Measuring structural unemployment: NAWRU estimates in the Nordic countries

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Abstract

The NAWRU indicator (Non-Accelerating Wage Rate of Unemployment), used by the OECD as a measure of structural unemployment, has risen for the four Nordic countries Denmark, Finland, Norway and Sweden. This paper presents stable empirical wage equations for the same countries over the period 1964-1994, in sharp contrast to the increased NAWRU estimates. The instability of the NAWRU estimates is an artefact of a misspecified underlying wage equation, and not due to instability in the wage setting itself.

Keywords: Structural unemployment, NAWRU indicator, econometric wage equations, stability, Nordic wage formation.

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I. Introduction

In recent years, the OECD has measured the structural rate of unemployment by use of a specific indicator, the NAWRU (Non-Accelerating Wage Rate of Unemployment) indicator, suggested first by Elmeskov and MacFarland (1993) and Elmeskov (1994). Crudely, this indicator measures the structural rate of unemployment as the rate of unemployment at which wage growth is stable. The NAWRU indicator has been used extensively by the OECD and others on several important issues. First, as the indicator is taken as a measure of the structural rate of unemployment, it is used to interpret the unemployment situation in various countries. Thus, the indicator is used to identify “success countries” (where the NAWRU has gone down), see Elmeskov et al. (1998), and it is also used in studies aiming at explaining the determinants of the structural rate of unemployment, see e.g., Ball (1996) and Elmeskov et al. (1998). Second, the NAWRU indicator is vital in the calculation of output gaps by OECD, as it is a crucial element in the estimate of the potential output (Giorno et al. (1995)). The output gap plays an important role in the policy analysis of the OECD; in OECD (1994, p. 69) it is argued that “...estimates of cyclical unemployment or of output gaps can be used in deciding whether there is in principle the scope for macroeconomic policy to influence unemployment in the short run.” It has also been used by independent policy observers, (see e.g., the Economist 16 May 1998, page 85). Third, the NAWRU indicator is important in the construction of OECD’s data for General government structural balance, as these are also based on the estimate on potential output (cf. Giorno et al. (1995)). The structural budget balance is used for several purposes (a measure of discretionary policy adjustment; an indicator of the degree of stimulus that the government provides to aggregate demand, and to detect possible trends towards unsustainable public debt positions).

The attractiveness of the NAWRU indicator is due to ease of construction (limited use of data), and its close link to the “consensus” theoretical framework on European unemployment; on equilibrium unemployment, cf. Layard et al. (1991). It provides simple and precise answers to important and difficult problems. The other side of the coin is that the simplicity and limited use of data also involve important weaknesses: Important explanatory variables are omitted, there is no estimation, and thus no test statistics, and there is no statistical measure of the uncertainty associated with the indicator itself.
While these objections are all valid in theory, do they matter in practice? We explore this issue within an empirical analysis of the evolution of hourly wages in the manufacturing sector in the four major Nordic countries, Denmark, Finland, Norway and Sweden. In all these countries, unemployment has risen since the early 1970s, first in Denmark, more recently in the other countries. For all countries, the NAWRU estimates indicate a corresponding increase in structural unemployment. One is led to the conclusion that the rise in unemployment is associated with a structural change in the labour market. However, when we explore the wage setting behaviour more closely, we find no changes. For all countries, we obtain stable empirical wage equations over the period 1964-1994 (Denmark 1968-94). The instability of the NAWRU estimate appears to be an artefact of a misspecified underlying wage equation, and is not due to instability in the wage setting itself.

Our empirical analysis is confined to the manufacturing sector, owing to the availability of high quality data for this sector for all countries. Thus, it is a possibility that changes in wage setting outside the manufacturing sector can explain the instability of the NAWRUs for the “business sector”, as used by the OECD. We do not think that this is an issue. First, the manufacturing sector NAWRUs that we calculate show a close similarity to OECD’s business sector NAWRUs, indicating that instability on the whole is the result of the method used, not the sector that is investigated. Second, the manufacturing sector includes both white and blue collar workers, skilled and unskilled, so that a large shift in demand or supply affecting one of these categories would be apparent in our data. Third, a recent econometric study of total economy wage formation in Norway shows no evidence of a structural break, Bårdsen et al. (1998).

The novelty of our argument does not lie in the view that the NAWRU indicator is an imperfect measure of structural unemployment; this view is already acknowledged. In early work on the NAWRU indicator, Elmeskov and MacFarland (1993) are careful in their interpretation of the evidence. They gave due attention to an alternative explanation that there is slow adjustment to the long-run equilibrium rate of unemployment. Moreover, they emphasized that, in case wage growth depends on the change in unemployment as well as the level, the NAWRU indicator corresponds to the short-run equilibrium rate of unemployment, and not the long run. However, as far as we know, the NAWRU indicator has not previously been subject to thorough empirical evaluation. In policy analysis and general discussions, the uncertainty and caution is often forgotten. In the applications of the NAWRU
indicator mentioned above, like the figures for output gap and structural budget balances, there is often no reference to the NAWRU indicator being a short-run concept.

The practical importance of the OECD figures on the NAWRU, the output gap and the structural budget balance should not be underestimated. National governments and central banks rarely tie their policy formulation directly to concepts like the NAWRU.\textsuperscript{1} However, most national ministries of finance and central banks have policy discussions both bilaterally with OECD representatives, as well as collectively in an OECD setting. There is reason to believe that the OECD figures affect national policy makers’ perception of the economic situation in their respective countries, and via this also the policy that is pursued.

The paper is organized as follows. Section II. records the operational definition of the NAWRU indicator, and evaluates the NAWRU for the Nordic countries. In section III. we present empirical wage equations, and compare with the NAWRU indicator. Section IV. concludes.

II. Theoretical framework and empirical NAWRU estimates

The basic theoretical framework, the same for both the NAWRU indicator and our empirical wage equations, known from e.g., Layard et al. (1991), is illustrated in Figure 1. The wage curve represents the outcome of the wage setting, negotiations between workers/unions and firms, or unilateral decisions by the firms; the price curve represents the pricing decision of firms that maximize profits, facing downwards sloping demand functions in the product markets and using constant returns scale technology. The equilibrium rate of unemployment is determined by the requirement that the wage and price setting must be consistent, i.e., the intersection between the wage curve and the price curve in Figure 1. According to the theory, actual unemployment may deviate from equilibrium unemployment due to expectational errors or nominal rigidities. For example, unemployment may be below its equilibrium value if an inflation shock causes real wages to become below the level

\textsuperscript{1}The NAWRU-indicator is discussed in policy documents of the ministries of finance in Norway (Nasjonalbudsjettet 1996) and Denmark (Finansredegørelsen 98/99), but not directly related to the policy discussion.
expected by the wage setters, and profit margins below (equivalent to real wages above) what is expected by the price setters.

The NAWRU indicator is based on the idea that actual unemployment being below equilibrium unemployment is associated with inflation being above its expected value. The method focuses on the wage setting, and thus inflation expectations are represented by the money wage growth of the previous year. In other words, money wage growth rises if and only if unemployment is above its equilibrium value. To be more precise, Elmeskov and MacFarland (1993) and Elmeskov (1994), define the non-accelerating wage rate of unemployment, NAWRU, in terms of a stylized wage-pressure equation

\[ \Delta w_t = -c_t (U_t - U_{t}^{NAWRU}), \quad c_t > 0 \]

where \( w_t = \Delta w_t \) denotes the rate of money wage growth in period \( t \), and \( U_t \) is the rate of unemployment and \( U_{t}^{NAWRU} \) is the NAWRU level of unemployment. In words, it is assumed that wage inflation is affected in a linear way by the difference between the actual level of unemployment and the NAWRU.

Based on an assumption that \( U_{t}^{NAWRU} \) is unchanged between consecutive observations, (1) is used to calculate the parameter \( c_t \), for each observation separately

\[ c_t = -\Delta^2 w_t / \Delta U_t. \]

Substituting the observation dependent parameter values \( c_t \) back into (1) the NAWRU is calculated as:

\[ U_{t}^{NAWRU} = U_t - (\Delta U_t / \Delta^2 w_t) \Delta w_t. \]

The raw NAWRU estimates as given by equation (3) are very volatile, cf. Figure 2, and published NAWRUs are based on Hodrick-Prescott filtering of these raw NAWRU estimates. Figure 3 records the NAWRUs that are cited in policy analysis discussions, see OECD (1997a), Economic Surveys for Norway and Sweden.

[Fig. 1 about here.]
The construction of the NAWRU indicators is thus based on a simple method, that captures the basic idea of the theoretical framework (that wage growth rises if unemployment is above its equilibrium level) in a neat way. However, real-world wage setting is not neat, and the problems associated with the NAWRU indicator are apparent at each step of its construction. First, according to theory, the effect of unemployment on wage growth is negative ($c_t$ is positive). In practice, however, wage growth and unemployment sometimes move in the same direction, rendering $c_t$ with the wrong sign. In our sample, this is the case for about one third of the observations for Denmark, Finland and Norway, and more than half for Sweden. Secondly, as $c_t$ is computed as a fraction, where the denominator (the change in the rate of unemployment) may be close to zero, it is highly volatile, inducing corresponding volatility in the raw NAWRU estimates.

As the NAWRU indicator is not derived by standard estimation methods, it eludes most of the standard design tests; there are no $R^2$, Durbin-Watson statistics, etc. However, this does not imply that the NAWRU indicator cannot be subject to empirical evaluation. First, consider within sample prediction. In the calculation of the raw-NAWRUs, the parameter $c_t$ is allowed to vary from observation to observation, so there is always a perfect fit. The weakest test is to check the sign of the predictions. Does money wage growth increase if actual unemployment is below the NAWRU? It turns out that for Norway and Sweden, the sign is wrong for about half of the observations; for Denmark and Finland the sign is wrong for more than one-third of the observations. This is illustrated in Figure 4, where the deviations of actual unemployment from the NAWRU are plotted against the changes in wage growth.

We also investigate the predictive power of the NAWRU indicator within a standard regression framework, i.e., regressing $\Delta w_g_t$ on $(U_t - U_t^{NAWRU})$, cf. equation (1). Note that assuming a constant parameter $c$ is not inconsistent with the underlying idea of the NAWRU framework, i.e., that the structural rate of unemployment may fluctuate over time. The results are unequivocal: Deviations of actual unemployment from the NAWRU are found to have virtually no predictive power for the change in wage growth. The ratio
between the residual standard error of regression (1) and the variance of
the $\Delta w g_t$ series is above one for all countries except Finland where it is
0.995, hence the NAWRU estimates explain nothing of the actual variation
in wage-acceleration.\textsuperscript{2} Not surprisingly, the estimated $c$-coefficients are all ill-determined: Denmark 0.008 (1.00), Finland 0.003 (1.25), Norway 0.001 (0.21), Sweden 0.006 (0.76), the numbers in parentheses are “t-values”. The
average point estimate is 0.0037 and the average t-value is 0.7.

The second part of our empirical evaluation of the NAWRU indicator con-
cerns the exclusion restrictions and is discussed in the light of the empirical
wage equations of the next section.

III. Empirical wage equations for the Nordic
countries

We use an equilibrium correction framework similar to that applied by e.g.,
Sargan (1964), Davidson et al. (1978) and Nymoen (1989a); the results draw
on the analysis of Rødseth and Nymoen (1999).\textsuperscript{3}

\begin{equation}
\Delta wc_t = \beta_0 - \beta_1 (wc - q - pr)_{t-1} - \beta_2 u_t + \beta_x'X_t + \varepsilon_t.
\end{equation}

The variables appearing in (4) are $wc = \log$ of hourly wage cost in manufac-
turing; $q = \log$ of the index of value added prices; $pr = \log$ of value added
labour productivity; $u = \log$ of the rate of unemployment. $\beta_x'X_t$ should be
viewed as a composite term that contains both growth rate variables, e.g., the
rates of change in the consumer price index, and variables that capture the
impact of changes in policy or in the institutional set-up. $\Delta$ is the difference
operator and $\varepsilon_t$ is a disturbance term.

\textbf{Estimation results}\textsuperscript{3}

Table 1 shows that wage growth in Norway is found to depend negatively
on the lagged wage share and of the level of open unemployment, and posi-
tively on the replacement ratio variable, $rpr_{t-1}$. The model is \textit{dynamically}
\textsuperscript{2}The ratios are 1.023 (Denmark), 0.995 (Finland), 1.034 (Norway) and 1.005 (Sweden).
Note that this ratio may exceed unity as there is no constant term in (1).
\textsuperscript{3}Holden and Nymoen (1998) contains a more detailed discussion of the results

6
homogenous, since the elasticities of the changes in the consumer and product price indices ($\Delta p_t$ and $\Delta q_t$) sum to unity (a test of this restriction yields $F(1, 21) = 0.03$, which is insignificant). Another empirically valid restriction is that the elasticities of growth in product prices and productivity are equal. Thus wage-setting adjusts to changes in value added, irrespective of whether the change originates in price or in productivity. The hours-variable ($\Delta h_t$) picks up the direct wage compensation in connection with reductions in the length of the working day, see Nymoen (1989b).

The estimated coefficient of the variable $\Delta lmp_t$ indicates that the active use of programmes in order to contain open unemployment reduces wage pressure—$lmp$ being the log of the share of open unemployment in total unemployment. The rate of total unemployment is defined as the sum of the number of persons on labour market programmes and the number of openly unemployed, divided by the labour force. Finally, there are two dummy variables in the Norwegian equation. $IP_t$ is designed to capture the effects of the wage-freeze in 1979 and the wage-laws of 1988 and 1989. $i67_t$ is a separate dummy which is 1 in 1967 and zero otherwise, due to a major reform of the social security system in Norway in that year.

Below the equation we report the estimation method (ordinary least squares, OLS), the sample length, $T$, the multiple regression coefficient, $R^2$, and the percentage residual standard error, $\hat{\sigma}$. $t_{ECM}$ is the t-value of the coefficient of the lagged wage share and is used here as a direct test of the hypothesis of no cointegration, see Kremers et al. (1992). Compared to the relevant critical values in MacKinnon (1991, Table 1) $t_{ECM} = -8.8$ gives formal support for cointegration between the wage-share, the rate of unemployment and the replacement ratio. This conclusion is supported by the results of multivariate cointegration methods, see Bårdsen et al. (2000).

[Table 1 about here.]

The remaining statistics are the F-forms of the test of first order residual autocorrelation, $F_{AR}$, and of heteroscedasticity due to squares of the

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4In comparison, Holden (1998) finds evidence of a floor on money wage growth at the central negotiations in the manufacturing sectors in the Nordic countries. The difference is related to (i) total wage growth vs central increase; (ii) wage growth on annual basis vs increase determined at the central negotiations, usually given as wage rate increase in the middle of the year.

5It is 1 in 1979 and 1988; 0.5 in 1980 and 1989.
regressors, $F_{\text{Het}, x^2}$, and a Chi-square test of residual normality, $\chi^2_M$, as implemented in PcGive, see Doornik and Hendry (1996a). Finally, we report two of Hansen’s (1992) statistics of parameter non-constancy: $\text{Stab}_\sigma(1)$ tests the stability of the residual standard error ($\sigma$) individually. $\text{Stab}_{\beta, \sigma}(10)$ tests the joint stability of $\sigma$ and the set regression coefficients ($\beta$). The degrees of freedom are in parenthesis, and, since the distributions are non-standard, the 5% critical values are reported in square brackets. Neither of the statistics are significant, which indicates that the empirical wage equation is stable over the sample.

The other countries’ equations in table 1 have several features in common with the Norwegian model: Dynamic homogeneity, strong effects of consumer price growth and of pay compensation for reductions of the length of the working week.

The **Swedish** equation contains just two levels variables, the rate of unemployment and the wage share. Unlike Norway, there is no effect of the replacement ratio; adding $\text{rpr}_t$ and $\text{rpr}_{t-1}$ to the equation yields $F(2, 23) = 1.1$, with a $p$-value of 0.36, for the joint null hypothesis of both coefficients being equal to zero. The insignificance of $\text{Stab}_\sigma(1)$ and $\text{Stab}_{\beta, \sigma}(6)$ indicates that the equation is stable over the sample period. We also tested the impact of intervention dummies that have been designed to capture the potential effects of the following episodes of active incomes policy and exchange-rate regime changes, see Calmfors and Forslund (1991) and Forslund and Risager (1994) (i.e., a “Post devaluation dummy”: 1983-85; Incomes policy: 1974-76 and 1985; Devaluation/decentralized bargaining: 1983-90). None of the associated dummies were even close to statistical significance when added to the Swedish equation in table 1.

The **Danish** and **Finnish** equations contain three levels variables; the replacement ratio, the unemployment level and the lagged wage share. In the Finnish model, the estimated coefficient of the lagged rate of unemployment is seen to be numerically rather insignificant, while the change in the rate of total unemployment ($\Delta \text{tu}_t$) have a much stronger effect. Both these features are consistent with previous findings, cf. Calmfors and Nymoen (1990) and Nymoen (1992).

The four wage equations are thus seen to be congruent with the available data evidence. We have also checked the robustness of the models, by testing the significance of potential “omitted variables”, e.g., the levels and the changes in the average income tax rates, and a composite “wedge” term, without finding any predictive power of these variables, see Holden and

Figure 5 confirms the stability of the equations already suggested by the insignificance of the $\text{Stab}_\sigma$ and $\text{Stab}_{\sigma,\beta}$ statistics. The column shows the 1-step residuals with $\pm 2$ residual standard errors, $\pm 2se$ in the graphs. The second column contains the estimated elasticities of the wage share, with $\pm 2$ estimated coefficient standard errors, denoted $\beta$ and $\pm 2\sigma$ in the graphs. All graphs show a high degree of stability, which stand in contrast to the instability of the NAWRU estimates.

**Encompassing tests**

As the NAWRU indicator is not based on an estimated wage equation, the NAWRU indicator cannot be evaluated directly in a standard encompassing test. However, a key prediction of the NAWRU-method, that the variable to be explained really is the change in the money wage growth (“high” unemployment leads to a reduction in wage growth, while “low” unemployment leads to increasing wage growth) can investigated within an encompassing framework. Thus, we estimate the nesting model, that encompasses both the specifications in table 1 and a pure NAWRU specification were lagged wage growth obtains a unit coefficient, while other coefficients, except the coefficient for unemployment, are equal to zero. A Wald test for general restrictions yields an overwhelming rejection of the restrictions according to the NAWRU-method, with $\chi^2$ test values from 80 and 550 (p-values less than 0.0000). In contrast, a Wald test for the restrictions imposed by our wage equations, a zero coefficient for lagged nominal wage growth and dynamic homogeneity, yields $\chi^2(2)$-test values from 0.36 to 2.93 (maximum p-value = 0.23, for Finland).

**A shift in the wage curve?**

The stability of the empirical wage equations does not preclude a shift in the wage curve in the employment - real wage space, i.e., if other explanatory variables have changed. To detect possible shifts in the wage curve due to the combined effect of all the explanatory variables, it is necessary to distinguish between shifts in the wage curve and movements along the curve.
To this end, we construct a new variable, the Average Wage-Share rate of Unemployment AWSU. This variable is defined as the rate of unemployment that (according to our estimated wage equations) in each year would have resulted in a constant wage-share in that year, if the actual lagged wage share were equal to the sample mean.

To clarify the calculation and interpretation of AWSU, consider a “representative” estimated wage equation

\[
\Delta(wc_t - p_t) = b_0 - b_1(wc - q - pr) - b_2 u_t + b_3 \Delta(q + pr - p)_t + b'_x X_t,
\]

where \(wc - q - pr\) is the sample mean of the wage share, and we recognize dynamic price homogeneity, a wage scope variable with estimated elasticity \(b_3\) and \(b'_x X_t\) which contains other, country-specific effects. Solving for \(u_t\) with \(\Delta(wc - q - pr)_t = 0\) imposed yields

\[
\begin{align*}
    u_t &= \frac{b_0}{b_2} - \frac{b_1}{b_2}(wc - q - pr) + \frac{b_3 - 1}{b_2} \Delta(q - p + pr)_t + \frac{b'_x}{b_2} X_t.
\end{align*}
\]

and the exponential of the left hand side of (6) is the AWSU. In the calculations of the AWSU, actual values are used for all the variables appearing in the estimated equations. Increased upward wage pressure (due to other factors than lower unemployment and lower lagged wage share) leads to a rise in the AWSU, because to keep the wage share constant the rate of unemployment must be higher.

The graphs of the AWSU for Denmark, Norway and Sweden are displayed in figure 6. Finland is omitted, because the very low estimated coefficient of lagged unemployment implies that the mapping of wage-pressure into unemployment is of little informative value. In the case of Denmark, the increase in the replacement ratio in the late 1960s explains the high AWSU estimates of the 1970s. In the 1990s, a reversion of the replacement ratio, and high growth in value added per man-hours, explain why AWSU falls below the actual rate of unemployment. For Norway and Sweden the AWSUs show quite similar developments: Periods when consumer price growth is rapid relative to growth in manufacturing value added per hour (the late 1970s and early 1980s), are marked by an increase in the AWSU. In the case of Norway, the replacement rate also contributes to the rise. However, the important overall conclusion to draw from the graphs is that there is little correlation between wage pressure (as measured by the AWSU) and unemployment; in particular
the rise in unemployment in the early 1990s cannot be explained by a rise in wage pressure.

IV. Summary and conclusions

In recent years, the OECD has measured the structural (or equilibrium) rate of unemployment by use of a specific method, the NAWRU indicator. In the Nordic countries, as well as in most other European countries, the NAWRU indicator has risen in line with the rise in actual unemployment. Thus, the NAWRU indicator has contributed to the view that the bulk of unemployment is structural. Furthermore, the NAWRU indicator is also used as an important part in the calculation of the output gap and the structural budget balance by the OECD. The OECD figures for the output gap and the structural budget balance are important elements in policy discussions by the OECD, as well as by national governments and independent policy observers.

The NAWRU indicator is, however, constructed by a very simplistic method. To explore the robustness of the method, we analyse the evolution of wages in the manufacturing sector in each of the Nordic countries to see whether our results are consistent with the evolution of the NAWRU indicator. Due to the increase in the NAWRU indicator, as well as the fact that many of possible explanations for the rising unemployment are related to the wage setting (cf. Bean (1994)), we would expect to find a change in wage setting behaviour that corresponds to the rise in unemployment. However, we find no changes in wage setting behaviour for any of the Nordic countries, nor do we detect changes in explanatory variables in the wage setting that can explain the rise in unemployment (as indicated by absence of an increasing trend in the AWSU indicator in Figure 6). The instability of the NAWRU indicator appears to be an artefact of a misspecified wage equation, and not due to instability in the wage setting itself.

A possible objection to our conclusions is that the NAWRU indicator is a short run concept, aimed at measuring the rate of unemployment at which money wage growth is stable. One cannot expect this short run concept to coincide with the long run equilibrium rate of unemployment, but it may nevertheless be of some interest. One problem with this argument is that the
NAWRU indicator is not a good measure even of the rate of unemployment at which money wage growth is stable. This is evident from its poor predictive power; as shown in section II., the NAWRU indicator has virtually no explanatory power even within sample. The reason is that the NAWRU indicator is based on a too restrictive view of actual wage setting. Whether money wage growth increases depend on a host of other explanatory variables than the rate of unemployment. For example, if inflation expectations have gone down, money wage growth may also be reduced even if unemployment is low. Or if the wage share is low, money wage growth may increase even if unemployment is high.

A second problem is that in important applications of the NAWRU, like the calculation of the structural budget balance and the output gap, it is not at all clear that stable money wage growth is the appropriate choice when determining the reference levels for unemployment and output. Consider a country where a temporary negative demand shock leads to a sharp rise in unemployment, but without affecting the long run equilibrium rate. The appropriate policy response to a temporary negative demand shock is presumably to stimulate demand via expansionary monetary and fiscal policy. However, if the NAWRU-indicator also increases, following the rise in the actual rate of unemployment, the output gap (as measured by the OECD method) will seem closed, and the structural budget balance will worsen. The closed output gap may lead to the belief that there is no scope for expansionary demand policy, and the worsened structural budget balance may be interpreted that fiscal policy should be tightened to avoid large public debt. In this hypothetical, but nevertheless not entirely unrealistic situation, the NAWRU-indicator would contribute to a faulty view that precludes an appropriate policy response.

Our study raises at least two crucial questions. First, if one accepts our conclusion that the wage setting in the Nordic countries has not changed, why did we observe high unemployment for the best part of the 1990s (i.e., in Finland and Sweden)? Secondly, why doesn’t the high unemployment lead to continuous reduction in wage growth? Our empirical investigation answers the second question. The idea that wage growth increases or decreases depending on whether unemployment is high or low, yields a bad description of real world wage setting. A high level of unemployment does have a dampening effect on wage growth. However, if the lower wage growth reduces the wage share, this counteracts the dampening effect of high unemployment.

The first question is more complex. Within an equilibrium rate of unem-
ployment framework, a rise in actual unemployment combined with a stable wage curve can be given two alternative interpretations: (i) Actual unemployment has risen, while equilibrium unemployment has remained constant; (ii) Equilibrium unemployment has risen due to a downward shift in the price curve. Interpretation (i) could be supported by the fact that in the Nordic countries aggregate demand has been weak over longish periods during the 1980s and the 1990s (first in Denmark, later in Norway, Finland and Sweden). Furthermore, the self-correcting mechanisms of the economy are probably weak, so that it may take long time before an economy reverts back to the long run equilibrium (Holden (1997)).

Interpretation (ii), that the price setting has changed, could perhaps be explained by the higher level of real interest rates internationally after 1980. A rise in the real interest rate induces a reduction in the use of capital, thus reducing demand for labour and shifting the price curve downwards, resulting in an increase in equilibrium unemployment. A shift in the price curve is also consistent with the reduction in wage shares that has taken place in most European countries, including the Nordic, over the last 15-20 years.6

As yet, these alternative explanations are little more than speculative thoughts. However, the results of our study strongly suggest that one should broaden the view, and also look for explanations of high unemployment that do not focus solely on a malfunctioning labour market.

A Data

All data are taken from the database on Nordic wage formation documented by Evjen and Langset (1997). The data can be obtained from http://www.uio.no/~rnymoen. In brackets, we give the variable’s name in Evjen and Langset’s database, and the transformations we use in the estimated equations.

The inclusion of labour market programmes among the explanatory variables of wage growth makes it important to avoid double counting of the unemployed. For that reason we use unemployment registered at the employment offices instead of labour force survey data.

6Obviously, one can view this explanation from a different angle, attributing the rise in unemployment to wage setting not being able to accommodate the shift in the price setting.
• $wc = \log$ of wage costs per hour in manufacturing. [Source variable: $WC, 1970 = 100$] : Transformation: $wc = \ln(WC/100)$.

• $p = \log$ of the consumer price index [Source variable: $CPI, 1970 = 100$, Transformation: $p = \ln(CPI/100)$].

• $q = \log$ GDP deflator for manufacturing [Source variable: $P, 1970 = 1$. Transformation: $q = \ln(P/100)$].

• $pr = \log$ of average labour productivity in manufacturing [Source variable: $PR, 1970 = 100$. Transformation: $pr = \ln(PR/100)$].

• $h = \log$ of normal weekly working hours. [Source variable: Denmark: $H$, Finland $H$, Norway: $HR$, Sweden: $HR$. Transformation: $h = \ln(H)$ and $hr = \ln(HR)$].

• $rpr = \log$ of replacement rate [Source variable: $RPR$. Transformation: $rpr = \ln(RPR)$].

• $u = \log$ of open unemployment (registered unemployed) in per cent of labour force [Source variable: $U$. Transformation: $u = \ln(U)$].

• $tu = \log$ of total unemployment (registered unemployed plus participants in active labour market programmes) in per cent of labour force [Source variable: $TUPR$. Transformation: $tu = \ln(TUPR)$].

• $lmp = \log$ of one minus the fraction of total unemployed who are participating in active labour market programmes. Yearly average.[Source: $AMUN$. Transformation: $lmp = \ln(1 - AMUN/100)$].

• $IP = \text{Dummy for income policy in Norway.} 1 \text{ in 1979. 0.5 in 1980. 1 in 1988 and 0.5 in 1989.}$

References


### List of Figures

1. Equilibrium unemployment, $U^*$ ........................................ 2
2. Actual rates of unemployment and “raw” NAWRUs for the four Nordic countries ......................................................... 3
3. Actual rates of unemployment (U) and NAWRUs for the four Nordic countries ................................................................. 4
4. Cross plots of change in wage growth, $\Delta w_t$ (vertical axis) and $(U_t - U_t^{NAWRU})$ (horizontal axis) ........................................... 5
5. Recursive stability of Nordic wage equations ......................................................... 6
6. Unemployment and the Average Wage-Share rates of Unemployment (AWSU; see explanation in text) ........................................... 7
Fig. 1. Equilibrium unemployment, $U^*$
Fig. 2. Actual rates of unemployment and “raw” NAWRUs for the four Nordic countries.
Fig. 3. Actual rates of unemployment (U) and NAWRUs for the four Nordic countries.
Fig. 4. Cross plots of change in wage growth, $\Delta w_{gt}$ (vertical axis) and $(U_t - U_t^{NAWRU})$ (horizontal axis).
Fig. 5. Recursive stability of Nordic wage equations.
Fig. 6. Unemployment and the Average Wage-Share rates of Unemployment (AWSU; see explanation in text).
List of Tables

1 Manufacturing sector wage equations. 9
### Table 1. Manufacturing sector wage equations.

<table>
<thead>
<tr>
<th>Country</th>
<th>Equation</th>
<th>Method: OLS</th>
<th>$T$</th>
<th>$R^2$</th>
<th>$\hat{\sigma}$</th>
<th>$\chi^2_N(2)$</th>
<th>$F_{AR}(1, 22)$</th>
<th>$F_{HET,x^2}(15, 6)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Norway</td>
<td>$\Delta(wc_t - p_t-1) = -0.584 + 0.446 {0.5\Delta_2(q + pr)_t - \Delta p)_t-1} - 0.276 \Delta h_t$</td>
<td>OLS</td>
<td>31</td>
<td>0.98</td>
<td>0.58%</td>
<td>0.19</td>
<td>2.03</td>
<td>0.55</td>
</tr>
<tr>
<td></td>
<td>$- 0.0286 , u_t + 0.109 , \Delta mp_t - 0.2183 (wc_{t-1} - q_{t-1} - pr_{t-1})$</td>
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<tr>
<td></td>
<td>$+ 0.075 , rpr_{t-1} + 0.039 , i67_t, - 0.054 , IP_t$</td>
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</tr>
<tr>
<td></td>
<td>Method: OLS</td>
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<tr>
<td>Sweden</td>
<td>$\Delta(w_t - p_t-1) = -0.157 + 0.360 {\Delta(q + pr)_t - \Delta p)<em>t-1} - 0.849 \Delta h</em>{t-1}$</td>
<td>OLS</td>
<td>30</td>
<td>0.854</td>
<td>1.49%</td>
<td>0.01</td>
<td>0.04</td>
<td>0.43</td>
</tr>
<tr>
<td></td>
<td>$- 0.042 , u_{t-1} - 0.273 (wc_{t-1} - q_{t-1} - pr_{t-1})$</td>
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<tr>
<td>Finland</td>
<td>$\Delta(wc - p)<em>t = 0.110 + 0.111 , rpr_t - 0.070 , \Delta tu_t - 0.008 , u</em>{t-1}$</td>
<td>OLS</td>
<td>33</td>
<td>0.809</td>
<td>1.17%</td>
<td>0.36</td>
<td>0.57</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td>$- 0.146 (wc_{t-1} - q_{t-2} - pr_{t-2})$</td>
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<tr>
<td>Denmark</td>
<td>$\Delta(wc - p)_t = -0.032 - 0.644 \Delta_2 h_t + 0.428 \Delta(q + pr - p)<em>t - 0.0322 u</em>{t-1}$</td>
<td>OLS</td>
<td>27</td>
<td>0.85</td>
<td>1.51%</td>
<td>2.15</td>
<td>3.53</td>
<td>0.79</td>
</tr>
<tr>
<td></td>
<td>$- 0.336 (wc_{t-1} - q_{t-1} - pr_{t-2}) + 0.150 , rpr_{t-1}$</td>
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