate and it was em-

[16] *Cf. also Pissarides and Moghadan (1989) who conclude that the wage variations in nine different Finnish industrial sectors are not determined by industry-specific factors.*

[17] *See e.g. Solow (1986) who repeats the argument that workers and firms cannot bargain over the real wage.*

[18] *See e.g. Brown and Ashenfelter (1986) who use eleven different measures of the reference (comparison) wage. As a referee pointed out it is likely that reference wage W^r is endogenous with respect to the aggregate unemployment rate unless wage formation in the reference sector is based on the seniority model. In this respect the test of the seniority model is, in principle, conditional on the reference wage being exogeneous, i.e. it is determined by seniority behaviour. This assumption is, however, not necessary in the case of the simplified specification which omits the variable.*

ployed as the main reference wage proxy in the paper industry's wage equation. With regard to the textile industry's wage equation, two alternative measures were applied. These were: (i) the average wage rate of woman workers in manufacturing; and (ii) the average wage rate in manufacturing. The measurement of the unemployment benefit variable posed a similar problem. As above, two alternative measures were employed: (i) a direct proxy measuring real unemployment benefits; and (ii) an indirect proxy measuring accessibility to state unemployment benefits and union funds.[19] Third, the variables for union membership, bargaining power, and the alternative wage were excluded from the analysis. The exclusion of the membership variable L, for which we had no data, from the reduced-form equations can be justified either by arguing that it is endogenous or by appealing to the additive utility function, in which case it drops out of the first-order conditions. The former argument applies to the bargaining strength variable β which was similarly omitted in the subsequent empirical analysis. As far as the alternative wage variable W^a is concerned, we assumed that it is determined by the aggregate unemployment rate U and the level of unemployment benefit B and hence can be omitted.[20]

There are three further points related to estimation technique which are also worth noting. First, we estimated two basic specifications, labelled the »generalized» specification and the »simplified» specification, respectively. The main difference between these specifications is that the latter omits the reference wage as an explanatory variable. Furthermore, variables measuring labour market tightness (aggregate unemployment rate) do not appear in the purest form of the simplified specification. Second, reduced-form wage equations were estimated by OLS. This gives rise to a possible endogeneity problem. In the case where industry-level dependent variables are applied, aggregate-level explanatory variables such as the unemployment rate and the level of unemployment benefits as well as different tax variables can, to some extent, be treated as exogeneous. Exogeneity of industry-specific explanatory variables which enter through the labour demand function can in turn be justified by appealing to firms' price-taking behaviour.[21] Finally, because the theory provides no predictions about the appropriate lag structure we started with a general (baseline) specification and adopted the sequential testing approach of Hendry and Mizon (1978). Given the relatively small number of observations (the data are annual and cover the period 1960 – 1985) the order of the polynomials chosen was two.

3.1 The paper industry

A set of OLS estimates for the paper industry's wage equation is reported in Table 1. Columns 1a – 1c report the estimates of the »generalized» specification, while the results of the »simplified» specification are reported in columns 2a – 2c, respectively. As a whole the results are satisfactory: in general the variables enter the equations significantly and are correctly signed; the long-run elasticity results seem to be plausible; and the equations satisfy a number of statistical tests.

Although both basic specifications are fairly robust, i.e. they satisfy a number of statistical tests and therefore they can be regarded as good description of the data, the statistical performance of the generalized specification, however, seems to be slightly better. In fact, the average error, measured as a percentage of the mean of the dependent variable, doubles when moving from the generalized to the simplified specification. Furthermore, though the simplified specification does not seem to suffer from misspecification, significant change in the values of the LM statistics (from around 0.2 to 3.5 – 9.5) indicate that the

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[19] *The first variable is compiled by Tor Eriksson. I am grateful to him for putting the data at my disposal. The second variable (the coverage of the benefit system) is measured as the proportion of recipients of unemployment assistance and union unemployment benefits out of the total stock of unemployed. The latter variable is also used in Eriksson (1985) and Pehkonen (1989).*

[20] *See Blanchflower et al (1987) for a similar treatment.*

[21] *The validity of these assumptions could be examined by the means of Granger causality test. See for instance Pencavel and Holmlund (1988) who apply the test in order to establish the exogeneity of producer prices in a wage-employment system. Tyrväinen (1989) carries out similar tests for consumer prices, capital stock and aggregate production.*

exclusion of the reference wage variable from the equation is not an unproblematic exercise. On the other hand, the forecasting performance of the generalized specification is somewhat unsatisfactory, though not unacceptable (see column 1b). This is mainly due to the final observation (1985) which the equation badly underestimates. This problem, however, does not appear in the simplified specification (cf. forecasting statistics reported in columns 2a – 2c).[22]

The baseline specification we started with

[22] *Extending the investigation to cover the years 1986 – 1988 would allow the forecasting performance of the equations to be scrutinized even further.*

Table 1. The wage equation of the paper industry. Log-linear specification. Dependent variable: $ln(W_c)$. Full sample OLS estimates, 1960 – 1985.*

Variables	Model 1a	1b	1c	2a	2b	2c
Lagged dependent variable	0.318 (4.79)	0.322 (5.14)	0.382 (5.17)	0.610 (4.36)	0.612 (5.49)	0.660 (6.91)
Reference wage $ln(W^r)_t$	0.802 (8.14)	0.789 (9.63)	0.819 (8.90)			
Trend productivity $ln(Q/L)_t$				0.155 (1.29)	0.158 (1.74)	0.258 (3.12)
Real import prices $ln(M_p)_{t-1}$	−0.159 (3.62)	−0.161 (3.80)	−0.156 (3.19)			
Labour tax rate $ln(1 + \tau_1)_{t-1}$	−0.542 (1.22)	−0.460 (1.68)	−0.651 (1.59)			
Indirect tax rate $ln(1 + \tau_3)_t$	−0.132 (0.93)			−0.193 (1.39)	−0.190 (2.08)	−0.181 (2.28)
Unemployment $ln(U)_t$	−0.022 (1.76)	−0.024 (2.54)	−0.020 (1.89)	−0.023 (0.36)		
Unemployment $ln(U)^2_{t-1}$	0.017 (4.00)	0.016 (4.18)	0.015 (3.92)	0.010 (0.44)		
Coverage of Benefits $ln(CB)_{t-2}$	0.104 (2.17)	0.102 (2.23)		0.211 (1.69)	0.204 (2.01)	
Benefits $ln(B)_{t-1}$			0.019 (0.86)			0.082 (2.12)
Diagnostic						
S.E.	0.84	0.74	0.80	1.86	1.77	1.76
LM; $CHI^2(2)$	0.18	0.13	1.24	3.24	3.91	9.58
NORMALITY; $CHI^2(2)$	0.14	0.07	0.79	0.69	0.90	0.97
ARCH	0.10 F(2,11)	0.13 F(2,13)	1.24 F(2,13)	0.53 F(2,13)	0.62 F(2,15)	0.23 F(2,15)
RESET	0.93 F(2,13)	0.83 F(2,17)	2.37 F(2,17)	2.61 F(2,15)	2.78 F(2,17)	0.71 F(2,17)
CHOW	2.64 F(4,11)	2.06 F(4,13)	5.20 F(4,13)	0.88 F(4,13)	0.95 F(4,15)	0.54 F(4,15)
FORECAST; $CHI^2(4)$	9.97	7.34	19.09	1.08	1.05	1.21
FIC(U)	8.02 F(2,16)	9.21 F(2,18)	6.43 F(2,18)	0.46 F(2,18)	–	–
FIC(B)	3.89 F(1,17)	5.02 F(1,19)	1.82 F(1,19)	4.06 F(1,19)	4.06 F(1,19)	4.52 F(1,19)
FIC(U, B)	8.18 F(3,15)	9.24 F(3,17)	4.21 F(3,17)	1.29 F(3,17)	–	–

Notes: t-values are in parentheses; constant terms are included but not reported; S.E. = standard error expressed as a percentage of the mean of the dependent variable; FIC() = F-test for the null hypothesis of the seniority model.

had two trended variables: reference wage W^r and productivity proxy Q/L, measured by the average earnings in manufacturing and the ratio of the industry's output to its labour input, respectively. As can been seen from columns 1a – 1c, the reference wage variable enters the generalized specification significantly and is well determined. The long-run elasticity is centred around unity. The productivity proxy which reflects the industry's own performance on wages does not show up significantly in this specification.[23] However, the variable does enter the simplified specification which omits the reference wage proxy, as ex-

[23] *Though the variable was correctly signed, the omitting of the variable improved the specification's forecasting performance and hence it was dropped. The same remark applies to the capital stock/user cost of capital variables which were similarly omitted.*

Table 2. The wage equation of the textile industry. Log-linear specification. Dependent variable: $ln(W_d)$. Full sample OLS estimates, 1962 – 1985.*

Variables	Model 1a	1b	1c	2a	2b	2c
Lagged dependent variable	0.363	0.358	0.315	0.515	0.508	0.574
	(6.21)	(6.29)	(5.13)	(6.04)	(5.78)	(6.14)
Reference wage $ln(W^r)_t$	0.698	0.832	0.887			
	(5.40)	(10.1)	(10.0)			
Trend productivity $ln(Q/L)_t$	0.074			0.298	0.232	0.265
	(1.28)			(4.40)	(4.42)	(4.46)
Indirect tax rate $ln(1 + \tau_3)_t$	−0.299	−0.214	−0.237	−0.314		
	(2.32)	(1.91)	(2.15)	(1.47)		
Real import prices $\Delta ln(M_p)_{t-1}$	−0.086	−0.051	−0.089	−0.171	−0.138	−0.010
	(1.58)	(1.09)	(1.62)	(1.96)	(1.59)	(0.10)
Unemployment $ln(U)_t$	−0.098	−0.077	−0.065	−0.182	−0.204	−0.178
	(2.73)	(2.39)	(2.00)	(3.38)	(3.83)	(3.15)
Unemployment $ln(U)^2_t$	0.047	0.039	0.036	0.071	0.071	0.065
	(3.60)	(3.41)	(3.07)	(3.43)	(3.33)	(2.81)
Coverage of Benefits $ln(CB)_{t-2}$	0.037			0.166	0.141	
	(0.64)			(1.89)	(1.58)	
Benefits $ln(B)_{t-1}$			−0.012			−0.027
			(0.64)			(0.70)
Diagnostic						
S.E.	0.76	0.76	0.73	1.26	1.31	1.43
LM; $CHI^2(2)$	1.93	2.77	2.92	5.79	3.81	1.91
NORMALITY; $CHI^2(2)$	0.65	0.08	0.62	0.38	0.57	0.36
ARCH	0.31	0.01	0.45	0.38	0.75	0.68
	F(2,11)	F(2,13)	F(2,13)	F(2,12)	F(2,13)	F(2,13)
RESET	0.55	0.33	0.25	0.00	0.29	1.32
	F(2,13)	F(2,15)	F(2,14)	F(2,14)	F(2,15)	F(2,15)
CHOW	2.39	1.66	1.13	1.56	1.48	1.60
	F(4,11)	F(4,13)	F(3,14)	F(4,12)	F(4,13)	F(4,13)
FORECAST; $CHI^2(4)$	2.99	1.95	1.81	1.96	1.87	3.52
FIC(U)	8.20	7.63	8.67	5.37	6.43	5.41
	F(2,16)	F(2,17)	F(2,17)	F(2,17)	F(2,18)	F(2,18)
FIC(B)	0.40	–	1.87	2.45	0.25	0.26
	F(1,17)		F(1,17)	F(1,18)	F(1,19)	F(1,19)
FIC(U, B)	5.40	–	5.72	5.33	5.49	3.67
	F(3,15)		F(3,15)	F(3,16)	F(3,17)	F(3,17)

See notes to Table 1.

pected (see columns 2a – 2c).

Our results lend some support to the idea that a rise in import prices (M_p) knocks the real consumption wage of the trend. The import price elasticity of the real consumption wage calculated from columns 1a – 1c is around −0.23 and is thus of the same magnitude as estimates derived from the aggregate manufacturing data (cf. Tyrväinen 1988) as well as from the aggregate Finnish data (cf. Pehkonen 1989). However, this result is tentative only since the variable does not contribute to the simplified specification.

As far as the tax variables are concerned, the results are somewhat mixed.[24] Firstly, the employers' labour tax variable which significantly enters the generalized specification, does not contribute to the simplified specification at all. Although we have no clear explanation for this we would regard the result of the generalized specification as more robust because it is in line with that obtained in Tyrväinen (1988) who also finds that changes in the employer's tax rate are fully passed on as lower wages. Secondly, the indirect tax variable which significantly enters the simplified specification has only a minor influence on the generalized specification (see column 1a). Nevertheless, the long-run indirect tax elasticity of the real consumption wage is of the same magnitude in both specifications (−0.25 – −0.45).

The results suggest the rejection of the seniority model. For instance, in column 1a the F-test for the null hypothesis of the joint insignificance of the aggregate unemployment and the unemployment benefit proxy is 9.24, the corresponding 5 and 1 per cent critical values being 3.20 and 5.18 respectively. Also, the separate F-tests suggest the rejection of the FIC model. The exclusion restriction for the unemployment terms yields the F-value of 8.02 (column 1a), 9.21 (column 1b), 6.43 (column 1c). The exclusion restriction for the unemployment benefit proxy, measured either by the coverage of the benefit system CB or by the real level of unemployment benefits B, is similarly rejected, though only at a 5 per cent level of significance. This result also applies to specifications 2a – 2c.[25]

The non-linear effects of the unemployment term on wages are worth noting because they imply that the unemployment elasticity of real wages W_u increases in absolute terms as the unemployment rate rises.[26] For instance, at the beginning of the sample $U = 2.0$ % and $w_u \approx -0.01$, while at the end of the sample $U = 5.5$ % and $W_u \approx -0.03$.

3.2 *The textile industry*

Table 2 summarizes our findings for the textile industry's wage equation. Both basic specifications of the wage equation track the data well: there is no sign of residual correlation and all equations pass the parameter constancy and prediction tests as well as a number of other diagnostic checks.

The results of the textile industry's wage equation follow the pattern of the paper industry with one major exception, namely that the employer's labour tax variable does not show up in the generalized specification.[27] As far as the other variables are concerned, the reference wage variable, measured by the average wage rate of women workers in manufacturing, plays a significant role in the generalized specification.[28] The long-run elasticity of

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[24] *The statistical performance of the specification which included the wedge term given as* $ln[(P_p/P_c)(1-\tau_2)/(1+\tau_1)]$, *was inferior (in terms of residual autocorrelation and forecasting performance) to be specification where the tax terms were separated and* $ln(P_c/P_p)$ *proxied by the indirect tax rate,* $ln(1+\tau_2)$.

[25] *The fact that the benefit proxy, measured by the coverage of the benefit system, enters the equation only when lagged twice is somewhat puzzling. We can offer no clear explanation for this and in the worst case the proxy might be picking up something other than was originally intended to. Nevertheless the results concerning the rejection of the seniority model are not altered even where the variable is dropped from the model.*

[26] *The quadratic unemployment term plays an important role in the wage equation. In fact, specifications fail badly if this variable is omitted from the analysis. We examined the robustness of the results by employing two alternative measures of the labour market proxy, namely the male unemployment rate and the unemployment rate in the district of Helsinki. The results reported here were not materially affected by these experiments. Similar experiments with sector-specific unemployment data should have been preferred but unfortunately the data was not available.*

[27] *This result that the payroll tax variable enters the paper industry's wage equation but not the textile industry's wage equation accords to some extent with the findings reported in Lilja and Santamäki (1988).*

[28] *The results are similar but less precise when we use*

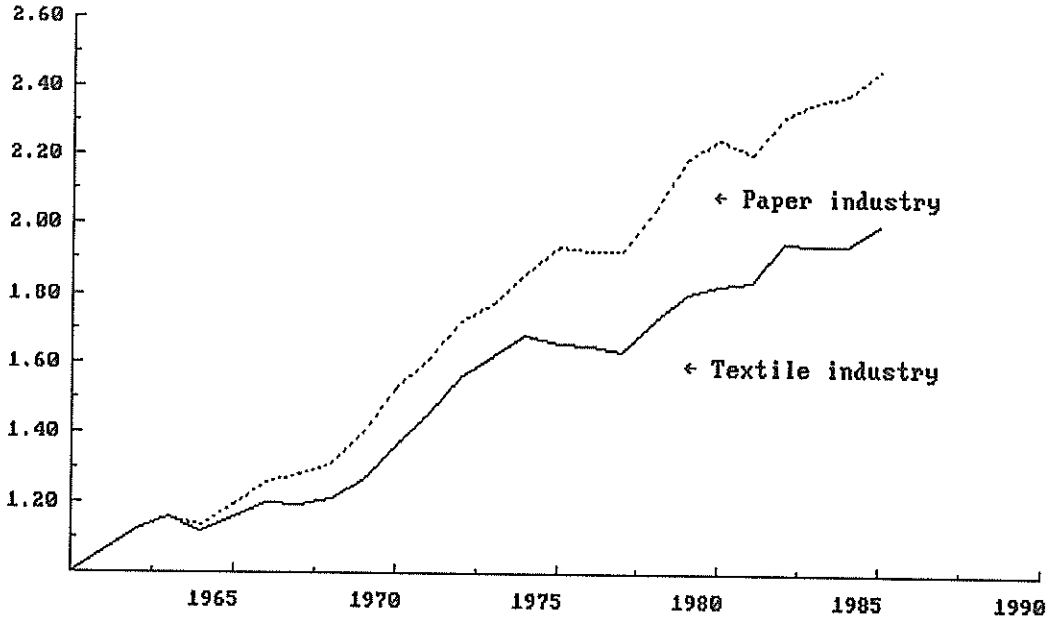

Figure 3. Real consumption wage in the paper industry (solid line) and in the textile industry (dotted line).

the reference wage with respect to the industry's real consumption wage is centred around unity. In line with the paper industry's wage equation, the productivity variable is insignificant, though correctly signed, in the generalized specification but highly significant in the simplified specification. The indirect tax elasticity of real wages is approximately −0.6, which is of the same magnitude as the estimates reported in Table 1. Again, a rise in import prices knocks the real consumption wage of the trend. In this case the effect is temporary in nature, the variable entering the equation only in differences and not in levels. As in the case of the paper industry's wage equations, the capital stock/user cost proxies of the capital variable did not contribute to the equation and thus they were omitted.

The data rejects the seniority model. The F-test statistics for the joint insignificance of the aggregate unemployment rate and the benefit proxy reported in Table 2 vary between 3.67 and 5.72 being well above their 5 per cent critical values. Neither does specification 1b, which omits the benefit proxy, provide support for the FIC model.[29]

As in the paper industry's wage equation, the relationship between the real consumption wage and aggregate unemployment is nonlinear: on average the unemployment elasticity of real wages varies between −0.10 and −0.12, depending upon the level of the rate of unemployment.

5. *Conclusions*

In this study we applied a reduced-form test for the seniority model of trade union behaviour as suggested in Carruth et al (1986). It was shown that, under certain plausible conditions, the monopoly union and efficient bargain models of trade union behaviour cannot

the aggregate wage rate of manufacturing as a proxy of the reference wage.

[29] *It should be noted that the benefit proxy, when measured by the level real unemployment benefits, enters the model with a negative sign, contrary to a-priori beliefs. The variable is however insignificant. Eriksson et al (1989) report similar results for the private sector. In line with the paper industry's wage equation, the coverage of benefit system proxy enters the model only with a lag of two periods.*

be discriminated empirically by means of the reduced-form tests and therefore the possible rejection (acceptance) of the seniority model implies the joint acceptance (rejection) of the monopoly union model as well as the efficient bargain model. Because the seniority model and the efficient bargain/monopoly union models have different employment implications, a reduced-form test for the seniority model provides a preliminary check on trade union objectives which should be conducted prior to discrimination tests between the monopoly union and the efficient bargain models.

This study addressed the question of the objectives of trade unions by examining data on two Finnish industries. The results from the paper industry's wage equation did not provide support for the seniority model, the null hypothesis of the joint insignificance of aggregate unemployment and real unemployment benefits being rejected at any conventional level of significance. The results from the textile industry's wage equation followed the same pattern: our findings suggest that the restrictions implied by the seniority model cannot be accepted. As far as these two industries are concerned, the study finds no support for the idea that trade unions aim merely to push their members' wages as high as possible. It should be noted, however, that although external factors (aggregate unemployment, unemployment benefits) do affect pay determination significantly, their influence on the level of wages in those industries remains relatively small.

There are two other findings which are worth emphasizing. First, the relationship between the real consumption wage and aggregate unemployment is non-linear in such a way that elasticity rises in absolute terms with the unemployment rate. Although absolute changes in the elasticities are rather small, percentage changes are considerable and statistically significant. This finding, which suggests a moderation of union wage claims when the odds of finding an alternative job fall, applies to both industries. Second, the unemployment elasticity of the real consumption wage differs significantly across the industries. According to the results, a doubling of the unemployment rate would reduce the real consumption wage by 2 percent in the paper industry and on average by 10 percent in the textile industry. This is an interesting result that provides an insight into the differences in wage determination across the industries. Surprisingly little research has been done in this area and in the future it would also be interesting to extend the analysis to cover some other industries as well. Beside the external factors focused in this study, it would be interesting to investigate the role of internal factors, such as profitability, in wage determination across different industries.

Finally, although the present results are worthy of attention, they are only tentative. In particular, the following points should be taken into consideration when interpreting the results. First, the lack of industry-specific data may undermine the robustness of the results, although in our case where both industries exhibit quite a similar pattern in wages, as Figures 2 and 3 point out, the problem appears not to be particularly alarming. Second, the empirical analysis simplifies the nature of the wage formation process considerably. Although the hypothesis that the wage drift component can be omitted from the analysis has gained some support (cf. Eriksson et al 1989), the fact that the processes generating wage drift have not been modelled explicitly should be accounted for when interpreting the robustness of the results. Third, the testing methodology which is based upon very generally formulated exclusion restrictions encounters a number of possible shortcomings. In particular, alternative interpretations for the appearance of the unemployment term in the reduced-form wage equation are possible. For instance it can be argued that the unemployment term does not reflect union, concern over its members utility but is simply picking up correlations between wages and unspecified variables not included in the model.

References

Blanchflower, D.G., Oswald, A.J. and Garrett, M.D. (1987), Insider power in wage determination: part 2, University of Surrey, mimeo.

Brown, J.N. and Ashenfelter, O. (1986), Testing the efficiency of employment contracts, *Journal of Political Economy,* 94, S41 – S87.

Carruth, A. and Oswald, A.J. (1985), Miners' wages in post-war Britain: an application of a model of trade union behaviour, *Economic Journal,* 95, 1003 – 1020.

Carruth, A., Oswald, A.J. and Findlay, L. (1986), A test

of a model of trade union behaviour: the coal and steel industries in Britain, *Oxford Bulletin of Economics and Statistics,* 48, 1–18.

Dertouzos, J.N. and Pencavel, J.H. (1981), Wage and employment determination under trade unionism: the international typographical union, *Journal of Political Economy,* 89, 1162–1181.

Dunlop, J.T. (1944), *Wage Determination under Trade Unionism,* Macmillan, New York.

Eriksson, T. (1985), *Some Investigations into Finnish Unemployment Dynamics,* Meddlelanden från Stiftelsens för Åbo Akademi Forskningsinstitut, N:o 107, Åbo.

Eriksson, T., Suvanto, A. and Vartia, P. (1989), Wage setting in Finland, The Research Institute of the Finnish Economy, Discussion Paper N:o 286.

Farber, H.S. (1979), Individual prefenrences and union wage determination: the case of the united mine workers, *Journal of Political Economy,* 86, 923–942.

Farber, H.S. (1987), The analysis of union behaviour, in O. Ashenfelter & R. Layard (eds.), *Handbook of Labour Economics,* North-Holland, Amsterdam.

Grossman, G.M. (1983), Union wages, temporary layoffs, and seniority, *American Economic Review,* 73, 277–290.

Hendry, D.F. and Mizon, G.E. (1978), Serial correlation as a convenient simplification, not a nuisance: a comment on a study of the demand for money by the Bank of England, *Economic Journal,* 88, 549–563.

Holden, S. (1989), Wage drift in Norway: a bargaining approach, University of Stockholm, Institute for International Economic Studies, Seminar Paper N:o 430.

Holmlund, B. and Skednger, P. (1988), Wage Bargaining and wage drift: evidence from the Swedish wood industry, Uppsala University, Department of Economics, Working paper N:o 8.

Leontief, W. (1946), The pure theory of the guaranteed annual wage contract, *Journal of Political Economy,* 54, 76–79.

Lilja, R. and Santamäki, T. (1988), Downward stickiness of wages in Finnish industries — how market-persistent are wages to market pressures?, Labour Institute for Economic Research, Discussion Paper N:o. 80.

MaCurdy, T.E. and Pencavel, J.H. (1986), Testing between models of wage and employment determination in unionized markets, *Journal of Political Economy,* 94, S3–S39.

McDonald, I.M. and Solow, R.M. (1981), Wage bargaining and employment, *American Economic Review,* 71, 896–908.

Manning, A. (1987), An integration of trade union models in a sequential bargaining framework, *Economic Journal,* 97, 121–139.

Nickell, S. and Andrews, M. (1983), Unions, real wages, and employment in Britain 1951–79, *Oxford Economic Papers,* 35, 183–220.

Oswald, A.J. (1985), The economic theory of trade unions: an introductionary survey, *Scandinavian Journal of Economics,* 67, 160–193.

Oswald, A.J. (1987), Efficient contracts are on the labour demand curve: theory and facts, London School of Economics, Centre for Labour Economics, Discussion Paper N:o 284.

Pehkonen, J. (1989), The causes of unemployment in Finland 1970–82: some further empirical evidence, *Applied Economics,* 21 (6), 723–739.

Pencavel, J.H. (1984), The trade-off between wages and employment in trade union objectives, *Quarterly Journal of Economics,* 99, N:o 2, 216–231.

Pencavel, J.H. (1985), Wages and employment under trade unionism — microeconomic models and macroeconomic applications, *Scandinavian Journal of Economics,* 97 (2), 197–225.

Pencavel, J.H. and Holmlund, B. (1988), The determination of wages, employment and work hours in an economy with centralized wage-setting: Sweden, 1950–1983, *Economic Journal,* 98, 1105–1126.

Pissarides, C. and Moghadam, R. (1989), Relative wage flexibility in four countries, London School of Economics, Centre for Labour Economics, Discussion Paper N:o 331.

Solow, R. (1986), Unemployment: getting the questions right, *Economica,* 53, S23–S34.

Tyrväinen, T. (1988), *Wages and Employment in a Unionised Economy,* Bank of Finland, D:68, Helsinki.

Tyrväinen, T. (1989), Unions, wages and employment in Finland, Bank of Finland, Discussion Paper N:o 17.

Data appendix

W_c: Real consumption wage, defined as $W(1-\tau_2)/P_c$.

W: Nominal hourly wage rate in the industry. Source: Kauppi and Törmä.*

P_c: Consumer price index. Source: Central Statistical Office of Finland, Bulletin of Statistics.

τ_1: Payroll tax rate in manufacturing (%). Source: Bank of Finland, BOF3.

τ_2: Marginal income tax rate (%). Source: Bank of Finland, BOF3.

τ_3: Indirect tax rate (%). Source: Bank of Finland, BOF3.

W^r: Reference wage rate, defined as $W^i(1-\tau_2)/P_c$, where W^i is either the average nominal wage rate in manufacturing (TOL34) or the average wage rate of women in manufacturing (TOL32).

Q/L: Trend productivity, measured as the ratio of the industry's output to its labour input. Source: Kauppi and Törmä.

U: Aggregate unemployment rate. Source: Ministry of Labour, Labour Reports.

B: Real unemployment benefits. An index compiled by Tor Eriksson. The 1985 figure was estimated by the author.

CB: Coverage of benefit system. A proxy defined as $(U_s + U_u)/U$ where U_s is the recipients of state unemployment assistance, U_u is the unemployed members of insurance funds, and U is the total stock of unemployed job-seekers. Source: Ministry of Labour, Labour Reports.

K_p: User cost of capital. Source: Kauppi and Törmä.

M_p: Real price of imported raw materials, defined as P_m/P_p, where P_m is the nominal price of imported raw materials and P_p output price index of the industry concerned. Source: Kauppi and Törmä.

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