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WAGE FORMATION IN DENMARK

by

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INSTITUTE FOR INTERNATIONAL ECONOMIC STUDIES

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1. Introduction

Since collective bargaining has been the predominant mode of wage determination in Denmark for many years it seems appropriate to analyze wage formation within a framework which allows for this institutional feature. This paper is a modest attempt to study the determination of wages within a set-up of collective wage bargaining between trade unions and employer's federations each pursuing their own self interest. To this end we build on the recent developments of the theory of union behaviour and wage bargaining as surveyed by Oswald (1985) and Farber (1986).

The theoretical framework underlying this study differs from the traditional approach to wage determination in Denmark which has been based on the Phillips-curve model. However, as recognized already by Phillips (1958) this model has little theoretical foundation and if any it is best thought of as a wage-adjustment mechanism which gradually equilibrates demand and supply of labour in an otherwise atomistic market, which also seems to be in conflict with the Danish institutional characteristics. Due to that we hope that the more adequate bargaining approach will provide new insights but also raise new questions on how wages in fact are determined in Denmark. There is thus an abundant amount of work to be done also because the bargaining models are still in their infancy. The ultimate test of whether this approach encompasses the Phillips model [Mizon (1984)] is thus to be awaited - although there is evidence in favour of the bargaining approach. Similarly, the determination of wages in the public sector is another important topic outside the scope of this chapter.
The topics dealt with in this chapter are organized in seven sections. In section 2 we sketch the twin problems of the Danish economy, namely persistent deficits on the current account and high unemployment. This section provides the motivation of this study since wages play a crucial role both for the international competitiveness and the employment situation. But since the unhappy mix of external and internal imbalance only simultaneously can be abolished through an expansion of production and employment of the competitive sector it is natural along with a study of wages also to focus on the determination of employment in the competitive sector. As the agricultural policy of the EEC effectively prohibits an expansion of Danish farm production we shall only be concerned with the determination of wages and employment in manufacturing since it by and large is the only sector that can remedy the twin problems of the Danish economy. Following the description of the Danish economy, section 3 outlines the wage-bargaining institutions and the behaviour of wages in the light of the major shocks that have hit the economy. In section 4 we then present our econometric analysis of the determination of wages and employment in manufacturing. To this end we use a right to manage model in the spirit of Andrews and Nickell (1983) and Hoel and Nymoen (1988) which also allows for the possibility of insider-outsider effects as emphasized by Lindbeck and Snower (1987). In section 5 we take a more disaggregated view in order to investigate the behaviour and determinants of relative wages on the manual labour market applying a model of union rivalry. On the basis of this model we test for the degree of substitution between decentral and central earnings growth of skilled and unskilled workers in order to see whether the recent restrictive incomes policies directed mainly towards the outcome of the cen-
tral negotiations have led to wage restraint. That is the core of section 6 as this section discusses the incomes policy pursued from 1982-87 where the overall macroeconomic strategy was changed rather fundamentally in the direction of a less accommodative policy. As the effectiveness of incomes policies obviously depends on the design of the entire policy program we present a detailed case study of recent experiences in the light of the overall macroeconomic policy changes. In section 7 we discuss labour-market specific as well as more general policy implications of our analysis in view of the fundamental problems of external and internal imbalance of the Danish economy.

2. General Economic Background

The basic problem for Danish economic policy in the entire post-war period can be summarized in the form of a double trade-off between on the one hand inflation and unemployment and on the other unemployment and current-account deficits. Traditionally, these trade-offs have been taken to be stable and thus exploitable by economic policy in the sense that the choice in the short-run was between either low unemployment, high inflation and current-account deficits or high unemployment, low inflation and a more favourable current account. The data summarized in table 2.1 shows that the performance of the economy up to 1973 was broadly consistent with this view. From 1974 and onwards the entire situation deteriorates as we now face high unemployment, high inflation and sizeable current-account deficits. The change towards a less accommodative policy in late 1982 [OECD (1986)] has improved slightly on this problem. Employment has been rising al-

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2.1. A recent account of Danish economic policy is given in Kjærsgaard and Damgård Hansen (1984).
Table 2.1: Main Economic Indicators 1950-1986

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Growth in real GDP</td>
<td>3.18</td>
<td>4.57</td>
<td>1.65</td>
<td>3.15</td>
</tr>
<tr>
<td>Unemployment</td>
<td>9.76</td>
<td>3.83</td>
<td>10.78</td>
<td>12.00</td>
</tr>
<tr>
<td>Inflation</td>
<td>4.24</td>
<td>5.62</td>
<td>10.90</td>
<td>5.60</td>
</tr>
<tr>
<td>Current Account in % of GDP</td>
<td>0.33</td>
<td>-1.30</td>
<td>-3.54</td>
<td>-3.89</td>
</tr>
</tbody>
</table>

Source: Danmarks Statistik

though this is not clear from the unemployment figure due to an increasing supply of labour. Inflation has come down, but the current account has not improved. Hence, the Danish economy remains stuck in a situation with high unemployment and a substantial current-account problem. As manufacturing must expand if both problems are to be solved it is natural to focus the subsequent analysis on wage and employment determination in that particular sector. Before we turn to that issue we offer a detailed description of the unemployment problem.

2.1 Unemployment

Unemployment has since 1974 been at a high and persistent level, see table 2.1. Whereas labour demand has been fluctuating there has been a slight upward trend in the growth rate of labour supply which is in part due to an increasing participation rate for women. The increase in public sector employment has partially compensated the reduced private sector employment, but after 1982 the private sector accounts for the increase in employment.

The dynamics in the labour market is seen by splitting the unemployment figure into the duration of unemployment spells and the frequency of entering unemployment. The rise in unemployment from
1974 is primarily driven by an increased frequency. The permanency of unemployment is reflected in the later increase in the duration of unemployment spells at a constant frequency [Smith (1983), Pedersen (1983a), Pedersen and Westergård-Nielsen (1984)]. In accordance with the hysteresis hypothesis the upswing in employment from 1983 does not reverse this pattern, but reduces the frequency more than the average duration of unemployment spells. By international comparison, the duration of unemployment spells is relatively short, whereas the frequency of unemployment and hence the number of unemployment spells is rather high. This may in part be due to specific aspects of the unemployment insurance system, cf. below.

The burden of unemployment is unevenly distributed [Jensen (1986), Pedersen (1983a), Pedersen og Smith (1984)]. A large group is affected by short spells of unemployment, but the long-term unemployed account for a larger share of the total amount of unemployment measured in terms of full-time unemployed. In 1980, 9% of the unemployed were long-term unemployed (being unemployed for more than 80% of the total available work time) but they account for close to 30% of total unemployment whereas the 50% of the unemployed who were short-term unemployed (being unemployed for less than 20% of the total available work time) only account for 13% of the total unemployment.

Females had a lower unemployment rate than males in the 1960's but this relationship was reversed by the increase in unemployment in the mid 1970's. This may in part be due to the increased female participation in the labour market and the high proportion of females in sectors particularly disadvantaged by the reces-
sion. Furthermore, the high unemployment rates made it possible for housewives without strong preferences for work to take financial advantage of the unemployment insurance system.

Finally, educational and geographical immobility implies that shortage of specific types of labour coexists with high aggregate unemployment. The educational differences are indicated by unemployment rates in 1986 of 3.9% for highly educated, 7.3% for professionally trained and 11.1% for persons without any further education. This causes substantial differences in unemployment among unions representing different trades, say electricians with 2.4% unemployment by the end of 1986 compared to waiters and the like with 27.3%. Geographical differences are reflected in an unemployment rate of 11.8% in the northern part of the country in 1986 compared to 6.0% in Central Zealand.

Unemployment Insurance

The sensitivity of wages to unemployment depends crucially on the financing, level and length of unemployment insurance (UI) benefits. In all these respects the Danish system creates very little incentives for wage moderation.

The parties negotiating wages do not face any immediate link between wage demands and unemployment benefit expenditures since the government finances marginal expenses, whereas unemployment funds and employers contribute relative to their membership and work force, respectively.

UI-benefits cannot exceed 90% of previous earnings and there is
moreover a maximum amount which can be paid to any unemployed. Up to the policy shift in 1982, this limit was regulated biannually based on an indexation to both consumer prices (net of taxes) and wages. The ceiling implies quite some variance in the degree of compensation since the maximum relative to wages in e.g. 1986 amounted to 57% for skilled workers, 63% for unskilled male workers and 71% for unskilled female workers. The indexation was abandoned in autumn 1982 and the nominal ceiling remained unchanged until mid 1987, but is now regulated annually by a percentage stipulated in the budget for government finances.

If an unemployed within the last three years has not been in employment for at least 26 weeks the right to unemployment benefits expires, and economic support must be sought under the social security programme. However, this constraint is not immediately binding due to a job-offer scheme introduced in 1978 which guarantees a job of 7 to 9 months' duration to unemployed under the age of 60. A person can get at most two offers, and the second offer can be in the form of professional training or further education. This ensures that long-term unemployed can keep contact with the labour market and prolongs the period where UI-benefits are accessible. Altogether this scheme makes it possible to remain in the UI-system for close to 10 years.

It is also important to mention that persons employed for less than normal hours of work can obtain UI-benefits to compensate for the difference. These benefits can be obtained infinitely, and this helps explain the high female participation rate and the high frequency (about 1/3) of women working part-time.
Since the employers' contributions to the financing of UI-benefits are independent of the number who obtains UI-benefits (no experience rating) firms with temporary excess capacity can costlessly lay-off workers. Brüniche-Olesen (1986) estimated that 19% of the full-time unemployed in 1980-81 were temporarily on UI-benefits until they returned to their previous employer.

Selective Unemployment Programmes

The persistent unemployment problem has motivated a number of selective unemployment measures. The initiatives aim at both improving employment as well as preserving and enhancing the qualifications of the unemployed. Most measures aim at specific groups: youth, old, long-term unemployed. Table 2.3 gives a quantitative assessment of these initiatives. The figures reveal that Denmark on top of high open unemployment also has substantial hidden unemployment. The number of persons in selective unemployment programmes was around 135,100 in 1986, which should be compared to the 220,400 registered full-time unemployed (8% of the labour force). Hence, by including hidden unemployment, 355,500 or some 12% were unemployed in 1986.

This figure gives an upperbound estimate of the hidden unemployment implied by selective unemployment programmes. Many of the activities improve the qualifications of the labour force and as such maintain the effective supply of labour. It should also be kept in mind that some activities are useful to the society at large. A lower bound estimate is given by those on early retirement, since this scheme directly reduces the supply of labour. Hence, hidden unemployment in 1983 must be somewhere between
Table 2.3  Number of Persons (in full-time equivalents) in Employment Programmes or Open Unemployment 1981 to 1986.

<table>
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</tr>
</thead>
<tbody>
<tr>
<td>Youth Unemployment Projects</td>
<td>7,000</td>
<td>7,800</td>
<td>10,500</td>
<td>14,000</td>
<td>10,100</td>
<td>10,000</td>
</tr>
<tr>
<td>Job Offers</td>
<td>17,700</td>
<td>27,600</td>
<td>36,100</td>
<td>35,000</td>
<td>29,500</td>
<td>24,500</td>
</tr>
<tr>
<td>Early Retirement 1)</td>
<td>62,253</td>
<td>78,068</td>
<td>81,635</td>
<td>90,841</td>
<td>94,888</td>
<td>100,600</td>
</tr>
<tr>
<td>Open Unemployment</td>
<td>242,969</td>
<td>262,750</td>
<td>283,041</td>
<td>276,263</td>
<td>251,813</td>
<td>220,400</td>
</tr>
</tbody>
</table>

1) Number of persons on early retirement at the end of the year.

Sources: Arbejdsmarkedet og Arbejdsmarkedspolitik, Arbejdsmarkeder, November 1986 and Direktoratet for Arbejdsmarkedspolitik

100,000 and 135,000 corresponding to an overall unemployment rate between 11% and 12% of the labour force. The Danish unemployment problem is therefore more severe than the official figures suggest. The UI-system creates, on the other hand, incentives which imply that the official unemployment figures exaggerate the amount of idle labour, namely, by increasing the labour supply [Pedersen (1982)] and by making it possible for firms to obtain external finance for temporary variations in the need for labour.

3. Collective Wage Bargaining

Now consider the Danish institutional features of collective wage bargaining. We begin by characterizing the dominant players, namely, the trade unions and their principal organization the Danish Federation of Trade Unions (LO) and the Danish Employers' Federation (DA) and its affiliates.
3.1. The Dominant Labour-Market Organizations

As shown by table 3.1 the number of LO-members amounts to more than 50% of the entire work force. Practically all manual workers are organized union members. The three largest unions out of the 32 unions belonging to LO are Specialized Workers' Union, Commercial and Clerical Employees' Union and Metal Workers' Union; all three organized along craft lines which is the typical picture in Denmark. While the degree of unionization is high among manual workers it is considerably lower among salaried workers, civil servants and academics, implying that the overall degree of unionization is about 70%.

Table 3.1. The Size of LO and DA, 1985

| Trade Unions                                      | Members in thousands and in per cent of work force
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1. Danish Federation of Trade Unions (LO)</td>
<td>1,399 [51]</td>
</tr>
<tr>
<td>Affiliated unions</td>
<td></td>
</tr>
<tr>
<td>a. Specialized Workers' Union (SID)</td>
<td>317 [12]</td>
</tr>
<tr>
<td>b. Commercial and Clerical Employees' Union (HK)</td>
<td>310 [11]</td>
</tr>
<tr>
<td>c. Metal Workers' Union (Metal)</td>
<td>139 [05]</td>
</tr>
<tr>
<td>d. Others</td>
<td>633 [23]</td>
</tr>
<tr>
<td>2. Public Servants' Union (FTF)</td>
<td>397 [14]</td>
</tr>
<tr>
<td>3. Academics</td>
<td>74 [03]</td>
</tr>
<tr>
<td>4. Others</td>
<td>164 [06]</td>
</tr>
<tr>
<td>Employers</td>
<td></td>
</tr>
<tr>
<td>5. Danish Employers' Federation (DA)</td>
<td>514 [19]</td>
</tr>
<tr>
<td>b. Salaried Workers</td>
<td>203[2] [07]</td>
</tr>
<tr>
<td>6. Central Government</td>
<td>210[3] [08]</td>
</tr>
<tr>
<td>7. Local Government</td>
<td>475[3] [17]</td>
</tr>
<tr>
<td>Work Force</td>
<td>2,753</td>
</tr>
</tbody>
</table>

1) Figures in brackets express the size in % of work force.
2) Source: Danish Employers' Federation's Annual Report, 1985-86.

Source: Statistisk Tidssroversigt 1986.

Despite that less than half of the LO-members are employed by firms belonging to DA, the settlements between LO and DA general-
ly set the pattern for the entire manual labour market.

3.2 Collective Bargaining

The negotiations between the two dominant labour-market organizations on the manual labour market take place every second year. Their agreements usually run for 2 years. The recent settlement, established in spring 1987, extended, however, the duration of agreement to 4 years. This agreement allows, however, the unions and their counterparts to renegotiate wages after 2 years whereas the settlement on the general issues, cf. below, is fixed for the entire period.

The collective bargaining is typically split into so-called general and special issues. The general issues are of importance for the entire LO-DA area and are therefore usually addressed by the principal labour-market organizations. Examples of general issues, including the rules guiding the negotiations, are the number of weekly working hours and the determination of the minimum and standard wage rates, cf. below. The special issues apply to the single bargaining units and are therefore addressed at a decentralized level by the individual unions and their counterparts on the employer side. Occasionally, they also address the general issues under some coordination by the principal organizations.

The central negotiations establish two types of base wage rates, namely, a so-called standard wage rate and a minimum wage rate. The standard wage rate cannot be altered within the period of agreement whereas the minimum wage rate only sets the "floor" for those who are on the minimum wage system. For that group periodi-
cal wage-renegotiations at the local level is the rule rather than the exception. The minimum wage system therefore injects a large degree of decentralization into the wage formation process, cf. below.

For the group of manual workers employed by firms affiliated with DA about 55% are on the minimum wage system [Leth-Jeppesen (1984)]. The minimum wage system applies mainly to skilled workers. Thus 80% of skilled workers are on the flexible minimum wage system whereas only 40% of unskilled workers are covered by that system. For the latter group, wage increases stem in principle entirely from central bargaining and wage indexation, cf. below, while wage drift provides an additional source of earnings growth for workers on the minimum wage system. This explains why Specialized Workers' Union, organizing only unskilled workers, traditionally has pressed for relatively high wage increases in the central negotiations and for a high degree of automatic inflation compensation while Metal Workers' Union, organizing skilled workers, traditionally is less aggressive in the central negotiations.

3.3. Bargaining Solutions

If the negotiations concerning the special issues result in an agreement between the concerned parties the deal is completed provided DA's executive committee also approves since the individual member organizations of DA, in contrast to their counterparts in the trade-union movement, have no right to sign an agreement without the approval of DA. When the parties fail to reach agreement in due time before the existing contracts expire the nego-
tations continue with the interference of the principal labour market organizations and the board of mediators. Provided that the continuation of the negotiations results in an agreement about the general and special issues the settlement is submitted to a referendum among the members of the organizations.

According to existing laws, the mediator has the authority to link the individual settlements together such that the voting is over the entire package. Rejection of a compromise proposal in a referendum requires that a majority overturns the proposal and that the majority rejecting the proposal accounts for more than 35% out of those entitled to vote. Experiences show that if the most important labour-market organizations support the mediator's compromise proposal it is hard to overturn the package despite that some unions, and a majority of their members, may be strongly against the elements of the agreement which applies to them.

If the mediator's proposal is overturned in a referendum or rejected by the central organizations various outcomes are possible. Outbreak of strikes and lockouts is one possibility provided the board of mediators has not used its authority to postpone work stoppages for as long as 2 weeks and urged the involved parties to reach an agreement. A second possibility is that the Danish Parliament intervenes and enacts a proposal into legislation. That became increasingly common in the 1970's, cf. below.

3.4. Wage indexation

So far we have characterized the bargaining institutions underlying one source of centralized earnings growth, namely, central
rate increases. Another important source of centralized earnings growth is the automatic wage-indexation system which was in place until 1983. This system linked the hourly wage to a special cost of living index net of indirect taxes and subsidies. For every 3 percentage points increase in the index during a 6-months interval, a fixed hourly wage increase - a so-called portion - was automatically triggered. Portions were to be paid either in January or July. Despite that the indexation system only provided partial protection against increases in the consumer-price index, partly because indirect taxes were left out and partly because the portions were too small to fully compensate for the rise in prices it has, nevertheless, accounted for a large share of total earnings growth. Figure 3.1 shows the relative importance of the two sources of centralized earnings growth. From 1960-86 central rate increases accounts on average for 24.5% of total earnings growth while indexation accounts for 30.5%. The remaining 45% is due to decentral wage bargaining. However, as the three sources of ear-
nings growth are likely to be interdependent the above proportions should be interpreted with some caution. A decline in the importance of one source of earnings growth is thus likely to be followed by a rise in another. The extent to which that is the case is investigated in section 5.

3.5 Recent Wage-Bargaining Experiences

The 1970's is characterized by increasing difficulties of reaching collective agreement. In 1973 the country thus experienced a nationwide strike which ran for about four weeks until a settlement was established. The forthcoming three collective-bargaining sessions were also characterized by inability to establish agreement. In order to prevent the outbreak of strikes and lock-outs the Danish Parliament intervened. In 1975 and 1979 the statutory settlements extended the previous agreements with some changes due to the mediator. In 1977 the Parliament simply enacted the mediator's proposal into legislation.

Along with this Denmark experienced a wage explosion in the mid 1970's as shown by figure 3.1. From 1973-75 average nominal wage growth thus exceeds 20%. This leads to a considerable increase in the growth rate of the real consumption wage which reaches its peak in 1975 where the consumption wage goes up by no less than 8%, see figure 3.2. Part of this increase is due to a lowering of indirect taxes which explains why the consumption wage grows by about 3% more than the product wage in 1975, see figure 3.2. This diagram also shows that the growth rate of the product wage is declining in response to the quadrubling of the oilprice in 1973, which raised the price index of imported raw materials by about
100%. However, as the level of the product wage remains increasing until 1978 it is hardly surprising that the adverse supply shock had to raise unemployment. From 1973-76 the unemployment rate more than quadroled despite the government's attempts to expand demand through tax cuts in 1975. If we define the degree of real-wage flexibility as the extent to which movements in wages tend to reduce unemployment the above episode is thus an example of inadequate wage adjustment. As the automatic wage-indexation system accounts for about 50% of total earnings growth in this period and as wage indexation amplifies the unemployment and inflation effects of an adverse supply shock it is obvious why the remainder of the 1970's is characterized by attempts to reduce the role of wage indexation in the economy.

In the adjustment to the second oilprice increase in 1979, which is of the same magnitude as the first shock, the product wage shows less resistance partly because of lower inflation compensation through indexation. Thus in order to avoid that increases in energy prices were passed into higher wages, the energy compo-

Figure 3.2 Growth Rate of Real Product Wage and Consumption Wage

![Graph showing growth rate of real product wage and consumption wage](source: Andersen and Risager (1988b))
ments were taken out of the index in 1980. In addition, all portions to be paid in January 1980 were annulled. This helps to explain why the adjustment is less painful in terms of unemployment. Another important explanation is the Danish exchange-rate policy. In contrast to 1973-79, where the Danish Krone was revalued, the trade weighted exchange rate is devalued by 18% from 1979-82. That is partly due to external events such as the appreciation of Sterling in the beginning of the Thatcher-era, but also due to four small Danish devaluations. Despite that devaluation strengthens the contractionary supply-side impulse originating from the oilprice increase, it is generally recognized that the expansionary demand-side effect operating through the switching effects in exports and imports outweighs the contractionary supply-side effect in the short term [see Gylfason and Risager (1984)]. The devaluation strategy is therefore likely to have facilitated the adjustment to the second major real shock experienced in the 1970's.

Against the background of unsatisfactory macroeconomic performance in the 1970's and increasing government intervention into the wage-formation process which ultimately could deprive the trade unions and the employers' federations their role in the bargaining system, it became increasingly important for the labour-market organizations to demonstrate that they alone were able to reach agreement. In order to facilitate agreement the parties adopted a decentralized negotiation schedule in 1981 defined as a scheme where the individual trade unions and their counterparts address both the general and special issues. Such a decentralized bargaining schedule would also make it more difficult for the government to interfere [see Lund (1987)]. The la-
bour-market organizations also bargained decentrally in 1983 but without the success of 1981. In 1983, centralized negotiations were concluded by the parties' acceptance of the mediator's proposal. This agreement marked the beginning of a period with low inflation, see figure 3.1. The attempts to disinfla te were continued in 1985. Since the labour market organizations again had failed to reach agreement, the government enacted into legislation a highly ambitious incomes policy which we discuss in detail in section 6. In 1987, the settlements were concluded by a referendum which gave support to the mediator's proposal.

4. Wage and Employment Determination in Manufacturing

The preceding description of the employment situation and the wage-formation process leads us to an analysis of the determination of wages and employment in manufacturing. We are not attempting to test a specific model of wage and employment determination, but we use a bargaining model as a benchmark around which to organize our empirical analysis. The results reported in this section are extracts from Andersen and Risager (1988b) to which we refer for a more detailed discussion of the underlying labour market model, the data set, and the empirical results.

4.1. A Bargaining Model of Wage and Employment Determination

We consider a setting where wages for a given period are determined at a centralized negotiation between a union and an employ-

4.1. An analysis of the whole economy by use of a similar methodology yielded results of the same nature. Consistency between the wage and employment series is however difficult to attain at the aggregate level.
ers' federation. Given the wage, firms choose the level of employment which maximizes profits. This particular sequential structure is known as the right to manage model, see e.g. Andrews and Nickell (1983) and Hoel and Nymoen (1988). Here as in other empirical analyses based on this model there is no distinction between the different channels through which wage changes may come about, say, central negotiations, wage drift, and indexing. Consequently, it is implicitly assumed that the split between the different channels is of no importance for aggregate wages. Although this assumption could be called into question we find that it constitutes a reasonable starting point for an analysis of aggregate wage determination. As we do not wish to cluster our model with arbitrary expectation formulations we have chosen to see how well a perfect foresight version fits the data.4.2

Employment is determined by firms' demand for labour. Under the assumption of profit maximization, employment, expressed as the demand for men, is given by

\[
l_t = \alpha_0 + \alpha_1 (w_t - q_t) + \alpha_2 (r_t - q_t) + \alpha_3 t + \alpha_4 w_t + \alpha_5 h_t + \alpha_6 d_t + \alpha_7 l_{t-1} \quad (4.1)
\]

where a lower case letter denotes the logarithmic value of the variable in question. Equation (4.1) shows that employment decreases if either wages, w, or raw material prices4.3, r, increase relative to output prices, q. This reflects that increases in input prices relative to output prices reduce the profitability of production and thus the need for labour. Employment taxes, t,
increase the cost of labour and thus reduce the demand for labour, where $t_\text{E}_t$ is defined as $\log(1+T_\text{E}_t)$. Since total labour input depends both on the number of men, $l$, and working hours, $wh$, it follows that higher working hours lower the need for men. The average productivity of labour, $h$, enters as a measure of both technological progress and the capital-labour ratio. To the extent that the aggregate demand pressure, $ad$, constrains firms in terms of eg. a current sales constraint it might affect the demand for labour$^{4.4}$. As a measure of the demand pressure we use capacity utilization, defined as demand relative to potential output. It is important to note that this variable is trendless. Hence, in the long run where the capacity level is adjusted in accordance with the activity level employment depends only on relative prices and the like. In the short run, however, the capacity level cannot be readily adjusted which explains why the demand pressure may exert an independent influence on the demand for labour. Finally, the lagged level of employment should appear if the adjustment of employment is costly, see Sargent (1979).

When negotiating a wage rate the parties recognize that the level of employment is determined according to (4.1). The union is concerned about both real wages and employment, and the relative importance of those two objectives depends among other things on the strength of insiders where the group of insiders is defined as those being in employment in the previous period, $l_{t-1}$. An increase in the number of insiders has two opposite effects on the union's wage demands, namely, to moderate wage demands in order to maintain the jobs of insiders and to increase wage demands.

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4.4 The presence of this variable can also be rationalized with reference to imperfect competition in product markets or through expected future market conditions.
since unemployed union members have less weight in the union's objective function. In general it is uncertain which effect dominates, see appendix. Employers on their part aim at the highest possible level of profits. If the outcome of the bargaining process is determined by the asymmetric Nash-bargaining solution [see Binmore et al. (1986)] which allows the parties different bargaining strength the real-wage equation is given as

\[ \Phi(B)(w_t-p_t) = \beta_0 + \beta_1(q_t-p_t) + \beta_2(r_t-p_t) + \beta_3te_t + \beta_4wh_t \]

\[ + \beta_5h_t + \beta_6ad_t + \beta_7l_{t-1} + \beta_8(b_t-p_t) + \beta_9ti_t \quad (4.2) \]

\[ + \beta_{10}f(U_t) + \beta_{11}AC_t + \beta_{12}DUMMY_{83-85} + \beta_{13}\Delta^2p_t \]

Since the demand for labour is crucial for wage negotiations, equation (4.2) is a reduced form which comprises the labour demand function (4.1), and all variables in (4.1) are therefore also in (4.2). The result of the wage negotiation is here specified as a real-wage equation, but since wages and raw material prices are deflated by producer prices in (4.1) we arrive at (4.2) by introducing the relative price term \((q-p)\) and using that \(w-q = (w-p) - (p-q)\) and \(r-q = (r-p) - (p-q)\). An increase in \((q-p)\) improves the trade-off between wages and employment faced by the union, and hence the variable enters with a positive coefficient. Equation (4.2) includes two variables which are both directly relevant for labour demand and the preferences of the union, namely, working hours, \(wh\), and lagged employment, \(l_{t-1}\). Unions care not only about real wages but also about the total real income of workers. A reduction in working hours must thus in itself release
a pressure for wage increases to avoid a proportional decrease in total real income. Lagged employment influences labour demand due to adjustment costs but is also a measure of the number of insiders among union members. Similarly, productivity appears since it is directly relevant to both labour demand and the pay-off to employers.

An increase in the purchasing power of unemployment compensation, b-p, allows the union to be more aggressive in its wage demands since those eventually driven into unemployment obtain a higher compensation. As union members are basically interested in their net of tax wages we include the income-tax variable, ti, which is defined as $ti = \log (1 - TI)$, and hence real disposable income is increasing in ti. The real wage is increasing in the unions' bargaining power. We do not have a good measure of bargaining power but include the rate of unemployment, U, as a proxy for this variable, assuming that the unions' bargaining strength is declining in the level of unemployment, and vice versa for employers. We use the aggregate unemployment rate which is only marginally affected by the conditions in manufacturing (in terms of employment it constitutes approximately 15% of the whole economy). Since we have no a priori knowledge about the functional relationship between bargaining power and unemployment, attempts have been made with different functional forms.

Real wages depend on the government's willingness to accommodate changes in private sector employment by changes in public sector employment, see e.g. Calmfors and Horn (1985). We introduce this effect by both a series which proxies the government's willingness to accommodate employment fluctuations, AC, and a dummy va-
riable for the years 1983, 1984 and 1985 where there was a shift towards a less accommodative policy, cf. section 6. The AC-vari-

able is constructed as the relation between the change in trend-corrected public sector employment and the change in pri-

vate sector employment. With full accommodation this variable equals minus one.

A distinctive property of Phillips-curve models is that increases in the rate of inflation are not matched one-to-one by wage in-

creases in the short run. The real wage can thus be kept permanently low by accelerating the rate of inflation. Such an effect is precluded by assumption from our real-wage model which only allows a role for real variables. Newell and Symons (1986) show that the inclusion of the variable \( \Delta^2 p = (p_t - p_{t-1}) - (p_{t-1} - p_{t-2}) \) is a test of whether the real-wage equation can be rewritten in the form of a non-vertical Phillips-curve model. If \( \Delta^2 p \) is insig-

nificant we reject the hypothesis that real wages can be affected by an accelerating rate of inflation.

We allow for the possibility of sluggish adjustment of the real-

wage due to frictions or adjustment costs by including a lag-po-

lynomial of the dependent variable, where \( \Phi(B) = 1 - \lambda_1 B - \lambda_2 B^2 \), and B is the lag-operator.

Equations (4.1) and (4.2) represent our wage-employment model. It is important to notice that (4.1) is a structural equation, whereas (4.2) is a reduced form equation which embodies (4.1). This explains the recursive structure of the model where current wages affect current employment, whereas the opposite is not the case. We have chosen to work with the reduced form wage equa-
tion despite the implied interpretative problems since we do not expect our data set to contain sufficient information to allow a separate identification of the pay-off functions of unions and employers. In any case, such a procedure would only be possible with a specific parameterization of the model which we find too costly in terms of lost generality.

4.2. Empirical Results

The employment and wage equations have been estimated on annual data from 1959 to 1985 for the manufacturing sector. Our estimation strategy has been to start out with the general specification of (4.1) and (4.2), and then deleting one-by-one the variable with the lowest significance level using a critical level of 5%. By this procedure we have arrived at the specific equations reported in table 4.1. In connection with the preferred employment and wage equations we report a number of diagnostic tests, none of which reveals any anomalies at a 5% significance level. As there might be a simultaneity bias in these single equation estimations we also report the results of IV estimation. As can be seen, the simultaneity problem does not seem overwhelming.

Employment

The presence of the lagged employment level in the employment equation shows that the demand for labour (men) is adjusted sluggishly to changes in the explanatory variables. The adjustment is, however, relatively fast with the impact effect being 54% of the total effect. Already after the second period, 90% of the to-

4.5 A similar procedure has been adopted by Andrews and Nickell [1987] and Hoel and Nymoen [1988].
Table 4.1. Real-Wage and Employment Equations, 1959-85

<table>
<thead>
<tr>
<th>Independent Variables</th>
<th>Summary Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>R²</td>
</tr>
<tr>
<td>Employment</td>
<td>0.983</td>
</tr>
<tr>
<td>(1.40)</td>
<td>(0.05)</td>
</tr>
<tr>
<td>Real Wage</td>
<td>0.9997</td>
</tr>
<tr>
<td>(0.05)</td>
<td>(0.11)</td>
</tr>
<tr>
<td>B. IV-estimation</td>
<td></td>
</tr>
<tr>
<td>Employment</td>
<td>NA</td>
</tr>
<tr>
<td>(1.96)</td>
<td>(0.06)</td>
</tr>
<tr>
<td>Real Wage</td>
<td>NA</td>
</tr>
<tr>
<td>(0.05)</td>
<td>(0.11)</td>
</tr>
</tbody>
</table>

Notes:
NI: Variable not relevant. NA: test statistic not available. 0: Variable insignificant. Numbers in brackets are standard deviations. ‘‘’ indicates that the test shows design inadequacy using a 5% significance level.
1) F-test of autocorrelation of lag 1, lags 1 to 2, lags 1 to 3.
2) F-test of autoregressive conditional heteroscedasticity of lag 1, lags 1 to 2, lags 1 to 3.
3) F-test of heteroscedasticity dependent on explanatory variables.
4) X²-test of normality of error terms.
5) X²-test of parameter stability.
6) X²-test of the validity of instruments.
7) Endogenous variables: employment, product wage, real wage, productivity and working hours.
8) Instruments: current and lagged gdp in OECD, current and lagged labour supply, current and lagged import prices, income taxes (only in employment equation), trend and a dummy 1974-1985.

Data Source: Andersen and Risager (1988b)
tial effect has materialized. The equation confirms that a mix of Keynesian (aggregate demand pressure) and Classical (product wage) influences are important for employment, as also confirmed by the studies of Bean, Layard and Nickell (1986) and Andersen and Overgaard (1988). The aggregate demand pressure influences labour demand significantly in the expected way. The elasticity of employment with respect to the product wage is relatively moderate with a long-run value of -0.56, but it is highly significant. Bean et al. (1986) reports about the same elasticity for Denmark, and compared to other countries it is of average size.

We find that neither raw material prices nor employment taxes are significant. As concerns raw material prices the reason might be that the two oil-price hikes were accompanied by a huge fall in aggregate demand in most European Countries, see Bean and Dréze (1988), and it is therefore difficult to disentangle the separate effects of these two variables. The series available on employment taxes is a crude measure as it includes both involuntary contributions and contributions which are the outcome of negotiations between workers and employers. Moreover, we have not been able to distinguish between contributions related to the number of employed persons and those which are related to the wages paid. Hence, we do not take this finding to be evidence against the importance of employment taxes.

A reduction of working hours by 1% increases the demand for men by .6% in the short run and by 1% in the long run. The substitutability between hours and men is thus greater in the long run than in the short run. A reduction of working hours will decrease the demand for man hours in the short run whereas it will be un-
changed in the long run, other things being equal.

The employment equation is assumed to satisfy the homogeneity property since it includes only relative prices and other real-variables. We have tested this property which implies that the coefficient to wages is numerically equal to the coefficient to producer prices. With a F-test\(^{4.6}\) statistic of \(F = 0.82\) and a critical value \(F(1,22) = 4.3\) we cannot reject this hypothesis. The employment equation does not show any sign of parameter instability over the years 1983-85. This is important since it implies that the remarkable upswing in manufacturing employment (10%) can be explained by our model.

**Real Wages**

Real wages also adjust with some sluggishness to changes in the explanatory variables. As for employment the time-span between the short and long run is relatively short since the impact effect amounts to 56% of the total effect and since it requires only two periods to build up 92% of the total change. As predicted by our theory all variables found significant in the employment equation also appear significant in the wage equation.

It is interesting to note that we have difficulties in capturing any effects of the unemployment rate on real wages. This may be due to a strong influence of insiders in the wage determination and/or to the fact that the official unemployment figures are bad indicators of the demand pressure in the labour market and hence

\(4.6.\) This and other tests reported below apply to the OLS-estimation. The same quantitative results hold for the IV-estimates.
the bargaining power of unions, cf. section 2.7. We believe that both explanations may be relevant although we are unable to discriminate between them. Furthermore, as the variable measuring the demand pressure is correlated with unemployment caution is required in interpreting this result. However, the insignificant unemployment effect could be consistent with the presence of hysteresis in the sense that persistent unemployment does not put pressure on wages whereas short-term fluctuations captured by the ad-variable exert such an influence. This interpretation is supported by the fact that we also failed to find the change in unemployment to be significant, see Andersen and Risager (1988b).

In the light of these results it is perhaps not surprising that we are unable to locate any influence of unemployment benefits on real wages. We hasten to emphasize the difficulties in capturing all aspects of the Danish unemployment insurance system in a single variable, cf. section 2. On the basis of the disaggregated analysis in section 5 we shall, however, see that the rise in unemployment benefits at least has had important distributional effects.

Neither employment nor income taxes are important for real wages. Given the remarks made above on employment taxes this should come as no surprise. The surprising result that income taxes do not influence real wages implies that a 1% increase in

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4.7 We have tried to include the unemployment rate, the change in the unemployment rate, the inverse of the unemployment rate, and the log of the unemployment rate. Only in the first case is the unemployment rate significantly different from zero, though with a small coefficient. That equation suffers, however, from autocorrelation and is therefore not reported here.

4.8 The simple correlation between unemployment and the aggregate demand pressure is -0.2376, and between the change in unemployment and the demand pressure it is only -0.0232.

4.9 We have also tried to work with a real-after-tax-wage equation with a so-called wedge variable (te+(q-p)-ti). The restrictions implied by this composite variable are rejected by the data.
income taxation causes a similar reduction in disposable income. This is not in accordance with other results for Denmark (Pедерсен (1973)), but the international evidence on this point is mixed, see Knoester and van der Windt (1987). Again, attention should be called to the difficulties of summarizing a complicated system of income taxation in a single number, hence no policy conclusions should be based on this finding.

Working hours exert a significant influence on real wages such that a reduction in working hours would tend to increase real-wages. This may come about for two reasons, namely, either because shorter working hours increase the demand for labour or because unions are concerned not only about the hourly wage but also about total income. Hence, in order to avoid that shorter working hours causes a proportional drop in total income they might demand some wage compensation.

As should be expected for an open economy like the Danish the distinction between producer and consumer prices is highly important. We find that increases in the relationship between producer and consumer prices in part will be counteracted by an increase in the real wage. That is, the increase in this relative price term tends to reduce the product wage but not proportionally as part of the change will induce wage increases. With a F-statistic of 3.8 and a critical value $F(1,21) = 4.32$ we are unable to falsify the hypothesis that wages in the long run will change so much that the product wage stays unchanged. Obviously, this

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4.10 If log $U$ enters the wage equation we find that the income tax variable is significant with the correct sign whereas working hours drop out. This equation suffers, however, from autocorrelation and is therefore not reported here, see Andersen and Risager (1988b).

4.11 The test has been made by imposing a long-run coefficient of unity.
puts quite some perspective on previous difficulties and future possibilities of solving the twin problems of unemployment and current-account deficits.

Similar conclusions follow when we look at the effects of changes in productivity on the real wage. Productivity gains are in the short run split equally between real wage increases and increases in profitability, but in the long run real wages respond proportionally to productivity [compare to Newell and Symons (1986)].

We have included the variable $\Delta^2p$ in the real-wage equation in order to see whether our model is consistent with an extended Phillips-curve relation, see Newell and Symons (1986). As $\Delta^2p$ is insignificant we falsify the Phillips-curve hypothesis that real wages can be reduced by an accelerating rate of inflation. Moreover, this result also supports the appropriateness of studying wage formation in terms of a real-wage equation as implied by our bargaining model.

The real-wage equation reported in table 4.1 presumes the homogeneity properties to be fulfilled, i.e. it includes only relative price terms. Rewriting our wage equation as a nominal wage equation we find that it includes two coefficient restrictions, namely, that the coefficient to consumer prices equals one minus the coefficient to producer prices and that the coefficient to the lagged nominal wage rate is equal to minus the coefficient to the lagged consumer price. With a F-test statistic of 0.9 and a critical value of $F(2,18) = 3.6$ we fail to reject the two coefficient restrictions. Hence we cannot reject the homogeneity properties, and we conclude that the labour market apparently does not
give rise to any nominal rigidities.

We have also tried to investigate whether a more accommodative employment policy would induce wage increases. To capture this effect we included the AC variable reflecting the extent to which public employment is changed to mitigate fluctuations in private employment. Obviously, this variable is only a proxy for the degree of accommodation and it is perhaps not surprising to find it insignificant. Simultaneously, we have included a dummy variable for 1983-1985 to capture the shift towards a less accommodative economic policy. We find that this variable exerts the a priori expected influence on real wages which amounts to a reduction of real wages by 5-6%. Such a finding is a necessary but not sufficient condition that a regime-shift actually took place, and it is therefore only a weak test of the accommodation hypothesis. More research is therefore needed to clarify the exact influence of the policy change on wage formation, see section 6.

Our real-wage model fails to satisfy parameter constancy over the years 1983-85. This should come as no surprise since the parameter stability test is here essentially a test on the appropriateness of including the dummy variable for the years 1983-85, and we reconfirm this. Testing for parameter constancy over the years 1984-85 we find no signs of parameter instability.

**Long-run Properties**

Our wage-employment equations represent a dynamic model in which it can be difficult to trace the effects of a change in one of the explanatory variables on wages and employment over time. To
facilitate the interpretation table 4.2 reports the long-run coefficients to the exogenous explanatory variables. These coefficients may be of some help in highlighting the policy conclusions which can be drawn from this study, see section 7. However, as it is well-known that historically based relationships can be a fragile base for policy conclusions caution is required when reading table 4.2.

Table 4.2. Long-Run Coefficients

<table>
<thead>
<tr>
<th></th>
<th>Working Hours</th>
<th>Aggregate Demand Pressure</th>
<th>Relative Output Prices</th>
<th>Productivity</th>
<th>Dummy 83-85</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employment</td>
<td>-0.63</td>
<td>1.36</td>
<td>-0.22</td>
<td>-0.44</td>
<td>0.05</td>
</tr>
<tr>
<td>Real wages</td>
<td>-0.90</td>
<td>1.24</td>
<td>1.38</td>
<td>0.76</td>
<td>-0.08</td>
</tr>
</tbody>
</table>

1) Coefficients are calculated by use of results reported in table 4.1.8. The interpretation of the long-run coefficient to the aggregate demand pressure is the effect of permanently expanding demand beyond normal capacity, and hence it should not be given a standard steady-state interpretation.

Taking account of the interrelationship between wages and employment we find that a reduction in working hours by 1% in the long-run increases employment by .6% whereas the employed man hours decrease by .4%. The real wage increases, however, by almost 1% such that full wage compensation is ensured. It is possible to increase employment by expanding demand beyond normal capacity, but it induces at the same time an increase in real wages. Increases in both relative output prices and productivity have fairly small effects on employment, whereas there is a large effect on real wages. Finally, the long-run effect of the dummy is a substantial decline in wages and a large increase in employment.

4.3. Comparison to Other Studies

We shall comment on the relationship between our study and pre-
vious analysis of wage formation in Denmark, for a survey see Strøjer-Madsen (1984) and the references therein. Most studies belong to the Phillips-curve tradition including a number of additional explanatory variables [Paldam (1984)]. Generally, these variables are included one at a time which makes a comparison with the present work difficult as we have adopted the methodology of general to specific.

Most studies find that unemployment has a negative effect on wages. This differs from our finding, but different sample periods and the fact that these studies do not include other pressure variables may help explain this. The coefficient to the expected rate of inflation is generally found to be below unity, and this has been interpreted as evidence against a vertical long-run Phillips-curve, cf. Pedersen (1983b). A closer look at the different specifications of the Phillips-curve for the period 1946-76 reported in Pedersen (1983b) reveals, however, that the coefficient not in any single case is significantly different from unity. This is in accordance with our homogeneity results and the rejection of the presence of a long-run Phillips-curve trade-off. Other variables found to have a significant influence include: unemployment compensation, working hours, direct taxes, the degree of labour market organisation and the number of days lost due to labour market disputes.

5. The Behaviour and Determinants of Relative Wages

So far we have looked at the aggregate wage determination but since trade unions also are concerned for so-called fair wage differentials we now turn to a study of wage relativities on the
Table 5.1 shows that the wage structure became more egalitarian from the 1960's to 1977. The relative wage between unskilled women and unskilled men thus increased by 15 percentage points, while the relative wage between unskilled men and skilled workers (almost all men) increased by 6 percentage points. Since then the equalization process has stopped, and is actually followed by a slight tendency towards larger wage differentials from 1985-86. Despite the previous tendency of declining wage differentials, table 5.1 also reveals that the three wage rates in the entire period have been closely correlated insofar as the annual changes of the relative wages are fairly small. The apparent high degree of wage interdependence is the starting point for the following analysis. On the basis of a model with several unions concerned not only about their members' real wage and employment situation as in section 4 but also about their position in the earnings hierarchy, we hope to obtain insight into the following questions: Did the tendency towards a more egalitarian wage structure fuel the wage-inflation process, and if yes, what is the empirical relationship between a one percentage decline in wage differentials and the offsetting rise in wages in the next year, say? While this issue pertains to the relationship between relative wages and wage inflation in the short term, we shall also be concerned with the determinants of relative wages in the long term. In particular, we wish to test whether the considerable rise in real UI-benefits has affected the wage structure which one would expect as the rise in UI-benefits has been relatively more valuable to the lowest paid embodying a high concentration of persons - e.g. women - highly exposed to unemployment, cf. section 2. In
addition, does the high unemployment help to explain why wage differentials have stopped falling? To study these issues we first present the theory drawing on Risager (1987a), which in turn is an extension of Gylfason and Lindbeck (1984) and Oswald (1979), and thereafter the empirical results.

Table 5.1 Wage Relativities

<table>
<thead>
<tr>
<th>Year</th>
<th>Unskilled Female Workers</th>
<th>Unskilled Female Workers</th>
<th>Unskilled Male Workers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Unskilled Male Workers</td>
<td>Skilled Workers</td>
<td>Skilled Workers</td>
</tr>
<tr>
<td>1959</td>
<td>.77</td>
<td>.63</td>
<td>.82</td>
</tr>
<tr>
<td>-69</td>
<td>.80</td>
<td>.66</td>
<td>.83</td>
</tr>
<tr>
<td>1970</td>
<td>.81</td>
<td>.68</td>
<td>.84</td>
</tr>
<tr>
<td>1971</td>
<td>.83</td>
<td>.70</td>
<td>.84</td>
</tr>
<tr>
<td>1972</td>
<td>.86</td>
<td>.73</td>
<td>.85</td>
</tr>
<tr>
<td>1973</td>
<td>.88</td>
<td>.76</td>
<td>.86</td>
</tr>
<tr>
<td>1974</td>
<td>.90</td>
<td>.78</td>
<td>.87</td>
</tr>
<tr>
<td>1975</td>
<td>.91</td>
<td>.79</td>
<td>.87</td>
</tr>
<tr>
<td>1976</td>
<td>.92</td>
<td>.81</td>
<td>.88</td>
</tr>
<tr>
<td>1977</td>
<td>.92</td>
<td>.80</td>
<td>.87</td>
</tr>
<tr>
<td>1978</td>
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<td>1979</td>
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<td>1981</td>
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<td>1982</td>
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<td>1983</td>
<td>.91</td>
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<td>1985</td>
<td>.91</td>
<td>.80</td>
<td>.88</td>
</tr>
<tr>
<td>1986</td>
<td>.89</td>
<td>.78</td>
<td>.87</td>
</tr>
</tbody>
</table>

1) The hourly wage is exclusive of holiday pay and certain allowances.

Source: Danish Employers' Federation, Statistics Department.

5.1 A Model of Wage Relativities

To simplify the exposition of the model let us imagine that there are two types of workers and one representative firm employing both types of labour. Workers are organized in two distinct trade unions reflecting the Danish system where workers are organized along craft lines. The firm bargains simultaneously with the two
unions over the wage rates while it realistically decides on the employment of the two types of labour. There are two sources of wage interdependence in the model. The first source enters through the preferences of the workers since we assume that they care not only about the purchasing power of their own income but also about their income relative to the members of the other union. The second source of wage interdependence is a matter of the degree of factor substitutability, cf. below.

Under the assumption that the outcomes of the wage negotiations are given by the asymmetric Nash-bargaining solution the following log linear money-wage equation describes the determinants of the settlement between the firm and union-1,

$$w^1 = a_0 + a_1 w^2 + a_2 b + (1-a_1-a_2)p + a_3 (1-\gamma) (5.1)$$

where $w^1$ is the wage of union-1 members, $w^2$ is union-2 wage, $b$ is the currency value of unemployment compensation, $p$ is the consumer price index, and $(1-\gamma)$ is a measure of the bargaining power of union-1, while $\gamma$ is the bargaining power of the firm. In the specification of (5.1) we have also assumed perfect foresight such that all variables on the r.h.s. are the actual values implying that (5.1) is best thought of as a long-run wage equation with the properties outlined below. First, an equiproportional increase in $w^2$, $b$, and $p$ leads to an increase in $w^1$ of the same order of magnitude reflecting that the bargaining solution must fulfill the basic homogeneity property. Below, we test for

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$5.1$ Partly because we lack disaggregated data on some of the variables entering the previous model and partly because we now focus on other questions some of the previous variables are excluded from the present model. The subsequent misspecification tests should, however, show whether the model has become too simplistic.
this assumption. Secondly, despite that individuals care about their relative earnings position, something Gylfason and Lindbeck has labelled the "envy-effect", it is theoretically uncertain whether a rise in $w^2$ leads to an increase in $w^1$. Whether or not that will be the case depends also on the production technology and on the bargaining power of the firm. If the two production factors are substitutes such that a rise in $w^2$ leads to a higher demand of factor-1, union-1 will tend to take advantage of this by pressing for a higher $w^1$, and if the firm does not have too much bargaining strength the outcome will in fact be a higher $w^1$. Envy and factor substitutability thus tend in the direction of a positive correlation between the two wage rates and hence a positive coefficient to $w^2$. Thirdly, a rise in unemployment compensation has an unambiguously positive effect on $w^1$ reflecting that the union tends to balance the marginal benefit of being unemployed with the marginal value of having a job. It is also unambiguously true that more union power leads to a higher wage. With respect to the effects of higher prices it is theoretically uncertain how that affects $w^1$ though we would expect a positive relationship in reality.

Because the second bargaining problem is identical to the one we have considered, we have

$$w^2 = \beta_0 + \beta_1 w^1 + \beta_2 b + (1-\beta_1-\beta_2)p + \beta_3 (1-\epsilon)$$  \hspace{1cm} (5.2)

where $(1-\epsilon)$ represents union-2's bargaining power, while $\epsilon$ is the firm's bargaining power when it negotiates with union-2. By solving the simultaneous equations' system (5.1) and (5.2) we obtain the consistent Nash-equilibrium (reduced forms) which in turn
gives the following long-run relative wage equation,

\[ w^1 - w^2 = \epsilon_0 + \epsilon_1 p + \epsilon_2 b + \epsilon_3 (1-\gamma) + \epsilon_4 (1-\epsilon), \quad \epsilon_1 + \epsilon_2 = 0 \]  \tag{5.3}

Equation (5.3) says that it is uncertain how a rise in \( p \) affects the relative wage since \( w^1 \) may be more or less sensitive to price changes than \( w^2 \). The same argument applies to \( b \). An equiproportio-nate increase in \( p \) and \( b \) leaves, however, the relative wage unaffected in the long run. Henceforth, we refer to this as the homogeneity property. Fourthly, a rise in the bargaining power of union-1 increases \( (w^1 - w^2) \) contrary to the effect of a rise in the bargaining power of union-2. Since (5.3) is a long-run relationship which is unlikely to be a good description of the movement of the relative wage in the short term due to various lags in the adjustment process we now specify a dynamic version of (5.3) which allows wages to depart from (5.3) in the short term while they tend towards (5.3) in the long term. As the error-correction approach precisely is designed to this end we shall use that approach. The dynamic version of (5.3) is given as

\[ w^1_t - w^2_t = \lambda_0 + \lambda_1 w^1_{t-1} + \lambda_2 w^2_{t-1} + \lambda_3 \Delta p_t + \lambda_4 \Delta b_t + \lambda_5 p_{t-1} + \lambda_6 b_{t-1} \]  \tag{5.4}

\[ + \lambda_7 (1-\gamma_t) + \lambda_8 (1-\gamma_{t-1}) + \lambda_9 (1-\epsilon_t) + \lambda_{10} (1-\epsilon_{t-1}) \]

where we have assumed that a one period lag is sufficient to capture the dynamics. Below we shall see that this is the case given that we use annual data. In order to obtain (5.3) as the long-run solution to (5.4) we have to impose two sets of restrictions. The first restriction says that the elasticity of \( w^1 \) w.r.t. \( w^2 \) equals one in the long term, cf. (5.3). Hence, \( \lambda_1 = - \lambda_2 \). By
rewriting the model using this restriction and the definitions
\[ \Delta w_t^1 = w_t^1 - w_{t-1}^1, \quad \Delta w_t^2 = w_t^2 - w_{t-1}^2 \]
we have
\[ \Delta w_t^1 - \Delta w_t^2 = \lambda_0 + (1-\lambda_1)(w_{t-1}^2 - w_{t-1}^1) + \text{"Remaining terms"} \quad (5.5) \]

By imposing this restriction on the model we have thus obtained an error-correction model. Henceforth, we therefore refer to this as the ECM-restriction, which we below give an intuitive interpretation. The second restriction is the homogeneity assumption which says that \( \lambda_3 = -\lambda_5 \), and \( \lambda_4 = -\lambda_6 \), cf. (5.3). Hence,
\[ \Delta w_t^1 - \Delta w_t^2 = \lambda_0 + (1-\lambda_1)(w_{t-1}^2 - w_{t-1}^1) + \lambda_3(p_t - b_t) + \lambda_4(p_{t-1} - b_{t-1}) \quad (5.6) \]
\[ + \lambda_7(1-\gamma_t) + \lambda_8(1-\gamma_{t-1}) + \lambda_9(1-\epsilon_t) + \lambda_{10}(1-\epsilon_{t-1}) \]

In a steady state, where all nominal variables grow equiproportionately and where all real variables are constant, equation (5.6) satisfies the properties of (5.3). Hence, (5.6) is the dynamic error correction model which has imbedded in it a long-run solution consistent with our bargaining model. The interpretation of the error correction mechanism is straightforward. Suppose that \( w_{t-1}^2 - w_{t-1}^1 \) is above the long-run value implied by (5.3). In that case \( \Delta w_t^1 - \Delta w_t^2 \) is positive, assuming \( 1-\lambda_1 > 0 \), such that the relative wage moves towards its long-run target given by (5.3).

On the basis of (5.6) we have estimated a relative wage equation for unskilled men and unskilled women, and one for skilled workers and unskilled men. The most severe problem of the empirical investigation is to measure the power the unions have in the wage negotiations. Obviously, we have to rely on some proxies. A proxy which again comes to mind is unemployment. In the first equation
we have thus used the unemployment rate of unskilled women and the unemployment differential between unskilled women and unskilled men. The virtue of using the differential is to allow for different responses while avoiding the multicollinearity problem. In the second equation we have used the unemployment rate of skilled workers and the differential between skilled and unskilled men. In both cases it turns out that the differential is insignificant irrespective of whether the estimation technique is OLS or IV-estimation. Before we turn to the results we emphasize that we have started (and ended) the testing sequence by testing for the ECM-hypothesis and the homogeneity assumption both of which we cannot reject. Following these tests we have sequentially deleted those variables which are statistically insignificant at a 5% level. The final equations are given by table 5.2.

Let us first look at the inflationary implications of a change in the wage structure. Suppose that the relative wage between unskilled men and skilled workers (almost all men) increase by 1%. The effect of a more egalitarian wage structure across skills is to boost wage inflation insofar as the growth rate of skilled workers' wage in the subsequent year will exceed the wage increase of unskilled men by more than 1%.\(^5\)\(^2\) This result suggests that attempts to compress wage differentials across skills are futile since wages of skilled workers quickly nullify such attempts.

The picture is quite different when it comes to the relative wage across sexes. Regression 3 and 4 show that a 1% increase in the relative wage of unskilled women is only followed by a relative increase in the growth rate of unskilled men's wage by 0.03% in

\(^5\)\(^2\) In both the OLS and IV-case the responses are, however, not statistically different from 1%.
Table 5.2 Wage Behaviour and Wage Relativities, 1960-85.

<table>
<thead>
<tr>
<th>Regression Number</th>
<th>Group of Workers</th>
<th>Independent Variables</th>
<th>Summary Statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Constant</td>
<td>Skilled M</td>
</tr>
<tr>
<td>1 (OLS) Skilled W vs. Unskilled M</td>
<td>24.75 (4.24)</td>
<td>1.09 (0.19)</td>
<td>-0.05 (0.008)</td>
</tr>
<tr>
<td>2 (IV) do</td>
<td>32.22 (5.41)</td>
<td>1.42 (0.24)</td>
<td>-0.06 (0.009)</td>
</tr>
<tr>
<td>3 (OLS) Unskilled M vs. Unskilled F</td>
<td>0 (0.016)</td>
<td>0.03 (0.006)</td>
<td>-0.024 (0.046)</td>
</tr>
<tr>
<td>4 (IV) do</td>
<td>0.03 (0.006)</td>
<td>-0.024 (0.046)</td>
<td>0.154 (0.046)</td>
</tr>
</tbody>
</table>

Notes:
1) Unskilled W/ Skilled W is the lagged proportionate wage differential between unskilled male workers and skilled workers defined as 100 \( (w_{1-1}^L - w_{1-1}^S) \); Unskilled F/ Unskilled M is the lagged proportionate wage differential between unskilled male and unskilled females defined as 100 \( (w_{1-1}^L - w_{1-1}^M) \); Real unemployment benefit is average hourly unemployment compensation deflated by the CPI defined as 100(b_t - p_t); Unemployment is in all eq's some measure of the number of insured unemployed relative to total number of UI-members. In regr. 1 and 2 it is thus a weighted average of the unemployment rates within the 5 largest UI-funds of skilled workers. In regr. 3 and 4 it is the unemployment rate within unskilled women's UI-fund.

2) Numbers in parentheses are standard deviations; \( R^2 \) is coefficient of determination; DW is Durbin-Watson statistic; AR is the F-test of serial correlation of lag 1, lags 1 to 2, lags 1 to 3; Arch is the F-test of autoregressive conditional heteroscedasticity of lag 1, lags 1 to 2, lags 1 to 3; Normality is a \( \chi^2 \) (2) test of the normality of the residuals; Parameter Constancy is a \( \chi^2 \) (3) - test of forecast ability/parameter constancy over 1983-1985.

3) A * means that the test shows design inadequacy using a 5% significance level.

4) Is the lagged variable.

5) The unemployment variables are instrumented by a unit value index of imports, a lagged wage in manufacturing and a variable measuring the pressure of demand in the economy. Tests for instrument validity reveal no anomalies. Results in regr. 4 become identical to regr. 3 since current unemployment (the instrument variable) is insignificant and hence is deleted.

the subsequent year. Furthermore, as this estimate is only significant when using a slightly higher significance level than the 5%, we conclude that a more egalitarian wage policy across sexes only has minor inflationary consequences in the short term.

With regard to the role of unemployment compensation table 5.2 shows that higher compensation leads to a more egalitarian wage structure. Regression 2 shows that a 10% increase in real unemployment compensation in the short term is associated with 0.6% higher wage increases of unskilled men relative to skilled workers. In the long run the relative wage goes up by about 0.42%. The long-run effect on the relative wage between unskilled women and unskilled men equals 6.67% which clearly shows that unskilled women have been favoured by the improvement of the benefit system which took place from the beginning of the sample period to 1979. Since then, the real value of unemployment benefits has declined which helps to explain why the tendency towards a more egalitarian wage structure has stopped.

Table 5.2 also gives information on the role of unemployment for the behaviour of relative wages. The results show that higher unemployment of skilled workers deteriorates their relative earnings position. In comparison to the effect of higher female unemployment the response is, however, modest insofar as a permanent 1 percentage point increase in female unemployment lowers their relative wage by 5% in the long term. Despite that this effect seems implausible large it nevertheless demonstrates the important point that unskilled women are the most vulnerable to business cycle fluctuations.
The latter result also points attention to the need for sound scepticism when judging the results. That is also required as we have been unable to control for differentials in productivity growth reflecting lack of data. We have therefore undertaken some misspecification tests which should give us a hint of the degree of design inadequacy. Table 5.2 tests for serial correlation, autoregressive heteroscedasticity, and normality. With the exception of regression 1, where there is a minor Arch-problem, these tests fail, however, to show design inadequacy. The same comment applies when we test for parameter constancy over 1983-85. The above results seem thus reasonably well founded despite we would wish that the models have had a higher explanatory power.

5.2 Central and Decentral Wage Bargaining

Table 5.3 gives information on both the absolute and relative importance of the three sources of earnings growth, namely, wage drift, indexation, and central-rate increases. The latter two sources are centrally determined whereas drift results from decentral wage negotiations, cf. section 3. The table shows that central bargaining accounts for about 55% of the total wage increase of all workers from 1960-86, while wage drift accounts for the remaining 45%. These figures are subject to a good deal of annual variation as is shown by the reported standard deviations although they are basically trendless. It is also of interest to note that from 1983-86, where wage indexation has been suspended, the relative role of central and decentral bargaining has by and large been turned upside down such that wage drift now accounts for roughly 55% of the total wage increase. The variation across workers is quite substantial. Unskilled women have thus obtained
Table 5.3  Sources of Earnings Growth, 1960-86

<table>
<thead>
<tr>
<th>Decentral and Central Bargaining</th>
<th>Wage Drift</th>
<th>Indexation</th>
<th>Central Rate Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Absolute 1)</td>
<td>Relative 2)3)</td>
<td>Absolute Value</td>
</tr>
<tr>
<td>Skilled Workers</td>
<td>1.47</td>
<td>53.8</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>(14.0)</td>
<td>(15.4)</td>
<td></td>
</tr>
<tr>
<td>Unskilled Men</td>
<td>1.01</td>
<td>42.2</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>(16.3)</td>
<td>(17.6)</td>
<td></td>
</tr>
<tr>
<td>Unskilled Women</td>
<td>0.68</td>
<td>31.0</td>
<td>0.86</td>
</tr>
<tr>
<td></td>
<td>(15.2)</td>
<td>(19.5)</td>
<td></td>
</tr>
<tr>
<td>All Workers</td>
<td>1.11</td>
<td>45.0</td>
<td>0.84</td>
</tr>
<tr>
<td></td>
<td>(15.4)</td>
<td>(16.8)</td>
<td></td>
</tr>
</tbody>
</table>

1) Average wage increase (in Dkr).
2) Fraction of total wage increase (in per cent).
3) Figures in brackets are standard deviations.

Source: Danish Employers' Federation, Statistics Department.

About 70% of their wage increase through central negotiations while skilled workers being the group that is least dependent on central bargaining only receives 30% through central bargaining. Central rate increases also provide women - the lowest paid - with a larger absolute amount than skilled workers - the highest paid. With respect to wage indexation, we note that it has also been relatively more valuable to the lowest paid insofar as the various groups roughly have obtained the same absolute amount of compensation.

The distributional effects of central bargaining are thus to narrow wage differentials. Because central bargaining often has been carried out under some coordination and supervision of LO one may take that as an indication of egalitarian preferences of the tra-
de-union movement. That is, however, not necessarily the correct conclusion. The above pattern could merely reflect asymmetries between skills concerning the levels of negotiation and not fundamental preferences. Secondly, central bargainers may be well aware of this pattern and hence take it into account. Thus, the above pattern may just reflect that central bargainers know that the highest paid tends to obtain a larger piece of the cake in the local negotiations. Flanagan et al. (1983) examine these questions in some detail. From the period 1960-75 they find that a one percentage point relative wage increase of skilled workers is followed by a subsequent larger centrally negotiated wage increase of both unskilled males and unskilled females. Whether or not the bargaining objectives of the trade union movement nowadays are dominated by similar egalitarian goals is a matter that has become increasingly difficult to test by ordinary regression analysis because the central negotiations as mentioned earlier frequently have resulted in a break-down and subsequent government intervention which explains why we have not attempted to update the analysis of Flanagan et al. However, by merely inspecting table 5.1 it seems reasonable to conclude that if central bargainers strive for a more egalitarian wage structure they have obviously not been successful in recent years.

The analysis in the former section pointed out that the considerable increase in unemployment and the less generous benefit system are important explanations why the previous tendencies of declining wage differentials no longer are present. A third potential explanation is the decline in the degree of inflation compensation offered by the indexation system and the final suspension in 1982. Fourthly, the pursued incomes policies, which
have mainly been directed towards the outcome of the central negotiations, could also have played a role. Declining inflation compensation and restrictive incomes policies directed towards central rate increases will, however, only affect the wage structure if the substitution between central and decentral wage growth is imperfect for some categories of labour. To get a better grip of this point consider regression 1 in table 5.2 rewritten here for convenience, $\Delta w^1_t - \Delta w^2_t = \lambda_0 + (1 - \lambda_1)(w^2_{t-1} - w^1_{t-1}) + "Remaining terms"$. Now if we on both sides subtract the wage increase of skilled and unskilled men due to central negotiations we have a wage-drift equation,

$$\Delta w^1_t, Drift - \Delta w^2_t, Drift = \lambda_0 + (1 - \lambda_1)(w^2_{t-1} - w^1_{t-1}) + "Rem. (5.7) terms" \quad - (\Delta w^1_t, Central - \Delta w^2_t, Central)$$

which says that the differential in wage drift between skilled and unskilled men depends on the differential in the central negotiations and of course on the other variables already discussed. Furthermore, if the central negotiations result in a decline in unskilled men's wage increase relative to skilled workers the decline will be offset through relatively higher wage drift of unskilled workers. From 1960-82 unskilled men received on average 1.6% more than skilled workers in the central negotiations, whereas the differential is down to 0.8% from 1983-85. If the degree of centralization of the wage negotiations is a veil as hypothesized by (5.7), unskilled men's relative wage drift should then have increased by 0.8%, ceteris paribus. But are central and decentral bargaining perfect substitutes? To obtain insight into this issue we have estimated (5.7) using the differential $(\Delta w^1_t, central - \Delta w^2_t, central)$ and $\Delta w^1_t, central$ as expla-
atory variables. The virtue of this is to allow for asymmetries in the response of drift to central wage increase for the two groups of workers. We report the results of both OLS and IV estimation. For the period 1960-85 both estimation techniques show that the substitution elasticity in absolute terms is less than one. In the IV-case the absolute substitution elasticity equals 0.65 which is higher than the elasticity for the subperiod 1960-82 suggesting that drift has become more sensitive to declines in central rate increases. However, as we cannot falsify the hypothesis that the substitution elasticity in the IV-case is equal to one, it follows that drift to a large extent has offset the decline in central rate increases.

In the case of unskilled men and unskilled women we were unable to prove any substitution at all between decentral and central wage bargaining, which suggests that a decline in the differential between central wage increase of unskilled women relative to unskilled men, as we also have experienced, tends to lead to a

| Table 5.4. Substitution Elasticity Between Central and Decentral Bargaining |
|-----------------|-----------------|-----------------|
|                  | 1960-82         | 1960-85         |
| Skilled W vs. Unskilled M | OLS\(^1\)  | (0.13) | (0.12) |
|                  | IV\(^2\)  | -0.38  | -0.65  |
|                  |                | (0.16) | (0.22) |

1) The equation has undergone the same misspecification tests as regr. 1 in table 8.2 but with no anomalies to report.

2) In the IV-estimation we have started with a simple dynamic model with only one lag on relative wages to save the lagged r.h.s. variables as instruments for the 2 unemployment variables and the 2 variables measuring central rate increase of skilled workers and the differential between skilled and unskilled men. Other instruments are a unit value index of imports, aggregate demand pressure, the lagged wage in manufacturing, and the lagged endogenous variable. The instruments pass the test. Similarly, there is no sign of misspecification except that the forecast is bad as reflected by the rise in the substitution elasticity.

3) Figures in brackets are standard deviations.
more unequal wage structure. However, there is also the possibility that central and decentral wage bargaining are two different games with different objective functions of the players implying that we cannot obtain valid information on the substitution elasticity when we implicitly assume that the two wage processes are identical. Whether or not that is the case is left for future research.

6. A Case Study of Incomes Policy Experiences, 1982-87

In order to understand the contents and merits of recent Danish incomes policies it is necessary first to sketch the ingredients of the other policies since the successfulness of incomes policy depends on the design of the entire policy program.

The policies introduced in autumn 1982, where a liberal-conservative minority coalition came into power, had a clear flavour of a non-accommodation strategy. The main ingredients were: tight fiscal policy, fixed exchange-rate policy, and incomes policy [see OECD (1986)]. Against the background of a quickly increasing budget deficit and high interest rates viewed by international standards, the government immediately reduced public expenditure growth and announced further cuts to follow in the future. As part of the fiscal strategy cash limits and budget norms were introduced in order to bring the growth rate of real government expenditure down to zero from an average of 2.5% from 1979-82. The government's strong adherence to a fixed exchange rate policy also marked a change in policy formation since the Danish Krone was devalued frequently from 1979-82, cf. section 3. Despite that the substantial depreciation of the currency may have easened the ad-
justment to the second Opec-shock it also stimulated the expectations of further devaluations insofar as the twin problems of the Danish economy remained unsolved. These devaluation expectations were reflected in high domestic interest rates well above 20% and presumably also in higher wage inflation in comparison to what would otherwise have been the case [see Andersen and Risager (1988a) and Christensen (1988)].

The overall goals of the policy were lower inflation and interest rates, a balanced government budget in 1990, and a balanced current account in 1988 - initially set to 1986-87. There were no targets for employment. Instead, it was implicitly clear due to the non-accommodative signals that employment essentially had become the unions' and employers' own responsibility.

6.1. Incomes Policies, 1982-87

Against this stylised background let us now look at the ingredients of the incomes policy, see table 6.1. As is obvious from the table, incomes policy comprises all policies, guidelines, and announcements which attempt to moderate nominal earnings growth of both workers and capitalists, though it seems clear that the pursued policy de facto has been directed mostly towards wage inflation also because the policy intended to make it more profitable to expand investment and R&D activities. Space limitations force us to address only a limited number of the initiatives; a more extensive analysis can be found in Andersen and Risager (1987).

The abolition of the indexation of wages and salaries in both the private and public sector is the most remarkable element of the incomes policy as evidence suggests that this system, despite the
Table 6.1. Main Ingredients of Incomes Policies, 1982-87

<table>
<thead>
<tr>
<th>Date of legislation</th>
<th>Wage Earners</th>
<th>Employers</th>
<th>Associated Announcements and Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>16.10.82</td>
<td>Suspension of indexing of wages and salaries</td>
<td>Ceiling over profits per unit of production</td>
<td>Guideline for wage increase: 4% in 1983-84, 4% in 1984-85</td>
</tr>
<tr>
<td></td>
<td>Suspension of indexing of unemployment benefits</td>
<td>Freeze of dividends at the level of the previous year</td>
<td>The government intends to take leadership in forthcoming negotiations Tax cuts if the guideline is followed</td>
</tr>
<tr>
<td></td>
<td>Temporary wage freeze</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17.05-84</td>
<td>Extended suspension of indexing of wages and salaries</td>
<td></td>
<td>The government urges to three party discussions with the goal of improving competitiveness by 2% per year</td>
</tr>
<tr>
<td>31.03.85</td>
<td>Wage ceilings: 2% from 1985-86, 1.5% from 1986-87</td>
<td>Increase in corporate taxation from 40% to 50%</td>
<td>Wage norms enacted into legislation: 2% in 1985-86, 1.5% in 1986-87</td>
</tr>
<tr>
<td></td>
<td>One hour reduction in working hours to take place 1.12.86</td>
<td>Ceilings over profits Per unit of production may increase by 1.7% from 1.12.86</td>
<td></td>
</tr>
<tr>
<td>04.06.86</td>
<td>Final Abandoning of indexing of wages and salaries</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Andersen and Risager (1987)

early mentioned attempts to reduce the degree of inflation compensation, has responsibility for the insufficient real-wage flexibility in Denmark. The indexing of UI-benefits was also suspended until the government in mid 1987 introduced a new system which provides a single annual adjustment of the maximum amount available. As is wellknown from any union model we should expect that the decline in real unemployment compensation has contributed to wage moderation. However, as pointed out in sec-

6.1 In the study by Flanagan et al. of wage formation in Denmark and in countries akin to Denmark, it is also concluded that this has left Denmark with a wage-indexation system that is the most comprehensive and inflexible system followed by any country in this study and that has contributed to both the propagation and the momentum of Danish inflation [Flanagan et al. (1983), p. 455].
tion 4, we have been unable to pick up any direct effects of the fall in real UI-benefits on aggregate wages. As this result is rather common in the literature it is important to mention two exceptions, namely Blomgren-Hansen og Knøsgaard (1980) in a study of wage drift in Denmark, and Pedersen (1983c) who looked at total wages in Denmark and in other countries and found a significant relationship in the Danish data set.

The third element of the incomes policy which we wish to point attention to is the government's attempt to take leadership in the wage negotiations in spring 1983. The government announced that it intended to conclude its negotiations with the unions in the public sector prior to the conclusion of the negotiations on the private labour market. Because the settlements in the private sector traditionally have been concluded a month ahead of the settlements in the public sector this marked an attempt to take leadership in the bargaining games, which in turn could strengthen the credibility of the government's 4% wage guideline. Due to opposition of the unions in the public sector this attempt was unsuccessful. However, as the public sector agreement, which was concluded at the same time as LO and DA reached agreement, was in line with the 4% target it might still have had some influence on the private sector - through its inflation expectations - insofar as a fair share of the deals in the private sector are concluded decentrally, cf. section 3.

As the low wage-inflation target by and large was followed in both the private and public sector, cf. below, the government intended to offer tax cuts as it had promised. Due to opposition of the other parties in the Parliament, this sort of TIPS policy failed again [see Estrup (1982) for previous experiences].
Following the measures undertaken in autumn 1982 the government urged to three party negotiations prior to the negotiations in spring 1985 which should establish wage agreements for the forthcoming two years. This attempt was without any success as the negotiations resulted in a breakdown and subsequent government legislation with the most ambitious wage norms seen so far in Denmark. The targets were 2% from 1985-86, and 1.5% from 1986-87.

Against the employers the package contained an increase in corporate taxation which was supposed to finance the cut in pay-roll taxes. Working hours were reduced by one hour which annually would increase wage costs by 2.5%. The allowed 1.7% increase in profits per unit of production was intended to mitigate this effect. However, as legislation aiming at controlling profit margins is rather soft because the Monopolies Control Authority has insufficient resources to monitor profit ceilings, the package was favourable to employers assuming that wages did not depart too much from targets, which is addressed below.

6.2. Targets versus Reality: A Suggestive Interpretation

Table 6.2 gives an indication of how effective the policies have been in terms of reaching the wage-inflation targets. Roughly, policies were on target from 1983-84 and slightly off from 1984-85. But the highly ambitious targets for the following two years have obviously not been reached within the private sector. However, if we compare the average wage increase during the first three years with the recent past, wage inflation is only about half the size experienced previously. Below we argue that policies played a significant role in disinflating the economy whereas the recent inflation revival is attributed to the (time inconsis-
tency) problem of maintaining a tight incomes policy prior to an election as well as to insufficient control of aggregate demand.

Table 6.2. Average Wage Inflation: Targets and Reality

<table>
<thead>
<tr>
<th></th>
<th>1980-81</th>
<th>81-82</th>
<th>82-83</th>
<th>83-84</th>
<th>84-85</th>
<th>85-86</th>
<th>86-87</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Wage Inflation</td>
<td>8.6</td>
<td>9.8</td>
<td>8.4</td>
<td>4.5</td>
<td>4.9</td>
<td>5.5</td>
<td>7.8</td>
</tr>
<tr>
<td>Target Wage Inflation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>4.0</td>
<td>4.0</td>
<td>2.0</td>
<td>1.5</td>
</tr>
</tbody>
</table>

1) Average hourly wage increase in Manufacturing is from 1st quarter to 1st quarter next year. Target wage growth refers to March 1 to March 1 next year.

Source: Statistiske Efterretninger

The point is that the non-accommodative strategy established a high degree of credibility fairly quickly essentially because of the government's strong adherence to the fixed exchange-rate policy in a period of balance-of-payments crisis and speculative outflows partly induced by aggressive devaluations of neighbour countries. The Swedish 16% devaluation on October 8, 1982 thus provided an important test of the credibility of the exchange-rate policy. If the government had responded by a devaluation, as the Finnish government did on October 11, its reputation would obviously had been blown. Now since the government resisted the temptation to counteract the loss in competitiveness it is quite likely that this event gave support to the credibility of the policy. Similarly, the Parliament's adoption of the tight fiscal policy also strengthened the credibility of the disinflationary strategy. We take the decline in interest rates of no less than 8 percentage points from October 1982 to May 1983, which is matched by almost the same decline against foreign rates, as evidence of
this hypothesis [see Andersen and Risager (1988a) and Christensen (1988)]. In the same vein, the moderate wage settlements which were reached through arbitration, but without direct government intervention, also provide indication of the decline in inflation expectations - otherwise it is hard to explain wage increases of about half the size experienced in previous years.

The role the suspension of wage indexation played in the disinflationary process is not entirely clear. Obviously, the immediate effect is to reduce inflation because the substitution elasticity between central and decentral wage growth is less than one for some groups in the labour market as shown by section 5. However, as the dismantling of wage indexation has an adverse credibility effect reflecting that the government's incentive to undertake a surprise devaluation now obviously is larger the net-effect seems uncertain.

Despite that the policy change led to disinflation it did not improve wage-competitiveness as demonstrated by table 6.3.

Table 6.3. Wage Competitiveness

<table>
<thead>
<tr>
<th>Year</th>
<th>Competitiveness1)</th>
<th>Trade Weighted Exchange Rates</th>
<th>Relative Wage Costs2)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage Change</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1982-83</td>
<td>-0.4</td>
<td>+0.9</td>
<td>-1.3</td>
</tr>
<tr>
<td>1983-84</td>
<td>+3.0</td>
<td>1982-86:</td>
<td>-0.4 1982-86:</td>
</tr>
<tr>
<td>1984-85</td>
<td>+0.1</td>
<td>-1.6 1982-86:</td>
<td>+1.0 1982-86:</td>
</tr>
<tr>
<td>1985-86</td>
<td>-4.1</td>
<td>-5.0</td>
<td>+0.9</td>
</tr>
<tr>
<td>1986-87</td>
<td>-9.4</td>
<td>-3.6</td>
<td>-5.8</td>
</tr>
</tbody>
</table>

1) A +(-) indicates that competitiveness has improved (deteriorated) due to a depreciation (appreciation) of the exchange rate, as shown by a +(-) in column 2, and/or due to an increase (decline) in foreign wage costs relative to Danish wage costs, as shown by a +(-) in column 3.

2) Includes also pay-roll taxes.

Source: Danish Economic Council. The Economics Department.
Thus from 1982-86 relative wage costs are basically unchanged whereas there is a minor deterioration of international competitiveness due to an appreciation of the trade-weighted exchange rate. From 1986-87 both the behaviour of the exchange rate and wages contribute, however, to a considerable loss in competitiveness. The target of a 2% annual improvement of competitiveness has thus not been met. In combination with the upswing in domestic private demand which started materializing in spring 1985 this provide the most important explanations why the current account moved further and further away from the target of external balance in 1987, see table 6.4.

Despite that policies did not improve competitiveness evidence suggests that they raised the profitability of production and employment from 1982-86. The significant dummy in the wage equation thus shows that the real wage was 6% lower in comparison to what it otherwise would have been. The boost in private sector employment from 1982-86, which amounts to about 200,000 persons [the Economic Council (1987)], must be seen in the light of this result, but is of course also likely to be triggered by the rise in private consumption and investment demand. The interpretation that both supply and demand side effects are important in explaining the upturn in employment is consistent with the model of manufacturing, which furthermore quantitatively is able to trace the 10% employment increase in manufacturing.

### Table 6.4. Current-Account Deficits in per cent of GDP, 1982-1987

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<td></td>
<td>4.14</td>
<td>2.49</td>
<td>2.17</td>
<td>4.73</td>
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1) Forecast by Council of Economic Advisers, ultimo 1987

Source: Danmarks Statistik, Statistisk Tiårsoversigt
The considerable upswing in the private sector from 1982-86, which by international comparison is remarkable since "the growth of output, employment and investment has been stronger than elsewhere in Europe" [OECD (1986)] fuelled, however, also the wage-inflation process, which in turn raised the question whether the demand management was consistent with the announced policy objectives. Eventually, the government recognized the consistency problem and started to intervene by a further tightening of fiscal policy in December 1985. In spring 1986 and in autumn 1986 policies were tightened further but obviously also insufficiently in view of the current account and bottlenecks in particular in construction which experienced double figured wage increases.

In sum, from 1982-86 Denmark experienced a fast reduction in inflation but also a large increase in private sector employment despite that the overall strategy did not commit itself to any particular employment target. Along with the upswing of the economy, the public deficit was removed whereas Denmark's international indebtedness continued to increase due to current-account deficits. Since then, the conduct of economic policy has undergone some changes. Prior to the expiration of wage settlements in spring 1987 it became clear that the government did not want to formulate wage targets for the forthcoming two years. One explanation could simply be that the policy had had an asymmetric effect on employees in the private sector and in the public sector which in turn led to political problems. Thus since wage increases of public sector employees had been in accordance with targets they had experienced a decline in their relative incomes position. This led public sector unions to organize large scale newspaper campaigns prior to the new wage settlements warning the government that if it did not give concessions severe disputes
would follow. Against increased discontent with the incomes policy the government conceded, and promised public sector employees some compensation for their restraint. A second explanation why the contour of the policy became less clear is the fact that the 1987 election might have tempted the government to give concessions in the hope that this could improve the chances of re-election. However, irrespective of which explanation is the most important the softening of policies has obviously led to higher wage inflation in 1987 compared to previous years. This raises the question whether the incomes policies will turn out only to have temporary effects and hence confirm the majority of previous experiences; see Auken and Buksti (1975), Blomgren-Hansen and Knøsgaard (1980), Estrup (1982), and Flanagan et al. (1983).

7. Policy Implications

If a small economy like the Danish experiences a prolonged state of high unemployment two potential explanations immediately come to mind. It is either because wages do not respond sufficiently to the state of the labour market or because the demand for labour is insensitive to changes in wages. Our analysis supports the first explanation since unemployment apparently exerts little pressure on wages. The second explanation cannot be completely rejected insofar as the wage sensitivity of labour demand is not overwhelmingly high. However, as our elasticity-estimate is in line with findings reported by other researchers (see Bean et al. (1986)) this result only strengthens the need for wage adjustment. Hence, the subsequent question is bound to be why there are insufficient incentives for wage adjustment, and which policy initiatives are needed. Our analysis is less rich on answers to
this type of questions which reflects that the method used is better suited for identifying those factors which help explain wage changes rather than those which cause insufficient wage adjustment. Despite these reservations there are a number of policy conclusions which can be drawn on the basis of both the analysis of the insititutional aspects of the Danish labour market and the wage-employment model of manufacturing.

Wages seem to be unresponsive to the current excess supply of labour. In terms of policy this calls attention to at least two possible - though yet unsettled - reasons. First, there seems to be a mismatch problem to the extent that the qualifications possessed by the unemployed are not demanded by the firms. This may come about either as a result of depreciation of human capital after a long period of unemployment or a permanent matching problem. Initiatives which increase flexibility, mobility and education seem thus to be needed. Secondly, a generous unemployment insurance system may mute the influence of unemployment on wages. We find that at least two aspects of the current system require rethinking. The fact that the UI-system finances temporary layoffs tends to bias the unemployment figure in an upward direction. This could be rectified by making employers bear the financial burden in case of temporary lay-offs. Secondly, the duration of the UI-entitlement period is long, reflecting the widely held policy-view that unemployed must never be squeezed out of the UI-system. Rather than the high replacement ratio we believe that this aspect of the UI-system is highly important and that it creates disincentives with respect to wage adjustment. This is most obvious in respect to the supplementary benefits available to part-time workers where the entitlement period is infinite.
As regards the adjustments required to improve employment our results point out that substantial wage moderation is needed. It is worthwhile emphasizing that the employment equation performs well and actually is capable of tracing the upswing in employment starting in 1983. With a long-run product-wage elasticity around 0.6 in absolute terms, a 10% increase in employment in the manufacturing sector, corresponding to 36,000 new jobs, requires a fall in the real wage by about 16%! Despite that this may be overly pessimistic it does, nevertheless, emphasize the immense difficulties of solving the twin problems of the Danish economy.7.1

Is a reduction in working hours the clue? Our employment equation shows that hours and men are perfect substitutes in the long run, provided wages stay constant. However, as the total number of man hours at best will be unchanged production will also be left unchanged. The current-account problem can therefore not be solved along this route [see also Andersen (1985)]. Furthermore, as the increase in the number of employed men exerts an upward pressure on wages the gain in employment will also to some extent be reduced due to wage adjustment.

It is possible to stabilize employment in the short run by aggregate demand management through changes in public expenditure, but at the cost of real-wage increases. This result points attention to previous and present difficulties of maintaining the effectiveness of incomes policies. Despite that incomes policies may have contributed to disinflation from 1982-85, recent experiences show that the policies lost their effectiveness partly because of

7.1 That is because the calculation presupposes that the elasticity is constant which is unlikely in case of such a large change.
an excessive upswing in private demand. It seems therefore appropriate to cite a wellknown textbook: "For incomes policies to have a chance of reducing the inflation rate in a lasting way, they have to be accompanied by restrictive aggregate demand policies"7.2.

The most clear-cut conclusion which has substantial support in our empirical analysis is the result that the labour market apparently is not characterized by any nominal rigidities. It is important to point out that our tests reject the existence of nominal rigidities in two forms. First, we have not found support for any real effects of a change in the rate of inflation, that is, an accelerating rate of inflation will not affect the real-wage (super-neutrality). Secondly, with respect to level effects (neutrality), both the real-wage equation and the employment equation fulfill the homogeneity properties. The absence of nominal rigidities suggests that the so-called Phillips-curve trade-off at best exists in the very short run, i.e. within a year. This is an important result in view of the Danish policy discussion which usually takes such a trade-off for granted.

This result should not be interpreted as if there is no scope for policies, but it suggests that substantial real-effects cannot be gained by inflating the economy nor by redefining currency units [see also Risager (1987b)]. Effective policies should change the incentives in the labour market in order to influence the determination of wages and employment. More research is needed to identify exactly which changes are needed.

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Appendix

This appendix explains why the number of insiders have an ambiguous effect on wages in a right to manage model. A formal proof is given in Andersen and Risager (1988b), and similar models are analyzed by Andrews and Nickell (1983) and Hoel and Nymoen (1988).

If the union cares more about insiders (those in employment in the last period) than outsiders (all other union members) its gain from wage increases depends on the past employment level ($L_{t-1}$). The marginal bargaining pay-off of wages to the union is decreasing in the wage rate, see figure A-1. If all insiders are employed, the union has a relative strong preference for wage increases since the employment prospects of outsiders is given less concern than the wages of insiders. In case of unemployed insiders the incentive to press for higher wages is reduced since that would squeeze more insiders into unemployment. Figure A-1 shows this asymmetry in the union's pay-function around the point where all insiders are employed. The wage rate, $\bar{w}_t$, ensures that the current employment level equals the number of insiders, i.e. $L_t(\bar{w}_t) = L^O_{t-1}$.

The bargaining solution stipulates that the marginal bargaining value of wages to the union and the employers' federation must sum to zero, and it is given by $w_t^*$ in figure A-2. The marginal profit-effect of wages is negative and decreasing in the wage rate and hence the numerical marginal bargaining pay-off of wages to employers becomes upward sloping.

How is the bargaining outcome affected by a change in the number of insiders ($L_{t-1}$)? Figure A-3 shows how of an increase in the number of insiders affects the union. With a larger number of insiders ($L^I_{t-1} > L^O_{t-1}$) the wage must be $\bar{w}_t^I (< \bar{w}_t^O)$ to ensure that all insiders are employed, and the horizontal kink moves leftward. To the left of $\bar{w}_t^I$ the preference for wages is strengthened since the number of insiders with no unemployment risk has increased.

Figure A-4 shows the possible influence of a change in $L_{t-1}$ on the bargaining outcome, and three possibilities are identified, 1) Defined as the union's bargaining power times the marginal utility of wages relative to the union's net-gain from reaching an agreement.
namely, an unchanged wage (case I), a lower wage (case II) or a higher wage (case III). Case I is characterized by some insiders being unemployed, and the bargaining solution is left unchanged by a marginal change in the number of insiders. In case II, a marginal increase in the number of insiders implies some unemployment among insiders, and this releases a downward pressure on wages. Finally in case III, an increase in the number of insiders puts an upward pressure on wages since insiders have no unemployment risk.

A number of authors [Blanchard and Summers (1986), Gottfrieds and Horn (1987) and Lindbeck and Snower (1987)] argue that a temporary fall in demand can cause persistent unemployment since a decrease in the number of insiders tends to increase wages (as in case II). Despite the potential empirical relevance of this hypothesis, it is nonetheless the case, that models featuring insider-outsider considerations in general are ambiguous as to the effect of insiders on wages (see also Blanchflower and Oswald (1987)).