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WAGE BARGAINING AND THE WAGE DRIFT: EVIDENCE FROM FINLAND

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Abstract

This article examines various aspects of the wage drift. It is reaffirmed that in Finland wage drift is closely related to the excess demand for labour. As excess demand for labour indicates that contractual wage is below the equilibrium wage we specify a bargaining model which determines the target wage. This model for equilibrium (real) wages consists of variables influencing profits, on the one hand, and the utility of the union, on the other hand. In addition, the relative bargaining power matters. After having described the three-step bargaining process in Finland, an error correction equation for the conditional wage drift is specified with changes in target wages, changes in contract wages and the target-error stemming from the past as independent variables. Several variants of the model are estimated. We conclude that, in Finland,

1) there is a robust inverse correlation between contract wages and the wage drift. The latter acts as an error correcting factor. The relevant equilibrium wage is generated by the bargaining process described in the paper.
2) the adjustment of wages through the wage drift is not instantaneous.
3) wage drift is contributed by "target errors" stemming from the past periods.
4) the variation in the wage drift appears to be correlated with errors in (inflation) expectations.
5) the wage drift tends to be larger when the dispersion of the economic position of the firms – measured by standard deviation of the stock of orders – is large.

1 Introduction

In Scandinavian economies a large part of wage increases stems from the wage drift, which is defined as wage increments in addition to the wage rates agreed upon collectively. By definition, the importance of the wage drift becomes smaller when the wage determination becomes more atomistic. Hence, although wage drift can be detected in all countries with collective negotiations its role is exeptional in the Scandinavian economies where wage bargaining is highly centralized.[1] The concept of "central negotiations" usually refers to nation wide bargaining and occasionally to bargaining on industry level.[2] Figure 1 gives an idea of wage inflation, wage drift and demand for labour in Finland since 1965.

Although the literature on wage drift has been increasing recently the mechanism in concern is still not well understood. Most earlier empirical work relied on a Phillips curve type of framework, where wages are assumed to be driven by excess demand for labour.[3] These models will be discussed in section 4 below.

In line with more recent theorising, wage drift may be regarded as the outcome of local bargaining about the implementation of central contracts between individual firms and their unions. The wage drift is the outcome of the local "game" as in Holden (1988a) and Holmlund & Skedinger (1990). The approach of this study follows the same idea.

Flanagan (1990) questions the use of bargaining models when the role of the wage drift is as pronounced as in the Scandinavian countries. He appears, however, to underestimate the union influence in economies with overwhelming unionization.

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[1] In 1971—1985 wage drift has comprised some 30 to 60 per cent of annual increases in hourly earnings in Nordic countries (see Flanagan, 1990).

[2] In Finland, the period 1964—1990 saw only four years when settlements were concluded at industry level with no central agreement.

[3] Isachsen (1977) and Söderström and Udden-Jondal (1982) suggest that output prices as well contribute to variation in the drift. Schager (1981, 1988) stresses the role of profitability. Holden (1989) argues that inventories serve as a buffer against wage drift.

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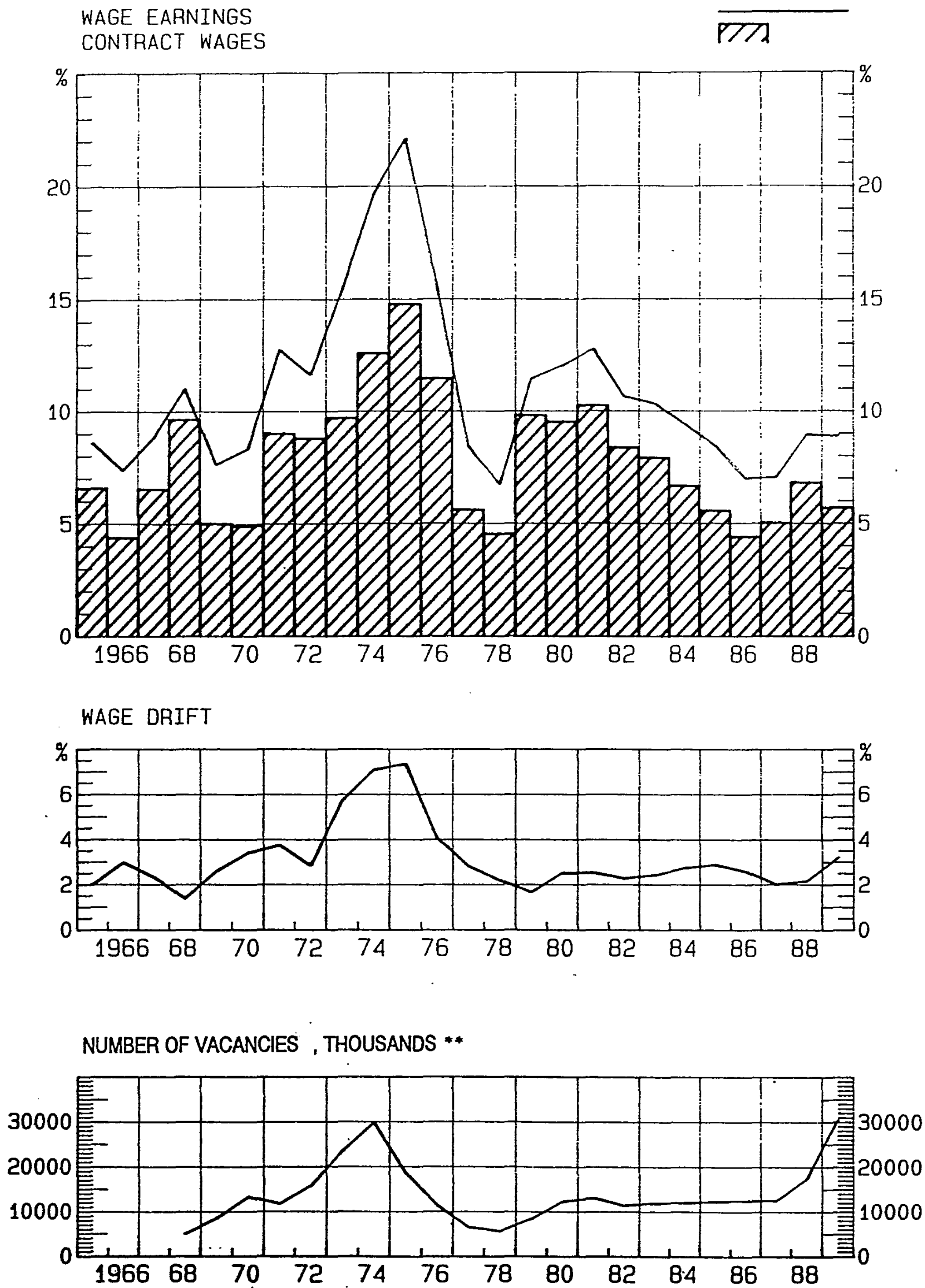
Figure 1. **Wages and Demand for Labour in Finland 1965–1989**



** There is a discontinuity in the series for vacancies in 1988 when a new employment act made it obligatory for employers to publish all vacancies. This appears to have increased the number of vacancies as much as by one third.

Section 1 below which describes the mechanism of wage determination in Finland is designed to justify the use of bargaining models in our analysis. Unions have an influence on all (hierarchic) levels of the economy as Manning (1987) as well underlines. Section 2 introduces our model and its empirical application. Section 3 evaluates why the wage drift is permanently positive and why it fluctuates considerably. Special attention is given to expectational errors. Section 4 discusses some earlier studies and the final section summarizes the main conclusions.

2 The Contract Wage and the Wage Drift[1]

In Finland, wages are determined in a three step process. These steps are 1) the level of central confederations, 2) the industry level and 3) the local level. Not only the first but the second as well represents centralized bargaining. So, in accordance with Hibbs & Locking (1991) we refer to this tri-level bargaining system as the "centralized" institutional regime. On all three levels workers negotiate with the employer. They are represented with the relevant union body. Each bargaining level influences the level of earnings.

Level of earnings statistics is based on information about individuals. Firms deliver the data to the Central Confederation of Employers (STK) which according to an agreement with the Central Organization of Labour Unions (SAK) prepares the wage statistics. This data is supplied to the Central Statistical Office (CSO).

Contract Wage Index is based on an approximation made on aggregate level about the effect of the wage settlement on the present wage level. These changes are cumulated to an index. In reality, wage bargaining never takes the previous contract wage as a starting point. The negotiations are about the actual wages and in the present wage round the past wage drift is evaluated as part of the prevailing contract wage. Hence, there is a permanently growing gap between the level of the Contract Wage Index and the Level of Earnings Index. By nature, the Contract Wage Index is a synthetic series which has no connection to the factual wage level. Only differencies of this index are useful.

All locally born pay increases are part of the wage drift no matter whether they concern an individual or a group. Hence, a pay rise which stems from a local contract only shows up in the wage drift.

The "list wage" determines a kind of a floor for a special kind of job. In practice, most of the workers receive more. To reduce this gap "list wages" have been in several wage rounds increased more than the factual wages. If, for instance, the general pay rise has been 50 pennies per hour, the "list wage" may have been increased by 80—140 pennies. If the post contract wage of a worker is above the level of the new "list wage", the arrangement should not influence him. In real life, the rise in the "list wage" also influences the better paid. The gap between the "list wages" and factual wages appears to be rigid in most firms. The resulting pay rise only shows up in the wage drift even though it follows from the contract. In addition, if the effect of changes in the (text of a) contract

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[1] This section summarizes the example discussed in Appendix 1 about how central agreements are implemented to generate factual wages.

cannot be generally quantified on aggregate level the impact will be seen only in the wage drift.

The discussion above shows that the boundary between the contract wage and the wage drift is not straightforward. In addition, the wage drift is largely a result of local bargaining and local settlements. So, a bargaining model is valid for analysis of the local wage formation as well. The relevant variables are qualitatively the same as in the analysis of collective bargaining but the actual values are the firm specific ones. The aggregate variables, on the other hand, are averages of these micro variables.

3 Wage Drift and the Bargaining Process

It can be argued that the wage drift is consequenced by excess demand for labour which in turn indicates that the contract wage has been settled below the equilibrium level. A higher contractual wage would have originally diminished the gap concerned. Not only the labour demand but the wage drift as well would have been reduced. In this section we formalize this analysis with help of the concept of the "target wage" or "equilibrium wage", W*, and evaluate whether an inverse relation between contract wages and the wage drift can be detected in Finland.

3.1 The Sequential Bargaining Process

As described in the previous section, wage determination in Finland takes place in three stages. First, the central confederations agree on a settlement. These settlements give the general guidelines for the wage development in the year or two to come. So, they are based on expectations concerning this period. However, as past achievements can be expected to matter as well we write the equation for contract wages in form of an error correction model.

On aggregate level, the wage drift, $W_{d,t}$, is permanently positive, because of reasons which will be discussed below. Rational wage setters who are aware of external restrictions facing the economy take this into account especially when encompassing unions are concerned. As economic policy may influence the bargaining process policy dummies are in contract wage equation (i) below:

$$\Delta W_{c,t} = \rho_1 \Delta W_t^{*e} - \rho_2 W_{d,t}^{e} + D_t^{policy} + \rho_3 [W_{t-1}^{*} - W_{t-1}] \qquad \text{(i)}$$

$$\rho_1, \rho_2 > 0, \ 1 > \rho_3 > 0$$

Policy effects are difficult to quantify. The artificial nature of the contract wage index is also worth keeping in mind. This is why we consider skeptically attempts to estimate separately equations for contract wages in Finland.[1]

Central agreements only become effective after having been approved at the industry level. If one adds to the discussion in section 1 the fact that the centrally negotiated wage change acts as a floor below which no industry adjusts wages, it is no surprise that the growth of contract wages on industry level regularly exceeds that implied by the central settlement, $\Delta W_{c,i,t} > \Delta W_{c,t}$.

Differences in economic performance - both past and present - influence the sector specific applications. Expected wage drift also varies because of systematic differencies in wage drift among sectors. In addition, policy considerations may play a more pronounced role in the key industries than in secondary branches. In industry i, the central contract $\bar{W}_{c,t}$ is modified because of factors seen below:

$$\begin{aligned}\Delta W_{c,i,t} = \Delta\bar{W}_{c,t} &+ \delta_1(\Delta W^{*e}_{i,t} - \Delta W^{*e}_{t}) \\ &+ \delta_2\{[W^{*}_{t-1,i} - W_{t-1,i}] - [W^{*}_{t-1} - W_{t-1}]\} \\ &+ \delta_3[W^{e}_{d,i,t} - W^{e}_{d,t}] + [D^{policy}_{i,t} - D^{policy}_{t}]\end{aligned} \tag{ii}$$

In firm j the contract wage of the industry i, $\bar{W}_{c,i,t}$, is taken as given . As the firm specific factors matter as well, the conditional wage drift in firm j is

$$W_{d,j,t} = \xi_1\Delta W^{*}_{j,t} - \xi_2\Delta\bar{W}_{c,i,t} + \xi_3(W^{*}_{j,t-1} - W_{j,t-1}) \tag{iii}$$

As we have no data on firm specific variables, we are obliged to work with aggregate time series. Aggregation over identical firms gives us the following error correction model for the conditional wage drift on aggregate level:

[1] In the uncertainty model of Holmlund (1986), shifts in the level of ambition of the government policy effect the split-up of wages into its relevant components. In Finland, the determination of contract wages has been severely distorted by government interventions in several wage rounds. For political reasons, the unions in 1974—1975, e.g., agreed on "moderate" settlements when labour demand was heavily overheated. With no doubt the wage setters foresaw that the wage drift will be boosted helping the union leadership to escape from the "bad" settlements.

$$W_{d,t} = \zeta_1 \Delta W_t^* - \zeta_2 \Delta \bar{W}_{c,t} + \zeta_3 \cdot [W_{t-1}^* - W_{t-1}] \qquad \text{(iv)}$$

If the drift immediately corrects the target error due to an "inappropriate" increase in contract wage, $\zeta_1 = \zeta_2 = 1$. If this is permanently the case, no target error emerges, and the lagged error term in (iv) vanishes. If a past target error exists, it may keep on inducing wage drift even when $\Delta W_t^* - \Delta W_{c,t} = 0$.

In real life firms are not identical. Their position can be entirely different. In some firms the current contract wage is below the marginal product but above it in some others. The collective agreement acts as a wage floor in the firms and negative wage drift is rare. This implies an asymmetry in the process determining the wage drift. If we let the dispersion (DISP) of the economic position in the firm sector to influence the aggregate wage drift, this leads us to an augmented equation (iv')

$$W_{d,t} = \zeta_1 \Delta W_t^* - \zeta_2 \Delta \bar{W}_{c,t} + \zeta_3 \cdot [W_{t-1}^* - W_{t-1}] + \zeta_4 \cdot DISP_t. \qquad \text{(iv')}$$

The role of dispersion has been hardly evaluated at all in research concerning wage drift.[2] It is straightforward to expect that $\zeta_4 > 0$.

Empirical implementation of the wage drift equation iv (or iv') requires specification of the target wage, W*. This is on the agenda of the next section.

3.2 Modelling the Process: The Target Wage and the Wage Drift

Let us take the model of Holmlund & Skedinger (1990) (H-S) as a point of reference. It is a conventional model of the "right-to-manage" type. Wages are determined in negotiations between the firm and the local union, and employment is unilaterally set by the firm after the wage has been agreed upon. The wage rate (W) is determined by a Nash-bargaining solution, i.e.,

[2] Hibbs & Locking (1991) is one of the only exceptions although in a slightly different context.

$$\max_{W}(V - \underline{V})^{\beta}(\Pi - \underline{\Pi})^{1-\beta} \quad \text{s.t. } \Pi_N = 0 \tag{v}$$

where V(.) is the union's welfare when an agreement is reached, and $\underline{V}$(.) is its status quo point. Π(.) is the firm's real profit when an agreement is reached, and $\underline{\Pi}$ is the firm's status quo point. The union's status quo point is identified as the utility available to union members if there is a delay of a wage agreement (see Binmore et al. (1986)). Analogously, the firm's status quo point represents profits if there is a wage dispute.

The parameter β is a measure of union power. When β approaches unity we obtain the monopoly union solution; the union then sets its desired wage to which the firm responds by setting employment at the profit-maximizing level.

Instead of assuming that the firm is a price taker as in H-S we assume that imperfect competition prevails in the product market. There are n identical firms with constant returns to scale production functions, F(N, M, K), with three inputs, labour (N), raw materials (M) and capital (K). Capital stock is taken as predetermined. The Firm maximizes profits which are defined as the difference between sales revenue and production costs:

$$\Pi = p[ZF(N, M, K)]F(N, M, K) - W(1+\tau_1)N - P_m M - cK, \tag{vi}$$

where $Q = p^{-1}(P)Z^{-1} \equiv D(P)Z$ is a downward sloping demand curve of the separable form introduced by Nickell (1978, p. 21). Z is a parameter describing the position of the demand curve faced by the firm and p = producer price of the firm, P = competitors' producer prices, W = nominal (consumer) wages, τ_1 = payroll taxes, P_m = prices of raw materials (incl. energy), and Q = output.

The firm bargains over the wage with a utilitarian union which maximizes the utility of its members, both employed and unemployed. The union has a utility function

$$V = N \cdot v(W(1-\tau_2)/P_c) + (U-N) \cdot v(B), \tag{vii}$$

where P_c = consumer prices, τ_2 = income taxes, U = number of union members, which is assumed to be given, and B = unemployment benefits in real value.

A delay of a wage agreement involves costs to both parties, the firm as well as the workers. Swedish labour legislation does not allow strikes after the contractual wages have been fixed at the industry level. H-S therefore assume that the union cannot use a wild-cat strike as a credible threat. As in Holden (1988a,b, 1989) the union can, however, impose other costs to the employer, for example by go-slow and work-to-rule practices. In this case, if there is a delay in negotiations, the worker's utility depends on the (centrally agreed) contract wage.

$$\underline{V} = v\left(\frac{W_c(1-\tau_2)}{P_c}\right) \qquad \text{(viii)}$$

where $W_c = W_{-1}(1+\Delta W_c)$.

The specification of the threat point $\underline{V}$ is the second point where we differ from H-S. In Finland as well strikes are illegal when the collective argeement concerning an industry has been approved. However, the penalty fees have been so small that strikes have been common in local negotiations. As far as the number of wild cat strikes is concerned, Finland is among the top countries in the industrialized world. Go-slow actions are rare in Finland.[3] Hence, we specify the disagreement point in local bargaining as a strike. So, in Finland $\underline{V}$ depends on (real) strike allowances, $\underline{V} = v(S)$, instead of the contract wage as in (viii) of H-S above.

The resulting model of equilibrium (real) wages consists of variables influencing profits, on the one hand, and the utility of the union, on the other hand. In addition, a role is played by determinants of the fall-back utilities of the parties in the event an agreement is not reached. Finally, the relative bargaining power matters.

Because of the differencies in underlying assumptions the equation arrived at in H-S differs from ours. The wage equation of H-S can be written in the following form[4]

$$\frac{W(1-\tau_2)}{P_c} = W\left(\underset{(-)}{\frac{(1+\tau_1)P_c}{(1-\tau_2)P}}, \underset{(-)}{\frac{P_m}{P}}, \underset{(+)}{W_c}, \underset{(+)}{B}, \underset{(-)}{UR}, \underset{?}{N_{-1}}\right). \qquad \text{(ix)}$$

According to (ix) the equilibrium wage level depends on the contract wage. As the utility of the union in (vii) as well as the profit of the firm

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[3] In 1975—1989, of all labour disputes 90 per cent were strikes. The share of go-slows and refusals to do overtime work was around 1 per cent each.

[4] Holmlund & Skedinger (1990) also have a reference wage in this equation. It was added ad hoc to allow envy.

in (vi) depend on the total wage, this may be considered dubious. As we saw above, the contract wage enters the model via the disagreement point (viii) which H-S assume to refer to a go-slow action. We specified the disagreement point differently because of Finnish institutions. As a result, W_c, does not enter our (real) wage equation (x) below.

Another point of interest concerns the lagged employment term in (ix). H-S assume that in case of disagreement there are N_{-1} workers retained from the previous period and they receive the utility level relevant in case of a delay in the local negotiation. Again, as we specify the disagreement point differently, lagged employment does not enter our equation. H-S bypass the role of the bargaining power, β. Here as well we take a different position and include β in our model.

In its most general form, our model is

$$\left(\frac{W}{P_c}\right)^* = \underset{(-)}{W(\tau_1}, \underset{(+)}{\tau_2}, \underset{(-)}{\frac{P_c}{P}}, \underset{(+)}{\beta}, \underset{(-)}{\frac{P_m}{P}}, \underset{(+)}{Z}, \underset{(+)}{B}, \underset{(+)}{S}, \underset{(+)}{K}, \underset{(+)}{t)} \qquad \text{(x)}$$

Z is the demand shift variable which enters via the downward sloping demand curve of the product market (vi). As Holmlund & Skedinger assumed perfect competition to prevail, this term does not enter their equation (ix). As a purely technical transformation we have moved τ_2 over to the right hand side. Technical progress (t) and the (pretermined) capital stock (K) enter via the production function. Indirect taxes (= τ_3) are part of P_c/P. The parameters are signed according to an exercise with explicitely defined functional forms reported in Tyrväinen (1991).[5]

Union power can be proxied by union density (UNION), as in Tyrväinen (1988a,b). Union militancy may also be affected by the prevailing rate of unemployment (UR) as in Andersen & Risager (1991). The expected utility of the union during a labour dispute may partly depend on the opportunity of its members to find a job in an other firm. So, we assume that

$$\beta = \beta(\underset{+}{\text{UNION}}, \underset{-}{\text{UR}}) \qquad \text{(xi)}$$

[5] In addition to signs of the parameters several parameter restrictions are achieved. Because the underlying specification includes a complicated set of joint hypothesis, the parameter restrictions for the regression equations become, however, intractable in practice.

As the data approves the long run homogeneity between wages and consumer prices, and as we are interested in money wages, we rewrite (x) as

$$W* = P_c W(\underset{(-)}{\tau_1}, \underset{(+)}{\tau_2}, \underset{(+)}{\frac{P_c}{P}}, \underset{(-)}{\frac{P_m}{P}}, \underset{(+)}{Z}, \underset{(+)}{B}, \underset{(+)}{S}, \underset{(+)}{K}, \underset{(+)}{t}, \underset{(+)}{UNION}, \underset{(-)}{UR}) \qquad (x')$$

H-S translate their real wage equation (ix) into a wage drift equation by noting that the nominal wage level can be written as

$$W_t = W_{t-1}(1 + \Delta W_{c,t})(1 + W_{d,t}). \qquad (xii)$$

When H-S substitute (xii) in the empirical counterpart of (ix), and rearrange the terms they end up with a wage drift equation of the following form

$$\ln(1 + W_{d,t}) = \gamma_0 + \gamma_1 \ln\left[\frac{(1+\tau_1)P_c}{(1-\tau_2)P}\right]_t + \gamma_2 \ln(P_m/P)_t + (\gamma_3 - 1)\ln\left[\frac{W_{t-1}(1-\tau_{2,t})}{P_{c,t}}\right] + (\gamma_4 - 1)\ln(1+\Delta W_{c,t}) + \gamma_5 \ln B_t + \gamma_6 \ln UR_t + ... \qquad (xiii)$$

In (xiii) there are terms both in levels and differencies. The level terms implicitely represent the model which determines the real wage level (equation (ix)). The difference terms are due to disaggregation of the wage level according to (xii). There is no term which refers to price inflation in the wage drift equation (xiii). All the price terms are in relative form.

Our framework is basically in accordance with that of Holmlund & Skedinger. Several differencies in specifications have allready been made explicit above. As far as the final set up is concerned, there are three causes for further deviation. First, we wish to be explicit in taking account of the equilibrium implied by the bargaining model (equation (x') above). Second, we wish to allow for error correcting behaviour discussed in section 2.1 which ensures that the wage outcome resulting from the wage drift converges towards the long-run equilibrium. Third, we wish to have an equation for the wage drift where the effect of price inflation is not restricted to zero as in equation (xiii) of H-S above.

A two stage procedure will be used.[6] First we estimate an equation for equilibrium wages, that is, equation (x') above in log levels with no dynamics. At the second stage we estimate an error correction equation in log differences. To show that the conclusions are not model specific, we also give results from estimations of other frequently utilized specifications.

After recognising that there is no coherent series for strike allowances, (S),[7] the log linear equation for the level of equilibrium wage is:

$$\log W_t^* = \log P_{c,t} + \alpha_1 \log(P_m/P)_t + \alpha_2 \log Z_t + \alpha_3 \log(1+\tau_1)_t$$
$$+ \alpha_4 \log(1-\tau_2)_t + \alpha_5 \log(P_c/P)_t + \alpha_6 \log(B/P_c)_t \qquad \text{(xiv)}$$
$$+ \alpha_7 \log(K/N)_t + \alpha_8 \log(UNION_t) + \alpha_9 \log(UR_t)$$
$$+ \text{constant} + \varepsilon_t$$

where ε_t is the residual of the equation, that is W_t - W_t^*, and $\alpha_1 < 0$, $\alpha_2 > 0$, $\alpha_3 < 0$, $\alpha_4 < 0$, $\alpha_5 > 0$, $\alpha_6 > 0$, $\alpha_7 > 0$, $\alpha_8 > 0$, $\alpha_9 < 0$.

In the error correction equation the lagged residual of the above level equation, ε_{t-1}, will replace the error correction term (W^*_{t-1} - W_{t-1}) in formula (iv). The current change in the target wage, $\Delta\log W_t^*$, will be determined by equation (xiv). The wage drift is modelled as part of a bargaining process determining actual wages, that is

$$W_d = \alpha_{10}\Delta\log W_t^* - \alpha_{11}\Delta\log W_{c,t} + \alpha_{12}\varepsilon_{t-1} + \text{constant} \qquad \text{(xv)}$$

in which we expect $1 \geq \alpha_{10} > 0$, $1 \geq \alpha_{11} > 0$, and $-1 < \alpha_{12} < 0$. This system ensures that the wage outcome will in the longer run converge towards the equilibrium implied by (xiv). In this set-up wage drift mainly contributes to the wage dynamics.

In the wage drift equation (xiii) of H-S coefficients γ_3 and γ_4 should be equal. This restriction stems from their equation (ix) where the equilibrium wage level depends on the level of the contract wage. The coefficient in concern is definitely positive. If $\gamma_3 = \gamma_4 = 1$, W_c drops out from the wage drift equation.

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[6] See Engle & Granger (1987).

[7] See the discussion in Tyrväinen (1989a).

In addition, γ_4 - 1 is negative whenever $\gamma_4 < 1$. Consequently, a model with the disagreement point refering to the contract wage implies a smaller negative coefficient for the contract wage in the wage drift equation than a model in which the disagreement point is a strike. Hence, in economies where strikes are not used in local bargaining wage drift is less sensitive to changes in contract wages. This may explain part of the differencies between the results concerning Finland and Norway and Sweden. In addition, in a slightly different set-up Moene (1988) shows that when the type of the industrial action is a slow-down higher wage results than if the threat is a strike.

We first let the coefficients of the wedge terms to be determined freely. Later on we report regressions were the restrictions apparent in (xiii) have been imposed.

3.3 Results

3.3.1 Data and Estimation Method

In estimations annual data for the aggregate[8] private sector and manufacturing industry[9] is used. The observation period is 1965—1989. The data is from the data base of the quarterly model of the Bank of Finland, BOF4. Most of the series are either indecies published by the CSO or come from the National Accounts. The series are available by request.

It has been argued that quarterly analysis is not well-grounded when economies with annual wage rounds are evaluated (see Eriksson et al. (1990), e.g.). Although we do not fully agree with this argument we choose to work with annual data despite loss in the degrees of freedom. The profound reason is that — as discussed allready in section 1 — contract wage series and level of earnings series are constructed very much differently. As a result, quarterly timing of contract effects may show up differently in the two statistics especially when the contracts become in effect retroactively which is not exceptional in Finland. In annual analysis this noise can be overlooked. However, the results in general appear not to be fragile as far as aggregation over time is concerned (see also Tyrväinen (1991)).

Table A1 in Appendix reports the results of ADF-tests for the degree of integration. There are both series which are I(1) and I(2). This matter has been evaluated in Tyrväinen (1991).

If the empirical counterpart of equation (xiv) will produce an error term which is stationary, the set of series concerned is cointegrated. Then,

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[8] In Finland, micro data which would be usefull for our purposes is not available.

[9] Manufacturing industry is around one third of the aggregate private sector.

OLS is an appropriate estimation method for the cointegrating regression which is run in levels with no lags in any of the variables.

3.3.2 Cointegrating Regressions

Having presupposed monopolistic competition in the product market, a variable (Z) is required which determines the location of the downward sloping demand curve. Pencavel & Holmlund (1988) use household disposable income in this purpose. However, income is by and large a product of wages, on the one hand, and employment, on the other. Moreover, its third key component, the tax rate, is one of the right-hand side variables. On the other hand, in so far as instantaneous adjustment is assumed to take place on the product market variations in inventories are abstracted away and aggregate output (Q) could be a suitable proxy of the aggregate demand especially in the long run equations. We prefer the latter alternative here. Tyrväinen (1991) shows that the wage equations are not sensitive to how the demand shift variable is proxied or instrumented.

In conditions of imperfect competition, the endogenous pricing decisions of a firm are influenced by the prices of competitors which are exogenous. In aggregation over identical firms, the counterpart of competitors' producer prices is the aggregate producer price of the industry concerned. This is a fairly typical result of aggregation. A test of the Granger-causality does not reject models where the producer price and output are considered as exogenous with respect to wages (see Tyrväinen (1991)).[10]

Unemployment benefits played no significant role in the estimations. The result is common in studies concerning Nordic Countries (see Calmfors (1990)). So, B was omitted from the reported regressions.

Cointegrating regressions are introduced in Table 1. In literature it has been common to leave out the t-statistics. As there is no dynamics in the cointegrating regressions, strong autocorrelation can be expected (see Hendry (1986)). As the t-statics are potentially biased, they have been simply left out. This has not been considered as a problem because the parameter estimates are "superconsistent" and converge towards the "real values" "quickly" (Engle & Granger (1987)).[11] According to our estimations autocorrelation is not particularly severe in Finnish cointegrating wage regressions. So, as the t-statistics could be helpful in judging the significance of the coefficients concerned we introduce them in the Table.

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[10] Similar results have been reported for Sweden in Pencavel & Holmlund (1988) and for Denmark in andersen & Risager (1990).

[11] This property has been confirmed more recently by Phillips & Hansen (1990).

TABLE 1. **Cointegrating Equations: Wages**

Estimation period: 1965—1989, except 1968—1989 in equations (6)—(7) and 1971—1989 in equations (8)—(9)

Estimation method: OLS

Independent variables	Dependent variable: log (W/P_c)								
	Private sector		Manufacturing industry						
	* (1)	* (2)	* (3)	(4)	(5)	(6)	* (7)	* (8)	(9)
log(CPI/P)	-.400	-.219	-.323	-.196	-.513	-.379	-.177	-.454	-.206
	(2.63)	(1.38)	(3.17)	(1.54)	(2.83)	(3.96)	(2.29)	(5.45)	(1.61)
$\log(1-\tau_2)$	-.516	-.560	-4.70	-.533	-.291	-.346	-.421	-.328	-.407
	(3.96)	(4.74)	(3.95)	(4.41)	(1.35)	(2.93)	(5.40)	(3.34)	(4.55)
$\log(1+\tau_1)$	-.840	-.717	-.191	-.016	-1.009	-.627	-.301	-.682	-.386
	(1.80)	(1.70)	(0.50)	(0.04)	(1.49)	(1.35)	(0.98)	(1.67)	(1.05)
$\log(P_m/P)$	-.183	-.148	-.177	-.129	-.124	-.203	-.112	-.147	-.116
	(6.87)	(5.17)	(5.55)	(2.99)	(2.17)	(5.66)	(3.60)	(3.81)	(3.32)
log(Q)	.469	.369	.328	.273	-	.304	.198	.235	.198
	(7.98)	(5.36)	(6.53)	(4.58)		(6.47)	(5.11)	(5.09)	(4.74)
log(UNION)	.148	.174	.201	.214	.407	.397	.422	.246	.419
	(3.59)	(4.49)	(3.63)	(3.98)	(4.80)	(2.71)	(4.45)	(1.65)	(2.87)
log(K/N)	.311	.394	.302	.311	.667	2.92	.332	.475	.346
	(2.41)	(3.25)	(3.78)	(4.05)	(6.30)	(3.55)	(6.16)	(4.79)	(3.46)
log(UR)	-	-.034	-	-.025	-	-	-.048	-	-.044
		(2.22)		(1.56)			(4.38)		(2.34)
DSTAB	-.034	-.032	-.042	-.039	-.063	-.025	-.022	-	-
	(2.75)	(2.92)	(2.75)	(2.71)	(2.30)	(1.31)	(1.78)		
Constant	-8.448	-7.746	-6.456	-6.055	-4.503	-5.921	-5.025	-6.151	-5.087
	(21.48)	(16.39)	(16.27)	(11.87)	(9.29)	(10.28)	(11.85)	(12.05)	(8.12)
R^2	.999	.999	.998	.998	.993	.998	.999	.997	.998
R^2C	.998	.998	.997	.997	.990	.996	.998	.995	.996
ADF	5.10	6.59	6.73	7.65	4.22	5.15	6.31	4.73	5.49
CRDW	2.063	2.345	2.327	2.482	1.754	2.004	2.518	1.981	2.430
SE	.0136	.0122	.0145	0.0139	.0270	.0131	.0084	.0108	.0091

CPI = consumer price index, P = producer prices, P_m = import prices of raw materials and semifinished products (incl. energy), τ_1 = employers' social security contributions, τ_2 = marginal rate of income taxes, Q = output, K = capital stock, N = number of persons employed, UNION = U/N = unionization rate, where U = the number of union members, UR = unemployment rate, DSTAB is a stabilization policy dummy which receives the value of one in 1968Q2—1970Q4, and is 0 elsewhere.

Below the parameter estimates are shown the t-ratios.

The commonly applied tests confirm the cointegration property of the relevant equations. In all cases the signs of the coefficients are as expected. Parameter estimates are of reasonable magnitude and in line with other studies. In addition, they are close to those reported in Tyrväinen (1988a) in which the equations were slightly different and the estimations were carried out on quarterly data with an observation period which was five years shorter.[12]

Higher raw material prices press down wages because they reduce the profitability of firms. Higher income taxes tend to push up pre-tax wages. Increasing indirect taxes as part of CPI/P have reduced real wages. Higher pay-roll taxes appear to have been partly shifted backwards to lower wages. Here, the coefficients, however, vary. The positive role of economic activity is clearcut. Larger unions have been pushing up wages whereas unemployment appears to have a negative effect on wages.

3.3.3 The Wage Drift

From the cointegrating regressions an approximation of the target error for each period is derived. It is the difference of the actual wage from the fitted wage. This error term enters the wage drift equation (xv) above.

At this stage we have to consider one additional complication. - In the profit function (vi), labour costs include not only wages but also indirect labour costs. In addition, changes in working hours play a role. For instance, the annual average hourly labor cost increases when the annual working time shortens, because shorter working hours hardly ever involve a corresponding cut in wage earnings.

The reasoning in the theoretical section is in terms of National Accounts. The wage drift is not derived from this framework. Wage drift is the difference of the change in the level of earnings index and contract wages. The level of earnings index measures the wage for normal working time. So, it is not affected by a change in normal working time. This inconsistency must be corrected if the target error derived from level equation (xiv) is used in equation for the wage drift.

Let us consider the problem in a more formal way. In the profit function average wages (W) can be derived from the labour cost (LC) as

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[12] The set of right hand side variables is quite large in Table 1. We wished to know whether the parameter estimates are fragile as far as time aggregation is concerned. Tyrväinen (1991) introduces similar equations estimated on quarterly basis. The number of independent variables is equal (8—10) but the number of observations was 100 instead of 25 as in annual regressions. There were no major differences as compared to annual estimations. It can hardly be an accident if a static regression with large number of independent variables produces parameter estimates which are robust and reasonable. At least the probability of this should be tiny. So, we are quite confident on the robustness of the cointegrating equations.

$$W = \frac{LC}{(1+\tau_1)H}, \qquad \text{(xvi)}$$

where H refers to hours worked. If the actual change in the average wage differs from that in the level of earnings index (W_I), $\Delta\log W \neq \Delta\log W_I$ or $\Delta\log (W/W_I) \neq 0$.

By writing

$$\Delta\log W \equiv \Delta\log \left(\frac{W}{W_I} \cdot W_I\right), \qquad \text{(xvii)}$$

we see that

$$\Delta\log W_I \equiv \Delta\log W - \Delta\log (W/W_I). \qquad \text{(xviii)}$$

So, the relation of the change in the target wage in these two frameworks is,

$$\Delta\log W^* - \Delta\log W_I^* = \Delta\log (W/W_I). \qquad \text{(ixx)}$$

To avoid noise stemming from the fact that the relevant wage in the basic optimization problem — as also most of the explanatory variables — and the wage drift are derived from two different statistical frameworks, the wage drift equation is augmented to include $\Delta\log (W/W_I)$.

Wage drift equations are reported in Tables 2 and A2 in Appendix. In the head of each Table, we report the level equation from which the relevant target error is derived. We have estimated four variants of each specification. In the first, all the determinants of the change of the present target wage are estimated freely. These regressions are in Table A2. It is noteworthy that in these overparametrized equations the coefficients are generally of expected sign. Their magnitudes are reasonable and well in accordance with the ones discovered in the level equations. The past target error $(W/W^*)_{-1}$ plays a clearcut role. Finally, there is an inverse relationship between the wage drift and contract wages.

The second variant of wage drift equations was designed to overcome the overparametrization problem. Here, we let the cointegrating equation to determine $\Delta\log(W^*)$. Again, the target error plays significant role and the inverse relationship between contract wages and the wage drift is apparent (see Table 2).

TABLE 2. **Wage Drift**

Estimation period: 1966–1989, except 1969–1989 in equation (19) and 1972–1989 in equations (20)–(22)
Estimation method: OLS

Independent variables	Dependent variable: W_d = wage drift														
	Private sector						Manufacturing industry								
	Target wage eguation in Table 2 with which the wage drift equation concerned is connected													Lagged error term omitted	
	(1)			(2)			(3)			(7)	(8)				
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
$\Delta\log(W^*)$-$\Delta\log(W_c)$ - $(W/W^*)_{-1}$	-	-	.714	-	-	.757	-	-	.774	.912	-	-	.874	-	.541
			(5.05)			(6.08)			(4.82)	(10.28)			(6.77)		(3.94)
$\Delta\log(W^*)$-$\Delta\log(W_c)$	-	.707	-	-	.746	-	-	.778	-	-	-	.876	-	.468	-
		(5.01)			(6.23)			(4.88)				(6.25)		(4.37)	
$\Delta\log(W^*)$	.606	-	-	.649	-	-	.688	-	-	-	.716	-	-	-	-
	(4.50)			(5.35)			(5.27)				(6.38)				
$\Delta\log(W_c)$	-.431	-	-	-.483	-	-	-.486	-	-	-	-.508	-	-	-.332	-
	(2.14)			(2.67)			(2.81)				(3.38)			(2.02)	
$(W/W^*)_{-1}$	-.728	-.763	-	-.966	-.965	-	-.987	-.923	-	-	-.825	-.821	-	xxx	xxx
	(3.31)	(2.91)		(4.46)	(4.62)		(4.05)	(3.45)			(3.00)	(2.75)			
D89	.004	.004	.004	.002	.002	.003	.003	.003	.004	.000	.002	.002	.002	.006	.005
	(0.22)	(3.05)	(5.99)	(1.09)	(1.14)	(5.37)	(2.17)	(2.20)	(5.53)	(1.22)	(2.16)	(1.87)	(3.71)	(5.99)	(1.41)
Constant	.001	.010	.010	.001	.009	.009	-.003	.008	.008	.003	-.003	.005	.005	.010	.016
	(0.22)	(2.11)	(2.03)	(0.18)	(2.26)	(1.88)	(0.32)	(1.40)	(1.43)	(0.89)	(0.30)	(0.88)	(0.98)	(1.05)	(2.80)
R^2	.688	.630	.629	.797	.739	.726	.719	.670	.662	.864	.839	.783	.782	.469	.446
R^2C	.634	.574	.593	.755	.700	.700	.660	.620	.630	.849	.790	.737	.753	.390	.393
DW	1.630	1.474	1.538	1.852	1.715	1.982	1.904	1.873	1.976	2.253	1.467	1.711	1.672	1.754	1.744
SB	.0093	.0099	.0097	.0076	.0084	.0084	.0105	.0111	.0110	.0067	.0080	.0090	.0087	.0141	.0140

D89 is a dummy which receives value of one in 1989.

Below the parameter estimates are shown the White's heteroscedasticity adjusted t-ratios. Degrees of freedom correction has been made according to McKinnon & White (1985).

As a third step we combined the change in the target wage and actual contract wage.[13] If $\Delta\log(W^*) - \Delta\log(W_c) > 0$, contract wages have not filled the "room for wage increases" and wage drift should emerge. Our results suggest that around three quarters of a gap is corrected within a year.

As the coefficients of the "present target error" and the "past target error" did not differ significantly from each other we went on and made yet one further simplification. The resulting equation containes only one independent variable. This variable does not make any difference between target errors stemming from the past or from the present period. Again, three quarters of a gap between "target wages" and contract wages is corrected through the drift within a year.

The discussion in section 1 indicates that observed changes in contract wages are measured with error. As Holmlund & Skedinger (1990) show, measurement errors produce an underestimate of the coefficient of contract wage in the wage drift equation. The larger the proportion of the variance in observed contractual wage that is due to error, the closer the coefficient of the contract wage is unity. We argued above that the change in contract wages is systematically underestimated because of statistical matters. As the wage drift is consequently overestimated, we expect our coefficient of -0.7— -0.8 to be the upper limit of the correct parameter value. The actual error correction is probably somewhat slower than indicated by our results.

In 1989 the Finnish economy was heavily overheated as discussed in Tyrväinen (1991). The significant role played by a dummy (D89) confirms that the wage drift in 1989 exceeded historical relationships.

One of the novelties of the present study is the discussion of the potential impact of dispersion of the economic position in the firm sector. Six different alternative measures all calculated from the Business Survey of the Confederation of the Finnish Industries were experimented with (see Appendix 3).

The most succesfull attempts used an alternative which is based on the current order books. Of course, this measure has a straightforward interpretation as a proxy for short run production expectations. A positive and a highly significant coefficient was found in all cases when equations in Table 2 were augmented to include the measure in concern (see Table A5 in Appendix 3). This evidence, however weak it is, indicates that a larger dispersion tends to increase the wage drift (ceteris paribus).[14]

To conclude, the results in this section have following implications:

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[13]The data rejects the implicit restrictions imposed in moving from equation (11) to (12) in Table 2 on 5 per cent significance level but not on 1 per cent level. In other cases restrictions concerned are not rejected.

[14] The main reason for discretion here stems from the fact that the dispersion data is very much different by nature from the rest of the data used in estimations.

1) There is a robust inverse correlation between contract wages and wage drift. The latter acts as an error correcting factor which brings the wage outcome in line with its underlying determinants. The adjustment is, however, not instantaneous.

2) Wage drift is contributed by "target errors" stemming from the past periods.

3) Larger dispersion in the firms' stock of orders tends to lead to higher wage drift, ceteris paribus.

If the term capturing the past target error is omitted from the relevant equations the results of interest still hold. The explanatory power of the regressions is, however, substantially reduced. Equations (23) and (24) in Table 2 and (36) in Table A2 give the evidence.

3.3.4 Are the Results Robust?

As the results introduced above derive from equations which may be controversial, a collection of alternatives for aggregate private sector have been produced. They have been run although they are potentially misspecified versions of the "correct" ones. These exercises can be found in Appendix 2 in Tables A3—A4.

In the original equations, each of the variables influencing the relation of real labour costs to the real after-tax wages, (τ_1, τ_2, CPI/P), are included separately. We now introduce restrictions expressed in (ix) and combine them in one variable, the WEDGE. As a second step, we disqualify unionization rate as an appropriate measure of union power.

The third modification stems from the notion that simultaneous inclusion of Q and K/N may also be questioned. Hence, we introduce an equation where the growth of productivity is the driving force of real wages. There are two variants of this model, one including a proxy for union power and the other excluding it.

These exercises have been carried out to see whether the key results are equation specific. This appears not to be the case. As can be seen in Table A3, the cointegrating equations are much like the ones discussed earlier. However, the explanatory power has been reduced because of the alterations. It is of special interest to note that exclusion of the unionization rate has a profound unfavourable effect. Especially, unemployment rate as well as the stabilization policy-dummy turned insignificant when unionization rate was excluded.

Because modifications tend to increase autocorrelation in the wage drift equations a lagged dependent variable was included when necessary. Generally, the results do not differ much from the earlier ones (see Table A4).

4 Why is Wage Drift Always Positive and Why does it Fluctuate so Much?

As stated above, the registered aggregate wage drift is permanently positive. In addition to statistical matters discussed in section 1, there are at least three contributing factors. The first stems from the permanent adjustment in the wage structure. The second concerns expectational errors. The third reflects the ability/desire of the firms to shift excessive wage increments forward to higher prices which is an issue of considerable interest especially in economies which used to follow devaluation strategies.

4.1 Wage Drift and the Wage Structure

In a highly centralized wage setting restructuring of the wage differentials can mainly take place through wage drift. In this perspective a moderate and managed wage drift should be acceptable for all the parties. Its magnitude could be more or less perceived.

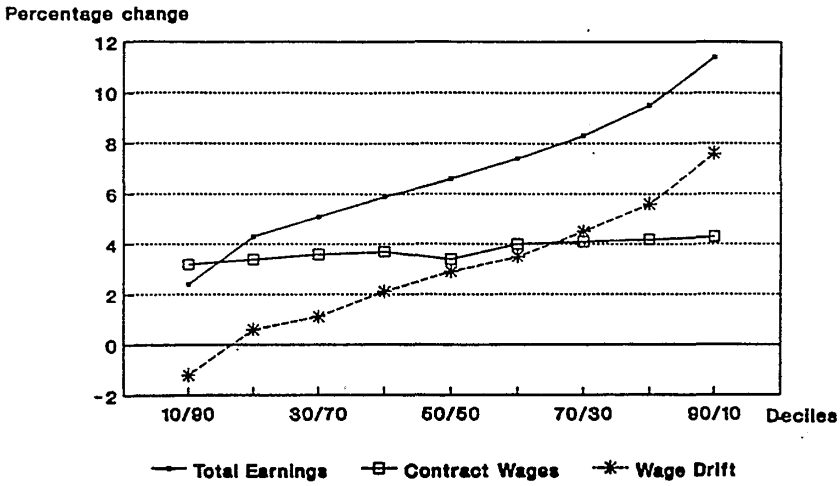
In all industries – good and bad – wage drift occurs. This appears to be due to inter industry adjustment. Figure 2 provides an example concerning the metal and engineering industry (Rasmus (1989)). Within four quarters 1986Q4–1987Q4 the wage drift varied from -1 % to +8 % between the lowest and highest deciles of the firms in concern.[1] As the development of contract wages was fairly uniform the differencies in the growth of total earnings were due to differencies in the wage drift.

Rasmus did not find any significant relation between profitability of the firm and the wage drift. This result must, however, be evaluated with care as the number of firms in this part of the study is small (53) and the data only covers one year with the profit of the current year as an explanatory variable. In fact, profitability is a quite problematic variable in this context. One commonly used measure is the gross operating surplus as percentage of gross value added (see Flanagan (1990), e.g.). As far as ex post statistics are used, the wage drift is regressed on a variable which has been directly influenced by the wage drift. As it is postulated that the wage drift is positively related to profits, but the profits are reduced due to the wage drift, it is no wonder that empirical results are often indeterminate when the wage drift is regressed on current profits.

[1] It has been argued that a negative wage drift in a firm is usually an artifact which stems from a profound structural change influencing the structure of labour force (introduction of an investment, new plant, e.g.).

Figure 2. **Changes in Total Earnings and Contract Wages, and the Wage Drift in the Metal and Engineering Industry in Finland, 1986Q4–1987Q4, per cent**

Firms have been grouped in deciles according to the growth of total earnings



Source: Rasmus (1989)

Tuominen (1985) argues that the wage drift depends on the "not-yet-eaten" room for wage increase. The latter is measured by deducting the rise in contract wages and payroll taxes from the combined effect of productivity and export prices.[2] This pre-wage drift measure of profitability, does not suffer from the same deficiencies as the ones discussed earlier. As a result, Tuominen's equations are statistically excellent. In his model the coefficient of the contract is restricted to take the value of (minus) one.

As far as the relation of the wage drift to the adjustment of wage structure is concerned it is finally interesting to note that Pissarides & Moghadam (1990) were not able to link the variation of sectoral wage differentials in Finland to the relative performance of the sector in concern. They estimated equations for relative wages between industries in four countries: Finland (9 sectors), Sweden (8 sectors), Britain (16 sectors) and USA (17 sectors). They used industry specific independent variables (relative productivity, change in relative productivity, employment share, change in employment share, relative vacancies) and aggregate variables (vacancies, change in inflation). In Sweden the relative wages have been rather rigid. The variation in Finland has been much more pronounced, in fact of same order of magnitude as in Britain and in USA. On the other hand, none of the sector specific variables was

[2] In our notation, Tuominen (1985) states that $W_d = f(\Delta W^* - \Delta W_c(1+\tau_1))$, where $W^* = W(Q/H, P_x)$, and P_x is the export price.

significant in equations for Finland. However, as the authors point out, "in most Finnish sectors there is evidence of dynamic misspecification" (p. 25). Whether this affects the punchline of the study, is hard to judge. There is, however, an additional caveat. Pissarides & Moghadam analyse wage flexibility between sectors. In Finland, 9 sectors including agriculture and forestry are evaluated. Table 1b (p. 425) indicates that self-employed who are majority of employees in these sectors have not been excluded from the data as in other countries. As a consequence, results concerning interaction between wages and industry specific variables (productivity, employment share) are biased. This may have contributed to the inability of the authors to link relative wages to industry specific factors in Finland. This may have distorted consideration of dynamics as well.

4.2 Wage Drift and Expectational Errors

So far we have analysed wage drift from an ex post point of view with realized values of all variables concerned. In so far as agents are considered rational and perfect forsight is implicitely assumed, it could be expected that the wage drift would not fluctuate much. This is so because of potential costs related to variation in the wage drift.

Industry unions are very much interested in their relative wage positions. If contract wages are set well below the optimum level the resulting local struggle over additional wage increments may lead to considerable changes in relative wages. This causes a series of compensatory claimes. An encompassing union is aware of the inflation effects. In addition, as the dissatisfaction of loosers appears to overweight the satisfaction of the winners, it is in the interest of union leaders to avoid this kind of turmoil.

Equation (i) above related wage contracts to expectational variables

$$\Delta W_{c,t} = f(\Delta W_t^{*e},...). \qquad \text{(i')}$$

As we showed above that the wage drift reduces the gap between factual equilibrium wage and the contract wage we now evaluate whether a link between the wage drift and expectational errors could be found. A thorough analysis of this matter is, of course, outside the scope of this paper.

When (i') is substituted in the wage drift equation (iv) we see that the wage drift is (positively) correlated with expectational errors concerning the change in the target wage, that is

$$W_{d,t} = \underset{+}{f}(\Delta W_t^* - \Delta W_t^{*e}, ...) \qquad \text{(xx)}$$

Although the model above is simple its empirical implementation is not straightforward. Equation (x') lists variables which determine W*. Now we need appropriate measures for related expectations. Pencavel (1985) and Holmlund (1985) stress the role of uncertainty concerning the future price inflation and as we wish to keep things simple, we assume that the profound uncertainty concerns price inflation and the level of activity.[3] So, we approximate the relevant expectational errors with

$$\Delta W^* - \Delta W^{*e} \approx [\Delta Z - \Delta Z^e] + [\Delta P - \Delta P^e] \qquad \text{(xxi)}$$

In section 2 we proxied the demand shift factor Z with the output variable. We do so here as well.

How can we approximate growth and inflation <u>expectations</u> at the time of the wage bargaining? - The wage round for year t in Finland usually starts in the fall of the previous year t-1. The official forecast of the Ministry of Finance is published as part of the budget proposal in september each year. As it appears to rule the discussion at the time when the unions set their wage claims, we take this forecast as a starting point. A prediction for the GDP growth in volume terms is available. As there is, however, no explicit forecast neither for output prices nor for the GDP deflator we approximate domestic inflation with consumer prices and take foreign trade prices into account separately. As far as expectational errors in export and import prices move hand in hand, they don't influence the size of the pie. Hence, we combine them in one term: terms of trade, P_x/P_m.[4]

So, we have the following measure for expectational errors:

$$\Delta W^* - \Delta W^{*e} \approx [\Delta Q - \Delta Q^e] + [\Delta P_c - \Delta P_c^e] + \gamma * [P_x/P_m - P_x^e/P_m^e] \qquad \text{(xxii)}$$

[3] More formally, we could assume that other issues (taxes, e.g.) are foreseen with insignificant errors. In fact, inclusion of other variables discussed in earlier sections would require use of quite arbitrarily generated measures of expectations.

[4] The National Accounts identities imply that $\Delta P_Q \approx \Delta P_D + \gamma \cdot \Delta(P_x/P_m)$, where P_Q is the GDP deflator, P_D is the deflator of domestic demand, and γ is the share of the foreign trade in the GDP.

We first estimated equations where expectational errors concerning output growth, consumer prices and terms of trade were included separately. The output variable was never significant. Not only deviation from the government forecast but also the second difference of the output were experimented with. When similar experiments were carried out with consumer prices and the terms of trade, government forecasts appeared to work best. Finally, we combined expectational errors concerning consumer prices and the terms of trade in one variable, $P - P^e$. As the results in Table 3 (equations (25) and (29)) indicate, expectational errors concerning inflation – both domestic and foreign – appear to have a clearcut influence on the size of the wage drift.

When evaluating this result one must be cautious. The proxies for expectations are rough. More sophisticated models are clearly needed for firm conclusions on this issue.

Misperceptions concerning future inflation can be either fully exogenous or internally born by nature. Oil price booms are examples of the first group. Forward shifting of excessive labour costs to higher prices represent the second.

An important aspect related to the second alternative concerns the role of external restraint in a small economy. – Until the late 1970s Finland followed a strategy of repetitive devaluations. The labour market parties anticipated that sooner or later the loss of competitiveness will be checked by lowering the external value of the Finnish markka. As devaluations were carried out with "reasonable" intervals (1957, 1967, 1977/78) the process remained under control. Inflation in Finland followed shifts in inflation rates in competitor countries, but on a permanently higher level. Tyrväinen (1991) indicates that real wages have been adjusted quite rapidly to their equilibrium level and inflating may well have been part of the process.

In the 1980s, Finland has followed a hard currency line. As a result, the external price restraint has been more strict although the credibility of the new policy line has been frequently suspected. The new stance may have influenced the bargaining process with a result apparent in Figure 1. The wage drift has been not only stable but fairly low as well when compared to the past.

TABLE 3. **Wage Drift, Expectational Errors and Excess Demand for Labour**

Estimation period: 1969—1989*
Estimation method: OLS

Independent variables**	Dependent variable: Wage drift							
	Private sector[a]				Manufacturing industry			
	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
P - P[e]	.335	-	-	.185	.319	-	-	-.133
	(4.68)			(1.67)	(3.83)			(1.72)
Number of vacancies (in thousands)	-	.002	-	.001	-	.004	-	.005
		(4.54)		(1.74)		(9.44)		(7.05)
Average duration of vacancies (weeks)	-	-	.017	-	-	-	.010	-
			(6.52)				(8.04)	
D80	-	-	-.026	-	-	-	-.010	-
			(6.58)				(4.28)	
D88/D89	-	-.022	-.012	-.013	-	-.012	-.011	-.015
		(2.21)	(1.85)	(1.14)		(2.22)	(2.33)	(2.78)
Lagged dependent	.379	.440	-	.380	.513	.563	.399	.605
	(3.21)	(3.79)		(3.27)	(4.17)	(8.73)	(4.64)	(9.18)
Constant	.019	.001	.010	.009	.015	.001	-.001	-.003
	(4.45)	(0.18)	(1.64)	(1.32)	(3.07)	(0.20)	(0.19)	(0.91)
R^2	.777	.780	.782	.813	.744	.926	.909	.938
R^2C	.752	.741	.743	.766	.715	.913	.885	.922
DW	1.282	1.998	2.181	1.414	2.240	2.153	2.462	2.348
SE	.007	.008	.008	.007	.009	.005	.006	.005

a) Disaggregation of vacancies between public and private sector is not available. Data for the whole economy is used in the equations for private sector. For manufacturing industry the appropriate sector specific data is used.

* In equation (31) the estimation period is 1970—1989 because of the lack of data for 1969. Below parameter estimates are shown the t-ratios.

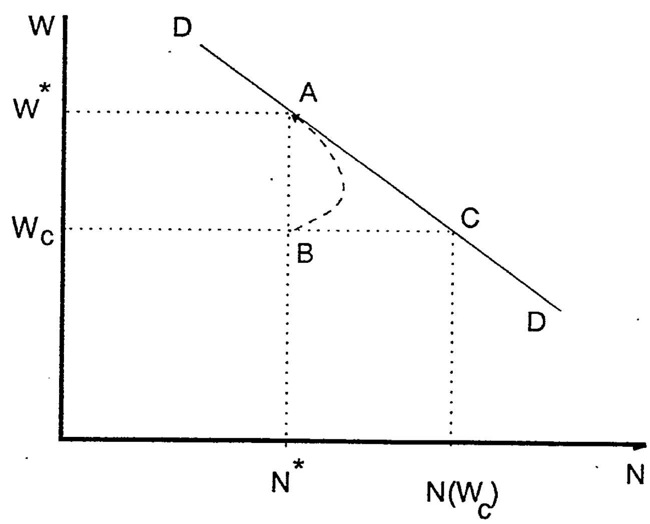
** There is a discontinuity in the series for vacancies in 1988 when a new employment act made it obligatory for employers to publish all vacancies. This appears to have increased the number of vacancies as much as by one third. To take account of this we have a dummy D88 in equations (26), (28), (30) and (32). D88 receives value of one in 1988—1989 and is zero elsewhere. Two statistical changes in the Labour Force Survey influence the series for the average duration of vacancies. The first took place in the beginning of the 1980's and the second in 1989. To take account of this we include two dummies — D80 and D89 — in equations (27) and (31).

5 Further Discussion

In earlier research, there is lot of evidence that wage drift can be successfully regressed on excess demand for labour. Table 3 introduces regressions where the wage drift has been explained by two alternative measures for labour market slack. These equations clearly confirm the eye-econometrics (see Figure 1) by explaining 80—90 per cent of the variation in the wage drift in 1969—1989 (equations (26)—(27) and (30)—(31)). When the change in contract wages was added no significant relation between the contract wage and the wage drift was depicted. In addition, expectational errors and excess demand for labour appear rather to be substitutes than complements as explanatory variables (see equations (28) and (32)). This is fully in accordance with the basic model of this paper. Below we evaluate further this point.

Bargaining models imply that there is an equilibrium combination between wages and employment (see Tyrväinen (1991)). In equilibrium, the gain of the union and the firm achieved from (co-operative) bargaining are equal. Point A in Figure 3 is an equilibrium. It lies on the labour demand curve and defines the profit maximizing level of employment (N*) related to W*. If the outcome of collective agreement is a wage below the equilibrium level, $W_c < W^*$, the profit maximizing firm demands for more labour. If the demand for and supply of labour would both be fully flexible, the new wage-employment combination would be in point C. In reality, adjustment is gradual. In each period, wage drift eliminates a fraction of initial excess demand. One possible adjustment path is described in the Figure. Regressions with excess demand for labour as the explanatory variable capture this process.

Figure 3. **Adjustment of Wages and Demand for Labour when Contract Wages are below the Equilibrium Level**



In the recent literature based on bargaining models it has been stated that one can conceive three main hypothesis on the relation between centrally negotiated wages and wage drift (Calmfors (1990)). According to the strong version of the first hypothesis, central negotiators determine the final wage outcome. They can both predict wage drift and set negotiated wages so that variations in predicted wage drift are perfectly offset. In the weak version, central negotiators can offset anticipated variations in wage drift but may fail to reach the desired wage outcome because of expectational errors.

The second hypothesis is the antithesis of the first one. It argues that wage drift is the determinant of the final wage outcome, which squares with the fact that wage drift takes place after central negotiations. Central negotiations are seen as a veil concealing the real determinants of wages, since variations in wage drift will always perfectly offset variations in centrally negotiated wages.

A third hypothesis, finally, is that the final wage outcome is the joint outcome of central negotiations and wage drift. Although drift and central wage increases may affect each other, variations in one do not completely offset variations in the other. Hence, both processes matter for the final outcome.

Flanagan (1990) suggests a test on this issue. The negotiated wage changes are determined by a vector of variables, X, the response of negotiators to wage drift, and an error term, e. Wage drift is determined by a vector of variables, Z, along with any influence of centrally-negotiated wage developments on decentralized pay decisions and an error term, u. The vectors X and Z may have some common variables.

$$\Delta W_c = X\alpha + bW_d + e \qquad \text{(xxiii)}$$

$$W_d = Z\gamma + c\Delta W_c + u \qquad \text{(xxiv)}$$

The four cases of interest are:

(A) If $b = -1$ and $-1 < c < 0$, the vector X determines overall earnings growth. Wage drift is perfectly anticipated and centralized bargaining is the key element in earnings determination. Separate analyses of negotiated wages and wage drift is not necessary to understand the macroeconomic behaviour of earnings, because the drift is effectively incorporated in the negotiated increase.

(B) If c = -1 and -1 < b < 0, the vector Z determines earnings growth, and the wage outcomes of central negotiations do not matter. This is the case of market-determined earnings, in which the role of centralized bargaining is one of form but not of substance.

(C) If b = c = 0, the central bargaining and the wage drift are completely independent determinants of earnings.

(D) If -1 < b < 0 and -1 < c < 0, the interaction between the two components of earnings growth is sufficiently muted that both X and Z determine earnings growth as centralized and decentralized pay decisions only partially adjust to each other.

The application of the test procedure above is, however, not straightforward. So far, empirical applications have implicitely assumed instantaneous adjustment. If the adjustment is gradual the procedure becomes problematic. This matter can only be evaluated if the target wage is modelled independently. There are, however, additional caveats in Flanagan (1990) as also pointed by Rødseth (1990) and Holmlund (1990). Because Flanagan estimates equations (xxiii)–(xxiv) simultaneusly, vectors X and Z are imposed not to be identical. As Holmlund ((1990), p. 416) stresses, however, the natural starting point would be to expect X and Z to be identical. This is why the procedure is prone for problems related to omitted variables.

Flanagan regresses separate equations for contract wages and wage drift. A price variable is only included in the first one and the price elasticities discovered are typically low and homogeneity of wages and prices is clearly rejected. Why? As wages have increased much more than prices due to third factors (productivity etc.) homogeneity can be missed if the wage equation is inadequate. The same concerns Pehkonen (1990) who replicates regressions of Flanagan with a different data set. Pehkonen estimates the equations separately with a price variable in not only the contract wage equation but in the wage drift equation as well. However, neither Flanagan nor Pehkonen tracks well the data.

Calmfors (1990) argues that models which regard wage drift as the outcome of local bargaining may be consistent with all hypothesis above as it is recognised that local bargainers are likely to be affected qualitatively by the same variables as central negotiators. Our model shares this property. Looking from one angle, our equations could be classified under the heading (D) in Flanagan's classification. As far as real wages are concerned in the longer run, (B) is also relevant. Our model does not imply, however, that the competitive wage is the outcome. The actual wage converges towards the equilibrium determined by the labour market where optimizing parties act in their appropriate manner.

How about case (A) where the wage setters foresee the wage drift and take it into account? If the strong version would be true, no lagged error-correction term would emerge. This contradicts our results. As, finally, reflections of expectational errors can be seen in the variation of the wage drift our results seem to imply that the wage setters take the wage drift into account but are not able to foresee it perfectly. Hypothesis (C) appears to be definitely rejected.

Holden (1988a) evaluates wage drift in Norway. First, the contract wage is set by the central union unilaterally. Then, firms choose the employment which will prevail until the next period. Finally, bargaining over the wage drift between firms and local unions takes place. In this final phase, not only contract wage but employment as well is taken as given. Both the central union and the firms know how the local bargaining functions and can perfectly anticipate the resulting wage outcome. Furthermore, the central union is assumed to know the firm's revenue function and it can thus predict employment. As the parties have agreed not to use strikes or lock-outs in local bargaining, the fall-back income of union members is the centrally negotiated wage.

In this model employment depends on the division of actual wages into contract wages and the wage drift. This is due to definition of the threat point. Unions can buy more employment by being moderate in the central negotiations and by taking the advantage in local negotiations. "The central union may comfortably concentrate on the employment level in central negotiations, while knowing that higher wages will be achieved through local wage bargaining" (Holden (1988a), p. 99). A similar result is in a theoretical paper by Holmlund (1985). If the wage drift is flexible, i.e., it reacts quickly to realized excess demand, "the union will lower the contractual wage in order to increase expected employment" (p. 231). These conclusions appear to violate the basic premise concerning profit maximizing behaviour of firms. In standard models both the union utility and the profit of the firm depends on the prevailing wage level and the parties optimize with respect to it. If this premise is challenged an alternative optimization procedure should be introduced.

Holden (1989) proceeds by assuming that losses of the firm due to go-slow are smaller when inventories are large. His regressions indicate that there is a significant negative correlation between the size of inventories and the wage drift. Let us evaluate this issue somewhat further. In addition to the long run trend towards lower inventory-sales ratio cyclical variation is pronounced. When the demand on product market drops unexpectedly inventories tend to increase. The opposite is true when the demand turns into a growth after a recession. If there is a negative correlation between the size of inventories and the unexpected variation in demand Holden's results and our discussion above on the role of expectational errors are well in accordance.

The wage setters can probably foresee changes in W* with reasonable accuracy as they are well informed of the prevailing output prices, order books, over-time work etc. For given wage contract, the uncertainty interval with regard to the wage drift could be as small as ±0.5 % in general.[1] If roughly half of this misperception is followed by consecutive misperceptions in price inflation (supposing constant mark-up), the uncertainty for the real wage outcome which is related to the drift is not large. The uncertainty related to exogenous variables is much more profound.

It has been argued that large increases in contract wages tend to be accompanied with a large wage drift.[2] This argument is supported by the fact that high contract wage increases and high wage drift often occur simultaneously (see Figure 1). Our results above, however, indicate that there is an inverse relation between the contract wage and the wage drift. Similar result has been achieved by Holmlund & Skedinger (1990)[3] who use microdata of the Swedish wood industry. On the other hand, Calmfors & Forslund (1990) do not find conclusive evidence for any specific relation of contract wages and the drift in time series regressions for Swedish manual workers. Holden (1989) uses Norwegian time series of manufacturing industry, and finds that contract wages have no effect on the wage drift. According to Flanagan (1990) contracts and the drift have no interaction in the Scandinavian countries with Finland as a possible exception. So, the evidence is mixed.

In light of the discussion in the earlier sections it is easy to understand the existence of opposite empirical results. – If the gap between contracts and target wages is the driving force behind the wage drift, a large gap – and, thus, large wage drift – may emerge with "high" increases in contract wages in periods with high inflation. It may also occur with low contracts in times of slow inflation. If the relation between the two is very unstable and non-systematic, a result of

[1] For 1976–1989, a constant forecast which corresponds the average wage drift for the period produces an annual error of less than 1/2 percentage point for both manufacturing industry and the aggregate private sector. A forecast which relates wage drift to the previous observation gives an annual forecast error of 3/4 percentage points. Rødseth & Holden (1990) show that wage drift in Norway as well can be predicted with a high degree of accuracy from a simplistic forecasting model.

[2] In the model of Holden (1988a) "a higher tariff wage increases (underlined by Holden) wage drift" (p. 96). Holden adds that the empirical evidence does not support conclusions in either direction (p. 96).

[3] In Holmlund & Skedinger (H-S) the coefficient of contract wages in wage drift equation lies usually between 0.7 and 0.8. This is of the same magnitude that we have reported above. Honkapohja & Koskela (1990) estimated the equation of H-S using data for Finland. They report a parameter estimate of 0.76.

independence is not surprising if the model is not sophisticated enough.[4] When we regress the wage drift on the change of contract wages only we discover a zero correlation in Finland. The same is true if we augment this simplistic regression by adding the change in the current price inflation to the right-hand side. This also underlines that one should not model wage drift in isolation from models incorporating interrelationships between total wages, profits and employment.

[4] Holden (1989) regresses the change in total wages on a set of variables in which the change in contract wages is (implicitely) included. As the coefficient of contract wages receives a value of approximately one, Holden argues that contract wages have no impact on the wage drift. If changes in contract wages and wage inflation move by and large hand in hand the result is as could be expected. On the other hand, the equation in concern can be interpreted close to an equation where wage drift is explained with the level of vacancies and inventories. So, the discussion on the results introduced in Table 4 in the beginning of this section is relevant here as well. The large, positive and highly significant intercept in all equations implies that wages grow on an annual rate of 6–9 per cent when the number of vacancies and inventories are on "normal" level. This figure is surprisingly high.

6 Conclusions

The results introduced in this paper have the following implications:

1) In Finland, wage drift is closely related to the excess demand for labour.

2) There is a robust inverse correlation between contract wages and the wage drift. The latter acts as an error correcting factor. The gap in concern is, however, not the one between the contract wage and the competitive wage. The relevant equilibrium wage is generated by factors contributing the bargaining process.

3) Present wage drift is contributed by "target errors" stemming from the past periods.

4) The variation in the size of the wage drift appears to be influenced by the expectational errors concerning inflation.

5) If the dispersion of the economic position of the firms – measured by the standard deviation of the stock of orders – is large, wage drift tends to be larger than otherwise, ceteris paribus.

In one sense the institutions – centralized bargaining, e.g. – do not add much to the determination of wages. Jackman (1990) points to the rather similar wage paths in countries with centralized and decentralized bargaining. In an other aspect, however, the institutions matter a lot. This is so especially when the economy has moved off the course or serious imbalances are about to emerge. For economic policy this gives an option of great importance. Finally, as the adjustment of the wage drift is not instantaneous, moderate wage settlements may generate expectations concerning not only inflation but business climate in general.

Appendix 1

Wage Formation in Finland: The Case of the Paper Industry

A.1 The Industry and the Institutions

In Finland, there are around 40 000 employees in the paper industry which is one fifth less than in the middle of the 1970's. The share of the paper industry of the total work force in the manufacturing industry has been quite stable at slightly less than 10 per cent. The share of the total output has been around 15 per cent but its cyclical variation has been more profound than in most other industries. Of the total export of the country, paper industry accounted for one half in the middle of the 1960's. Until early 1980's this share had dropped to 28 per cent, but has increased again afterwards. In 1989 around one third of the Finnish exports came from the paper industry.

Around 80 per cent of the employees in the paper industry are blue-collar workers. In practice, the industry is fully unionized. The branch is a kind of wage leader. The Central Union of Paper Workers has been the first to settle on several wage rounds. The average earnings of male workers in paper industry are the highest among manual workers, around 10—15 per cent above the average wage level. The gap concerned has considerably increased in the 1980's.

In paper industry, the annual average change in contract wages was 6.2 per cent in 1975—1986. This is almost identical with the figure for the aggregate manufacturing industry. The average wage drift of 5.0 per cent per annum is, however, more than 1/2 per cent above the average figure. The wage drift fluctuated slightly less than in the manufaturing industry on average (Pehkonen, 1990).

In wage negotiations, firms are represented by the Confederation of the Employers in the Paper and Pulp Industry (Metsäteollisuuden työnantajaliitto). The Central Union of Paper Workers has 50 employees. Half of them permanently travel around the country visiting local unions. There are 74 local unions, each of which has a chief shop steward who is elected by union members. Less than half of the chief shop stewards in the paper industry are full-time but the rest are paid as well. In addition, there is a large amount of part-time shop stewards and vice shop stewards.

The chief shop steward represents the local union in bargaining with the firm. He is informed about wages in other firms in the industry. Chief shop stewards and chairmen of the local unions have regularly country wide conferencies. Connections are close both between the local bodies and between the central union and local unions.

Below we describe how a central agreement is implemented to generate the factual wages in paper industry. We wish to show that bargaining influences wages on all levels of the process. Arguments according to which the wage drift represents the competitive part of the wage determination are not in accordance with the factual processes and statistical procedures.

A.2 The Central Agreement

In Finland, wage bargaining is centralized and synchronized. In 1965—1990 there are only four years with a failure in reaching any agreement between the central organizations. In these wage rounds there was, however, collective agreement settled on the industry level. The central agreement which is applied in the paper industry is settled between the Central Organization of Labour Unions (SAK) and the Central Confederation of Employers (STK).

The central agreement defines changes in wages either in markka terms or in per centages or as a combination of the two: X markka per hour, however at least Z per cent. Some settlements have included an index clause or an earnings development quarantee. The latter ensures a compensation for those branches were the wage drift is (systematically) below the others. In addition, certain share of the wage sum, Y per cent, is often directed to branch specific arrangements.

Central agreements are short papers written in general terms with just a few pages. Hence, they only reveal their actual nature when applied at the industry level. The agreement of the central organizations is not binding for anybody before it has been approved at the industry level. The SAK has no authority to conclude agreements which are binding for member unions. Strikes are legal until the industry specific contract has been signed.

A.3 The Agreement for the Industry

The collective agreement for paper industry is settled between the industry specific Confederations of Unions and Employers. Whenever a central agreement exists the negotiation concerns its application. Even when there is no central agreement or the industry has deviated from it, industry specific negotiations continue from the ones previously held at the central level. Hence, they are influenced by earlier central negotiations.

At the industry level, a large collection of issues are bargained over. Even the ones which do not directly concern wages, do with almost no exception imply costs for the employer. The sector specific agreements are difficult to evaluate for others than specialists of the field. For example, the collective agreement for the paper industry in 1986—1988 comprised 117 pages which is by no means exceptional as compared with other branches. In addition, in appendix there are several agreements which determine the status and working conditions of shop stewards, pay during an illness etc.

Changes in the text of the contract often hide pay rises which exceed the effect of the central agreement. Such arrangements are especially usual when the cyclical situation is favourable. An example follows.

Paper industry generally has continous three-shift work. Around 10 years ago the parties agreed about a "sauna-bonus". This implies that between saturday 6 AM and sunday 6 AM each worker receives for each hour worked an extra payment called "sauna-bonus" (!) which is 20 per cent (!) of the average hourly earning in paper industry. This kind of extra payments have increasingly been defined in terms of per centages and, hence, their effect is permanent.

Bonuses and pay increases stemming from changes in the text of the agreement are a key reason to the fact that the ex post statistics on contract wages and the ax ante approximations differ considerably. The outcome systematically exceeds the ex ante evaluations.

After the collective agreement for the paper industry has been signed, strikes are not legal.

A.4 The firm: Myllykoski Oy[1]

Myllykoski Oy is a highly specialised, advanced paper mill which exports 96—98 per cent of its output. There are 1250 employees 1000 of which are blue-collar workers. The size of the staff has diminished by one third from the end of the 1970's.

Even when the collective agreement is in effect local issues are negotiated over almost continously. In Myllykoski Oy there are around 100 firm specific bonuses. They concern special working conditions, production record, piecework pay etc. and most of them are settled annually. For each paper machine there are ten different categories of bonuses. If the wage contract implies an increase of 1 markka in the wage of the machineman, after local bonuses the increase exceeds 1.50

[1] The information was received during a stay at the Myllykoski Oy in 7—9.11.1990. The visit was arranged by the Confederation of the Finnish Industries (Teollisuuden keskusliitto). I am greatful for having the opportunity to discuss with the head of personell as well as with the chief shop steward of the mill and the chairman of the local union.

markka. In lower vacancies the effect of local bonuses is approximately 20 per cent. The average effect appears to be around 33 per cent. This all comes on top of the bonuses implied by the collective agreement of the industry discussed above. In Myllykoski the effect of local bonuses exceeds that of bonuses specified in the collective agreement.

Evaluation of productivity gains has created problems in local negotiations. At the firm level wage compensation for full productivity growth in the firm is claimed although the average productivity has allready been accounted for not only in the central but in the industry specific agreement as well. The union in Myllykoski Oy claimed for more wage even when the number of employees was reduced: "Part of the gains stemming from reduction in the wage costs must be shared with the workers".

According to paragraph 11 in the collective agreement for the paper industry, "if there are essential changes in the conditions according to which the wages have been agreed upon new wages will be negotiated locally. It is endeavoured to reach agreements about adjustment of wages and other conditions before a new work arrangement is introduced. The negotiations are started with no unnecessary delay and if no agreement is reached locally the issue will be settled by the industry confederations if possible already before the work arrangement takes place. If the confederations in the paper industry do not reach unanimity the case will be directed to the central confederations". It is not surprising that this expression has lead to wage claimes on miscellanous grounds. For example, in the spring of 1990 the whole Myllykoski paper mill was at a standstill for 5 days because one group of workers required more pay when at the request of foreign customers stronger core board was introduced in paper rolls. The employer argues that more wage is asked even when the new equipment makes the work easier: "If it is now enough to push a botton insted of turning it as before, more wage is claimed". According to an anecdote, a union representative has defined the essential change in working conditions as a change which can be noticed.

The expression "it is endeavoured to reach the agreement" has also lead to confusion as far as the legality of strikes is concerned. In Myllykoski, for instance, a renewed paper machine was at a standstill for several weaks because of a dispute concerning introduction of a new cutting machine. Unions consider that they have right to prevent the introduction of an investment if the wage arrangements have not been settled. Employers argue the opposite. There is no prejudgement of the labour court. Despite several disputes the employer confederation has not brought them to the court.

In Myllykoski Oy, both the employer and the union confirm that the employer has no wage policy which is not covered by the bargaining process. There are no personal incentive bonuses. The efficiency wage hypothesis thus appears not to be followed in this Finnish enterprise.

All in all, the local union settles the local pay rise with the employer as a result of local bargaining. The initiative usually comes from one group (department) and the shop steward of the department introduces the claim to the head of the department. In the next stage, the chief shop steward negotiates with the head of personell of the firm. If the issue is not settled, it will be passed over to the industry confederations. The final stage is the one between central confederations, SAK and STK. - For example, in 1989 in the paper industry 60 cases were passed from local level to the industry confederations. Seven (!) of these concerned Myllykoski Oy. Not a single case was passed further to the central level.

Appendix 2

TABLE A1. **The Order of Integration**

Annual series, 1965–1989
Results of an Augmented Dickey-Fuller (ADF)-test

W	private sector	I(2)
	manufacturing	I(2)
N	private sector	I(2)
	manufacturing	I(2)
CPI		I(2)
P_m		I(2)
P	private sector	I(2)
	manufacturing	I(2)
CPI/	private sector	I(1)
P	manufacturing	I(1)
	private sector	I(1)
P_m/P	manufacturing	I(1)
	private sector	I(2)
$1+\tau_1$	manufacturing	I(2)
		I(2)
$1-\tau_2$	private sector	I(2)
Q	manufacturing	I(2)
	private sector	I(2)
K	manufacturing	I(2)
	private sector	I(2)
K/N	manufacturing	I(2)
		I(2)
U		

TABLE A2. **Wage Drift**

Estimation period: 1966–1989, except 1969–1989 in equation (36) and 1972–1989 in equation (37)
Estimation method: OLS

Independent variables	Dependent variable: W_d = wage drift					
	Private sector		Manufacturing industry			
	Target wage eguation in Table 1 with which the wage drift equation concerned is connected					Lagged error term omitted
	(1)	(4)	(3)	(7)	(8)	
	(33)	(34)	(35)	(36)	(37)	(38)
$\Delta\log(W_c)$	-.545	-.403	-.705	-.622	-.599	-.663
	(4.69)	(2.56)	(3.99)	(4.10)	(3.40)	(4.21)
$(W/W^*)_{-1}$	-.634	-.496	-.583	-.829	-.735	xxx
	(5.53)	(3.78)	(2.51)	(2.59)	(3.32)	
$\Delta\log(W/W_I)$	-.204	-.230	-.246	-.500	-.386	-
	(1.41)	(1.37)	(1.75)	(2.87)	(2.28)	
$\Delta\log(P_c)$	.649	.514	.819	.818	.841	.710
	(8.95)	(4.46)	(7.54)	(6.25)	(6.30)	(7.60)
$\Delta\log(P_m/P)$	-.078	-.052	-.097	-.089	-.106	-.053
	(5.17)	(2.73)	(3.85)	(3.41)	(4.22)	(2.39)
$\Delta\log(CPI/P)$	-.021	-.051	-	-.017	-.126	-
	(0.40)	(0.79)		(0.35)	(2.59)	
$\Delta\log(1-\tau_2)$	-.309	-.289	-.512	-.348	-.372	-.483
	(3.61)	(3.88)	(6.31)	(4.77)	(5.06)	(6.79)
$\Delta\log(1+\tau_1)$	-.177	-.108	-	-	-.287	-
	(1.34)	(0.61)			(1.11)	
$\Delta\log(Q)$	.464	.291	.322	.222	.317	.273
	(6.98)	(2.74)	(4.61)	(2.30)	(3.45)	(4.54)
$\Delta\log(UNION)$	.054	.033	.086	.203	.048	.013
	(3.27)	(1.40)	(2.31)	(3.23)	(0.98)	(0.46)
$\Delta\log(K/N)$	.397	.445	.174	.335	.400	.155
	(5.83)	(5.28)	(2.62)	(4.69)	(4.72)	(2.01)
$\Delta\log(DSTAB)$	-.030	-.019	-.034	-.014	-	-.023
	(9.12)	(3.94)	(4.47)	(1.65)		(3.60)
$\Delta\log(UR)$	-	-.016	-	-.043	-	-
		(1.78)		(3.38)		
D89	.003	.003	.010	.001	.006	.012
	(1.52)	(1.09)	(4.53)	(0.27)	(3.75)	(6.69)
Constant	-.013	-.005	-.009	-.011	-.020	-.001
	(2.70)	(0.91)	(1.32)	(1.26)	(2.55)	(0.08)
R^2	.938	.916	.906	.940.	.941	.881
R^2C	.857	.785	.819	.830	.801	.804
DW	1.851	2.061	2.092	1.987	1.838	2.255
SE	.0058	.0071	.0077	.0071	.0078	.0080

W = average wages, W_c = contract wages, W_I = level of earnings index, P_c = consumer prices, P = producer prices, P_m = import prices of raw materials and semifinished products (incl. energy), τ_1 = employers' social security contributions, τ_2 = marginal rate of income taxes, Q = output, UNION = unionization rate, K = capital stock, N = number of employed persons, UR = unemployment rate, DSTAB is a stabilization policy dummy which receives value of one in 1968Q2–1970Q4, and is 0 elsewhere, D89 is a dummy which receives value of one in 1989.

Below the parameter estimates are shown the White's heteroscedasticity adjusted t-ratios.

TABLE A3. **Cointegrating Equations: Wages, Private Sector**

Estimation period: 1965—1989
Estimation method: OLS

Independent variables	Dependent variable: log (W/P_c)			
	(39)	(40)	(41)	(42)
log(WEDGE)	-.411 (6.75)	-.602 (11.78)	-.247 (2.91)	-.133 (1.88)
$\log(P_m/P)$	-.167 (5.97)	-.167 (5.32)	-.071 (1.52)	-.125 (3.27)
log(Q)	.410 (6.16)	.518 (9.24)	-	-
log(UNION)	.154 (4.10)	-	-	.176 (4.01)
log(K/N)	.399 (4.60)	.374 (5.79)	-	-
log(Q/H)	-	-	.872 (28.73)	.749 (19.43)
log(UR)	-.022 (1.51)	-	-	-
DSTAB	-.027 (2.37)	-	-	-
Constant	-8.212 (18.99)	-9.514 (28.54)	-10.952 (36.19)	-9.474 (21.77)
R^2	.999	.997	.993	.996
R^2C	.999	.996	.992	.995
DW	1.982	1.634	1.267	2.079
SE	.0130	.0172	.0257	.0196

P = producer prices, P_m = import prices of raw materials and semifinished products (incl. energy), Q = output, H = hours worked, K = capital stock, N = number of persons employed, UNION = unionization rate, UR = unemployment rate, DSTAB is a stabilization policy dummy which receives the value of one in 1968Q2—1970Q4, and is 0 elsewhere.

Below the parameter estimates are shown the t-ratios.

TABLE A4. **Wage Drift, Private Sector**

Estimation period: 1966—1989
Estimation method: OLS

	Dependent variable: W_d = wage drift											
	Target wage eguation in Table A3 with which the wage drift equation concerned is connected											
	(39)				(40)				(42)			
Independent variables	(43)	(44)	(45)	(46)	(47)	(48)	(49)	(50)	(51)	(52)	(53)	(54)
$\Delta\log(W^*)-\Delta\log(W_c)$ - $(W/W^*)_{-1}$	-	-	-	.518	-	-	-	.367	-	-	-	.245
				(7.58)				(3.18)				(2.12)
$\Delta\log(W^*)-\Delta\log(W_c)$	-	-	.473	-	-	-	.363	-	-	-	.242	-
			(6.61)				(2.88)				(2.27)	
$\Delta\log(W^*)$	-	.471	-	-	-	.356	-	-	-	.228	-	-
		(6.02)				(2.81)				(1.96)		
$\Delta\log(W_c)$	-.283	-.467	-	-	-.230	-.294	-	-	-.381	-.171	-	-
	(1.95)	(3.59)			(1.20)	(1.56)			(2.40)	(0.80)		
$(W/W^*)_{-1}$	-.460	-.726	-.727	-	-.371	-.398	-.391	-	-.324	-.329	-.326	-
	(4.14)	(6.37)	(6.66)		(3.72)	(3.95)	(3.61)		(2.99)	(2.21)	(2.19)	
$\Delta\log(W/W_I)$	-.217	-	-	-	-.098	-	-	-	-.136	-	-	-
	(1.35)				(0.53)				(0.81)			
$\Delta\log(CPI)$	.421	-	-	-	.375	-	-	-	.238	-	-	-
	(4.56)				(2.22)				(2.35)			
$\Delta\log(P_m/P)$	-.063	-	-	-	-.066	-	-	-	-	-	-	-
	(3.22)				(2.19)							
$\Delta\log(WEDGE)$	-.149	-	-	-	-.148	-	-	-	-.120	-	-	-
	(5.55)				(2.69)				(1.98)			
$\Delta\log(Q)$	.296	-	-	-	.412	-	-	-	-	-	-	-
	(3.59)				(3.74)							
$\Delta\log(UNION)$	.017	-	-	-	-	-	-	-	-	-	-	-
	(0.74)											
$\Delta\log(K/N)$	.575	-	-	-	.389	-	-	-	-	-	-	-
	(7.70)				(3.06)							
$\Delta\log(Q/H)$	-	-	-	-	-	-	-	-	.244	-	-	-
									(4.71)			
$\Delta\log(DSTAB)$	-.017	-	-	-	-	-	-	-	-	-	-	-
	(4.27)											
$\Delta\log(UR)$	-.012	-	-	-	-	-	-	-	-	-	-	-
	(1.63)											
$W_{d,-1}$	-	.441	.445	.406	.362	.481	.535	.530	.582	.457	.501	.493
		(5.18)	(6.87)	(5.64)	(2.10)	(4.11)	(5.21)	(5.47)	(4.31)	(2.38)	(2.37)	(2.26)
Constant	-.007	.004	.004	.003	-.017	.002	.004	.004	.014	.008	.010	.010
	(1.65)	(1.12)	(1.26)	(1.01)	(3.24)	(0.74)	(1.10)	(1.08)	(2.67)	(1.14)	(1.88)	(1.95)
R^2	.918	.837	.837	.805	.819	.722	.715	.715	.801	.607	.602	.592
R^2C	.843	.802	.812	.786	.703	.663	.673	.687	.713	.524	.542	.553
DW	1.769	1.609	1.603	2.004	2.426	1.675	1.615	1.673	1.964	1.643	1.623	1.714
SE	.0061	.0068	.0066	.0071	.0083	.0089	.0088	.0086	.0082	.0106	.0104	.0102

W = average wages, W_c = contract wages, W_I = level of earnings index, CPI = consumer prices, P = producer prices, P_m = import prices of raw materials and semifinished products (incl. energy), Q = output, UNION = unionization rate, K = capital stock, N = number of employed persons, UR = unemployment rate, DSTAB is a stabilization policy dummy which receives value of one in 1968Q2—1970Q4, and is 0 elsewhere, D89 is a dummy which receives value of one in 1989.

Below the parameter estimates are shown the White's heteroscedasticity adjusted t-ratios.

Appendix 3

Dispersion and the Wage Drift

We discussed in the text the impact of dispersion of the economic position in the firm sector. Empirically, six different alternative measures all calculated from the Business Survey of the Confederation of the Finnish Industries have been experimented with. The dispersion was measured with standard deviation in accordance with Jalas (1981). As normal distribution is assumed in this procedure dummies for double peaked annual observations were added when necessary. The annual series for manufacturing industry (excluding construction) have been generated from quarterly data on following questions with three alternative answers:

I	As compared to the previous year, output volume of the firm is	larger ☐	equal ☐	smaller ☐
II	As compared to the previous year, inventories of the firm are	☐	☐	☐
III	As compared to the previous year, the number of employees is	☐	☐	☐
IV	Do you consider the current stock of orders of the firm as	large ☐	normal ☐	small ☐
V	Do you expect the cyclical position of the firm in the close future to	improve ☐	unchanged ☐	worsen ☐
VI	Do you expect the number of employees in the next quarter to be	larger ☐	equal ☐	smaller ☐

Alternatives I—III are backward looking. Number IV refers to the current situation although it has a clearcut interpretation as a proxy for short run production expectations. Alternatives V—VI are forward looking by nature. Here, however, problems arise because annual data has been generated by taking the annual average of expectations concerning one quarter ahead. So, estimations with series V and VI one must evaluate especially cautiosly.

Among the backward looking alternatives (I—III) the share of double peaked annual observations is 10—25 per cent. In addition, the annual share of the answer "equal" is permanently below 50 per cent (in I and III below 40 per cent). In the other three cases there are no double peaked observations. In the forward looking cases V and VI the share of the answer equal/unchanged is allways above 50 %. So, expectations are centered in the neutral alternative.

With backward looking measures (I—III) no significant role for dispersion was generally found. There is, however, one exception. When the estimation period is shorter (1972—1989) as in equations (20)—(21) in Table 2 the alternative III — employment compared to the previous year — appeared to play a role in manufacturing industry. A positive coefficient of the standard deviation is significantly different from zero on 5 per cent risk level. The positive coefficient of the dummy for double peaked annual observations does not quite reach the 5 per cent significance level but is very close to that.

The most succesfull attempts to evaluate the role of dispersion stem from evaluations concerning order books. A positive and significant coefficient was found in all cases when equations in Table 2 were augmented to include a measure of the standard deviation in concern. This can be seen in Table A5. In addition, the statistical properties of the equations have been improved and in other coefficients only minor changes have taken place. This appears to indicate that variation in dispersion explaines part of the variation which was unexplained by our basic model.

As allready mentioned, calculation of the annual expectations based on series V—VI was somewhat arbitrary. In this light it is not worrying that a significant role was in general not found. However, when the wage drift equation (20) for manufacturing industry (Table 2) was augmented to include a dispersion measure generated from employment expectations (VI) a highly significant positive coefficient was discovered.

TABLE A5. **Wage Drift and Dispersion in Stock of Orders among Individual Firms**

Estimation period: 1966—1989, except 1972—1989 in equations (61)—(62)
Estimation method: OLS

Independent variables	Dependent variable: W_d = wage drift							
	Private sector				Manufacturing industry			
	Target wage equation in Table 2 with which the wage drift equation concerned is connected							
	(1)		(2)		(3)		(8)	
	(55)	(56)	(57)	(58)	(59)	(60)	(61)	(62)
$\Delta\log(W^*)-\Delta\log(W_c)$ - $(W/W^*)_{-1}$	-	.685 (6.29)	-	.728 (6.77)	-	.734 (6.20)	-	.822 (7.47)
$\Delta\log(W^*)-\Delta\log(W_c)$	.684 (6.52)	-	.721 (7.33)	-	.736 (6.37)	-	.825 (7.16)	-
$(W/W^*)_{-1}$	-.700 (2.78)	-	-.907 (4.45)	-	-.788 (3.38)	-	-.728 (2.27)	-
Dispersion	1.100 (1.88)	1.106 (1.90)	.860 (1.90)	.915 (2.00)	1.860 (2.38)	1.895 (2.45)	1.111 (2.11)	1.088 (2.07)
D89	.003 (3.03)	.003 (5.52)	.001 (1.09)	.002 (4.34)	.003 (2.21)	.003 (4.18)	.002 (1.42)	.001 (2.55)
Constant	-.012 (0.90)	-.013 (0.91)	-.008 (.838)	-.010 (0.99)	-.030 (1.77)	-.031 (1.82)	-.017 (1.26)	-.016 (1.24)
R^2	.674	.674	.766	.756	.758	.758	.822	.820
R^2C	.605	.625	.717	.720	.708	.721	.767	.781
DW	1.430	1.452	1.676	1.924	1.807	1.862	1.780	1.728
SE	.0096	.0094	.0081	.0081	.0097	.0095	.0084	.0082
D89 is a dummy which receives value of one in 1989.								

Below the parameter estimates are shown the White's heteroscedasticity adjusted t-ratios. Degrees of freedom correction has been made according to McKinnon & White (1985).

References

Andersen, T.M. & Risager, O. (1991) A Wage-Bargaining Model for Denmark, Applied Economics, 23.

Andrews, M.J. (1987) Some Models of the Aggregate Labour Market, University of Manchester, Department of Econometrics and Social Statistics, Discussion Paper ES184.

Calmfors, L. (1990) Wage Formation and Macroeconomic Policy in the Nordic Countries: A Summary, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Calmfors, L. & Forslund, A. (1990) Wage Formation in Sweden, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Engle, R.F. & Granger, C.W.J. (1987) Co-integration and Error Correction: Representation, Estimation, and Testing, Econometrica, Vol. 55, No. 2.

Eriksson, T. & Suvanto, A. & Vartia, P. (1990) Wage Formation in Finland, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Flanagan, R.J. & Soskice, D. & Ullman, R. (1983) Unionism, Economic Stabilization and Incomes Policy: European Experiences, Brookings Institution.

Flanagan, R.J. (1990) Centralized and Decentralized Pay Determination in Nordic Countries, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Hibbs, D.A. Jr. & Locking, H. (1991) Wage Compression, Wage Drift, and Wage Inflation in Sweden, FIEF Working Paper No. 87, Stockholm.

Holden, S. (1988a) Local and Central Wage Bargaining, Scandinavian Journal of Economics, Vol. 90, No. 1.

Holden, S. (1988b) Wage drift in Norway: An Empirical Study on Quarterly Data, Memorandum from Department of Economics, No. 15, University of Oslo.

Holden, S. (1989) Wage Drift and Bargaining: Evidence from Norway, Economica, 56.

Holmlund, B. (1985) Comment on Pencavel, Scandinavian Journal of Economics, vol. 87, No. 2.

Holmlund, B. (1986) Centralized Wage Setting, Wage Drift and Stabilization Policies under Trade Unionism, Oxford Economic Papers, 38.

Holmlund, B. (1990) Comment to Flanagan, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Holmlund, B. & Skedinger, P. (1990) Wage Bargaining and Wage Drift: Evidence from the Swedish Wood Industry, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Honkapohja, S. & Koskela, E. (1990) A Study of the Differential Incidence of the Reform Proposals of Employers' Social Security Contributions in the Finnish Manufacturing Industry (in Finnish, with English Summary), Kansaneläkelaitoksen julkaisuja, Helsinki.

Incomes Policy Information Commission (1983) On The Wage Drift (in Finnish), Helsinki.

Isachsen, A.J. (1977) A Note on Wage Drift. The Case of Sweden, Scandinavian Journal of Economics, 79.

Jackman, R. (1990) Wage Formation in the Nordic Countries Viewed from an International Perspective, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Jalas, K. (1981) Business Expectations of Finnish Industrial Firms in 1966–1979 According to the Business Survey of the Confederation of Finnish Industries (in Finnish), The Research Institute of the Finnish Economy, Series A6, Helsinki.

McKinnon, J.G. & White, H. (1985) Some Heteroskedasticity-Consistent Covariance Matrix Estimators with Improved Finite Sample Properties, Journal of Econometrics, 29.

Molander, A. (1969) A Study of Prices, Wages and Employment in Finland, 1957–1966, Helsinki.

Pehkonen, J. (1990) Centralized versus Decentralized Wage Setting: Pay Determination in Finland, in Pehkonen, J. Collective Bargaining, Wages and Employment: Studies of the Finnish Labour Market, Jyväskylä Studies in Computer Science, Economics and Statistics, 14.

Pencavel, J. (1985) Wages and Employment under Trade Unionism: Microeconomic Models and Macroeconomic Applications, Scandinavian Journal of Economics, vol. 87, No. 2.

Pencavel, J. & Holmlund, B. (1988) The Determination of Wages, Employment, and Work Hours in an Economy with Centralized Wage Setting: Sweden 1950–1983, Economic Journal, 98.

Phillips, P.C.B. & Hansen, B.E. (1990) Statistical Inference in Instrumental Variables Regression with I(1) Process, Review of Economic Studies, 57

Pissarides, C.A. & Moghadam, R. (1990) Relative Wage Felxibility in Four Countries, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Rasmus, R. (1989) The Relation of the Wage Drift to the Demand for Labour, Profitability and Productivity in the Metal Industry Firms in Finland (in Finnish), mimeo, University of Tampere.

Rødseth, A. & Holden, S. (1990) Wage Formation in Norway, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Rødseth, A. (1990) Comment to Flanagan, in Calmfors, L. (ed.) Wage Formation and Macroeconomic Policy in the Nordic Countries, SNS Förlag, Oxford University Press.

Schager, N.H. (1981) The Duration of Vacancies as a Measure of the State of Demand in the Labour Market. The Swedish Wage Drift Equation Reconsidered. In Eliasson, G., Holmlund, B., and Stafford, F.P. (eds.): Studies in Labour Market Behaviour: Sweden and the United States. IUI Conference Reports 1981:2. The Industrial Institute for Economic and Social Research, Stockholm.

Schager, N.H. (1988) Causes of Wage Increases in Swedish Manufacturing: A Remarkable Case of Regular Behaviour. The Industrial Institute for Economic and Social Research, Stockholm (mimeo).

Söderström, H.T. & Udden-jondal, E. (1982) Does Egalitarian Wage Policy Cause Wage Drift? An Empirical Study of Sweden 1960–1979. Seminar Paper No. 203, Institute for International Economic Studies, University of Stockholm.

Tuominen, A. (1985) Teollisuustyöntekijäin palkkaliukumasta. (On the Wage Drift of the workers in the Manufacturing Industry, in Finnish), mimeo.

Tyrväinen, T. (1988a) Palkat ja työllisyys järjestäytyneillä työmarkkinoilla (Wages and Employment in a Unionized Economy, in Finnish), Bank of Finland D:68.

Tyrväinen, T. (1988b) Wages and Employment in a Unionized Economy: Practical Implications of Theoretical Considerations in the Context of Finland, Bank of Finland, Discussion Papers 20/88.

Tyrväinen, T. (1989a) A Guide to the Finnish Labour Market, Finnish Economic Papers Vol. 2, No. 2.

Tyrväinen, T. (1989b) Why Break Down Centralized Wage Bargaining, Bank of Finland, Discussion Papers 22/89.

Tyrväinen, T. (1991) Unions, Wages and Employment: Evidence from Finland, Bank of Finland, Discussion Papers, forthcoming.

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