Unemployment, Labour Market Programmes and Wages in Norway*

Oddbjørn Raaum†

Foundation for Research in
Economics and Business Administration

Fredrik Wulfsberg‡

Research Department, Norges Bank

February 20, 1998

Abstract

The Norwegian authorities pursue active labour market policies to fight unemployment by qualifying the unemployed in a wide range of programmes. We discuss theoretically and investigate empirically the effects such policies might have on the wage curve using a panel of more than 5400 Norwegian firms and regional unemployment figures. Total unemployment is a better predictor of wage pressure than open unemployment. The wage flexibility is reduced when we control for labour market programmes. The results support the view that labour market programmes shift the wage curve downwards and hence increase the equilibrium employment.

JEL Classification: C23, J38.
Keywords: Active labour market policy, wages, panel data.

1 Introduction

Recent developments in the theory of equilibrium unemployment have focused on the importance of real wage flexibility, i.e. to what extent real wages respond to aggregate unemployment. Comparative studies of wage formation and unemployment often claim that the low unemployment rates in Sweden and Norway until recently can partly be explained by the high responsiveness of real wages, see Alogouskoufis and Manning (1988) and Calmfors and Nymoen (1990). This view is controversial, as empirical studies present very different estimates of the real wage responsiveness. Low unemployment in the Nordic countries is also attributed to the active labour market policies (ALMPs) which are strongly advocated by the OECD (OECD (1994)). Such policies influence equilibrium unemployment in numerous ways: search effectiveness, matching, productivity and through wage formation, see Calmfors (1994). Although the OECD countries on average spend 1% of GDP on ALMPs, the empirical evidence on their beneficiary effects on the labour market is mixed. Among the OECD countries Sweden and Norway stand out as economies where the use of ALMPs play a major role in fighting unemployment. Hence, there are important lessons to learn from the experiences in these countries where unemployment soared in the late 80s and early 90s.

Wage bargaining theories as well as efficiency wage models, predict that the number of not-employed job seekers affects real wage pressure. In Norway, labour market programme participants represent a large fraction of not-employed workers. Recent studies of wage formation in the Nordic countries, in Sweden in particular, have focused on how the composition of the not-employed, i.e. the fraction of participants on labour market programmes relative to unemployment, influences wage formation. Two opposing, but not mutually exclusive views, dominate the literature. The *job competition* argument emphasized by for example Layard *et al.* (1991), claims that labour market programmes have positive effects on the re-employment prospects for participants through enhancement of skills, motivation and labour force participation. As labour market programmes raise the search effectiveness and the productivity of not-employed workers, job competition is increased and real wages lowered.

The opposing view points out that labour market programmes *reduce the welfare loss* experienced by laid-off workers as long as programmes are preferred to unemployment by the non-employed, see for example Calmfors and Forslund (1991). Most wage bargaining models then predict that the existence of labour market programmes cause unions to raise wage claims and obtain a higher wage. Calmfors and Lang (1995) demonstrate that the job competition and the welfare loss effects may both be present. Thus, the total effect on real wages is ambiguous.

The comparative study by Calmfors and Nymoen (1990) finds that the Norwegian real product wage is highly responsive to unemployment, but in contrast to Sweden there is no evidence of wage-raising effects of labour market programmes in macro data for l963–1987. The first of a substantial number of Swedish studies, report fairly

strong wage-raising effects of labour market programmes, see Calmfors and Forslund (1990), (1991) and Skedinger (1990). Recent studies on panel data, however, do not confirm these results. On the contrary, labour market training programmes tend to reduce wage pressure while relief work programmes (temporary public jobs) have an insignificant wage effect, see Edin *et al.* (1995) and Forslund (1993). Although the total Swedish evidence is mixed, Calmfors (1993) claims that the majority of these studies find that a higher participation rate, holding total unemployment constant, raises wage pressure.

This paper focuses on how wages respond to labour market conditions in Norway, with emphasis on whether the composition of the stock of not-employed job seekers affects the wage. Based on a panel of 5428 manufacturing firms in the period 1980–1991 and region specific information on the labour market, we estimate equilibrium correction models of the wage curve.

Before we reach the conclusions we start by providing some empirical background to the Norwegian labour market followed by a presentation of a model that illustrate the possible effects of ALMPs on wage formation.

2 Unemployment and labour market programmes in Norway

The Norwegian unemployment rate was fairly stable from 1960 until 1980, only varying between 1.4% and 2.2%, (OECD, Economic Outlook). The unemployment rate then peaked in 1983 at 3.4% for then to return to the previous low level by 1986. From 1988–89 unemployment again rose dramatically and stabilized around 5.5% in the 1990s. However, these numbers illustrate open unemployment, i.e. not including persons on labour market programmes. In our empirical study we use unemployment figures based on registered full-time unemployed at the labour offices, and labour market programme participants for the 19 Norwegian counties, 1980–1991.

There is a significant variation in unemployment as well as labour market programmes across regions and over time. Table 1 presents summary statistics for unemployment and labour market programme participation. We see that the participation rate which is the fraction of participants in labour market programmes relative to the labour force, is on average almost one third of total unemployment. There is also relatively more variation in the participation rate than in open unemployment. The accommodative stance which is defined as the ratio between the participation rate and total unemployment rate, is a measure of the authorities' level of ambition for active labour market policies. A more ambitious government will increase the relative importance of labour market policies by moving open unemployed to labour market programmes. The stance varies substantially from 8.5% to 54.5% across counties over time.

Figure 1 shows that the total unemployment rate varies significantly more across counties than does open unemployment, especially in years of high unemployment.

3

Table 1: Summary statistics of regional unemployment and labour market programmes in Norway 1980–1991. Percent.

Variable	Mean	Std. dev.	Min	Max
Open unemployment rate	3.4	1.6	0.3	6.8
Participation rate	1.4	1.1	0.1	5.9
Total unemployment rate	4.7	2.6	0.4	11.0
Participation – open unemployment ratio	36.8	17.9	9.3	119.6
Accommodative stance	25.8	8.6	8.5	54.5

The authorities allocate the labour market programmes such that regions with relatively high total unemployment are given priority.[1] Hence, open unemployment may be a biased proxy for labour market pressure since it understates the differences in regional labour market conditions.[2]

Programme participants include persons on 'ordinary individual programmes', which are conventionally divided into four groups (percentage of all participants in 1991 in parentheses); (i) Labour market training (42%), (ii) Vocational training programmes for youths (28%), (iii) Temporary jobs in the public sector (21%) and (iv) Wage subsidies (9%). The composition varies cyclically and training programmes become more important when the total programme expands.[3]

Programme compensation is generally around the level of the unemployment benefit. The programmes are targeted at youths and long-term unemployed, although labour market training courses frequently recruit participants with a short unemployment record, see for example Raaum and Torp (1993). Relatively few participants, however, enrol the Norwegian labour market programmes directly from employment.

2.1 Wage bargaining institutions

Rødseth and Holden (1990) describe the Norwegian labour market institutions and their history in greater detail. We will just give a brief introduction. The Norwegian economy is usually characterized as highly centralized, see for example Bruno and Sachs (1985), Calmfors and Driffill (1988) and Layard *et al.* (1991). There are wage negotiations at the national level, unionization is relatively high and the authorities have at several occasions interfered in the negotiations between the labour unions

---

[1]However, the rank correlation between open and total unemployment (sorted by year) is 0.9995, indicating that the regions with high total unemployment also have high open unemployment.

[2]Fjørtoft (1994) describes details on the regional distribution of labour market programmes in Norway.

[3]Further information on these programmes are provided in an appendix which is available from the authors upon request.
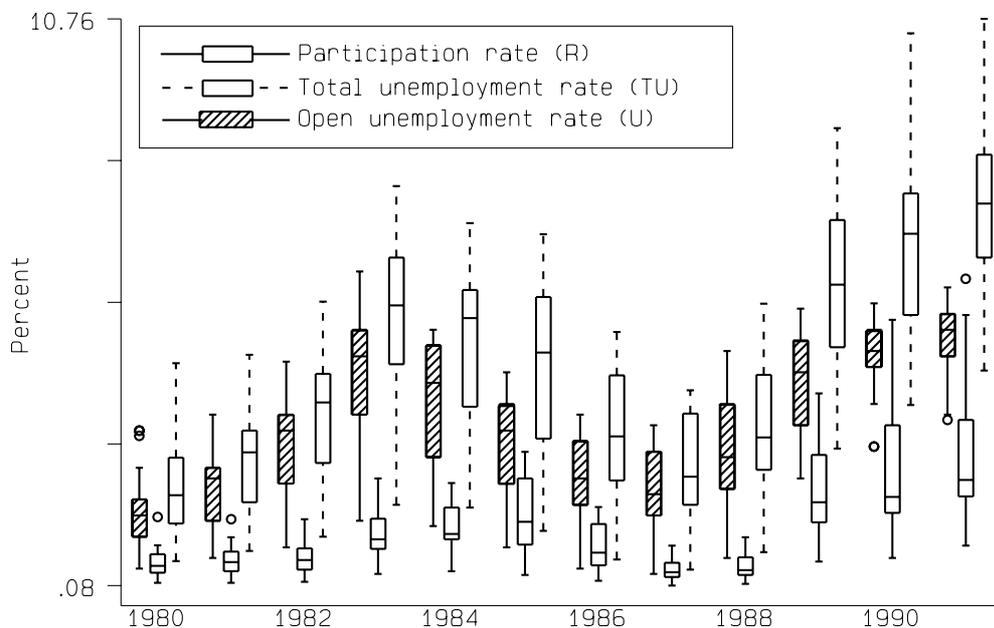
Figure 1: The distributions of the open unemployment rate, the participation rate and the total unemployment rate between regions by year. The horisontal line within the box is the median, while the upper and lower limits of the box is the 75 and 25 percentiles respectively. The whiskers and dots describe the outliers.

and the employers' confederations, either as a third part or as a mediator. Our data cover the manufacturing sector which is considered to be wage leading, i.e. the bargained tariff in this sector functions as a norm for the rest of the economy. The main organisations are LO which organizes blue collar workers, and their counterpart NHO. In 1988–89 there was a legislative ceiling on wage increments and local wage bargaining was prohibited. There are reasons to believe that this was initiated by LO, or at least it was a direct result of the LO–NHO central agreement in 1988. Furthermore, Norwegian union leaders frequently argue that extensive labour market programmes is a necessary condition for the success of income policies which involve moderate wage claims in the central negotiations.

Nevertheless, wage bargaining in the manufacturing sector typically takes place at both national and local levels. First, national organizations bargain over wage increments (tariff wage increases). These national negotiations are biannual with an intermediate adjustment. The central bargaining is followed by annual firm level negotiations over local adjustments resulting in wage drift.[4] The organizations have

---

[4]The wage drift is computed as a residual subtracting the tariff from the total wage increase. Hence there are also other factors than local bargaining that influence wage drift e.g. structural

agreed that strikes and lock-outs are allowed in the bargaining at national level, but not at the local level. Our data do not allow for a distinction between tariff increases and wage drift, thus the focus is on total wages.

Before we go on to investigate the Norwegian data, we outline a static model that captures the main characteristics of wage bargaining models and incorporates mechanisms by which labour market programmes might affect the outcome.

3   Theoretical model

Our model illustrates along the lines of for example Calmfors and Forslund (1991), the main arguments on how labour market programmes might affect wage formation in an economy with wage bargaining. We assume that the wage is determined by bargaining between the firm and the union, both indexed by i. The employer unilaterally sets employment given the outcome of the bargaining which is consistent with standard practice in the Norwegian labour market. The union seeks to maximize the expected utility of the representative union member which is given by

$$V_i = (1 - \ell_i)\, \widetilde{V}_i\left(\frac{W_i}{P}\right) + \ell_i \overline{V}_i \tag{1}$$

where ℓ_i denotes the lay-off probability, $\widetilde{V}_i\left(\frac{W_i}{P}\right)$ is the utility for a member who keeps her job which depends on the real wage $\left(\frac{W_i}{P}\right)$ where W_i is the nominal wage. P is an aggregate price index which is exogenous both to the union and the firm. $\overline{V}_i$ is the expected utility for a laid-off worker. The objective for the firm is to maximize real profits[5] given as

$$\Pi_i = Q_i\left(N_i\right) - \left(\frac{W_i}{P}\right) N_i$$

where $Q_i\left(N_i\right)$ is the real revenue function and N_i is employment. The bargained nominal wage is assumed to be the outcome of the Nash bargaining solution:

$$W_i = \mathsf{argmax}\left[\left(V_i - V_i^0\right)^{\beta}\left(\Pi_i - \Pi_i^0\right)^{1-\beta}\right] \tag{2}$$

$$\mathrm{s.t.} N_i = N_i\left(\frac{W_i}{P}\right) \text{ and } \ell_i = \ell_i\left(\frac{W_i}{P}\right)$$

where β is the bargaining power of the union and V_i^0 and Π_i^0 are the union and firm disagreement pay-offs respectively. We assume that the outcome of the wage bargaining is larger than any outside option. $N_i\left(\frac{W_i}{P}\right)$ is the labour demand curve

---

change in the employment skills.

[5]We assume no efficiency wage effects for simplicity. Such effects might coexist with wage bargaining and be a second channel for labour market conditions to influence wages.

with $N_i' < 0$. The lay-off probability depends positively on the wage, $\ell_i' > 0$. Assuming an interior solution to (2) the wage function is given by the first order condition:

$$\Phi\left(\frac{W_i}{P}, \overline{V}_i\right) = \beta\frac{(1-\ell_i)\,\widetilde{V}_i'\left(\frac{W_i}{P}\right) - \ell_i'\left(\widetilde{V}_i\left(\frac{W_i}{P}\right) - \overline{V}_i\right)}{(1-\ell_i)\,\widetilde{V}_i\left(\frac{W_i}{P}\right) + \ell_i\overline{V}_i - V_i^0} + (1-\beta)\frac{\Pi_i'}{\Pi_i - \Pi_i^0} = 0 \tag{3}$$

Labour market conditions influence the wage through the expected utility of laid-off workers, $\overline{V}_i$. Since $\partial\Phi/\partial\left(W_i/P\right) < 0$ by the second order condition, it follows that $\operatorname{sign}\partial\left(W_i/P\right)/\partial\overline{V}_i = \operatorname{sign}\Phi_{\overline{V}_i}$. In general we have

$$\Phi_{\overline{V}_i} = \beta\left\{\frac{\ell_i'\left[\widetilde{V}_i\left(\frac{W_i}{P}\right) - V_i^0\right] - \ell_i\left(1-\ell_i\right)\widetilde{V}_i'\left(\frac{W_i}{P}\right)}{\left(\left(1-\ell_i\right)\widetilde{V}_i\left(\frac{W_i}{P}\right) + \ell_i\overline{V}_i - V_i^0\right)^2}\right\}$$

Although the sign of $\Phi_{\overline{V}_i}$ is generally ambiguous, we assume throughout the paper that $\Phi_{\overline{V}_i} > 0$, implying that an increase in expected utility of an non-employed union member raises the bargained wage.[6]

In order to examine the effects of labour market programmes on $\overline{V}_i$, we assume that laid-off workers go to one of three alternative states with different utility levels. First, they might become employed elsewhere receiving the alternative wage $(\overline{W}_i)$. Second, they might enrol a labour market programme which gives them a real compensation level, A. Lastly they might be unemployed and obtain real unemployment benefit, B.

Active labour market policies influence the transition probabilities between these states, as well as the utilities associated with each state. The expected utility of a laid-off worker is a weighted average of the utilities in these three states:

$$\begin{aligned}\overline{V}_i &= \Upsilon\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right) + \Gamma\widetilde{V}_i\left(A\right) + \left(1-\Upsilon-\Gamma\right)\widetilde{V}_i\left(B\right)\\ &= \widetilde{V}_i\left(B\right) + \Upsilon\left[\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right) - \widetilde{V}_i\left(B\right)\right] + \Gamma\left[\widetilde{V}_i\left(A\right) - \widetilde{V}_i\left(B\right)\right]\end{aligned} \tag{4}$$

---

[6]Special cases: (i) Monopoly union $(\beta = 1)$ implies $\Phi\left(\frac{W_i}{P}, \overline{V}_i\right) = (1-\ell_i)\widetilde{V}_i'\left(\frac{W_i}{P}\right) - \ell_i'\left(\widetilde{V}_i\left(\frac{W_i}{P}\right) - \overline{V}_i\right) = 0$ and $\Phi_{\overline{V}_i} = \ell_i' > 0$. (ii) A common assumption is that status quo utility of the union equals the pay-off for the non-employed workers $(\overline{V}_i = V_i^0)$ which implies $\Phi = \beta\left[\frac{\widetilde{V}_i'\left(\frac{W_i}{P}\right)}{\widetilde{V}_i\left(\frac{W_i}{P}\right) - \overline{V}_i} - \frac{\ell_i'}{(1-\ell_i)}\right] + (1-\beta)\frac{\Pi_i'}{\Pi_i - \Pi_i^0} = 0$ and thus $\Phi_{\overline{V}_i} > 0$.

7

where Υ is the probability of re-employment outside the firm and Γ is the probability of becoming a programme participant. $\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right)$, $\widetilde{V}_i(A)$ and $\widetilde{V}_i(B)$ are utilities corresponding to the states of being re-employed, being a programme participant and being unemployed, respectively. We assume that $\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right) > \widetilde{V}_i(A) > \widetilde{V}_i(B)$. The best alternative is being re-employed as the labour market programme compensation and the unemployment benefit are typically less than the alternative wage. The representative laid-off worker prefer to participate in a program to being unemployed partly because compensation is in some cases higher, and partly because employers may pay attention to qualifications obtained in these programmes. Most labour market programmes in Norway have been rationed, indicating that $\widetilde{V}_i(A) > \widetilde{V}_i(B)$ for the representative laid-off worker. Labour market programmes affect the wage only if the utilities vary across states and if the transition probabilities are influenced by the composition of not-employed workers.

The re-employment probability (Υ) is assumed to be increasing in the employment rate and decreasing in the average job search effectiveness of the not-employed:

$$
\begin{aligned}
\Upsilon &= \Upsilon\left(\frac{N}{\overline{L}}, c_u\left(\frac{U}{U+R}\right) + c_r\left(\frac{R}{U+R}\right)\right) \\
&= \Upsilon\left(1 - U - R, c_u + (c_r - c_u)\left(\frac{R}{U+R}\right)\right) \qquad \Upsilon_1 > 0, \Upsilon_2 < 0 \qquad (5)
\end{aligned}
$$

where c_u and c_r are indicators of the job search effectiveness of the unemployed and labour market programmes participants respectively. U is the open unemployment rate and R is the participation rate, both relative to the labour force ($\overline{L}$). Hence, $c_u + (c_r - c_u)\left(\frac{R}{U+R}\right)$ denotes the average job search effectiveness of the non-employed. If participants are more efficient job seekers than unemployed, i.e. $c_r > c_u$ an increase in the participation rate *cet. par.* will increase the average search efficiency and hence reduce the re-employment probability. Calmfors and Lang (1995) stress that targeting programmes on long term unemployed and persons entering the labour market for the first time is important for this effect.

Equation (5) in combination with $c_r > c_u$ assumes that successful labour market programmes raise employability of job seekers through enhancement of skills and motivation. The micro evidence on the individual employment effects of Norwegian labour market programmes is mixed, but various studies indicate that some unemployed increase their re-employment probabilities through programme participation, see Try (1993), Torp (1994), Raaum *et al.* (1994) and Raaum *et al.* (1995). On the other hand, direct outflows from labour market programmes to employment are lower than from unemployment, see Hernæs and Strøm (1994) and Raaum and Torp (1993) who find that few participants in such programmes go to ordinary employment during the training period. The influence of active labour market policies on average job search effectiveness is therefore ambiguous.

8

The probability of entering a programme for a laid-off worker (Γ) depends on the accommodative stance, $\frac{R}{U+R}$:

$$\Gamma = \Gamma\left(\frac{R}{U+R}\right) \qquad \Gamma_1 > 0 \tag{6}$$

The stance variable is a crude measure of the degree of rationing in labour market programmes. If a not-employed person prefers open unemployment to joining a labour market programme, the stance may overestimate the rationing. However, it is reasonable to assume that the participation probability increases with the stance.

We now look at the effects of programmes and unemployment on the wage curve. From (3) we see that programmes and open unemployment affect the wages through the expected utility of the not-employed, or laid-off, workers. Three effects are present. First, a rise in unemployment or programmes, reduces the re-employment probability of laid-off workers because of lower employment. Secondly, changes in open unemployment or programme participation will affect the probability of entering a programme and thus the expected utility, provided that utility of the two alternative non- employment states are different ('welfare loss effect'). Thirdly, the re-employment probability change if unemployment or programmes affect the average search efficiency of the not-employed ('job competition effect').

Consider the impact of increasing the number of places on programmes, holding open unemployment constant. This describes a situation where a fall in employment is fully offset by an increase in the number of programme participants. The total effect on the expected utility of a laid-off worker is

$$\frac{\partial \overline{V}_i}{\partial R} = \underset{(+)}{-\Upsilon_1}\left[\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right) - \widetilde{V}_i(B)\right] + \underset{(+)}{\Gamma_1}\frac{U}{(U+R)^2}\left[\widetilde{V}_i(A) - \widetilde{V}_i(B)\right]$$
$$+ \underset{(-)}{\Upsilon_2}(c_r - c_u)\frac{U}{(U+R)^2}\left[\widetilde{V}_i\left(\frac{\overline{W}_i}{P}\right) - \widetilde{V}_i(B)\right] \tag{7}$$

The first term of (7) relates to the lower re-employment probability following fewer jobs and will have a negative effect on the wage. The second term contains a wage-raising effect of programmes, if these are preferred to open unemployment by the not-employed workers. The third term arises from the effect programmes may have on the average search efficiency of the not-employed. If $c_r > c_u$, job competition is increasing in the number of participants on programmes and this contributes to a lower wage.

The impact of higher open unemployment on $\overline{V}_i$, keeping programme participation constant, involves the same three effects, although the signs of the latter two

are reversed

$$
\frac{\partial \overline{V}_i}{\partial U} = \underset{(+)}{-\Upsilon_1} \left[\widetilde{V}_i \left(\frac{\overline{W}_i}{P} \right) - \widetilde{V}_i (B) \right] - \underset{(+)}{\Gamma_1} \frac{R}{(U+R)^2} \left[\widetilde{V}_i (A) - \widetilde{V}_i (B) \right]
$$

$$
\underset{(-)}{-\Upsilon_2} (c_r - c_u) \frac{R}{(U+R)^2} \left[\widetilde{V}_i \left(\frac{\overline{W}_i}{P} \right) - \widetilde{V}_i (B) \right] \qquad (8)
$$

Fewer jobs lower the re-employment probability with a negative effect on the wage, while more competition for labour market programmes reduces the probability of entering a programme. Lastly, the average search effectiveness falls if $c_r > c_u$ and this will dampen, and perhaps reverse the fall in the re-employment probability of laid-off workers.

The vast majority of programme participants are recruited from the pool of unemployed. The impact of increasing the number of programme slots on the wage, at a given employment level, involves two effects

$$
\left. \frac{\partial \overline{V}_i}{\partial R} \right|_{U+R=const} = \frac{\partial \overline{V}_i}{\partial R} - \frac{\partial \overline{V}_i}{\partial U} =
$$

$$
\frac{1}{U+R} \left\{ \underset{(+)}{\Gamma_1} \left[\widetilde{V}_i (A) - \widetilde{V}_i (B) \right] + \underset{(-)}{\Upsilon_2} (c_r - c_u) \left[\widetilde{V}_i \left(\frac{\overline{W}_i}{P} \right) - \widetilde{V}_i (B) \right] \right\} \qquad (9)
$$

The two terms in (9) relate to the 'welfare loss' and the 'job competition' effects of labour market programmes. More programmes increase the individual probability of entering a programme and the welfare loss of being laid off is lowered. On the other hand, if increased participation on a programme raises the average search effectiveness of not-employed workers, it will be more difficult to obtain re-employment and the expected utility of laid-off workers will fall. Note there is no direct effect on the re-employment probability in (9) as the total number of not-employed workers (and employment) is constant.

An important goal of most labour market programmes is to prevent that long term unemployed become discouraged and drop out of the labour force permanently. In our model the size of the labour force is exogenous, thus effects on the labour force are not included. If labour market programmes reduce the flow of not-employed out of the labour force, job competition will be stimulated, the re-employment probability of redundant workers will decrease thus dampening wage pressure. On the other hand, the reduced risk of laid-off workers dropping out of the labour force will tend to raise wages if the utility of early retirement is lower than the utility in alternative states, see Calmfors and Lang (1995).

In our meticulous theoretical discussion we focused on illustrating the competing arguments on the effects of labour market programmes. The composition of the not-employed labour force may affect wages, but several opposing effects make the

total impact ambiguous. However, a fall in regular employment is likely to reduce the wage, even if the increase in redundancies is met by absorbing these people into labour market programmes. An expansion of labour market programmes which transfers job seekers from open unemployment to labour market programmes are more likely to be wage reducing if the programmes raise employability of the participants, are targeted on persons at high risk of dropping out of the labour force, and the smaller the compensation on programmes is.

The net effect of labour market programmes on wages and unemployment is thus to be investigated and determined empirically in the next section.

4   Empirical wage equations

Without assuming any functional form of the union utility function or the revenue function we obtain an implicit real wage function from (3)

$$\frac{W_i}{P} = W_i\left(\overline{V}_i, \ell_i, N_i\right) = W_i\left(U, R, \overline{W}_i, A, B, N_i, P\right) \tag{10}$$

To derive a suitable empirical specification of (10) we have to make assumptions on the functional form and the variables involved. First, we omit A and B which have been stable over the period of interest, nor do they vary in the cross-section dimension. Second, in the theoretical model we did not distinguish between consumer and producer prices, nor did we include any taxes on labour or income. These variables creates a wedge between after tax real consumer wage and real producer labour cost which might induce real wage resistance. However, we have chosen not to include any wedge variables. When the union utility function is either iso-elastic or risk neutral the wedge does not affect wage cost (see Nickell and Wadhwani (1990)). From an empirical point of view, it is hard to claim that there exists a long run relationship between employment and the wedge. Therefore, the wage cost can not be affected by the wedge. Wulfsberg (1995) does not find real wage resistance using similar data from a different period. On the other hand, using time dummies as regressors will control for *inter alia* wedge effects which we shall return to in due course. Third, the internal variables; employment, producer prices and productivity are proxied by sales per employee which we shall call nominal productivity. Sadly, the data does not contain information on firm specific prices.

Taking these considerations into account we assume a log linear empirical model following the tradition in the literature. Furthermore, as we want to estimate wage equations allowing for flexible effects of labour market programmes, we consider two alternative specifications which are

$$w_i = c_1 + \gamma_1(p + y - n)_i + \gamma_2\overline{w}_i + \xi_1 u + \xi_2 r \tag{11}$$

11

and

$$w_i = c_1^* + \gamma_1^*(p + y - n)_i + \gamma_2^* \overline{w}_i + \xi_1^* tu + \xi_2^* (r - tu) \qquad (12)$$

Small letters denote logarithms, p is the output price and y is output. u is the open unemployment rate and tu is the total unemployment including participants on labour market programmes, $tu = \log(U + R)$. $r - tu$ is thus the accommodative stance.

Equations (11) and (12) are non-linear transformations of each other and thus alternative specifications to investigate the effect of participants on labour market programmes on wages. Model (11) is suitable to test whether participants on programmes have the same effect on wage formation as regularly employed or in other words that only open unemployment matters ($\xi_2 = 0$). On the other hand, model (12) is suitable to test the hypothesis that participants on labour market programmes have the same effect on wage formation as openly unemployed or that only total unemployment matters ($\xi_2^* = 0$).

The two specifications imply that labour market programmes have different effects on wages. Keeping the open unemployment rate constant, the effect on wages of increasing the number of participants is independent of the open unemployment level in model (11) while decreasing in model (12). For a given level of total unemployment, the effect on wages of increasing the number of participants depends positively on the open unemployment level in model (11) while the effect is independent of the open unemployment in model (12).[7] There are no *a priori* arguments which strongly advocates one specification to the other hence we shall investigate both.

It is also common to impose the long run homogeneity restriction $\gamma_1 + \gamma_2 = 1$ in (11) (and $\gamma_1^* + \gamma_2^* = 1$ in (12) respectively), saying that nominal wages increase proportionally with alternative wages ($\overline{w}$) and nominal productivity ($p + y - n$). In this case (11) and (12) can be interpreted as a steady state solutions to equilibrium correction models (ECM) with the wage share ($w - (p + y - n)$), and relative wage ($w - \overline{w}$), as equilibrium correction terms. The ECM corresponding to (11) is

$$\begin{aligned}
\Delta w_{it} = \ & f_i + \alpha_0\left(\Lambda\right)\Delta w_{it} + \alpha_1\left(\Lambda\right)\Delta(p + y - n)_{it} + \alpha_2\left(\Lambda\right)\Delta\overline{w}_{it} \\
& + \beta_1\left(w - (p + y - n)\right)_{i(t-1)} + \beta_2\left(w - \overline{w}\right)_{i(t-1)} \\
& + \lambda_1\left(\Lambda\right)u_{it} + \lambda_2\left(\Lambda\right)r_{it} + \varepsilon_{it}
\end{aligned} \qquad (13)$$

where $\alpha_m\left(\Lambda\right)$ and $\lambda_m\left(\Lambda\right)$ are polynomials of the lag operator. f_i is an unobserved firm specific time constant effect and ε_{it} is an error term assumed to be independently distributed with zero mean and constant variance. Substituting u with tu and r with $(r - tu)$ in (13) yield the ECM of specification (12).

---

[7]This is exposed mathematically in the appendix which is available from the authors upon request.

The ECM representation which has become widespread in time series econometric literature (see Hendry (1995)), has implications for the interpretation of the wage function because of the close relationship to cointegration theory established by the Granger representation theorem (Engle and Granger (1987)). Given the steady state solution of (11) (and (12)), the two equilibrium terms in (13) can be interpreted as constituting two cointegrating vectors and that both unemployment and the participation rate are stationary. The state of art in testing for time series properties in panel data is still juvenile and performing such tests is beyond the limits of this paper. However, the very ECM estimates may indicate the time series properties involved, see Banerjee et $al.$ (1993). E.g. given that $w \sim \mathsf{I}(1)$, the equilibrium correction estimates β_1 and β_2 are only significant if wages cointegrate with nominal productivity and the alternative wage. However, under the null hypothesis of no cointegration, the t-statistics does not have the standard distribution. Tables for the non-standard distribution does exist for time series (see for example Banerjee et $al.$ (1993) Table 7.6), but not for panel data. Nevertheless, we shall assume that (13) is balanced and that the standard errors are valid asymptotically.[8]

The ECM regression estimates both short run dynamics as well as long term relationships implied by the wage equations (11) and (12). We see that the relationship between the coefficients of the ECM, (13), which we call the short run elasticities, and the long run partial elasticities of (11) is given by

$$\gamma_1 = \frac{\beta_1}{\beta_1 + \beta_2}, \gamma_2 = \frac{\beta_2}{\beta_1 + \beta_2}, \xi_1 = \frac{-\lambda_1(1)}{\beta_1 + \beta_2}, \xi_2 = \frac{-\lambda_2(1)}{\beta_1 + \beta_2} \qquad (14)$$

where $\lambda_m(1)$ is the sum of the coefficients in the lag polynomial. As seen from (14), the ECM captures the homogeneity restriction $\gamma_1 + \gamma_2 = 1$.

We shall call the elasticities in (11) (and (12)) $partial$ elasticities because they reflect the impact on wages for a $given$ alternative wage. Changes in for example unemployment will of course affect wages indirectly through the alternative wage. Hence, the partial elasticities are not directly comparable to studies on aggregate data. Taking the indirect effect on alternative wages into account by imposing a stable wage structure in long run equilibrium (11) ($w = c_2 + \overline{w}$ where c_2 is a constant) we get

$$w = \frac{c_1 + (1 - \gamma_1) c_2}{\gamma_1} + (p + y - n) + \frac{\xi_1}{\gamma_1} u + \frac{\xi_2}{\gamma_1} lmp \qquad (15)$$

The elasticities in (15) are called $total$ elasticities which relate to the ECM coeffi-

---

[8]The ECM is just a reparametrisation of a distributed lag model and hence cointegration is only a sufficient criteria to represent the data generating process by an ECM.

cients by

$$\frac{\xi_1}{\gamma_1} = \frac{-\lambda_1\,(1)}{\beta_1}, \frac{\xi_2}{\gamma_1} = \frac{-\lambda_2\,(1)}{\beta_1} \tag{16}$$

Similar results apply of course to the specification in (12). Below we report short run as well as partial and total long run elasticities.

4.1 Effects of unemployment and labour market programmes

In order to control for the unobserved fixed effects, f_i, we use the GMM procedure proposed by Arellano and Bond (1991) which involves estimating the first difference of (13).[9] We choose to instrument the firm specific variables $\Delta w_{i(t-1)}$, $\Delta(p + y - n)_{i(t-s)}$, $(w - (p + y - n))_{i(t-1)}$ and $(w - \overline{w})_{i(t-1)}$. The reason we treat the lagged wage share and lagged relative wage as endogenous is that the wage is measured as average yearly wage per employee and that wage increases occur in the middle of the year. Instruments used are $pv_{k(t-\tau)}$, $\tau = 2, \ldots, 6$, where pv_k is a price index for input factors in sector k. $\overline{w}$, u, r and tu are treated as exogenous variables. Estimates of various specifications of the equilibrium correction are presented in Table 2 where the same lag structure has been imposed on all models in order to make it easier to compare the effects of labour market programmes. The partial and total elasticities of wages are presented in Table 3.

Our test procedure is as follows. First, in model (A), we estimate the model without any labour market programme variable. We find an insignificant effect of open unemployment on wages. The short run elasticity of open unemployment, i.e. the elasticity of open unemployment on wage growth is -0.004. The corresponding partial (long run) elasticity of open unemployment on wages which is achieved by setting all changes equal to 0 and solving for w, is estimated to -0.003. Lastly, the estimated total elasticity of open unemployment is -0.011. Neither the partial nor the total elasticity of open unemployment are significant.[10] The poor performance of open unemployment in model (A) might be due to the effect of labour market programmes as Figure 1 indicates. When programmes are allocated to regions with low employment, the open unemployment rate overestimates labour market pressure.

Thus in model (B) we include the participants on labour market programmes in total unemployment. The short run elasticity is -0.011 and significant at the 5% significance level in contrast to the short run elasticity of open unemployment in model (A). The partial and total long run elasticities of total unemployment on wages in model (B) are -0.011 and -0.037 respectively, and both are significant. However, the Wald statistic for joint significance of all regressors is not significantly larger in

---

[9]The ECM itself is not a differenced model. It is a reparametrization of a distributed lag model.

[10]The t-ratios are computed using the method of Bårdsen (1989).

Table 2: GMM2 estimates of wage equations. Dependent variable is Δw_{it}. Time dummies are not included. Sample period is 1984–1991.

Regressors	A	B	C	D
$\Delta w_{i(t-1)}$	0.367 (2.85)	0.229 (1.73)	–0.106 (0.75)	–0.111 (0.79)
$\Delta w_{i(t-2)}$	0.062 (0.73)	–0.033 (0.38)	–0.109 (1.25)	–0.114 (1.30)
$\Delta(p+y-n)_{it}$	0.267 (6.32)	0.275 (6.83)	0.374 (8.83)	0.377 (8.77)
$\Delta(p+y-n)_{i(t-1)}$	–0.036 (0.58)	–0.035 (0.58)	0.068 (1.05)	0.066 (1.02)
$\Delta(p+y-n)_{i(t-2)}$	0.103 (2.94)	0.112 (3.26)	0.070 (2.05)	0.067 (1.93)
$\Delta\overline{w}_{it}$	0.326 (5.54)	0.295 (4.93)	0.200 (3.10)	0.197 (3.04)
$\Delta\overline{w}_{i(t-1)}$	–0.296 (2.99)	–0.220 (2.24)	–0.117 (1.09)	–0.113 (1.06)
$\Delta\overline{w}_{i(t-2)}$	–0.193 (3.14)	–0.159 (2.56)	–0.057 (0.89)	–0.054 (0.84)
$(w-(p+y-n))_{i(t-1)}$	–0.370 (4.11)	–0.303 (3.40)	–0.244 (2.66)	–0.257 (2.80)
$(w-\overline{w})_{i(t-1)}$	–0.841 (4.96)	–0.678 (4.00)	–0.533 (2.81)	–0.520 (2.76)
Δu_{jt}	0.002 (0.58)		0.016 (3.69)	
$u_{j(t-1)}$	–0.004 (1.00)		0.023 (4.64)	
Δr_{jt}			–0.026 (8.50)	
$r_{j(t-1)}$			–0.030 (6.98)	
Δtu_{jt}		–0.006 (1.56)		–0.010 (2.43)
$tu_{j(t-1)}$		–0.011 (2.88)		–0.007 (1.70)
$\Delta(r-tu)_{jt}$				–0.030 (8.02)
$(r-tu)_{j(t-1)}$				–0.037 (6.74)
$WALD$ (df)	518.8 (12)	560.8 (12)	587.3 (14)	578.3 (14)
$SARGAN$ (df)	129.9 (30)	122.2 (30)	51.9 (30)	53.4 (30)
$AR(1)$	–4.6	–5.76	–2.80	–2.76
$AR(2)$	–1.3	–2.8	–0.01	–0.08
$\hat{\sigma}^2$	0.016	0.017	0.016	0.016

Notes: (i) The reported GMM2 estimates are two-step instrumental variable estimates, (ii) N=5428, NT=36376, (iii) $\Delta(p+y-n)_{i\cdot}$, $(w-(p+y-n))_{i(t-1)}$ and $(w-\overline{w})_{i(t-1)}$ are treated as endogenous variables. Instruments used are $pv_{k(t-\tau)}$, $\tau = 2,\dots,6$, where pv_k is a price index for input factors in sector k. $\overline{w}$, u, r and tu are treated as exogenous variables.

model (B)[11]. Hence there is weak evidence that open unemployment underestimates the effect of labour market pressure on wages.

While model (B) implicitly treats open unemployment and labour market programmes on wage growth symmetrically, model (C) includes the open unemployment rate and the participation rate separately. As argued in the theoretical discussion, being employed and being on a labour market programme are generally not perfect substitutes. The partial elasticity of open unemployment is now 0.030, while a 1%

---

[11]Testing H_0 that model (A) and (B) have the same explanatory power versus H_1 that model (B) explains more, the ratio $\dfrac{WALD_B(12)}{WALD_A(12)}$ is $\sim F(12,12)$ which test statistic is $\dfrac{561}{519} = 1.08$. The 5% critical value for this test is 2.69.

Table 3: Partial (given the alternative wage) and total (constant wage structure) long run elasticities on wages. t–ratios in brackets.

	Variable	Partial elasticities	Total elasticities
Model (A)	u :	−0.003 (0.92)	−0.011 (0.92)
Model (B)	tu :	−0.011 (2.11)	−0.037 (1.98)
Model (C)	u :	0.030 (3.57)	0.096 (2.44)
	r :	−0.039 (3.35)	−0.124 (2.46)
Model (D)	tu :	−0.009 (1.36)	−0.027 (1.34)
	$(r - tu)$:	−0.047 (3.47)	−0.144 (2.59)

increase in the participation rate reduces wages by −0.039% in the long run, given the alternative wage. The significant effect of the participation rate rejects the hypothesis that participants on labour market programmes have the same effect on wages as regularly employed. Furthermore, this result suggests that the participation rate is a better indicator of labour market pressure than open unemployment, which is consistent with Calmfors and Nymoen (1990). The positive elasticity of open unemployment indicates that reduced average search efficiency dominates the negative effect on wages following lower re-employment probability and more competition for participation on programmes, cf. (8).

The estimates from the alternative specification of the effects from labour market programmes in (12), is presented in model (D). We see that an increased emphasis on ALMPs, i.e. a partial increase in the accommodative stance, $(r - tu)$, significantly reduces wage pressure. Hence, we reject that participants have the same effect on wages as openly unemployed. Increasing the stance variable reduces wages with a long run partial elasticity of −0.047. Moreover, the partial elasticity of the total unemployment on the wage level is reduced to −0.009. Taking into account the indirect effect of total unemployment and the stance on the alternative wage, an increase in the stance by one percent reduces wages by 0.144 percent while an increase in total unemployment reduces wages by 0.027 percent.

In order to test the stability of the estimates of the effects from unemployment on wages, we re-estimate model (C) and (D) interacting all observations with a dummy for the years 1988–1991 which is the period of high aggregate unemployment. We find that neither of the short run elasticities of unemployment, participation rate or stance variables for the sub-sample change significantly. A simultaneous test for the significance of all the sub-sample coefficients yields Wald statistics of 6.1 with 4 d.f. in model (C) and 6.4 with 4 d.f. in model (D). The 5% critical value of this test is

16

9.49.[12]

4.1.1 Other results

We should also comment briefly on the other estimation results of models (A)–(D).
Both equilibrium correction terms are significant in all models which is important
to the long run interpretation of the model. The wage adjusts almost twice as fast
to the relative wage compared to the wage share, indicating that external conditions
are more important than the firm specific ones. The estimated short run dynamics
show that both productivity and the alternative wage are important. The specifica-
tion tests indicate serial correlation of first $(AR(1))$, but not second order $(AR(2))$
which is as expected from the first difference operation involved in the GMM pro-
cedure. The $SARGAN$ test statistics indicate that models (C) and (D) are better
specifications than model (A) and (B).

We have also estimated alternative specifications to the models (A)–(D) which
are reported in the appendix available from the authors. First, we included time
dummies to control for aggregate shocks common to all firms. As expected, these
dummies removed a lot of explanatory power from several variables in the model,
apart from the stance and the equilibrium correction estimates. A partial increase in
the accommodative stance still reduces the wage pressure ($\hat{\lambda}(1) = -0.017$ in model
(D) with a probability of significance of 8.6%). The smaller equilibrium correction
coefficient to the wage share implies that the large insider effects in models (A)–(D)
of Table 2 (i.e. $\hat{\gamma}_1$ relative to $\hat{\gamma}_2$) are in fact 'aggregate' equilibrium correction. The
high responsiveness to a deviation in the wage share from the equilibrium is due to
a common correction because of for example highly centralized wage bargaining.

The time dummies make it also difficult to interpret the long run solution to the
model because the time dummies capture aggregate effects of *all* variables including
ALMPs. E.g. the time dummies control for the subsequent correction to equilibrium
following aggregate shocks which bring the wage share out of equilibrium for all firms.
Such mechanisms are thus automatically excluded from the long run solution to the
model.

Aggregate effects can also be captured by variables like aggregate unemployment
and aggregate participation rates. Extending model (D) of Table 2 with aggregate
total unemployment and aggregate accommodation stance yield significant negat-
ive estimates for both regional and aggregate stance variables (–0.025 and −0.034
respectively) while the total unemployment variables are close to zero and insigni-
ficant. This indicates a stronger negative impact on wage pressure from ALMPs
than the models reported in Table 2. However, the aggregate variables may proxy
omitted aggregate effects and hence, are difficult to interpret as net effects.

---

[12]We also tried with a sub-samle from 1989–1991 with the same results.

5 Comparison with previous research

In the Appendix we summarise 20 empirical studies of Norwegian wage curves. Most of these focus on the effect on wages of open unemployment which differs considerably across the studies. While for example Rødseth and Holden (1990) and Holmlund and Zetterberg (1991) find no effect, comparative studies like Alogouskoufis and Manning (1988) and Layard *et al.* (1991) emphasize that highly responsive wages is one important explanation for the historically low unemployment in Norway. There is a striking tendency that the reported estimate of the wage responsiveness depends on the sample variation in the unemployment variable. As for the effect of unemployment, extending the observation period into the late 80s and early 90s and hence including observations of high unemployment, seems to reduce the (absolute value of the) unemployment elasticity.

Few studies consider effects on wages of labour market programmes. However, Calmfors and Nymoen (1990) do not find any effect on wages of the stance variable while the unemployment elasticity is large. Bårdsen *et al.* (1995) estimate an elasticity of total unemployment of –0.08 while they do not include the stance.

On the basis of our findings, we suspect the high wage responsiveness in some studies to be biased of two reasons. One obvious source of bias is omitted ALMP variables which the authorities adjust to the levels of open or total unemployment.[13] A second source may be little sample variation in the unemployment variable. In order to examine the relevance of the first type of bias, we estimate a gross elasticity of unemployment taking the correlation between labour market programmes and slack in the labour market into account.

In models (C) and (D) of Table 2 we have presented two different ways of accounting for labour market programmes in our wage equation. To find the relation between the ALMP variables and unemployment we use the within group method[14] to control for fixed effects (f_j). We get

$$r_{jt} = f_j + \underset{(25.4)}{1.21} u_{jt}$$
$$N = 19, \ NT = 266, \ R^2 = 0.71 \tag{17}$$

and

$$(r - tu)_{jt} = f_j + \underset{(7.6)}{0.238} tu_{jt}$$
$$N = 19, \ NT = 266, \ R^2 = 0.18 \tag{18}$$

There is a stronger correlation between r_{jt} and u_{jt} than between $(r - tu)_{jt}$ and tu_{jt}.[15] Thus, the authorities seem to pursue a target on open unemployment and

---

[13]With the exception of Calmfors and Nymoen (1990).

[14]Within groups estimation implies subtraction of the individual mean (here regional mean) from each observation and applying OLS to the transformed equation.

regulate the amount of labour market programmes accordingly. The elasticity in (17) is significantly larger than one, indicating that a 100 person fall in employment triggers an increase of 55 programme slots.[16]

We can now compute the gross unemployment elasticities taking the estimated correlations from (17) and (18) into account.[17] We find that a 1% increase in total unemployment reduce wages by 0.061% in model (D), while an equal increase in open unemployment in model (C) reduce wages by 0.053%.

Hence, taking the ALMP rule into account we are able to explain some of the discrepancy between our estimates of wage responsiveness to unemployment and the estimates of previous studies.

6 Conclusions

Our results question the view that highly responsive wages to the unemployment level is a major explanation of the low unemployment record in Norway. Studies that report high wage responsiveness to unemployment are likely to be biased because active labour market policy variables are omitted. ALMP variables as well as total unemployment, seem to be better indicators of downward pressure than open unemployment.

We find clear evidence that active labour market policies reduce wage pressure both in the short and long run. Therefore, in the light of our theoretical model, the job competition effects seem to dominate the welfare loss effects. Incomes policies in combination with labour market programmes, successful targeting and compensation levels below ordinary employment are possible explanations of our results.

One might suspect that the strong negative effects of labour market programmes can be explained by omitted variables in the wage equation representing slack in the labour market. We showed in section 2 that the authorities expand labour market programmes in regions and periods with high unemployment. However, unemployment rates are included as regressors, and we also control for fixed effects which strongly reduce this problem.

We may also use the estimates from above to indicate the importance of the change in active labour market policy in the late 80's. The accommodative stance increased by 34.8% in Norway from an average of 22.7% between 1975–1988 to an average of 30.6% for the period 1989–1993. Using the estimated elasticities of model (D) this significant rise implied a reduced wage pressure (semi-elasticity) of –0.029.[18]

---

[15]The correlation coefficient between r_{jt} and u_{jt} is equal to 0.85 and between $(r - tu)_{jt}$ and tu_{jt} the correlation coefficient is 0.40.

[16]It follows from $TU \equiv U + R$ that a 1% increase in TU yields a 1% increase in $U + R$. From (17) the (relative) increase in R must be 1.21 times the (relative) increase in U.

[17]We use the formulas $\mathsf{El}_U W = \mathsf{El}_U W \mid_R + (\mathsf{El}_R W)(\mathsf{El}_U R)$ and $\mathsf{El}_{TU} W = \mathsf{El}_{TU} W \mid_{(R/TU)} + (\mathsf{El}_{(R/TU)} W)(\mathsf{El}_{TU}(R/TU))$.

[18]The semi-elasticity is computed as $\frac{W_1 - W_0}{W_0} = \exp\{a[(r - tu)_1 - (r - tu)_0]\} - 1$ where index

Our results for Norway are at odds with what Calmfors (1993) claims to be the conclusion to be drawn from Swedish studies, namely that Swedish labour market programmes shift the wage curve upwards. Wage bargaining theories as presented in this paper, point out two possible explanations which may explain why labour market programmes seem to have opposite effects on the wage in the two countries. First, the composition of the programmes have been different. In the late 70s and mid 80s, relief work (or temporary jobs in public sectors) counted for a larger fraction of the programmes in Sweden than in Norway. These kind of programmes are closer substitutes to ordinary jobs than for example training, and therefore expected to have a stronger positive effect on wages according to the 'welfare loss argument'[19]. Secondly, the remuneration of programme participants have been higher in Sweden, as relief workers are paid according to the tariff wage and labour market training offer participants a pay above the unemployment benefit level. As pointed out by our theoretical model, the wage effect of labour market programmes is positively related to the remuneration on these programmes.

References

Alogouskoufis, G. S. and A. Manning (1988): 'On the Persistence of Unemployment', *Economic Policy,* **7**, 427–69 .

Arellano, M. and S. Bond (1991): 'Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations', *Review of Economic Studies,* **58***, 277–297.*

Banerjee, A., J. Dolado, J. W. Galbraith and D. F. Hendry (1993): *'Co-Integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data',* Oxford University Press, Oxford.

Bean, C., R. Layard and S. Nickell (1986). The Rise of Unemployment: A Multi-country Study, *Economica,* **53***, S1–22.*

Blanchflower, D. G. and A. J. Oswald (1994). *The Wage Curve*, The MIT Press.

Bruno, M. and Sachs, J. (1985): '*The Economics of Worldwide Stagflation*', Basil Blackwell, Oxford.

Bårdsen, G. (1989): 'Estimation of Long Run Coefficients in Error Correction Models', *Oxford Bulletin of Economics and Statistics*, **51**, 345–350.

0 refers to the 1975–1988 period and index 1 refers to the 1989–1993 period. Assuming that the elasticity of the stance on wages is normally distributed, the semi-elasticity has a log normal distribution. In this case a 95% prediction interval for the semi-elasticity is $(-0.043, -0.016)$.

[19]Recent Swedish studies also find that relief work programmes have wage effects which differ from those of labour market training, see e.g. Edin et al. (1995).

Bårdsen, G., P. G. Fisher and R. Nymoen (1995): 'Business cycles: Real Facts or Fallacies', Arbeidsnotat 95/1, Central Bank of Norway.

Calmfors, L. (1993): 'De institutionella system på arbetsmarknaden och arbetslösheten', Bilaga 4 in '*Nya vilkor för ekonomi och politik*', Bilagadel 1, Ekonomikommisionens förslag, SOU 1993:16, Stockholm.

Calmfors, L. (1994): 'Active Labour Market Policy and Unemployment – A Framework for the Analyses of Crucial Design Features', Seminar Paper 563, Institute for international economic studies, Stockholm.

Calmfors, L. and Driffill, J. (1988): 'Bargaining Structure, Corporativism and Macroeconomic Performance', *Economic Policy*, **6**, 14–61.

Calmfors, L. and Forslund, A. (1990): 'Real-wage Determination and Labour Market Policies: The Swedish Experience', in Calmfors, L. (Ed.) '*Wage Formation and Macroeconomic Policy in the Nordic Countries*', SNS and Oxford University Press.

Calmfors, L. and Forslund, A. (1991): 'Real-wage Determination and Labour Market Policies: The Swedish Experience', *The Economic Journal*, **101***, 1130–1148.

Calmfors, L. and Lang, H. (1995): 'Macroeconomic Effects of Active Labour Market Programmes in a Union Wage-setting Model', *The Economic Journal,* **105***, 601–619.

Calmfors, L. and Nymoen, R. (1990): 'Real Wage Adjustment and Employment Policies in the Nordic Countries', *Economic Policy,* **11**, 398–448.

Edin, P–A., Holmlund, B. and Østros, T. (1994): 'Wage Behaviour and Labour Market Programmes in Sweden: Evidence from Microdata', in Tachibanaki (Ed.) '*Labour Market and Economic Performance. Europe, Japan and the USA*', Macmillan Press, Hampshire.

Elgsæther, A. H. and K. Johansen (1993). En analyse av lønnsdannelsen i norsk industri, *Norsk Økonomisk Tidsskrift*, **107***, 255–276.*

Engle R. F. and Granger, C. W. J. (1987): 'Cointegration and Error-correction: Representation, Estimation, and Testing', *Econometrica*, **55**, 251–276.

Fjørtoft, R. (1994): 'Arbeidsmarkedstiltak og ledighet etter fylke, 1980–1994', Centre for Research in Economics and Business Administration, Oslo, Arbeidsnotat 1995.

Forslund, A. (1993): 'Labour Market Policies and Wage Setting: A Study of Swedish Unemployment Insurance funds', Department of Economics, Uppsala University.

Grubb, D. (1986). Topics in the OECD Phillips Curve, *Economic Journal,* **96**, 55–79.

Hendry, D. F. (1995): *'Dynamic Econometrics',* Oxford University Press.

Hernæs, E. and Strøm, S. (1994): 'Fra ledighet til jobb', Centre for research in economics and business administration, Oslo, Arbeidsnotat 28.

Hoel, M. and R. Nymoen (1988). Wage formation in Norwegian Manufacturing, *European Economic Review,* **32***,* 977–997.

Holmlund, B. and Zetterberg, J. (1991). Insider Effects in Wage Determination: Evidence from Five Countries, *European Economic Review,* **35***,* 1009–1034.

Johansen, K. (1994a). Wage Flexibility for Skilled and Unskilled Workers: New Evidence on the Norwegian Wage Curve, Discussion Paper, Department of Economics, University of Trondheim.

Johansen, K. (1994b). Dynamic Modelling of the Wage Formation Process in a Two–tier Bargaining System, Discussion Paper, Department of Economics, University of Trondheim.

Johansen, K. (1995a). Norwegian Wage Curves, *Oxford Bulletin of Economics and Statistics*, **57**, 229–48.

Johansen, K. (1996). Insider Forces, Asymmetries and Outsider Ineffectiveness. Empirical Evidence from Norwegian Industries, 1966–1987, *Oxford Economic Papers,* **48**, 89–104.

Johansen, K. (1995c). Hysteresis Effects in Wage Determination: Norwegian Evidence 1964–1990, Discussion paper, Department of Economics, University of Trondheim.

Layard, R. and Nickell, S. and Jackman, R. (1991): *Unemployment: Macroeconomic Performance and the Labour Market*, Oxford University Press, Oxford.

Newell, A. and J. S. V. Symons (1985). Wages and Employment in the OECD Countries, *European Economic Review,* **35***.*

Nickell, S. and Wadhwani, S. (1990): 'Insider Forces and Wage Determination', *The Economic Journal*, **100**, 496–509.

Nymoen, R. (1989a). Wages and the Length of the Work Day. An Empirical Test Based on Norwegian Quarterly Manufacturing Data, *Scandinavian Journal of Economics,* **91**, 599–612.

Nymoen, R. (1989b). Modelling Wages in the Small Open Economy. An Error-correction Model of Norwegian Manufacturing Wages, *Oxford Bulletin of Economics and Statistics,* **51**, 239–58.

Nymoen, R. (1991). A Small Linear Model of Wage- and Price Inflation in the Norwegian Economy, *Journal of Applied Econometrics,* **6**, 255–269.

OECD (1994): 'The OECD Jobs Study', Paris.

Rødseth, A. and Holden, S. (1990): 'Wage Formation in Norway', in Calmfors, L. (Ed.) '*Wage Formation and Macroeconomic Policy in the Nordic Countries',* SNS and Oxford University Press.

Raaum, O. and Torp, H. (1993): 'Evaluering av AMO-kurs: Sysselsettingseffekter og seleksjon til kurs', Centre for research in economics and business administration, Oslo, Rapport, 72.

Raaum, O., Torp, H. and Goldstein, H. (1994): 'Experiments in Manpower Policy Evaluation: The Case for Simple Estimators? Experience from a Norwegian Study of Labour Market Training', Revised version of Memorandum No 5, Department of Economics, University of Oslo.

Raaum, O., Torp, H. and Goldstein, H. (1995): 'Employment Effects of Labour Market Training in Norway', Memorandum 8/1995, Department of Economics, University of Oslo.

Skedinger, P. (1990): 'Real Wages, Unemployment and Labour Market Programmes: A Disaggregative Analysis', Working Paper 1990:15, Department of Economics, Uppsala University.

Stølen, N. M. (1994). Wage Formation and the Macroeconomic Functioning of the Norwegian Labour Market, Ph.D. Thesis no. 18, Department of Economics, University of Oslo.

Torp, H. (1994): 'The Impact of Training on Employment: Assessing a Norwegian Labour Market Programme', *Scandinavian Journal of Economics,* **96***, 531–550.*

Try, S. (1993): 'Effects of a Youth Labour Market Programme in Norway', Report 93:7, Institute for Social Research, Oslo.

Wulfsberg, F. (1997). An Application of Wage Bargaining Models to Norwegian Panel Data, *Oxford Economic Papers, 49,* 419–440.

Data description

All variables are in logarithms unless otherwise stated. The observation period is 1980–1991. The unbalanced panel with $\sum_i N_i T_i = 58088$ observations of 5428 firms has the following structure:

T_i	5	6	7	8	9	10	11	12
N_i	219	223	199	331	307	333	271	3545

$T_i \in \{5, \dots, 12\}$ is the number of observations per firm and N_i is the number of firms with T_i observations.

Variables used are:

W: Average annual wage cost per employee. Firm specific. Source: Industry statistics, Statistics Norway.

PY/N: Annual sales per employee. Firm specific. Source: Industry statistics, Statistics Norway.

S: The wage share of sales, WN/PY. Firm specific. Source: Industry statistics, Statistics Norway.

$\overline{W}$: Alternative wage. Average annual wage per employee in other firms in the same county. Firm specific. Source: Industry statistics, Statistics Norway.

U: Registered (or open) full-time unemployed relative to the work force, percent. County specific. Source: Directorate of Labour.

R: Participation rate. Number of participants on labour market programmes relative to the labour force. County specific. Source: Directorate of Labour.

TU: Total unemployment. The sum of registered unemployed and labour market participants relative to the labour force. County specific. Source: Directorate of Labour.

R/TU: Accommodative stance. The participation rate relative to total unemployment. County specific. Source: Directorate of Labour.

PV: Price index for input factors by sector. Source: National accounts, Statistics Norway.

A   Details on Norwegian labour market programmes

As stated in section 2, labour market programmes are conventionally divided into four groups[20] (percentage of all participants in 1991 in parentheses); 1. Labour market training (42%), 2. Vocational training programmes for youths (28%), 3. Temporary jobs in the public sector (21%) and 4. Wage subsidies (9%).

1. The labour market training programme provides vocational and general training for unemployed and others at risk of loosing their job, see for example Raaum *et al.* (1994). The majority of training courses lasts for up to 20 weeks. Most participants receive a training allowance, but those eligible for unemployment benefit can choose to keep it in the training period. The training allowance is somewhat below the unemployment benefit which amounts to about 68% of the after-tax wage for an average manufacturing worker. In 1991 64% of the labour market participants received the training allowance, while 22% had unemployment benefits and the rest received other kinds of public or private support.

2. Participants in the vocational training programme for youths are placed in ordinary workplaces for a period of $6 - 9$ months, see Try (1993). The trainees acquire working practice as well as some theoretical education. The training allowance is the same as for labour market training. The programme is targeted at youths aged $16 - 19$ (24) years without any work experience.

3. Temporary jobs in the public sector last for a maximum of 10 months. Participants are paid less than the wage rate according to collective agreements in the regular labour market, but receive more than the unemployment benefit. The long-term unemployed has been the main target group for temporary public jobs.

4. Wage subsidies which cover about 50% of the wage, may be given to employers for a period of up to 6 months. The worker is paid the wage rate according to collective agreements in the regular labour market. Wage subsidies are targeted at young and elderly unemployed, long-term unemployed and refugees.

---

[20]Persons on rehabilitation and firm-specific programmes are not included.

B The effects on wages of participants on labour market programmes in model (11) and (12)

In model (11) the effect of participants on wages keeping the open unemployment rate constant, decreases with the number of participants as

$$\frac{\partial w/w}{\partial R} = \frac{\xi_2}{R}$$

In model (12) we get (also keeping the open unemployment rate constant)

$$\frac{\partial w/w}{\partial R} = \frac{\xi_1^* - \xi_2^*}{U + R} + \frac{\xi_2^*}{R}$$

i.e. the effect of participants not only decreases with its own level, but also the level of total unemployment. The effects of increasing the number of participants keeping the total unemployment rate constant are

$$\left.\frac{dw/w}{dR}\right|_{TU} = \frac{\partial w/w}{\partial R} - \frac{\partial w/w}{\partial U} = \frac{\xi_2}{R} - \frac{\xi_1}{U}$$

and

$$\frac{\partial w/w}{\partial R} = \frac{\xi_2^*}{R}$$

in models (11) and (12) respectively. Keeping the total unemployment rate constant, the effect of participants decreases in the extent of programmes in both specifications. This effect also decreases the higher level of open unemployment.

C Time dummies and aggregate variables

Table 4: GMM2 estimates of wage equations. Dependent variable is Δw_{it}. Sample period is 1984–1991.

	Models with time dummies		Aggregate variables
Regressors	C	D	D
$\Delta w_{i(t-1)}$	–0.180 (4.60)	–0.179 (4.58)	–0.282 (1.74)
$\Delta w_{i(t-2)}$	–0.052 (5.58)	–0.052 (5.57)	–0.125 (1.25)
$\Delta(p + y - n)_{it}$	0.138 (4.38)	0.138 (4.38)	0.295 (6.38)
$\Delta(p + y - n)_{i(t-1)}$	0.044 (2.39)	0.045 (2.40)	0.147 (2.11)
$\Delta(p + y - n)_{i(t-2)}$	0.018 (4.37)	0.018 (4.39)	0.118 (2.83)
$\Delta\overline{w}_{it}$	0.099 (2.01)	0.099 (2.00)	0.246 (3.72)
$\Delta\overline{w}_{i(t-1)}$	–0.075 (1.42)	–0.076 (1.44)	–0.066 (0.57)
$\Delta\overline{w}_{i(t-2)}$	–0.020 (0.45)	–0.022 (0.48)	0.015 (0.23)
$(w - (p + y - n))_{i(t-1)}$	–0.064 (3.85)	–0.064 (3.85)	–0.076 (0.78)
$(w - \overline{w})_{i(t-1)}$	–0.337 (8.85)	–0.336 (8.82)	–0.579 (2.90)
Δu_{jt}	–0.001 (0.20)		
$u_{j(t-1)}$	0.006 (0.95)		
Δr_{jt}	–0.008 (1.35)		
$r_{j(t-1)}$	–0.015 (1.65)		
Δtu_{jt}		–0.009 (1.17)	0.003 (0.36)
$tu_{j(t-1)}$		–0.009 (0.99)	0.003 (0.29)
$\Delta(r - tu)_{jt}$		–0.008 (1.15)	–0.009 (1.26)
$(r - tu)_{j(t-1)}$		–0.017 (1.72)	–0.025 (2.31)
Δtu_t			–0.025 (2.28)
tu_{t-1}			–0.003 (0.26)
$\Delta(r - tu)_t$			–0.031 (3.66)
$(r - tu)_{t-1}$			–0.034 (2.15)
WALD (df)	291.9 (14)	290.9 (14)	626.3 (18)
SARGAN (df)	88.8 (51)	88.6 (51)	65.7 (30)
AR(1)	–6.18	–6.19	–2.06
AR(2)	–1.50	–1.48	–1.40
$\hat{\sigma}^2$	0.017	0.017	0.017

D Other studies on Norwegian data

Table 5 gives a brief summary of estimated wage responsiveness to unemployment and labour programmes, in about 20 studies of wage formation in Norway. Only Calmfors and Nymoen (1990) and Bårdsen *et al.* (1995) in addition to the present

study consider effects of labour market programmes. We obtain comparable results of Calmfors and Nymoen (1990) for Norway that the extent of labour market programmes is a better indicator of downward wage pressure than open unemployment. The wage responsiveness of both open and total unemployment is however considerably smaller than in Calmfors and Nymoen (1990) which is -0.171 and -0.155 respectively. Moreover, while the accommodative stance has no impact on product real wages in Calmfors and Nymoen (1990), we identify a significant negative effect. The estimated total unemployment elasticity of Bårdsen *et al.* (1995) is -0.08, using quarterly data from 1967 to 1993. They do however not report results on the stance variable.

Most studies focus on the effect of open unemployment. The effect of unemployment on wages differs considerably across the studies. While Rødseth and Holden (1990) and Holmlund and Zetterberg (1991) find no effect, comparative studies like Alogouskoufis and Manning (1988), Layard *et al.* (1991) and Calmfors and Nymoen (1990) emphasize that highly responsive wages is one important explanation for the historically low unemployment in Norway.

There is a striking tendency that the reported estimate of the wage responsiveness depends on the sample variation in the unemployment variable. As for the effect of total unemployment, extending the observation period into the late 1980s and early 1990s and hence including observations of high unemployment, seems to reduce the (absolute value of the) unemployment elasticity. Studies which allows for a more convex relationship between unemployment and wage than standard log-linear models, find that changes in unemployment at a level above about 3 percent have a negligible impact on wages, see for example Johansen (1995a), Stølen (1994).

As the studies differ in the empirical specification we have computed semi-elasticities of unemployment on wages, which is the percentage wage reduction of a 1 percentage point increase in the unemployment level. We start by noting that all studies estimate relations of the form

$$\log(W) = g\left(\beta X\right) + af\left(U\right) + error\ term \tag{19}$$

where X are other explanatory variables than unemployment. $f\left(U\right)$ is

$$f\left(U\right) = \begin{cases} \log(U) & \text{or,} \\ U & \text{or,} \\ U^{-1} & \text{or,} \\ U^{-2} \end{cases}$$

*Table 5: Summary of studies on wage formation in Norway. $\hat{a}$ and $f(U)$ refer to equation (B.1). $\underline{U}$ and $\overline{U}$ are minimum and maximum values of observed unemployment. A * idicates that information on observed unemployment was not available.*

Study	Sample period	$[\underline{U},\overline{U}]$	$\hat{a}$	$f(U)$
Alogouskoufis and Manning (1988)	1952–85	[1.5,3.4]	−19.47	U
Bean *et al.* (1986)	1953–83	[1.5,3.4]	−10.74	U
Blancflower and Oswald (1994)	1989–91	[2.1,5.7]	−0.08	$\log(U)$
Bårdsen *et al.* (1995)	1967(4)–93(2)	[1.0,9.6]	−0.08	$\log(TU)$
Calmfors and Nymoen (1990)	1960–87	[1.0,4.7]	−0.155	$\log(TU)$
	1960–87	[1.5,3.4]	−0.171	$\log(U)$
Elgssæther and Johansen (1993)	1964–87	[0.4,3.9]	0.139	U^{-2}
Grubb (1986)	1959–83	[1.5,3.4]	−6.17	U
Hoel and Nymoen (1988)	1968(1)–85(2)	[*,*]	0.092	U^{-1}
Holmlund and Zetterberg (1991)	1965–85	[1.5,3.3]	0.0	$\log(U)$
Johansen (1994a)	1964–90	[0.7,4.3]	−0.075	$\log(U)$
Johansen (1994b)	1963–87	[0.7,3.3]	−0.09	$\log(U)$
	1963–87	[0.7,3.3]	0.096	U^{-2}
Johansen (1995a)	1964–90	[0.7,4.3]	−0.07	$\log(U)$
	1964–90	[0.7,4.3]	0.086	U^{-2}
Johansen (1995b)	1966–87	[0.7,3.3]	0.08	U^{-2}
Johansen (1995c)	1973–90	[0.7,4.3]	−0.06	$\log(U)$
Layard *et al.* (1991)	1965–85	[1.5,3.4]	−3.05	U
Newell and Symons	1963–81	[1.5,3.4]	−6.86	U
Nymoen (1989a)	1967(2)–83(4)	[0.4,3.9]	0.12	U^{-1}
Nymoen (1989b)	1967(1)–87(4)	[0.4,3.9]	−0.21	$\log(U)$
Nymoen (1991)	1969(1)–87(4)	[0.4,3.9]	−0.2	$\log(U)$
Raaum and Wulfsberg (1995)	1980–91	[0.4,11.0]	-0.037	$\log(TU)$
	1980–91	[0.3,6.8]	−0.011	$\log(U)$
Røseth and Holden (1990)	1963–86	[*,*]	0.0	$\log(U)$
Stølen (1994)	1965–87	[1.5,3.4]	0.4207	U^{-2}
	1965–90	[1.5,5.2]	0.2833	U^{-2}
Wulfsberg (1996)	1972–88	[0.2,6.0]	−0.08	$\log(U)$

The estimated wage reduction when U_0 increases to U_1 is thus

$$\log\left(\frac{W_1}{W_0}\right) = \log(W_1) - \log(W_0) = a\left[f(U_1) - f(U_0)\right]$$

$$\Updownarrow$$

$$\frac{W_1}{W_0} = \exp\left\{a\left[f(U_1) - f(U_0)\right]\right\}$$

$$\Updownarrow$$

$$\frac{W_1 - W_0}{W_0} = \exp\left\{a\left[f(U_1) - f(U_0)\right]\right\} - 1$$

The semi-elasticity is thus defined as

$$\left| \frac{W_1 - W_0}{W_0} \right| 100 = - \left(\exp \left\{ a \left[f\left(U_1\right) - f\left(U_0\right) \right] \right\} - 1 \right) 100$$

Using the estimate of a and choosing U_0 and U_1 within the sample variation interval, yields the plotted semi-elasticities in Figures 2 and 3. Table 5 summarize the studies behind these figures; their sample period, observed unemployment levels, estimate of a and specification of $f(U)$.

We have grouped a number of time series and panel studies on Norwegian wage curves into those with observations before 1988 and those including more recent data. The first group consists of Grubb (1986), Bean *et al.* (1986), Newell and Symons (1985), Layard *et al.* (1991), Alogouskoufis and Manning (1988), Calmfors and Nymoen (1990), Hoel and Nymoen (1988), Nymoen (1989a), Nymoen (1989b), Nymoen (1991), Johansen (1994b), Johansen (1995b), Stølen (1994, Table 4.3.4) and Elgsæther and Johansen (1993), while the latter includes Blanchflower and Oswald (1994), Johansen (1994a), Johansen (1995a), Johansen (1995c), Stølen (1994, Table 4.5.2), Wulfsberg (1994) and model (A) of this study.

In Figure 2 we plot the *average* semi-elasticities for both groups over the respective sample variation in open unemployment. The upper line is thus the collection of average semi-elasticities for unemployment levels between 1% and 3.5%, while the average semi-elasticities for studies including post 1987 data constitute the lower line. This line is dotted for unemployment levels above 5% because these elasticities are based on panel data studies (Blanchflower and Oswald (1994), Wulfsberg (1996) and model (A) in this Chapter) while all other studies are based on time series. There is a clear indication that estimates of the unemployment elasticity based on low unemployment observations are larger than estimates also based on the recent high unemployment history.

Only Calmfors and Nymoen (1990) and Bårdsen *et al.* (1995) in addition to the present study, report elasticity of wages on total unemployment. The computed semi-elasticities for these three studies are plotted in Figure 3 over the sample variation in total unemployment. We see again that the estimated wage curve is steeper when there is less sample variation in unemployment.

Our results add to the growing scepticism towards the 'highly responsive wages' explanation of the low unemployment experience in Norway. The steepness of the Norwegian wage curve in comparative studies like Alogouskoufis and Manning (1988), Layard et al. (1991) and Calmfors and Nymoen (1990) may reflect a strong wage-raising effect of low unemployment, rather than a substantial adjustment of wages to negative labour demand shocks. Our data cover the period of rapidly increasing unemployment in the late 1980's and the panel contains more variation over time and across regions due to the panel structure of data.
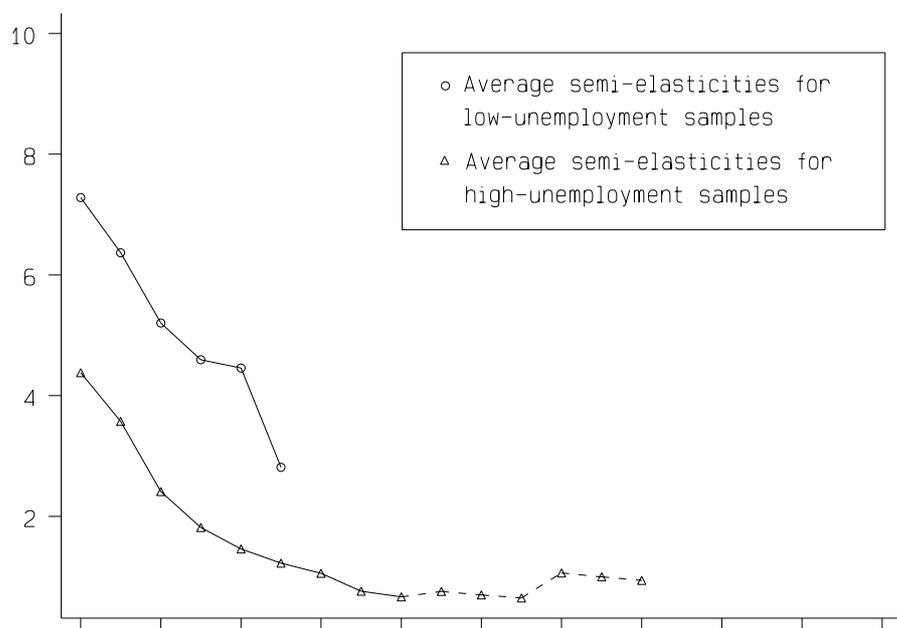
Figure 2: Average semi-elasticities of the wage curve for studies with sample period $t \in \{1960, \ldots, 1987\}$ *(low open unemployment) and studies with sample period* $t \in \{1960, \ldots, 1990\}$ *(include observations of high open unemployment).*
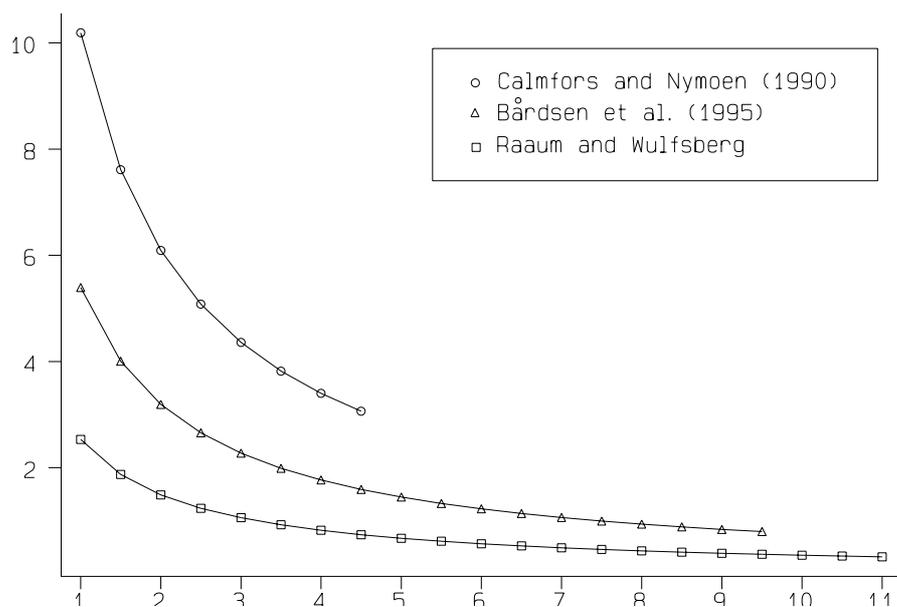

Figure 3: Semi-elasticities of the wage curve for studies using total unemployment.