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Wage Drift and Error Correction: Evidence from Finland

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Abstract

This article examines the process which generates wage increments in excess to those agreed upon collectively, i.e. wage drift. A synthesis of the explanations common in the literature is sketched. This attempt has been strongly motivated by the notion that the time series properties of the wage series of interest differ significantly from each other. This has led us to consider wage drift as dynamics related to adjustment towards an equilibrium defined in terms of cointegrating relations. Empirical results are in accordance with the error correction hypothesis proposed. There is a robust inverse correlation between the contract wage and wage drift. The adjustment is quite rapid but not instantaneous. Wage drift tends to be larger when the dispersion of financial prospects as foreseen by the firms – measured by the standard deviation of the stock of orders – is large. Wage drift is positively correlated with changes in the demand for labour. Finally, the variation in wage drift appears to be correlated with errors in (inflation) expectations.

Contents

1 Introduction*

In all economies with wage bargaining a share of pay increases stems from wage drift, i.e. wage increments in addition to the wage rates agreed upon collectively. In the Scandinavian economies where the bargaining is highly centralized this share is particularly high (see Flanagan, 1990). Figure 1 reviews wage contracts,[1] wage drift and demand for labour in Finland.

In Finland, wages are determined in a three step process described in detail in Appendix 1. First, the central confederations agree on a settlement which gives the general guidelines for the wage development in the year or two to come. Central agreements become, however, effective only after having been approved at the industry level. The contract wage index cumulates the approximated relative changes in the prevailing wage level due to these industry specific contracts.[2]

Not only the country-wide but the industry level 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 each level – including the local level – workers negotiate with the employer side being represented with the relevant union body.[3] Appendix 1 indicates that the major part of the wage drift results from local bargaining and local settlements. Consequently, the boundary between the contract wage and wage drift rather refers to the "local versus central bargaining" aspect than to the "bargaining versus competitive" aspect.

Calmfors (1990) and Rödseth (1990) state that the factors influencing on local level are qualitatively the same as in the central level. Although the local effects show up in a quite specific manner as will be seen below, this is basically in accordance with the argumentation in this paper. So, if we partition the growth of total wages, ΔW_t, into two components[4]

[1] In Finland, the period 1964–1990 saw not a single year with no collective agreement. In addition, there were only four years when settlements were concluded at industry level with no economy-wide agreement.

[2] In Finland, wage bargaining has been influenced by government interventions in several wage rounds. These effects are difficult to quantify. In addition, because of the method of calculating the contract wage index there is a permanently growing gap as compared to the prevailing wage and price levels (see Tyrväinen, 1991). Consequently, we consider skeptically attempts to estimate separate equations for contract wages in Finland.

[3] Although often overlooked as in Flanagan (1990), e.g., this finding is by no means new. Lerner & Marquand (1962) note that in British engineering "the greatest part of the wage drift ... in the 45 firms examined arose out of workshop bargaining between shop stewards and management".

[4] All variables are in log form throughout the paper.

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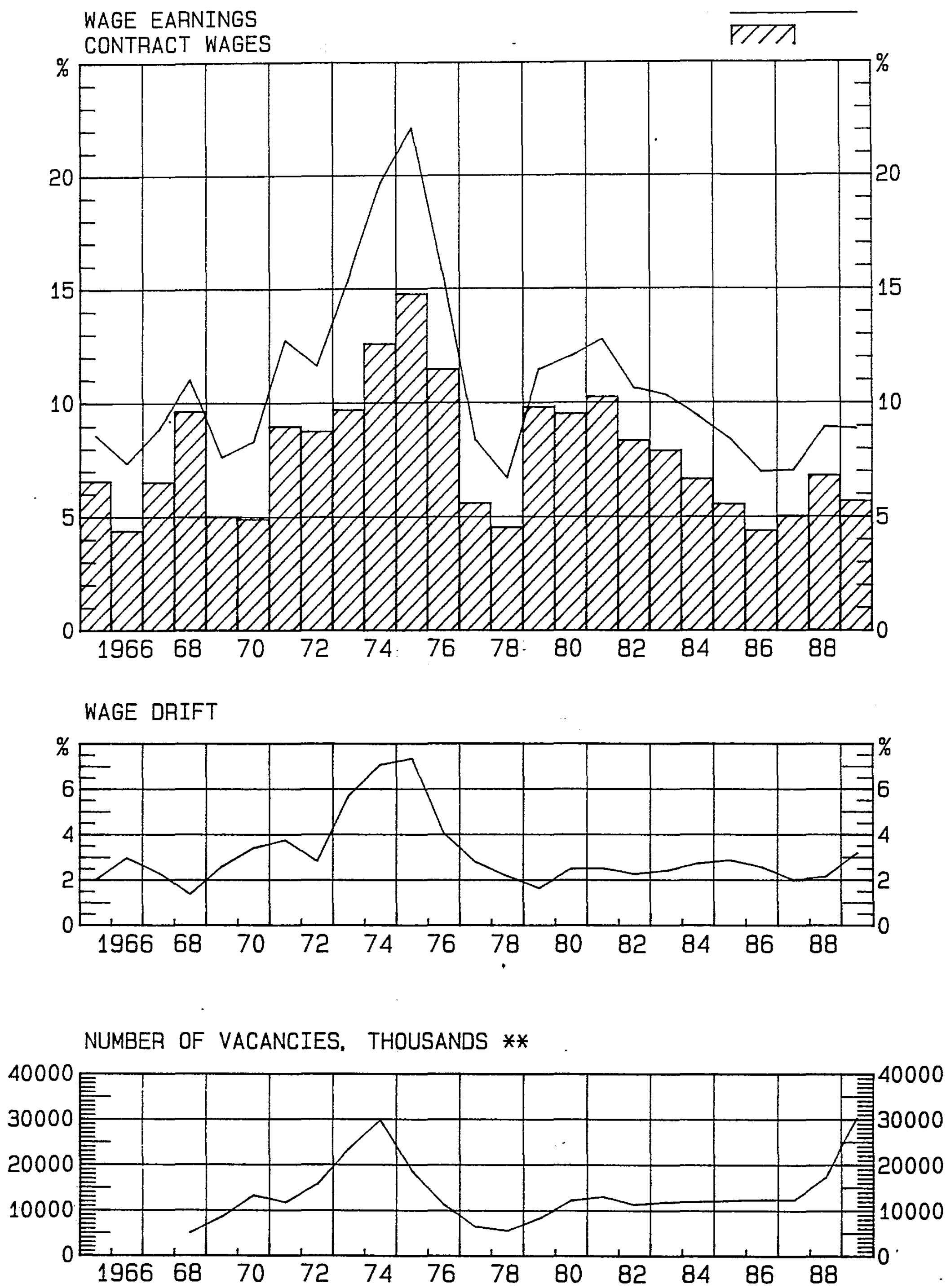
Figure 1. **Wages and Demand for Labour in Finland 1965–1989**



** 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.

$$\Delta W_t = \Delta W_{c,t} + W_{d,t}, \qquad (i)$$

where W_c is the contract wage and W_d is wage drift, both components can be analysed in terms of a bargaining model. Hence, it is an adequate description of the aggregate relation as well.

Majority of the early empirical work relied on a Phillips curve type of framework, often augmented in an ad hoc fashion with auxiliary variables.[5] Only recently wage drift has been considered as the outcome of local bargaining about the implementation of central contracts, see Holden (1988) and Holmlund & Skedinger (1990), e.g. This accords with the description above of the Finnish institutions. The potential role of expectational errors in the process has been stressed by Holmlund (1985) and Pencavel (1985), e.g.[6]

This paper intends to produce a kind of synthesis of the arguments above. The intuition is as follows. Empirical evidence confirms that wage drift is boosted by excess demand for labour. According to almost any theory, excess demand for labour signals that the prevailing wage level is below the equilibrium. This brings in the error correction mechanism as a potential means of modelling wage drift. Equilibrium errors which are the driving force of adjustment are presumably contributed by expectational errors since the contracts are made in advance for a period of 1–2 years. In order to evaluate this causal chain, we derive and estimate wage drift equations in terms of

1) an excess demand for labour model,
2) an error correction model,
3) a model emphasizing expectational errors.

The core of this paper is in the error correction model. So far, wage drift has not been analysed in a fully specified set-up according to this hypothesis. However, we also attempt to show that the three approaches above should not be considered as contradicting in the sense that acceptance of one would reject the others.

Modern econometrics indicates that an empirical structure is plausible only if certain conditions related to the time-series properties of the contributing series are met. Otherwise the relation is non-sense and any correlation discovered is spurious. These aspects which also give a statistical method for discrimination between empirical models have not been emphasized before in the context of wage drift analysis.

The paper is organized as follows. Section 2 introduces some useful conceptual tools which are then applied to define wage drift equations. Implications of uncertainty are also considered. Section 3 introduces an empirical application of the error correction model as well as of the two other models. Section 4 summarizes the paper and proposes some policy conclusions.

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[5] Isachsen (1977) and Söderström & Udden-Jondal (1982) suggest that output prices contribute. Hansen & Rehn (1956) and Schager (1981) stress the role of profitability.

[6] Quite recently, attempts have been made to evaluate wage drift in terms of efficiency wage models (Lucifora (1991), Lever (1991)). Hibbs & Locking (1991) consider the effect of wage compression due to central contracts on wage drift.

2 Wage Drift and Adjustment Towards the Equilibrium

A synthesis of the various ways to consider wage drift is sketched in terms of a bargaining model. For this purpose, we begin by introducing some useful concepts.

2.1 Attractors, Equilibrium and Adjustment

Let us suppose that in Figure 2 there is some mechanism existing such that if point (X,Y) drifts away from A, there will be a tendency to get back near to it. Due to this property, line A is said to act as an attractor. Because of uncertainties, rigidities, contracts etc., the mechanism may not immediately bring the points exactly to the attractor. However, there will be an overall tendency towards it. "If the economy lies on A, a shock will take it away. If there is an extended period with no exogenous shocks, the economy will definitely go to the line and remain there. Because of this property, the line A can be thought of as an 'equilibrium', of the centre of gravity type" (Engle & Granger, 1991, p. 2).

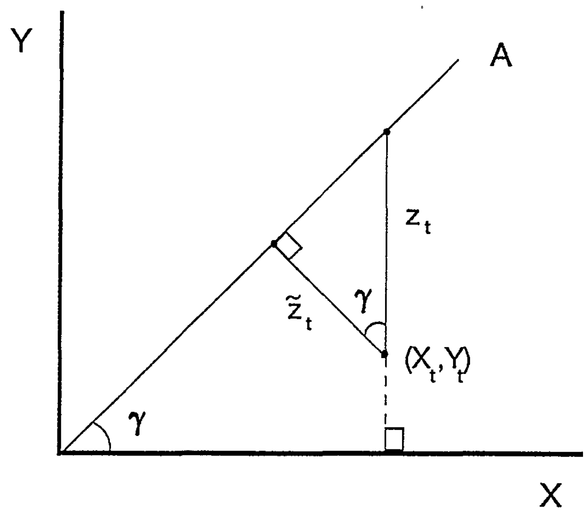
The attractor is related to the concept of cointegration as follows. Let us consider the relation

$$Y_t = AX_t + z_t \tag{ii}$$

where X is one variable or a vector of variables. If the error term z_t is stationary, I(0), the system is said to be cointegrated. Under this condition, the line Y = AX corresponds to an attractor for the pair of series (Y_t and X_t) and z_t is the line indicated in Figure 2 which takes a negative value when the point is below the line. $\tilde{z}_t = z_t \cos\gamma$ is the orthogonal (signed) distance from the point (Y_t, X_t) to the line Y = AX. Since z_t is stationary with zero mean as in (ii) above, then so will be it's linear transformation $\tilde{z}_t$ (Engle et al., 1991, e.g.). If X_t and Y_t are individually non-stationary, I(1) e.g., then point (Y_t, X_t) will be inclined to move widely around the Y–X plane, but as $\tilde{z}_t$ is stationary with zero mean there will be a tendency for the points to be around the line, and thus for this line to act as an attractor. "It is thus seen that cointegration is a sufficient condition for the existence of an attractor and this attractor can correspond to certain types of equilibrium that arise in macroeconomic theory" (Engle et al., 1991, p. 7).

It is wellknown from the literature that cointegrated variables can always be thought of as being generated by error-correction equations. In this interpretation, z_t (and $\tilde{z}_t$) is a measure of the extent to which the system is out of equilibrium. Accordingly, it has been called the "equilibrium error". Importantly, if there is no disequilibrium there is no incentive for any of the system variables to change.

Figure 2. **An Attractor**



2.2 Wage Drift and the Attractor

In order to consider the equilibrium as far as the wage setting is concerned, we define a Nash bargaining solution according to the "right-to-manage" hypothesis:

$$\max_{W} (U - U_0)^{\theta}(\pi - \pi_0)^{1-\theta} \quad \text{s.t. } N(.) = \arg \max_{N} \pi, \tag{iii}$$

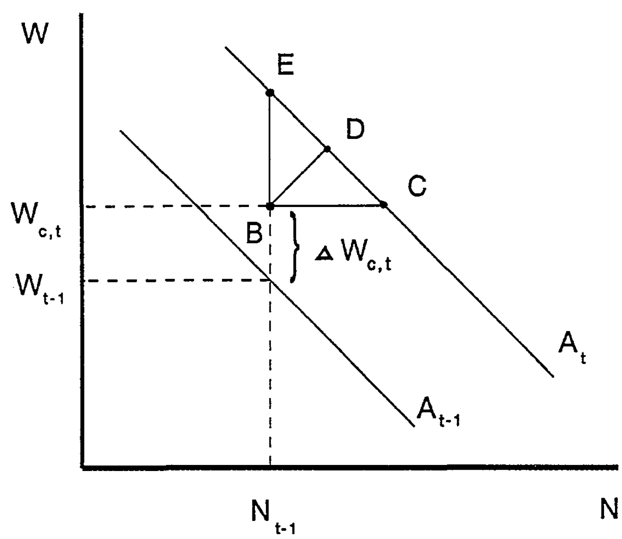
where U is a well-behaved utility function of the union and π is the profit function (see Appendix 2). U_0 and π_0 are the fall-back levels of utility and profit which materialize if no contract is settled. θ is a measure of union's bargaining power. Obviously, (iii) defines the levels of two endogenous variables, wages and employment.

In so far as the wage is concerned, we can solve a relation like $W = W(N,P,X)$, where the wage level depends on employment, prices and a set of exogenous variables X which consists of variables entering union's utility function, the profit function and a proxy for union power. In the present modelling context, we call this as a structural wage-employment relation.

Since it is straightforward to think that it is the real wage which defines both the union welfare and the marginal cost related to the labour demand, the model de facto defines an equilibrium relation between the real wage and employment given the economic environment described by X. Prices can be endogenously determined as in Appendix 1, but for our present purpose we do not loose anything by considering prices as exogenous and by normalizing them to unity.

The structural relation is in Figure 3. Obviously, it resembles the downward sloping labour demand curve which captures the inverse relation between wages and employment. For simplicity, let X to consist of one factor only, the output or product market demand for example. Let us assume that in the previous period (W_{t-1}, N_{t-1}) was on the attractor A_{t-1}. A shock, higher demand of products e.g., leads to an upward shift of the attractor. The new position is in A_t. Since the old equilibrium is no more valid, an incentive for adjustment emerges. Let the wage setters to react by setting the level of the contract wage which prevails in the beginning of period t at $W_{c,t}$. If $(W_{c,t}, N_{t-1})$ is below the attractor A_t as in Figure 3, a negative equilibrium error emerges. The disequilibrium can be defined in three respects. With respect to employment it is B–C, with respect to the wage it is B–E. Finally, the counterpart of $\tilde{z}_t$ is B–D. It is straightforward to presume that both wages and employment adjust. Accordingly, we expect $\Delta N_t > 0$ and $\Delta W_t > 0$. As a result, (W, N) drifts towards A_t. Since the contract wage is fixed, the condition $\Delta W_t > 0$ de facto implies $W_{d,t} > 0$.

Figure 3. **The Structural Wage-Employment Relation as an Attractor**



In the literature wage drift has repeatedly been regressed on the excess demand for labour. This kind of estimation apparently captures the process described above and the correlation discovered is usually high. Still, it is more a description of adjustment of two interrelated variables to shocks in third factors than a causal relationship although the time structure of the adjustment may create a relation which in econometric exercises may well look like causality. This is due to asymmetries in information. Let us presume that the factors influencing the profit function are not perfectly known by the union but it can collect information concerned indirectly. For instance, if it is profitable for the firm to hire additional workers, the marginal wage is presumably below the marginal product. This gives ground for wage claims. In so far as sudden changes in hirings are used as a screening device by the unions, the number of vacancies probably rise first and wage adjustment (through wage drift) follows in the aftermath. In this case we expect to discover a relation like

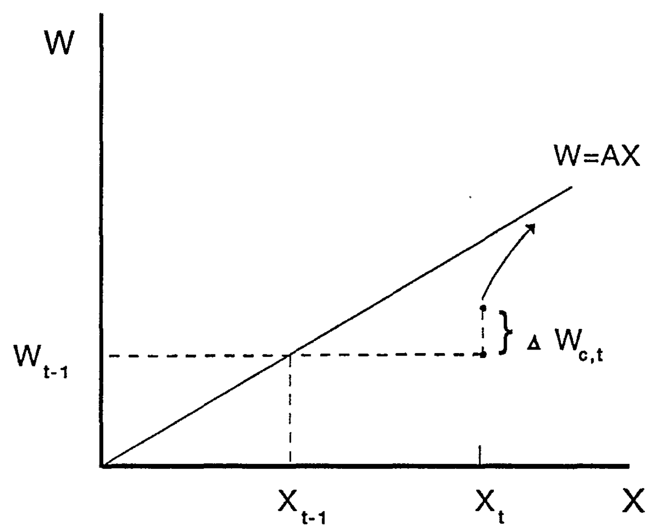
$$W_{d,t} = f(\Delta N_t), \quad f' > 0. \tag{iv}$$

We now turn to consider the structural relation again. The profit maximization condition implies that employment directly derives from the profit function and technology. It depends on real wages and some exogenous variables, $N = N(W/P, X_1)$, where X_1 is a subset of X and contains the variables entering the profit function.

By substituting N = N(.) into the structural relation, we define an alternative expression for wages W = W(P,X). We call this as a reduced form which applies when all adjustment of employment has taken place. Under the right-to-manage condition X consists of the same variables as in the structural relation. Under other conjectures on the structure of bargaining this does not necessarily hold. By normalizing prices to unity, the reduced form becomes also seemingly identical to (ii), i.e. W = AX.

Figure 4 introduces the attractor defined in terms of the reduced form. Since many of the contributing variables grow in a trendwise fashion, we have drawn the attractor as an upward sloping line in time. In real life the attractor is, of course, not linear. For expository reasons we, however, assume linearity and by doing so we do not loose anything as far as the insight is concerned.

Figure 4. **The Reduced Form Wage Relation as an Attractor**



Let us assume that all parties anticipate that W_{t-1} will not be an equilibrium for the forthcoming period t because of changes in X. However, the future is not perfectly foreseen. If the wage setters set the contract wage on a level $W_{c,t} = W_{t-1} + \Delta W_{c,t}$, which turns out to be off of the attractor, adjustment starts. Assuming that the error correction concerned is not immediate (and that we only examine this one shock), the adjustment could take place in a smooth manner indicated by the arrow.

In real life, adjustment is partial and it may take several periods (wage rounds) before the equilibrium has been restored. So, it may be of interest to partition the driving equilibrium error, $z_t = W^*_t - W_{c,t} = \Delta z_t + z_{t-1}$, where $\Delta z_t = \Delta W^*_t - \Delta W_{c,t}$, and to write the error correction hypothesis of the wage drift in a form in accordance with Engle & Granger (1987):

$$W_{d,t} = \rho \cdot z_t \qquad \text{(v)}$$
$$= \rho_1 \Delta W_t^* - \rho_2 \Delta W_{c,t} - \rho_3 z_{t-1},$$

where z_{t-1} indicates the need for adjustment which stems from the past and presumably $\rho_i > 0$.

The statistical preconditions for (v) to be a plausible specification are as follows. First, we need to manage to define empirically a cointegrating wage relation for W^* which generates a stationary error term, $z_t \sim I(0)$. The hypothesis $W_{d,t} = \rho \cdot z_t$ implies that wage drift should be stationary as well. Secondly, the two difference terms in (v) must be integrated of the same order. Otherwise they cannot cointegrate in a fashion which brings the full system down to stationarity. Since earlier evidence indicates that $W \sim I(2)$, then W_c should be I(2) as well. If this holds, the two difference terms will be I(1). In the context of the empirical results we show that these preconditions are met. This reveals that the time series properties of wage drift and the contract wage differ significantly.

In terms of equation (v), the hypotheses concerning the relation between the contract wage and wage drift can be characterized as follows (see also Calmfors (1990), Flanagan (1990)[7]):

(A) The wage setters predict wage drift and take it into account when setting the contract wage. According to the strong version, (A1), they succeed perfectly and, hence, central negotiations de facto determine the final wage. This implies $\rho_1 = \rho_2 = 1$. Under these restrictions, no target error can emerge and, thus $\rho_3 = 0$ by definition. According to the weak version, (A2), central negotiators make predictions but fail to reach the desired wage outcome because of expectational errors. By allowing that $\Delta W_t^* \neq \Delta W_t^{*e}$ and $W_{d,t} \neq W_{d,t}^e$, we allow $\rho_3 \neq 0$.

(B) According to the error correction hypothesis there is an inverse relation between wage drift and the contract wage. In an extreme version, (B1), the adjustment is instantaneous and, hence, permanently $\rho_1 = \rho_2 = 1$. Again, no equilibrium error can emerge and $\rho_3 = 0$ by definition. In the weak version, (B2), the adjustment may be gradual. If $\rho_1 \neq 1$ and $\rho_2 \neq 1$ and, thus, equilibrium errors emerge, $\rho_3 \neq 0$. If $\rho_1 = \rho_2 = \rho_3 = \rho > 0$, then the r-h-s in (v) collapses to $\rho \cdot z_t$ which we call as the strong version of the error correction hypothesis (B3).

[7] Flanagan (1990) suggests the following test. The negotiated wage change is determined by a vector of variables, V_1, along with the response of negotiators to the wage drift (with coefficient α_i). Wage drift is determined by a vector of variables, V_2, along with the influence of central negotiations on decentralized pay decisions (with coefficient α_j). The vectors V_1 and V_2 may have some common variables. The test concerns whether $\alpha_{i,j} = 1$ or $\alpha_{i,j} = 0$ or $0 < \alpha_{i,j} < 1$. The discussion above, however, indicates that the procedure is valid only if instantaneous adjustment is presupposed. Additional caveat is that Flanagan estimates his two equations simultaneusly and, hence, vectors V_1 and V_2 are imposed not to be identical. As the natural starting point would be the contrary, the procedure is prone for problems related to omitted variables (see Rødseth (1990) and Holmlund (1990)).

(C) Wage drift is independent of the wage contracts if $\rho_2 = 0$.

A closer investigation reveals that one cannot distinguish between (A1) and (B1) or (A2) and (B2) or (B3) when ex post statistics are used. (A) is a special case of (B) emphasizing whether the process has been foreseen. Therefore, when estimating equation (v) with ex post statistics we wish to distinguish between hypotheses (B1), (B2), (B3) and (C). Hypotheses (A) need to be examined differently as will be seen in later sections.

2.3 Further Considerations

The bargaining models have been typically analysed under an (implicit) assumption of certainty. This is clearly unsatisfactory when the relation between the contract wage and wage drift is considered.[8] The former is settled discretely ex ante for a predefined period. The latter represents the continous adjustment of actual wages during the contract period. Obviously, the information sets driving these two elements differ considerably.

In the present context, we illustrate the matter in a very simple set-up. Let the technology be $F(N)$, $F' > 0$, $F'' < 0$. Under certainty (abstracting away payroll taxes and normalizing exogenous prices to unity), the profit function is $\pi = F(N) - WN$ and the optimal demand for labour derives as $N^* = N(W)$. The union preferences are as in Appendix 2.

The agents decide on the contract wage at the time when they do not know the state of the world which is going to prevail during the contract period. Since we are primarily interested in wages, it is most instructive to make an ad hoc assumption that the uncertainty concerns the optimal level of labour input, $\tilde{N}^*$, which is a (subjectively) random variable with density function $d(\tilde{N}^*)$ and expected value $E[\tilde{N}^*]$. So, we rewrite the demand for labour condition as $\tilde{N}^* = N(W) + \tilde{e}$, where $\tilde{e}$ is a stochastic term which contains the information defining the state of the world.

A definition of the risk which can be applied in evaluation of the matter of interest involves 'stretching' of the probability distribution around a constant mean. A higher uncertainty is defined as a larger variance of $\tilde{e}$, $\delta^2_{\tilde{e}}$, which leaves the mean, $E[\tilde{N}^*]$, unchanged. In analogy with Sandmo (1971) we now evaluate the optimal (contract) wage under uncertainty as compared with the situation where N^* is known to be equal to the expected value of the original distribution. This will be emphasized in terms of the Nash solution with expectations involved:

$$\max_W \Omega = E[u(W) + v(N(W) + \tilde{e})] \cdot E[F(N(W) + \tilde{e}) - W(N(W) + \tilde{e})] = \Lambda \cdot \psi \tag{ii'}$$

The FOC of the problem which defines the optimum wage, W^*, is

[8] As far as the characteristics of the equilibrium wage are concerned, Oswald (1982) indicates that introduction of uncertainty into his model of the trade union leaves the model's qualitative predictions unaltered. However, changes in the magnitude of uncertainty may matter.

$$\Omega_W = \psi\Lambda_W + \Lambda\psi_W = 0.$$

From Rothschild & Stiglitz (1971) it follows that for the wage effect of uncertainty defined above in terms of $\delta^2_{\bar{\varepsilon}}$, it holds that

$$W^*_{\delta^2_{\bar{\varepsilon}}} \gtreqless 0, \qquad \text{when } \Omega_{W\bar{\varepsilon}\bar{\varepsilon}} \gtreqless 0. \tag{vi}$$

The decisive partial derivative is as follows:

$$\begin{aligned}\Omega_{W\bar{\varepsilon}\bar{\varepsilon}} &= \psi\Lambda_{W\bar{\varepsilon}\bar{\varepsilon}} + \Lambda\psi_{W\bar{\varepsilon}\bar{\varepsilon}} + 2\psi_{\bar{\varepsilon}}\Lambda_{W\bar{\varepsilon}} \\ &\quad + \Lambda_W\psi_{\bar{\varepsilon}\bar{\varepsilon}} + \Lambda_{\bar{\varepsilon}\bar{\varepsilon}}\psi_W + 2\Lambda_{\bar{\varepsilon}}\psi_{W\bar{\varepsilon}}.\end{aligned} \tag{vii}$$

It is easy to verify[9] that in economically meaningful circumstances $W^*_{\delta^2_{\bar{\varepsilon}}} < 0.$[10] This indicates, that higher uncertainty about labour demand tends to reduce the wage chosen. This serves as an insurence device against low realizations of labour demand. Since the uncertainty concerning the contract period (measured by $\delta^2_{\bar{\varepsilon}}$) is permanently smaller during the period than beforehand, a rational for the permanently positive wage drift has been discovered.

It is difficult to measure uncertainty. However, we can think that it is related to the dispersion of financial prospects faced by firms which are covered by the union contract. Surprisingly, this issue has hardly been evaluated in the literature on wage drift.[11] If the dispersion is large, the number of unfavourable realizations may be large if the contract wage is set "too high". In addition, it is commonly known that wage drift will quickly compensate a considerable part of the "excessive" wage moderation if the state of the world shows up to be favourable. Accordingly, in times of high uncertainty (consistent with large $\delta^2_{\bar{\varepsilon}}$) wage drift is presupposed to be larger. Therefore, (v) will be augmented to include a term describing the dispersion with a positive effect expected.

The magnitude of z_t is presumably correlated positively with shocks due to unexpected changes in the determinants incorporated in vector X. Expectational errors are supposedly also positively correleted with unexpected shocks. So, a positive relation between wage drift and expectational errors concerning the key determinants of W*(.) should show up, i.e.

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[9] Full set of derivations is available from the author upon request.

[10] This holds unambigously in the monopoly union model defined according to the present set-up. Oswald (1982) evaluates an increase in the riskiness of product demand in a slightly different set-up and finds a generally ambigous wage effect. Under specific technology restrictions the effect, however, appears to be wellspecified.

[11] Hibbs & Locking (1991) is an exception in a different context, however.

$$W_d = g(W^*(.) - E[W^*(.)]), \quad g' > 0. \tag{viii}$$

We have introduced three different manners to model wage drift. The structural wage-employment relation indicates Phillips curve type of correlation which is the most commonly applied model in the literature. The causality in this model is, however, not pure. The reduced form wage relation generates an error correction equation. Finally, the relation between the unexpected shocks and expectational errors gives an explanation for the variation of equilibrium errors and of wage drift as well. Of course, since expectations are also influenced by matters not covered by our model, the model emphasizing expectational errors is presumably the most tentative as far empirical implementation is concerned.

3 Empirical Results

3.1 The Error Correction Equation

The construction of the error correction equation (v) is such that the outcome of the central bargaining is given (or predetermined). Wage drift equation applies to the local stage of the sequential bargaining process. A closer look at the other models reveals that the error correction model is the only one which postulates a well-defined relation between the contract wage and wage drift. The relation is definitely inverse.

In the literature, this issue has been unsettled and already Phelps Brown (1962) documents the contradictory evidence. First, it has been argued that large increases in contract wages tend to be accompanied with a large wage drift. For instance, in a theoretical paper by Holden (1988, p. 96) "a higher tariff wage <u>increases</u> wage drift". This argument is supported by the fact that high contract wage increments and high wage drift often occur simultaneously (see Figure 1). Secondly, an inverse relation between the contract wage and wage drift has been discovered by Holmlund & Skedinger (1990)[12] with microdata of the Swedish wood industry and by Lucifora (1991) with Italian microdata. Finally, Calmfors & Forslund (1990) do not find conclusive evidence for any specific relation in time series regressions for Swedish manual workers. Holden (1989) using Norwegian time series of manufacturing industry ends up with the same result. Flanagan (1990) argues that contracts and drift have no interaction in the Scandinavian countries with Finland as a possible exception. So, the evidence is mixed.

[12] Calmfors (1990) argues that when the feed-back effect between industry and central agreements is accounted for, the net effect of a change in central agreement on wage drift may even be zero in Holmlund & Skedinger (1990).

The error correction structure implies that the wage outcome incorporating wage drift converges towards the long-run equilibrium which is defined theoretically and identified empirically as a cointegrating relation in Appendix 1.[13] As temporary disequilibrium is allowed, the price homogeneity, e.g., is not imposed to hold permanently.

Since the process converges towards the long-run equilibrium, wage drift primarily contributes to the dynamic path of the adjustment. The long-run elasticity of wage drift with respect to the contract wage is minus unity.

The observation period is 1965–1989 and the data for the aggregate private sector and manufacturing industry mostly derives from the data base of the quarterly model of the Bank of Finland, BOF4.[14]

It has been argued that quarterly analysis is not well-grounded when economies with annual wage rounds are concerned (see Eriksson et al. (1990), e.g.). The profound motivation for us to work with annual data despite of the loss in the degrees of freedom is, however, due to the fact the contract wage series and the level of earnings series are constructed very much differently (see Tyrväinen, 1991). The contract effects show up differently in the two series especially when the contracts become in effect retroactively which is by no means exceptional in Finland. This creates artificial volatility to the quarterly path of wage drift. In annual analysis this problem can be overlooked.

In order to discover an appropriate empirical specification, there is one more complication to consider. The equilibrium wage is defined and estimated in terms of National Accounts. In this context, the (annual) average hourly labor cost, W, tends to increase due to a reduction in the normal working hours because shorter hours hardly ever involve a one-to-one cut in wage earnings. Wage drift derives from the level of earnings index, W_I, which measures the wage for the normal working time. Here, a reduction in normal hours plays no role. This difference must be controlled when the equilibrium error from the cointegrating relation is plugged into the wage drift equation. So, the latter is augmented to include the term $\Delta(W/W_I)$.

An ADF-test indicates that for the error terms of the cointegrating relations holds $z_t \sim I(0)$ definitely (see Appendix 2). Wage drift is I(0) with a constant different from zero as the mean. Our earlier discussion on implications of uncertainty related to the sequential process implies that this is what we would

[13] Holmlund & Skedinger (1990) translate a level equation (comparable to (IV) in Appendix 1) into a wage drift equation simply by decomposing the wage level $W_t = W_{t-1}(1 + \Delta W_{c,t})(1 + W_{d,t})$. This is how they define a wage drift equation with terms both in levels and differences which is characteristic for the error correction models. The error correction structure is, however, not "full" because the difference terms are due to the disaggregation above and cover only the two wage components. – A closer investigation of the equation of Holmlund & Skedinger (1990) in comparison to ours reveals that a model with the disagreement point refering to the contract wage appears to imply a smaller negative coefficient for the contract wage than a model in which the disagreement is a strike. Consequently, if strikes are rare in local bargaining wage drift is less sensitive to changes in contract wages. 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. These aspects may explain part of the differences between the empirical results concerning Finland on the one hand, and Norway and Sweden on the other.

[14] In Finland, manufacturing industry is around one third of the aggregate private sector. Useful data for micro analysis is unfortunately not available.

expect to discover. Total wages and contract wages are both I(2) and, hence, the differences are I(1). This indicates that the structure of (v) is plausible prima facie and the regressions will show whether the I(1) terms cointegrate in a manner generating well-behaved error correction equations.

The error correction equations are reported in Tables 1 and A2 in Appendix. In the head of each Table, we indicate the cointegrating relation from which the contributing equilibrium error derives. There are four variants of each specification. In the first, the effects of all 12–13 contributory variables are estimated freely (see Table A2). In these overparametrized equations the coefficients are generally of expected sign. Their magnitudes are plausible and well in accordance with the ones discovered in the level regressions. The role of the past target error z_{t-1} is clear-cut. The inverse relationship between wage drift and contract wages is apparent.

The second variant was designed to overcome the overparametrization problem. Now ΔW^* is determined by the cointegrating relation. Again, the lagged equilibrium error enters significantly and the inverse relationship between contract wages and wage drift is straightforward (see Table 1).

The next restrictions $\rho_1 = \rho_2$ pass the test with no exception. The coefficient concerned takes a value of around three quarters.

The final restriction which implies $\rho_1 = \rho_2 = \rho_3 = \rho$ generally passes the test.[15] The resulting equations consist of only one independent I(0) variable, z_t. The restriction concerned generates in most cases a favourable effect on the adjusted R^2. The estimate of the ρ-coefficient indicates that around three quarters of an equilibrium error is corrected through the drift within a year.[16] The significant role played by a dummy (D89) confirms that wage drift in 1989 exceeded historical relationships. At the time, the Finnish economy was heavily overheated as discussed in Tyrväinen (1992a).

Investigation of the role of dispersion compels us to use of data which by nature differs significantly from the rest of the data. Six alternative measures all calculated from the Business Survey of the Confederation of the Finnish Industries were experimented with (see Appendix 4). The most succesfull attempts implemented information on current order books which have a straightforward interpretation as a proxy for short run production expectations. A positive, significant coefficient was found when equations in Table 1 were augmented to include the measure in concern. As can be seen in Table 2, the resulting equations have the same basic structure as the original ones. Still, they outperform those in

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[15]There is one exception, however. The restriction is rejected on 5 per cent significance level (but not on 1 per cent level) when imposed on equation (11) to get to (12).

[16] Tyrväinen (1991) indicates that observed changes in contract wages are measured with error. As Holmlund & Skedinger (1990) show, measurement errors influence the estimate 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. In Finland, the change in contract wages is systematically underestimated because of statistical matters (see Tyrväinen, 1991). As wage drift is consequently overestimated, we expect our coefficient of –0.7– –0.8 to be the upper limit of the "correct" parameter value although some recent studies applying different approaches and considering different countries have produced almost identical elasticities as the ones above. These studies are Honkapohja & Koskela (1990) which estimates the equation of Holmlund & Skedinger (1990) for Finland, Hibbs & Locking (1991) for Sweden and Lever (1991) for the Netherlands.

TABLE 1. **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								
	The cointegrating wage relation in Table A1 from which the lagged equilibrium error, z_{-1}, derives													Lagged error term, z_{-1}, omitted	
	(1)			(2)			(3)			(7)	(8)				
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
$\Delta\log(W^*)-\Delta\log(W_c)-z_{-1}$	-	-	.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	-	-	.648	-	-	.688	-	-	-	.716	-	-	-	-
	(4.50)			(6.11)			(5.27)				(6.38)				
$\Delta\log(W_c)$	-.431	-	-	-.483	-	-	-.486	-	-	-	-.508	-	-	-.332	-
	(2.14)			(2.67)			(2.81)				(3.38)			(2.02)	
z_{-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	.698	.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
SE	.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).

Table 1 with no exception. This indicates that a larger ex ante dispersion in financial prospects faced by firms tends to increase wage drift discovered ex post (ceteris paribus). The reason for discretion is due to the difference of the data on dispersion from the rest of the data.

To conclude, the results so far have the following implications:

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.

2) The adjustment is not instantaneous. Therefore, the present wage drift is also contributed by the "equilibrium error" stemming from the past.

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

When z_{-1} is omitted, the other elasticities remain intact. The explanatory power is, however, substantially reduced (see equations (23) and (24) in Table 1 and (46) in Table A2).

Since the results above derive from specifications of cointegrating relations which may be controversial, four modified regressions were run. (The full set of results is in Tyrväinen, 1991). First, we imposed the wedge restrictions implying $\beta_1 = \beta_2 = -\beta_3$ in (IV) and in the corresponding error correction equation. As a second step, we disqualified unionization rate as a measure of union power. The third modification stems from the notion that simultaneous inclusion of Q and K/N may be challenged. Instead, we estimated a relation where the growth of productivity is the driving force of real wages. This specification was estimated both including and excluding a proxy for union power.

The key results discussed above carry over to the new regressions. The cointegrating equations are much like the ones above although the explanatory power has been reduced. Especially, exclusion of the unionization rate has a profound unfavourable effect. Modifications tend to increase autocorrelation in wage drift equations and the lagged dependent variable was included when necessary. Otherwise, the results do not differ much from the earlier ones.

Let us now evaluate the behavioural hypotheses specified in section 2.2. First, the past target error plays a significant role which falsifies hypothesis (A1) and (B1) which indicate instantaneous adjustment. Second, contract wage enters significantly the wage drift equation which falsifies hypothesis (C) according to which central bargaining and wage drift are independent processes. The weak form of the error correction hypothesis (B2) indicating gradual adjustment and inverse correlation between contracts and the drift is in accordance with the empirical results. Furthermore, since the data does not reject the restrictions $\rho_1 = \rho_2 = \rho_3$, the strong hypothesis of error correction (B3) gets support. Hypothesis (A2) will be discussed in the next section when the role of expectational errors is evaluated.

The discussion above makes it easy to understand the existence of opposite empirical results in the literature. If any of the key elements is missing, the regressions become arbitrary. Two examples of inappropriate modelling are as follows. When wage drift is regressed on the change of contract wages only we discover a significant positive (!) elasticity in Finland. Notably in this non-sense regression an I(0) variable is explained by an I(1) variable and, consequently, any

TABLE 2. **Wage Drift and the Dispersion in Stock of Orders among Individual Firms**

Estimation period: 1966—1989, except 1972—1989 in equations (31)—(32)
Estimation method: OLS

Independent variables	Dependent variable: W_d = wage drift							
	Private sector				Manufacturing industry			
	Wage drift equation in Table 1 with which the wage drift equation concerned is connected							
	(11)	(12)	(14)	(15)	(17)	(18)	(21)	(22)
	(25)	(26)	(27)	(28)	(29)	(30)	(31)	(32)
$\Delta\log(W^*)-\Delta\log(W_c)-z_{-1}$	-	.685	-	.728	-	.734	-	.822
		(7.19)		(7.67)		(7.08)		(8.97)
$\Delta\log(W^*)-\Delta\log(W_c)$	.684	-	.721	-	.736	-	.825	-
	(7.45)		(8.37)		(7.28)		(8.59)	
z_{-1}	-.700	-	-.907	-	-.788	-	-.728	-
	(3.17)		(5.07)		(3.86)		(2.73)	
Dispersion	1.100	1.106	.860	.915	1.860	1.895	1.111	1.088
	(2.13)	(2.16)	(2.17)	(2.27)	(2.72)	(2.79)	(2.53)	(2.48)
D89	.003	.003	.001	.002	.003	.003	.002	.001
	(3.46)	(6.31)	(1.23)	(4.97)	(2.52)	(4.78)	(1.70)	(3.06)
Constant	-.012	-.013	-.008	-.010	-.030	-.031	-.017	-.016
	(1.03)	(1.04)	(.947)	(1.13)	(2.02)	(2.08)	(1.51)	(1.49)
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).

correlation is spurious. Augmenting this simplistic regression with the current price inflation which is an I(1) variable removes the positive effect and a zero (!) elasticity results. Of course, this regression suffers from a bias related to omitted variables.

3.2 Expectational Errors and Vacancies

Relation (viii) in section 2.3 indicates a correlation between wage drift and expectational errors concerning the equilibrium wage. In order to structure the investigation of this hypothesis let us evaluate the contributing factors. It is highly likely that some of the determinants of the target wage are foreseen with smaller errors than others. Tax scales which are announced in advance probably belong to the former group. The factors which mainly contribute to the expectational errors are in the latter group. Pencavel (1985) and Holmlund (1985) stress the uncertainty concerning future prices. The level of activity is an other candidate. Since inclusion of other variables specified in (IV) would require quite arbitrary operationalization of expectations, we therefore approximate the driving expectational errors with $\Delta W^* - \Delta W^{*e} \approx [\Delta Z - \Delta Z^e] + [\Delta P - \Delta P^e]$. We proxied above the demand shift factor Z with the output variable and do so here as well.

The annual wage rounds commonly start in the fall after the publication of the Government forecast incorporated in the budget proposal. Since it appears to conduct the discussion at the time when the unions set their wage claims, we take it as the point of reference. A prediction for the GDP in volume terms is available. Neither for producer prices nor for the GDP deflator there is, however, an explicit forecast. We therefore approximate domestic inflation with consumer prices. As far as export prices and import prices move hand in hand, the size of the pie is not affected. Therefore, foreign trade prices are taken into account by including the terms of trade, P_x/P_m.

So, we approximate the driving expectational errors with[17]

$$\Delta W^* - \Delta W^{*e} \approx [\Delta Q - \Delta Q^e] + [\Delta P_c - \Delta P_c^e] + \omega * [P_x/P_m - P_x^e/P_m^e] \tag{ix}$$

First, expectational errors concerning output growth, consumer prices and terms of trade were included separately. The output variable was never significant. In addition to the deviation from the Government forecast, static expectations and the second difference were experimented with. For consumer prices and the terms of trade, the Government forecast appeared to be an adequate choice. Finally, we combined expectational errors concerning prices into one variable, $P - P^e$, according to (ix). The resulting factor approximates output prices. As equations (33) and (36) in Table 3 indicate, errors in price expectations appear to have a clear-cut influence on the magnitude of wage drift. This is in accordance with the (weak) behavioural hypothesis (A2) introduced in section 2. When evaluating this result one must be cautious. The proxies for expectations are rough. More sophisticated models are clearly needed to confirm conclusions on this issue. Interestingly, for

[17] 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 ω is the share of the foreign trade in the GDP.

TABLE 3. **Wage Drift, Expectational Errors and Vacancies**

Estimation period: 1969–1989[a)]
Estimation method: OLS

Independent variables	Dependent variable: Wage drift					
	Private sector[b)]			Manufacturing industry		
	(33)	(34)	(35)	(36)	(37)	(38)
$P - P^e$	.335 (4.68)	-	-	.319 (3.83)	-	-
Number of vacancies (in thousands)	-	.002 (4.54)	-	-	.004 (9.44)	-
Average duration of vacancies (weeks)	-	-	.017 (6.52)	-	-	.010 (8.04)
D80[c)]	-	-	-.026 (6.58)	-	-	-.010 (4.28)
D88/D89[c)]	-	-.022 (2.21)	-.012 (1.85)	-	-.012 (2.22)	-.011 (2.33)
Lagged dependent	.379 (3.21)	.440 (3.79)	-	.513 (4.17)	.563 (8.73)	.399 (4.64)
Constant	.019 (4.45)	.001 (0.18)	.010 (1.64)	.015 (3.07)	.001 (0.20)	-.001 (0.19)
R^2	.777	.780	.782	.744	.926	.909
R^2C	.752	.741	.743	.715	.913	.885
DW	1.282	1.998	2.181	2.240	2.153	2.462
SE	.007	.008	.008	.009	.005	.006

a) In equation (38) the estimation period is 1970–1989 because of the lack of data for 1969. Below parameter estimates are shown the t-ratios.

b) 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.

c) 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 (34) and (37). 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 (35) and (38).

the full period the hypothesis of stationarity of the $P-P^e$ variable is rejected on the 1 per cent level although not on the 5 per cent level (see Blangiewicz et al., 1990). This result appears to be influenced by the fact that the Government partly purposely underestimated inflation in a row of years in the early 1970's. This lead to a systematically positive error of an extraordinary magnitude in inflation forecasts in 1971–1975. Before and after, forecast errors have fluctuated around a zero mean more nicely. If the test starts from the middle of the decade, stationarity is definitely approved also on the 1 per cent level.

Holden (1989) assumes that losses of the firm due to a go-slow are smaller when inventories are large.[18] His regressions indicate a significant negative correlation between the size of inventories and wage drift. If there is a negative correlation between the size of inventories and the unexpected variation in product demand, Holden's results are well in accordance with our discussion on the role of expectational errors.

Model (iv) above relates wage drift to (changes in) the excess demand for labour. Variation in the number of vacancies is a good measure for this. So, we define the empirical model as a relation between vacancies (or, analogously, the duration of the unfilled vacancies, see the discussion in Schager, 1981) and wage drift:[19]

$$W_d = f(V), \qquad f' > 0. \tag{iv'}$$

Table 3 introduces the regressions which confirm the eye-econometrics (see Figure 1) by explaining 80–90 per cent of the variation in wage drift in 1969–1989 (equations (34)–(35) and (37)–(38)). Importantly, both vancancies and average duration of vancancies appear to be I(0) variables. In so far as the latter is concerned for the aggregate private sector, the conclusion is slightly tentative.

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[18] In the model applied, employment is affected by the division of the actual wage into contract wage and the wage drift. This is due to defining the threat point similarly as in Holmlund & Skedinger (1990), i.e. if the bargaining breaks down, the production goes on and the centrally negotiated wage contract defines the prevailing wage. In Holden's model employment is decided before the local bargaining and, consequently, 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, 1988, p. 99). A similar conclusion 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 properties appear to contradict the profit maximization conjecture supposed to hold in both papers.

[19] Hansen (1970) examines the matter in a neoclassical framework. Some of the submarkets are in the mode of excess demand for labour and some in the mode of excess supply of labour. Thus, both vacancies and unemployment enter – in the form of an U/V-curve – Hansen's macro equation for wage drift. However, the unemployment figures have ceased to behave as good indicators for a number of wellknown reasons. Therefore, we prefer to use vacancies as the sole indicator of the labour market slack by two grounds. First, Schager (1981) indicates that the stocks of vacancies contain the same information of the labor market as stocks of job applicants. Second, since the centrally settled contract wage acts as a floor in local negotiations we expect an asymmetry to prevail between the submarkets with excess supply and excess demand such that the former is not crucial for the analysis of the aggregate wage drift.

In accordance with our presumptions, the expectational errors and vacancies appear to be rather substitutes than complements as explanatory variables. When they enter simultaneously both of the two variables loose their significance in estimations for private sector whereas in the manufacturing industry vacancies enter significantly but expectational errors non-significantly with an implausible, negative sign. When the equations concerned were augmented to include the change in the contract wage, no significant relation between the contract wage and wage drift was depicted. Finally, when 1) the number of vacancies and 2) $(P-P^e)$ were added to the error correction equations in Table 1, the related coefficients did not differ significantly from zero. Although these results are fully in accordance with the synthesis sketched which considers the three models as descriptions of different phases of the causal chain rather than contradictory or complementary explanations of wage drift, we admit that the chain of evidence is not fully conclusive.

As the final attempt to verify whether any of the three models dominates, the J-test suggested by Davidson & McKinnon (1981) was performed. For this purpose, the predictions of equations (13), (33) and (34) were saved. The first is an ECM-model, the second emphasizes expectational errors and the third is a vacancy-model. Then each model was reestimated with the prediction of an other model as an auxiliary explanatory variable. If the prediction stemming from an other model enters significantly, the models cannot be discriminated according to the test. The t-ratios in Table 4 indicate that this is what happens in the present context. This is the final evidence confirming that each of the models contains relevant information about the process. Of course, the differences in the marginal p-values, indicate that the ECM-model (13) could be the "strongest" and the expectation-model (33) the "weakest" of the three.[20]

[20] Interestingly, Pehkonen & Viskari (1992) investigate 1) the model presented in this paper, 2) the model of Holmlund & Skedinger (1990), and 3) a Phillips-curve type labour demand model augmented in a fashion commonly applied in the earlier literature. They estimate the models with data from the Finnish metal industry (with an observation period different from ours) and perform constancy as well as a selection of encompassing tests (Cox's test, Ericsson's IV test, Sargan's reduced form test, the joint model test). The conclusions are as follows. "The performance of Tyrväinen's model was quite respectable: the model explained the data with remarkable precision, its post- sample properties were satisfactory and it variance-encompassed both the rival models. As far as the question of the relative performance of ... models is concerned, our answer is tentative but not inconclusive: as a whole the results lend support to the view that the superiority of wage bargaining models is not only theoretical but also empirical."

Table 4. **The J-test***

The prediction stemming from:	The maintained model: ECM-model (13)	Exp.err-model (33)	Vacancy-model (34)
ECM-model (13)	–	6.00 (0.00 %)	5.86 (0.00 %)
Exp. error -model (33)	3.71 (0.08 %)	–	2.94 (0.42 %)
Vacancy -model (34)	6.14 (0.00 %)	4.00 (0.04 %)	–

* The table reports the t-values of a prediction stemming from each model when added to a competing model as an auxiliary explanatory variable. The marginal p-values are in parentheses below the t-values.

4 Conclusions

The results introduced in this paper can be summarized as follows:

1) In Finland, the time series properties of the relevant wage series differ significantly. The properties of the total nominal wages are similar to those of the contract wages and different from the properties of wage drift. Since the latter has been stationary during the observation period, it can not be considered as an independent factor contributing to the long-run trend growth in wages. Instead, it has a specific role in the adjustment process.

2) Wage drift acts as an error correcting factor. The attractor is, however, not the competitive wage. The equilibrium derives from the bargaining process. Since the adjustment is not instantaneous present wage drift is also contributed by "equilibrium errors" stemming from the past. Additionally, a robust inverse correlation between contract wages and wage drift has been detected.

3) If the dispersion of financial prospects faced by firms – measured by the standard deviation of the stock of orders – is large, wage drift tends to be larger than otherwise, ceteris paribus.

4) Wage drift is closely related to the excess demand for labour.

5) The size of wage drift appears to vary in accordance with the magnitude of expectational errors concerning inflation rate.

6) Wage drift has been regularly positive. This is as expected since the uncertainty concerning the state of the world which is going to prevail during

the contract period is permanently larger ex ante, i.e. at the time the contract wage is settled.

A policy implication of profound importance concerns the role of the Government as a partner aiming to pave the way for moderate wage contracts. In Finland, the process has typically proceeded as follows. First, unions are requested to approve a moderate contract (with the result: $W_c\downarrow$). Then, the Government backs the pact with expansive policy measures (with the result: $W^*\uparrow$). Finally, an increase in wage drift starts to undo the desired wage moderation. In light of the analysis above, this is straightforward in so far as the Government intervention has increased the gap W^*-W_c which is the driving force of wage drift.

In one sense, the institutions — centralized bargaining, e.g. — appear not to 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 may matter a lot. This is so especially when the economy has moved off the course or serious imbalances are about to emerge. In terms of our model this could be due to a sudden drop in W^*. As the contracts are synchronized, centralized wage setting gives an opportunity of a discrete adjustment. This indicates less delay in adjustment of actual wages towards the equilibrium.[21]

[21] According to OECD (1986) and Tyrväinen (1992a) there appears to be evidence of this in Finland. Jackman (1990) discusses related issues and Layard et al. (1991) give comprehensive empirical evidence in an international context.

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 aggregate output of the economy has been around 15 per cent with cyclical variation larger 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[22]

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 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

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[22] 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.

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

Modelling the Equilibrium Wage, W*

In derivation of the target wage, W^*, the "right-to-manage" model is applied which indicates that the wage is determined according to a Nash-bargaining solution

$$\max_{W}(U - U_0)^{\theta}(\Pi - \Pi_0)^{1-\theta} \qquad \text{s.t. } \Pi_N = 0 \tag{I}$$

where U(.) is the union's welfare and Π(.) is the firm's profit when an agreement is reached. The union's fall-back utility, U_0, is identified as the utility available to union members when an agreement is not reached (see Binmore et al., 1986). The firm's fall-back utility, Π_0, represents respective profits. We specify Π_0 as the constant cost of production, C = rK. The parameter θ is a measure of the union's bargaining power.

The union maximizes an iso-elastic utility function

$$U = u(W(1-\tau)/P_c) + v(N), \tag{II}$$

where P_c = consumer prices, τ = income taxes, N = employment and u' > 0, u" < 0, u''' > 0, v' > 0, v'' < 0, v''' > 0.

There are n identical firms with a constant returns to scale production function, F(N, m, $\underline{K}$), with three inputs, labour (N), raw materials (m) and capital ($\underline{K}$) which is considered as predetermined. The firm maximizes profits which are defined as the difference between sales revenue and production costs:

$$\Pi = \hat{P}[ZF(N, m, \underline{K})]F(N, m, \underline{K}) - W(1+s)N - P_m m - C, \tag{III}$$

where $\hat{Q} = \hat{P}^{-1}(P)Z^{-1} \equiv D(P)Z$ 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 $\hat{P}$ is the endogenous producer price of the firm, P = competitors' producer prices, s = payroll tax, P_m = price of raw materials (incl. energy), and $\hat{Q}$ is the endogenous output of the firm.

In Finland strikes are illegal after the argeement for an industry has been approved. However, the penalty fees have been negligible and strikes have been common in local negotiations. As far as the number of wild cat strikes is concerned, Finland is among the top countries whereas go-slow actions are rare.[23] Hence, the appropriate specification of the disagreement point refers to a strike not only in central but in local bargaining as well. So, U_0 depends on (real) strike allowances.

[23] 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.

Union power can be proxied by union density (UNION), as in Tyrväinen (1992a). Union militancy may also be affected by the prevailing rate of unemployment (UR) as in Andersen & Risager (1991) because 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 $\theta = \theta(\text{UNION, UR})$, $\theta_1 > 0$, $\theta_2 < 0$. After recognising that there is no coherent series for strike allowances (see Tyrväinen, 1989) the log linear equation for the level of the equilibrium wage becomes:

$$\begin{aligned}\log W_t^* = {} & \log P_{c,t} + \beta_1 \log(1+s)_t + \beta_2 \log(1-\tau)_t + \beta_3 \log(P_c/P)_t + \beta_4 \log(P_m/P)_t \\ & + \beta_5 \log Z_t + \beta_6 \log(K/N)_t + \\ & + \beta_7 \log(\text{UNION}_t) + \beta_8 \log(\text{UR}_t) + \text{constant} + \varepsilon_{W,t}\end{aligned} \tag{IV}$$

where $\varepsilon_{W,t} = W_t - W_t^*$ is the residual of the equation and $\beta_1 < 0$, $\beta_2 < 0$, $\beta_3 > 0$, $\beta_4 < 0$, $\beta_5 > 0$, $\beta_6 > 0$, $\beta_7 > 0$, $\beta_8 < 0$.

If the empirical counterpart of equation (IV) produces a stationary error term, the set of series concerned is cointegrated.[24] Then, OLS is an appropriate estimation method for the cointegrating regression which is run in levels with no lags in any of the variables.

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 income 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, inventories are abstracted away and aggregate output (Q) could be a suitable proxy of the aggregate demand. In the long run, it is straightforward to expect that output and demand grow hand in hand. So, we prefer to work with the output variable. On the other hand, Tyrväinen (1992a) shows that the results are not sensitive to how the demand shift variable is proxied or instrumented.

In conditions of imperfect competition, the endogenous pricing decision of the firm is influenced by competitors' prices. On aggregate level, the counterpart of competitors' prices is the aggregate producer price of the industry concerned. A test of the Granger-causality does not reject models regarding producer prices and output as exogenous with respect to wages.[25]

Cointegrating regressions are introduced in Table A1. As there is no dynamics in the cointegrating regressions, autocorrelation problems is to be expected (see Hendry, 1986). Hence, in literature the potentially biased t-statics have been simply left out. (This has not been considered as awkward because the parameter

[24] An ADF-test indicates that there are both series which are I(1) and I(2). For a discussion on this issue, see Tyrväinen (1992a).

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

estimates are "superconsistent" and converge towards the "real values" "quickly" (Engle & Granger, 1987). This property has been confirmed more recently by Phillips & Hansen (1990). Since, autocorrelation, however, appears not to be particularly severe in our cointegrating regressions, we choose to introduce the t-statistics as they give an indication of how precisely the coefficients are defined.

The commonly applied tests confirm the cointegration property of the relevant equations. The signs of all coefficients are as expected. Parameter estimates are of plausible magnitude and in accordance with other studies. In addition, they are close to those reported in Tyrväinen (1988) in which the specifications were slightly different and the estimations were carried out on quarterly data with a five years shorter observation period.[26] The similarity is clear-cut also to the relations estimated with the so called Johansen-method and reported in Tyrväinen (1992b).

[26] The set of right hand side variables is large in Table A1. Tyrväinen (1992a) 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 in annual regressions here. There were no major differences in results. So, we are quite confident on the robustness of our cointegrating equations.

TABLE A2. **Cointegrating Relation: The Equilibrium Wage, W***

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-τ)	-.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+s)	-.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), s = employers' social security contributions, τ = marginal rate of income taxes, Q = output, K = capital stock, N = number of persons employed, UNION = M/N = unionization rate, where M = 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.

Appendix 3

TABLE A3. **Wage Drift**

Estimation period: 1966–1989, except 1969–1989 in equation (44) and 1972–1989 in equation (45)
Estimation method: OLS

Independent variables	Dependent variable: W_d = wage drift					
	Private sector		Manufacturing industry			
	Target wage equation in Table A1 with which the wage drift equation concerned is connected					Lagged error term omitted
	(1)	(4)	(3)	(7)	(8)	
	(41)	(42)	(43)	(44)	(45)	(46)
$\Delta\log(W_c)$	-.545	-.403	-.705	-.622	-.599	-.663
	(4.69)	(2.56)	(3.99)	(4.10)	(3.40)	(4.21)
z_{-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)	
$\Delta\log(1-\tau)$	-.309	-.289	-.512	-.348	-.372	-.483
	(3.61)	(3.88)	(6.31)	(4.77)	(5.06)	(6.79)
$\Delta\log(1+s)$	-.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, z_{-1} is the target error stemming from the previous period, P_c = consumer prices, P = producer prices, P_m = import prices of raw materials and semifinished products (incl. energy), s = employers' social security contributions, τ = 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.

Appendix 4

Dispersion and Wage Drift

This section reports the methods applied in evaluating the 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 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 in wage drift equations. There is, however, one exception. When the estimation period is shorter (1972—1989) as in equations (20)—(21) in Table 1 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 1 were augmented to include a measure of the standard deviation in concern (see Table 2). In addition, the statistical properties of the equations were improved and in other coefficients only minor changes took 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 in Table 1 was augmented to include a dispersion measure which refers to employment expectations (VI), a highly significant positive coefficient was discovered.

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