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Centralisation of Wage
Bargaining
and Macroeconomic
Performance: A Survey

Lars Calmfors

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ECONOMICS DEPARTMENT

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**CENTRALISATION OF WAGE BARGAINING
AND MACROECONOMIC PERFORMANCE:
A SURVEY**

by
Lars Calmfors



ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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**CENTRALISATION OF WAGE BARGAINING AND MACROECONOMIC PERFORMANCE:
A SURVEY**

Starting from the theoretical argument underlying the "hump shape" hypothesis, the paper investigates the various dimensions of centralisation in the wage formation process. The diversity of effects discussed in the paper makes it hard to arrive at unambiguous policy conclusions. Careful analysis of the various features and economy-wide direct as well as indirect effects of the degree of centralisation in the wage formation process suggests that there exist various trade-offs, the most important of which appears to be that between real wage restraint and relative wage flexibility: centralisation favours the former but reduces the latter. This suggests that its effect on macroeconomic performance depends on the type of shocks affecting the economy.

* * *

Cette étude analyse les divers aspects de la centralisation dans le processus de formation des salaires en s'appuyant sur l'hypothèse théorique de "courbe en U inversée". La diversité des effets analysés rend ambiguës les conclusions politiques qui peuvent être tirées de ce papier. Une étude minutieuse des divers aspects de la centralisation et de leurs effets tant directs qu'indirects, sur le processus de formation des salaires suggère qu'il existe différents choix d'objectifs, le plus important semble être entre la contrainte de salaire réel et la flexibilité du salaire relatif : la centralisation favorise le premier et affaiblit le second. Ceci suggère que l'impact sur la performance macro-économique dépend du type de choc affectant l'économie.

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CENTRALISATION OF WAGE BARGAINING AND MACROECONOMIC PERFORMANCE: A SURVEY

Lars Calmfors (1)

I. Introduction

The wage bargaining systems of the OECD countries exhibit great differences. One extreme is represented by the US and Canada with very decentralised wage setting at the level of individual firms. The Nordic countries and Austria represent the other extreme with highly centralised bargaining. Other countries, such as, e.g., France, Italy, Belgium, the Netherlands and Germany, are between these polar cases with bargaining mainly at the industry level. The trend towards more decentralised bargaining in most European countries during the last decade may have reduced these differences somewhat, but on the whole they seem to persist (Windmuller et al., 1987).

The 1980s saw a growing interest in the macroeconomic consequences of various wage-bargaining systems. It has been claimed that centralised wage bargaining is conducive to real-wage restraint and low unemployment (early references are, e.g., McCallum, 1983; Bruno and Sachs, 1985; Bean et al., 1986; Newell and Symons, 1987). This conclusion has provoked a lot of research in the last few years, some of which has been based on the observation that both very centralised and very decentralised wage-setting systems seem to have been consistent with good macroeconomic performance (e.g., Heitger, 1987; Calmfors & Driffill, 1988; Rowthorn, 1992). One lesson appears to be that the issue of centralisation versus decentralisation of wage bargaining may be far more complex than was originally acknowledged. The aim of this paper is to survey the recent theoretical literature in this field and to try to draw policy conclusions from it.

The structure of the paper is as follows: the next five sections deal with aggregate wage determination. Section II discusses how centralised bargaining is likely to internalise the effects of wage increases for specific groups on the rest of the economy, and Section III extends this analysis by incorporating the restraining role of market pressures under decentralisation. Section IV highlights different dimensions of centralisation, whereas Section V addresses the effects of multi-level bargaining and Section VI co-ordination problems. In Section VIII the focus is shifted to the impact of various bargaining systems on employment, investment and effort decisions. Section VIII addresses the issue of wage differentials and relative-wage flexibility. Finally, tentative policy conclusions are presented in Section IX.

II. Internalisation effects and centralisation

The effects of varying degrees of centralisation on the aggregate real wage have been analysed in a wide range of models. The simplest ones are union wage-setting and efficiency-wage models (see Jackman *et al.*, 1991, for an exposition of the main ideas). In the monopoly-union framework, it is considered to be a good approximation to reality to regard wages as being set unilaterally by unions, which trade off the benefits from a real-wage increase for employed union members against the associated loss of employment. According to the efficiency-wage hypothesis, wages are instead determined unilaterally by employers, who trade off the disadvantages from higher wages due to the increase of the wage bill against the benefits in the form of more effort from the employees (because worker morale is boosted and/or "shirking" becomes more costly) or reduced turn-over of labour. The most realistic models are the explicit bargaining models (see again Jackman *et al.*, 1991), in which unions and employers negotiate about how the revenues from production are to be shared. These models always involve a trade-off between the gains from a higher wage for the employees and the associated profit decrease for the employer. The revenue sharing also depends upon the alternatives that the two bargaining parties face in the event of a break-down of wage negotiations, i.e. the so-called fall-back positions in the case of a labour-market conflict.

All these analytical frameworks stress the importance for wage formation of the incentives facing unions and employers. In this context it is natural to define the extent of centralisation as the degrees of inter-union and inter-employer co-operation in wage setting. The basic idea is that real-wage increases for one group of wage-earners have negative externalities on others that will be internalised under co-operative behaviour, and hence create incentives for real-wage restraint. Such internalisation effects will work on both sides of the labour market, since both other employees and other employers are likely to be affected by the adverse consequences of wage increases in one part of the economy. To make the analysis simple, the extent of co-operation is usually assumed to be the same for employers and unions and the economy to be symmetrical, so that it is natural to split the gains from co-operation equally between the co-operating agents on each side of the labour market.

At least seven types of negative wage externalities have been treated in the literature:

- i) A consumer price externality derives from the fact that "one man's wage increase is mainly another man's price increase" (Jackman *et al.*, 1991, p. 132). Every wage increase in the economy contributes to a rise of the general price level and therefore to a fall in the real disposable income of all workers -- and capital owners -- that are not directly affected by the wage bargain (Strand, 1987; Calmfors and Driffill, 1988; Jackman *et al.*, 1991; Moene *et al.*, 1993).
- ii) An input price externality arises if wage increases in one part of the economy causes price rises for the products used as material inputs by other firms. The consequence will be lower output elsewhere and also lower employment if material inputs and labour

are complements in production (Wallerstein, 1990; Jackman et al., 1991).

- iii) A fiscal externality is imposed on the rest of the economy if real-wage increases in one sector causes unemployment there to rise and the associated costs for unemployment benefits have to be paid through higher taxes or lower government expenditure in general. Indeed, an individual union can extract a subsidy from the rest of the economy in a decentralised system by raising wages, so that unemployment emerges among its members. A similar fiscal externality arises because a fall of output in one sector due to a real-wage increase there means a reduction of the aggregate tax base, which again will be paid for mainly by others (Blanchard & Summers, 1987; Calmfors & Driffill, 1988).
- iv) Real-wage increases in one sector may impose an unemployment externality on the rest of the economy. The reason is that each unemployment rise in the economy makes it more difficult for laid-off workers everywhere in the economy to find new jobs (Hoel, 1988; Jackman, 1990; Jackman et al., 1991).
- v) An investment externality may also arise under decentralised wage setting. Because of the turn-over of labour, some of the present employees in a given firm will quit before they can reap the benefits of higher future wages from present investment in capital stock. This will lessen union incentives for current real-wage restraint in order to promote such investment (Rødseth, 1985; Hoel, 1991).
- vi) If the welfare of individual workers depends negatively on the wages of others, every wage increase in the economy will have an envy externality that reduces the welfare of others (Oswald, 1979; Gylfason and Lindbeck, 1984; Calmfors, 1992a; Uddén Jondal, 1992). Although this idea was implicit already in Keynes' General Theory, the economics profession has on the whole remained sceptical of such effects, mainly because micro theory has traditionally not incorporated the consumption of others in the utility function of the individual. This practice is, however, probably more motivated by analytical convenience than by any deeper theoretical or empirical considerations. It does not take more than a brief conversation with a trade union official -- or some introspection -- to realise the importance of this factor (see also, for instance, Akerlof, 1984; Akerlof and Yellen 1990; or Blanchard and Fisher, 1989, p. 27).
- vii) Finally, there may be an efficiency-wage externality on the employer side. It arises if the effort of employees depends upon their relative wage, in which case one employer's wage increase will reduce effort elsewhere. Alternatively, a wage rise in one firm may make it more difficult for other employers to recruit and keep labour (Hoel, 1989; Layard, 1990; Moene et al., 1993; Rødseth, 1993).

The above externalities in wage setting have all been used to explain why centralised bargaining is likely to produce a lower aggregate real wage and hence, according to a standard negatively sloped labour-demand schedule, higher employment. The simple idea is that co-operative behaviour means that the effects on others of a wage increase in an individual bargaining area has to be considered. Thus the marginal benefit of a real-wage increase is reduced and/or the marginal cost increased. As a consequence, the incentives for real-wage restraint are strengthened.

III. The hump-shape hypothesis and the effect of competitive pressures

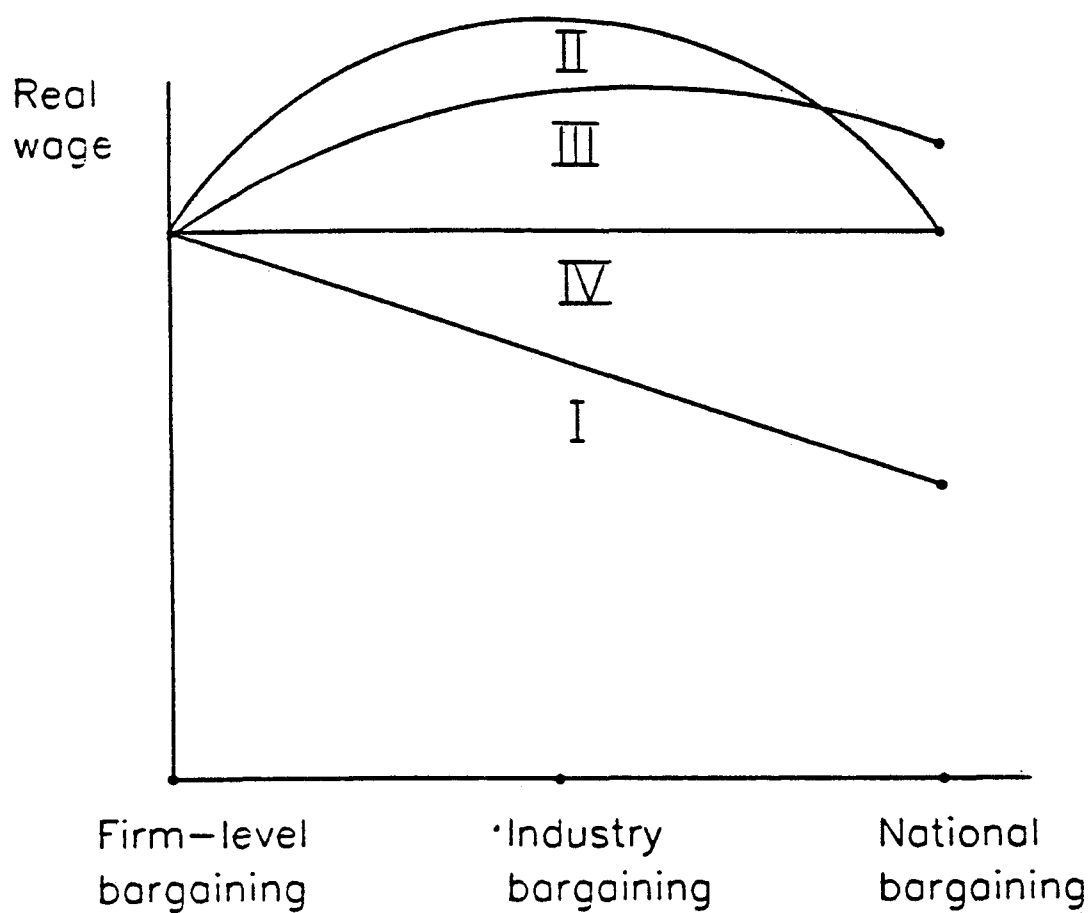
The externality arguments suggest a monotonic negative relationship between the extent of centralisation and the aggregate real wage, as depicted by the line I in Figure 1. This does not, however, take into account that the degree of centralisation may also affect the extent of market power of wage setters, and that competitive pressures may therefore help to restrain wages under decentralised bargaining. These issues have been analysed by Strand (1987) and Calmfors & Driffill (1988), and later on by Rowthorn (1991) and Danthine & Hunt (1992).

A. The theoretical arguments

The Calmfors-Driffill hypothesis is that both very centralised and very decentralised bargaining systems are likely to produce real-wage moderation and high employment. In the former case this is explained by the internalisation of the various wage externalities discussed above, in the latter by the restraint imposed by market forces. The highest aggregate real wage and the lowest employment may be associated with intermediate centralisation in the form of bargaining at the industry level, because then both market forces and the internalisation effects could be too weak to restrain wages. The result is a hump-shaped relationship between the extent of centralisation and the real wage, as illustrated by curve II in Figure 1.

The reasons for a hump-shaped relationship can be explained in more detail as follows (Calmfors & Driffill, 1988; Moene et al., 1993; Calmfors, 1991). Consider the incentives for raising the real consumption wage (the nominal wage deflated by the consumer price index) in a bargaining model, where unions care both about the real consumption wage and employment, and employers about the real value of profits (nominal profits deflated by the consumer price index). When wage bargaining concerns a whole industry, so that wages are raised simultaneously across all firms producing similar products, the possibilities of shifting pay rises on to consumers via an increase of the relative output price are great. This will hold back the rise of the sector's real product wage (the money wage deflated by the producer price). Since employment is determined by the real product wage, the employment loss from a given increase of the real consumption wage is reduced. This weakens the incentives for wage moderation on the union side. Similarly, the output price increases reduce the profit decrease from a given increase of the real consumption wage, so that the incentives for wage restraint are weakened on the employer side as well.

Figure 1: The extent of centralisation and the aggregate real wage (a)



Relationship I: An economy with strong externalities
 Relationship II: The case of a closed economy
 Relationship III: The case of an open economy
 Relationship IV: The case of an open economy when domestic and foreign goods are perfect substitutes

Compare then the case of industry bargaining above with the two extreme cases of completely decentralised wage setting at the level of the individual firm and completely centralised wage setting at national level. Assume furthermore that there is perfect competition in the goods market, that the economy is closed, i.e. that there is no foreign trade, and that the only externality is the consumer-price one discussed in Section II. Since the individual firm will be a price taker under perfect competition, it follows immediately that it cannot increase its relative price when the real consumption wage is increased in the firm only, but not elsewhere in the sector. Hence there is no relative-price offset to the employment loss and profit decrease from a real-consumption-wage increase under decentralised bargaining. Somewhat surprisingly, exactly the same result will hold if we instead consider completely centralised bargaining at the national level. The simple reason is that if real consumption wages are raised uniformly across all sectors, no relative price can change in the economy. Therefore a given increase of the real consumption wage will under the above assumptions give the same employment and profit effects under complete centralisation as under complete decentralisation. Since incentives are affected in exactly the same way, the result is the same real wage. It must be lower -- and hence employment higher -- than under industry bargaining (2).

The conclusion that bargaining at the level of the individual firm and at the national level gives the same aggregate-real-wage outcome should, however, be regarded only as a benchmark case that needs to be modified by bringing more considerations into the analysis. One should take account of at least the following factors:

- i) The possibility that individual firms cannot raise their relative prices under decentralised wage setting was ruled out above by the assumption of perfect competition in the product market. In the more realistic case of monopolistic competition, such a relative-price increase will indeed be the result of a wage increase. This weakens the incentives for wage restraint under decentralised wage setting (Moene et al., 1993). In Figure 1, the left-hand part of the hump-shaped relationship is shifted upwards. The conclusion that industry bargaining gives the highest aggregate real wage is, however, still likely to hold, since inter-union and inter-employer co-operation within industries will result in larger increases of market power than co-operation between industries (and hence a larger increase of the possibilities to raise relative output prices in the case of uniform wage increases across all co-operating firms). The reason is, of course, that the products within an industry are closer substitutes than the aggregate outputs of different industries (Jackman et al., 1991).
- ii) The result that no relative output price can change if wages rise uniformly across all sectors hinges on the assumption that the economy is closed. In an open economy with foreign trade, there will still exist a wedge between the real consumption and real product wages, because prices of imports are determined in the world market. Since the relative price between domestic and foreign goods will rise if the real consumption wages in all domestic firms rise, the employment and profit losses from wage

increases are dampened also under centralised bargaining in an open economy. This means that the incentives for wage restraint under centralised wage setting will be smaller in an open than in a closed economy (Calmfors, 1992a, 1993; Jackman *et al.*, 1991). The more open the economy is, the more will the right-hand part of the hump-shaped relationship in Figure 1 be shifted upwards (as indicated by, *e.g.*, curve III). Indeed, one can conclude that in an open economy, if the only externality is a consumer-price one, completely centralised wage setting must result in higher real wages than if wage determination can be decentralised to perfectly competitive firms (Jackman *et al.* 1991; Calmfors, 1993). When there is monopolistic competition between firms (see item i) above), it is less clear which of the two extremes that produce the most real-wage restraint in an open economy (3). It is, however, always true that complete centralisation tends to produce less real-wage restraint, the larger the share of foreign imports in domestic consumption.

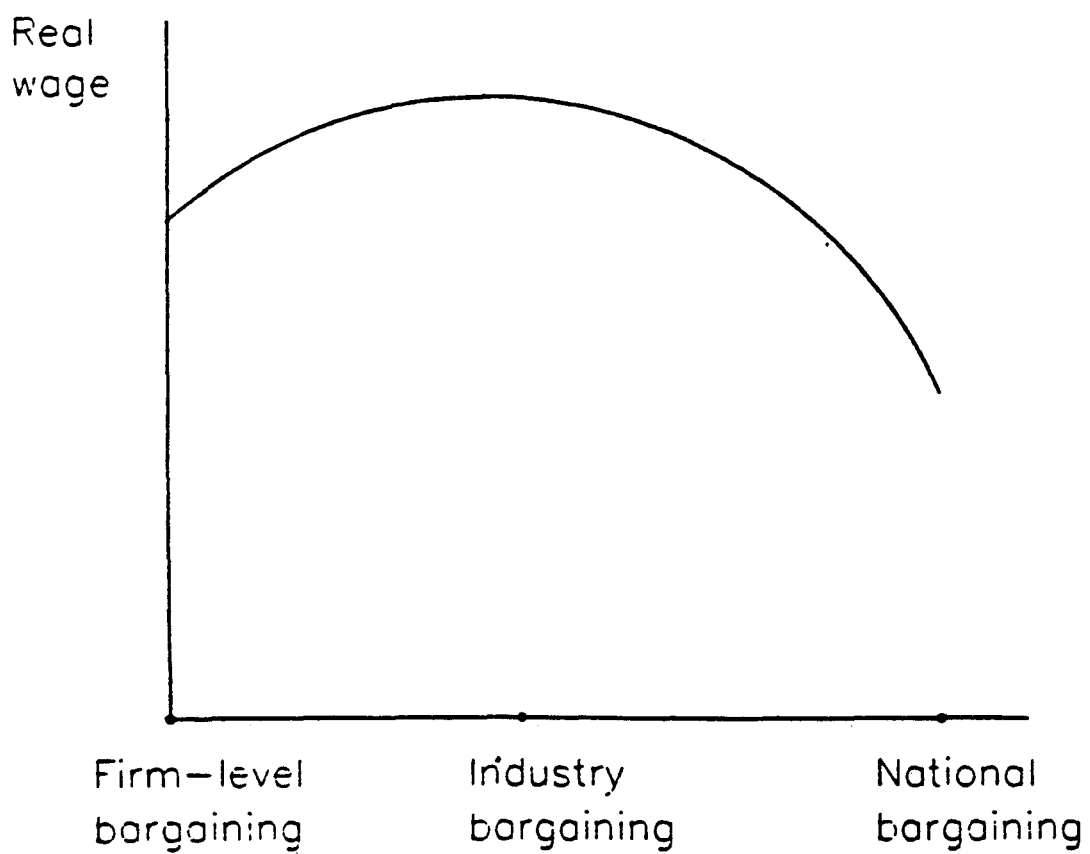
- iii) The conclusion that an intermediate extent of centralisation (wage setting at the industry level) may produce worse macroeconomic outcomes than both very high and very low degrees of centralisation rests on the assumption that a substantial amount of competitive pressures for wage restraint is eliminated if domestic producers bargain together. The increase in market power will, however, be less, the more important is international competition, since foreign competitors are not encompassed by domestic wage increase. As has been demonstrated by Danthine & Hunt (1992), the hump in Figure 1 will be lower the more international competition there is (curve III has been drawn so that it is flatter than the closed-economy relationship II). Indeed, if domestic and foreign products are perfect substitutes, it would be impossible for domestic firms within a given sector in a small open economy to raise their relative prices even if they co-operate (Calmfors & Driffill, 1988). In this case the relationship between the extent of centralisation and the aggregate real wage degenerates into a horizontal line like IV in Figure 1 (Calmfors, 1993).
- iv) I also assumed that the only externality was a consumer price one. As soon as one takes the other externalities discussed in Section II into account, strong arguments are, of course, added why nation-wide bargaining ought to result in lower real wages than bargaining at the level of the firm (Calmfors & Driffill, 1988; Calmfors, 1992a).
- v) The analysis above did not consider the insider-outsider issue that has received so much attention in recent years (see, *e.g.* Gottfries & Horn, 1986; Blanchard & Summers, 1986; or Lindbeck & Snower, 1988). The point of this literature is that temporary shocks reducing the level of employment are likely to have permanent wage-raising effects, because the unemployment risks of insiders become smaller when their number is reduced, which weakens their incentives for wage moderation. It is often argued that these effects should be weaker under centralised

bargaining, because unemployed workers remain union members and are not disenfranchised to the same extent as under decentralised wage setting (Blanchard & Summers, 1986; Jackman *et al.* 1991; Moene *et al.* 1993; Ramaswamy & Rowthorn, 1992). To the extent that this holds true, the incentives for real wage restraint ought to be stronger under centralised as compared to decentralised bargaining after adverse labour-demand shocks. It is not evident though how large the difference is likely to be, since it ought to be the same insiders that co-operate under centralised wage setting as those who decide union wage policy under decentralised bargaining (4).

- vi) Finally, the extent of decentralisation may also effect the relative bargaining strength of employers and employees, because the alternative welfare levels in the event of a labour-market conflict (the fall-back positions of the parties) are changed. Jackman *et al.* (1991) and Layard & Nickell (1991) have stressed how employer co-operation under centralised bargaining is likely to strengthen the bargaining position of this side to such an extent that workers' possibilities of finding alternative jobs during a conflict can be reduced. One might also argue that the risks that individual firms will lose market shares to their domestic competitors are decreased. This reasoning, however, runs counter to the argument that political constraints on the employer side on using economy-wide lock-outs in response to union strikes confined to key groups of workers may favour the union side under bargaining at the national level, as has been claimed to be the case, e.g. in the context of Sweden (Elvander, 1988; Calmfors & Forslund, 1990).

Trying to sum up the various modifications to the simple hump-shape hypothesis above, my conclusion is that there are strong reasons for expecting complete centralisation (nation-wide bargaining) to produce substantially more real-wage restraint than complete decentralisation (non-co-operative wage setting at the level of the individual firm). One might therefore expect a relationship like that in Figure 2. It does seem an exaggeration, though, to claim, like e.g. Jackman (1990) and Jackman *et al.* (1991), that full employment is likely to be the normal outcome of centralised bargaining. Moreover, in a realistic analysis it appears important to distinguish between different sectors of the economy. In tradeable sectors with strong foreign competition, the differences in terms of real-wage outcomes may be small between bargaining at industry and firm level. The risk of a pronounced hump at industry bargaining is larger, the weaker is the extent of international competition in a sector, i.e. especially in the private non-tradeable sectors. One should therefore expect strong incentives for wage restraint to be created by highly decentralised bargaining at the level of the individual firm in such non-tradeable sectors where there is a reasonable number of domestic competitors. When this is not the case, policies strengthening competition in goods markets may be a necessary prerequisite for real-wage moderation. Obviously increased international integration of markets for goods and services may be of crucial importance in this respect. Needless to say, increased international competition will have a wage-restraining effect only to the extent that inter-union and inter-employer co-operation in wage bargaining

Figure 2: The extent of centralisation and the aggregate real wage (b)



across borders but within sectors (for instance, in a more integrated Europe) is avoided.

An issue that seems to have been completely neglected in the theoretical literature is how the extent of centralisation is likely to affect wage setting in the public sector, which forms a substantial part of the non-tradeable sector in all countries. Obviously the argument that decentralised bargaining may produce wage restraint because of competition between different production units does not apply in this case (unless public-sector production is opened up for competition from the private sector, which may be possible in some cases but not in others). To analyse this issue, one would have to resort to other arguments. One way of reasoning focuses on fiscal discipline as a key factor influencing wage outcomes in the public sector. Attempts to create incentives for wage moderation there through strict cash limits may not be credible under centralised bargaining, because large pay rises can then result in cut-backs of public services that are not regarded as politically tolerable. One would expect it to be easier to adhere to strict fiscal discipline in the case of local bargaining within the public sector, because the parties to such wage agreements cannot expect to influence the central cash limits. In addition, it may be difficult for the central government to act as a tough employer under centralised bargaining, since it will then in effect be negotiating with a significant share of the electorate (Calmfors et al. 1985, 1988).

B. Centralisation and decentralisation in practice

Although the theoretical results above are clear-cut, the practical conclusions appear more ambiguous. The main reason for this is that the actual wage bargaining systems seldom conform to their theoretical counterparts. There is neither complete centralisation with nation-wide determination of all wages nor complete decentralisation with independent bargaining at the level of individual firms. In terms of Figure 2, one does not therefore find oneself at any of the extremes. Instead actual wage bargaining is characterised by various hybrid forms.

Much of the literature exaggerates the actual amount of centralisation in, for instance, the Nordic countries (e.g. Bruno & Sachs, 1985; Newell & Symons, 1987; Layard, 1990; Jackman, 1990; Jackman et al. 1991). In these economies there has never been complete centralisation in the sense that all wages have been determined in the same bargain. Instead, the traditional systems in the Nordic countries are better characterised as semi-centralised ones, since central bargaining has in effect meant that wages have been determined by a small number of bargaining units (Elvander, 1988; Calmfors & Forslund, 1990; Calmfors & Nymoer, 1990). Complete centralisation does not appear to be a feasible alternative, even in small and homogeneous countries like the Nordic ones or the Netherlands; it is, of course, out of the question in larger economies -- because of the inherent difficulties of holding large coalitions together and the problems of handling all the information necessary (Freeman, 1988; Moene et al. 1993). It is important to realise that this may make a substantial difference. It does matter whether the effects of wage increases are internalised completely or only partly (5). The point has also been made that the existence of a few, very large and competing wage earner organisations may reinforce union concerns over relative wages as compared to

more decentralised systems, with the consequence that the incentives for wage restraint are weakened (Calmfors, 1986; Uddén Jondal, 1992).

An equally important consideration concerns the actual degree of co-operation in decentralised systems. One can argue that a substantial amount of informal co-operation may emerge also when wage bargaining is formally decentralised. Since wage increases in one part of the economy will have a strong influence on other sectors, there will be strong incentives for informal consultations between employers and unions in various parts of the economy also in this case. It has been claimed that these tendencies are likely to be the strongest on the employer side, where there usually exist strong business and personal ties between different firms, and where it may be profitable for them not to jeopardise their long-run relationships through "irresponsible" wage-setting behaviour (Soskice, 1990). One would, however, expect similar mechanisms to operate for unions as well, since they, too, have strong incentives to maintain stable long-run relationships, for instance in order to achieve common political aims and to be able to form a united front against employers on such issues as working time, bargaining procedures and rules for settling disputes about the interpretation of wage contracts etc. that may be negotiated at more centralised levels also when wage bargaining is decentralised (Flanagan et al. 1983; Bratt, 1986; Windmuller et al., 1987). Such informal co-operation also appears to be a characteristic feature of both the German and the Japanese bargaining systems (in the former case between industry employer associations and unions, in the latter between individual employers and local unions at the firm level -- see, e.g. Windmuller et al. 1987, or Soskice, 1990).

An important reason why a certain amount of co-operation on both sides of the labour market may be unavoidable is the demand for insurance against labour market conflicts that exists from both unions and individual employers. One of the main functions of employer associations and union confederations at industry or national levels in many countries is to provide members with such insurance through the build-up of central conflict funds (Soskice, 1990). Indeed, the need to pool conflict risks appears to have been one of the driving forces behind the co-operation between employer associations and unions in the first place (Skogh, 1984). Such an insurance system does create trade-off problems under independent decentralised bargaining. On the one hand, compensation in the case of conflicts must be high enough to provide the individual firm (union) with sufficient bargaining strength relative to the other side. On the other hand, high compensation levels create problems of moral hazard, because the incentives for the insured agents to avoid labour market conflicts are weakened. Some kind of influence from the insurer (employer associations and industry unions/union confederations) on local wage bargaining seems to be a natural way to deal with these problems.

Many formally decentralised wage-setting systems are characterised by so called pattern bargaining, i.e. by a stable pattern according to which some sectors (or firms) act as wage leaders setting the pace for wage increases in the whole economy (Flanagan et al. 1983; Windmuller et al. 1987). In systems where the actual bargaining takes place at the industry level, it is often the metal and engineering sectors that fulfill this role (e.g. in Austria, Denmark, Germany, the Netherlands, New Zealand, Australia, and recently Sweden). One way of looking at such bargaining practices is as a method of informal co-operation, where the employer association and the union in the wage-leading

sector not only consider their own interests but also negotiate "on behalf" of all employers and unions in the economy (Soskice, 1990). Alternatively, one could view key-sector bargaining of this type as another form of intermediate centralisation, where the wage-leading employer association and union only take their own objectives into account but recognise that the wage they set will affect other wage decisions and hence have implications for the own members' welfare (Calmfors, 1987; Wallerstein, 1990). This may also help to promote real-wage restraint. Suppose that a wage increase in the wage-leading sector tends to raise all wages in the economy. If wage increases have negative externalities, it is then in the own interest of the employers and employees in the key sector to restrain wages as compared to a non-co-operative situation with independent bargaining, because their wage increases will trigger off wage increases for others that reduce the own welfare in the leading sector (6). In general, the resulting outcome will not be as favourable for employment as under co-operation, but it will be more favourable than with non-co-operative wage setting (Calmfors, 1987; Calmfors & Forslund, 1990) (7).

The above reasoning suggests that pure theory is not that helpful when comparing actual wage-setting systems. In terms of our diagrams it may not be meaningful to compare the two end points (national wage bargaining and bargaining at the level of the individual firm). One must also take into account how close to these extremes it is possible to come in practice. It ought to be more difficult to sustain inter-union and inter-employer co-operation at the national level, the larger is the economy. The fact that wage bargaining is very decentralised in the U.S., whereas the most centralised economies appear to be the Nordic ones and Austria may be seen as supporting evidence. But the overall picture is more puzzling. As discussed above, centralisation has always been far from complete in the Nordic economies, and Germany and Japan provide examples of large countries with high degrees of informal co-operation on both sides of the labour market. We also know very little about the degrees of informal inter-union and inter-employer co-operation that may emerge in the case of formal decentralisation of earlier highly centralised bargaining systems, such as in the Nordic countries. The recent example of New Zealand, seems, however, to suggest that a structural transformation of the wage-setting system, resulting in actual decentralisation, may indeed occur also in a small economy with a long tradition of fairly centralised bargaining (at least in a situation when fundamental macroeconomic imbalances create pressures for change; see the OECD Economic Surveys of New Zealand, 1988/89 and 1990/91).

IV. Different dimensions of decentralisation

There is often a tendency to focus the decentralisation-centralisation issue only on whether wage setting should occur at the level of the firm, the industry or the nation. There are, however, other dimensions as well. The consequences of decentralisation according to profession (trade), decentralisation along regional lines and the size of the unionised sector will be treated briefly.

A. Decentralisation according to profession

Consider first the extent of co-operation between unions that organise different professions, i.e. what Moene *et al.* (1993) has labelled the degree of horizontal decentralisation. The most obvious example of such horizontal decentralisation is, of course, Britain, where several unions for different professions that all bargain independently may coexist at the same work place. Similar conditions occur in Australia and New Zealand. But also in the Nordic countries, white-collar and blue-collar workers have traditionally had separate unions and bargained independently. In continental Europe it is more common that unions organise both blue-collar and white-collar workers.

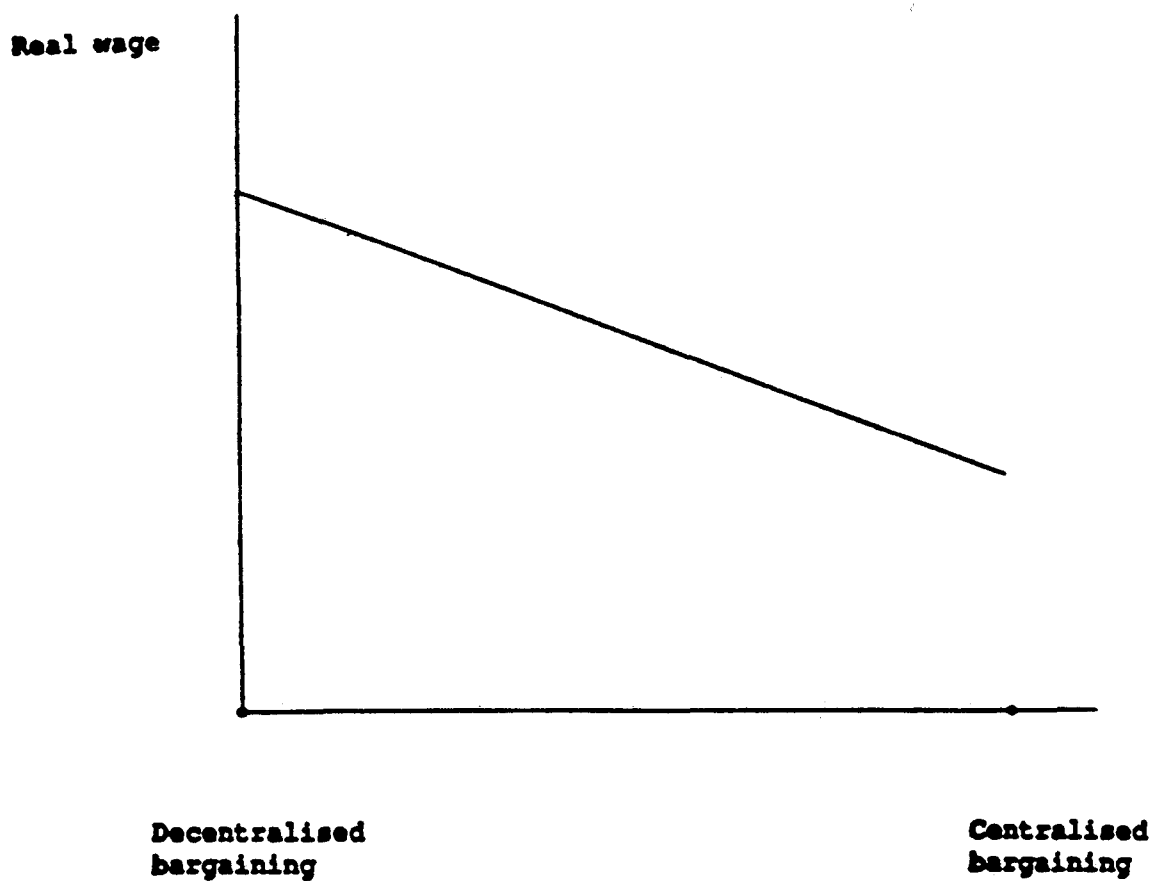
The possibility of a hump-shaped relationship between centralisation and real wages in Section 2 rested on the assumption that bargaining at the industry level means a substantial increase of the market power of wage setters as compared to bargaining at the level of the firm, because negotiations then encompass the producers of close substitutes. It appears unlikely that a similar argument would hold in the case of centralisation across professions, which ought not to be as easily substitutable for each other as are the outputs of different firms within an industry. One should therefore expect a monotonically negative relationship between the extent of centralisation across professions and real wages as in Figure 3. This must, of course, be the case if different professions are (gross) complements, so that a pay rise for one group reduces employment for another and vice versa (8).

Considerations with respect to the relative bargaining strength of employers and unions give similar conclusions. If individual groups of workers by themselves can inflict heavy production losses on the employer, the relative bargaining power of the union side becomes larger if unions negotiate separately instead of jointly (9). It can be shown formally that the difference is as if the employer has to share the value added in production several times with the employees instead of just once (Horn & Wolinsky, 1988). The outcome is higher wages and lower profits. There are hence likely to be benefits in terms of real-wage moderation from co-operation in wage bargaining between different professions, for instance, white-collar and blue-collar workers (Wallerstein, 1990; Moene *et al.* 1993). It should be noted that such benefits of horizontal co-operation are obtained independently of at which vertical level (the nation, the industry or the firm) bargaining occurs.

Against the above background it is interesting to register the recent tendency in Britain for different unions to bargain jointly with the employer (Windmuller *et al.*, 1987) as well as the tendency to adopt a single status for white-collar and blue-collar workers (Elvander, 1991). Sweden provides another example of how the employer side appears to aim for a change of the bargaining system so that all categories of employees should be encompassed by the same collective agreement (Elvander, 1991).

Note also that the above analysis applies only to co-operation across professions. Another issue is how wage setting is affected by decentralisation where several unions organise the same type of employees. This is often the case in, e.g. Belgium, the Netherlands and France, where unions are split along political and confessional lines (Flanagan *et al.* 1983; Windmuller *et al.* 1987). Decentralisation to unions that organise workers who are substitutes in production ought not to have the wage-raising effects discussed above. In

Figure 3: The extent of centralisation and the aggregate real wage with decentralisation across professions



principle, the risk of losing employment opportunities to other unions ought to promote wage restraint under these circumstances just as competition between firms does (cf. Section III). This effect may, however, be counteracted to the extent that competing unions try to attract members through proving their ability to raise wages. It is not clear to me though how important these considerations are in practice, since bargaining co-operation between different unions seems to be frequent in the countries mentioned above and the same collective agreement often encompasses the members of all unions (Flanagan *et al.* 1983; Windmuller *et al.* 1987).

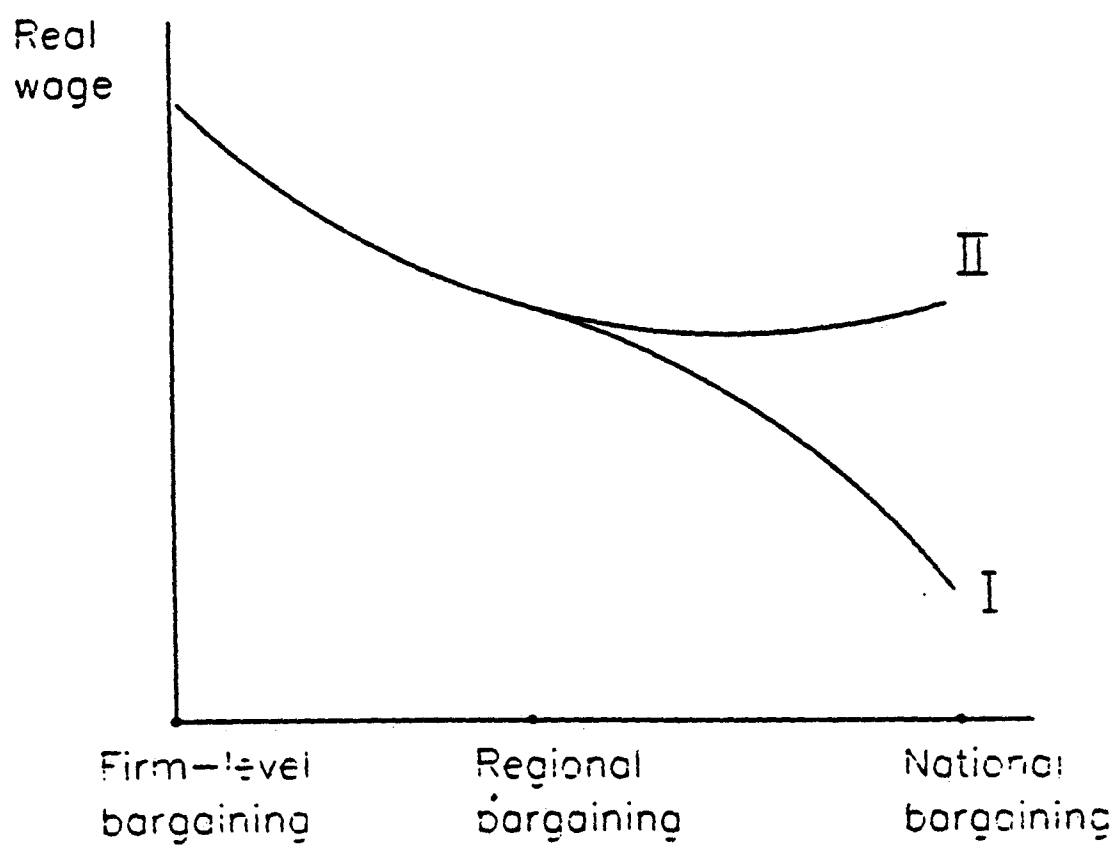
B. Centralisation by region

A second dimension of the centralisation/decentralisation issue, which is rarely discussed, is the regional one. This is surprising since bargaining at the regional level occurs across sectors in, e.g. Switzerland, Belgium and France, and within industries in, e.g. Austria, Germany and Britain.

One can argue that co-operation in wage setting between different industries within a region may contribute substantially to real-wage restraint, because several of the externalities that were discussed in Section II are likely to be internalised already at this level. One obvious reason is that the labour market is primarily regional. Hence the employers in a region ought to have a strong interest in preventing their competition for labour spilling over into higher wages. At the same time, unions should have incentives to restrain wages regionally in order to provide alternative employment opportunities in the case of lay-offs. Moreover, regional and municipal taxes play an important role in many countries, which ought to motivate wage restraint at the regional level in order not to reduce the regional tax base. Wage increases within a region also have negative effects on the regional price level, especially in the service sector, where the proportion of "non-tradeables" across regions is high. In addition, one could probably argue that envy effects of wage increases are likely to occur mainly at the regional level, because it appears most natural to compare one's own wage with those of others within the same region (see, e.g. Nilsson, 1987). Finally, regional co-operation is likely to entail smaller reductions of competitive pressures for wage restraint than industry bargaining, since firms in a region to a large extent compete with firms in other regions.

These considerations suggest that co-operation in wage setting at the regional level is likely to result in lower real wages and higher employment than co-operation at the industry level. One should probably expect a monotonic negative relationship between the extent of centralisation and the aggregate real wage, instead of a hump-shaped one if the intermediate level of centralisation is the regional one, as depicted by the curve I in Figure 4, and not a hump-shaped one. Theoretically, one cannot even rule out the possibility that regional co-operation across industries might produce more real-wage restraint than bargaining at the national level (curve II in Figure 4), although I would not regard this outcome as a likely one. In that case there would exist an optimal size of the region from the point of view of aggregate wage setting: on the one hand it should be small enough that there is sufficient inter-regional competition, on the other hand it must be large enough to allow the key externalities from a decentralised regime to be internalised.

Figure 4: The extent of centralisation and the aggregate real wage with decentralisation across regions



To the extent that regional bargaining occurs only within industries, the internalisation effects will, of course, be weaker. But the internalisation of unemployment and competition-for-labour externalities could still be quite substantial if the bulk of the mobility of labour in the region is within rather than between industries. Similarly, wage comparisons are likely to be more important within than between sectors (Nilsson, 1987).

C. The extent of unionisation

A third dimension of centralisation, finally, concerns the degree of unionisation. A fall in union density can be interpreted as a move towards more decentralised wage setting but is likely to have quite different effects than a reduction of the extent of co-operation between union. When analysing the impact of the degree of unionisation, it makes sense to distinguish between union membership in unionised firms and union coverage, i.e. the share of the economy that is covered by collective agreements (Jackman et al. 1991). These dimensions are important, since the differences between the OECD countries in these respects are as pronounced as the differences in bargaining structure within the unionised sector (OECD Employment Outlook, 1991).

The analysis of union membership in unionised firms is quite straightforward. Union membership determines how large a fraction of the labour force can go on strike, and hence also the damage that the union can inflict on the employer in the case of a conflict. Therefore, a decrease in union membership weakens the relative bargaining strength of the union and thus tends to restrain wages and increase employment (Bean et al. 1986; Jackman et al. 1991).

Union coverage, i.e. the number of firms covered by collective agreements, determines the size of the non-unionised (competitive) sector that coexists with the unionised sector. As a first approximation, one can assume that wages in the non-union sector are set so as to equalise the supply and demand of labour (Minford, 1983; Oswald, 1986). A reduction of union coverage can be analysed as a shift of labour demand from the unionised to the non-unionised sector (Jackman et al. 1991). In the union sector the result is likely to be a fall of both wages -- because the number of well-paid union jobs that may provide alternative employment for laid-off workers is reduced -- and employment. In the non-union sector both wages and employment will rise. The average wage in the economy is reduced because the non-union wage is lower than the union wage. The effects on total employment are ambiguous. On the one hand, the real-wage increase in the competitive sector will raise the supply of labour to it. On the other hand, to the extent that non-union jobs are regarded as inferior to union ones (because they are lower paid) labour force participation may drop, so that the supply increase to the non-union sector becomes smaller than the employment decrease in the union sector. The net outcome is theoretically ambiguous, although one would probably expect the former effect to dominate (Jackman et al. 1991; Layard & Nickell, 1991).

Changes in union coverage are likely to have different effects depending upon the degree of co-operation in wage bargaining within the unionised sector. The wage-reducing effect in the union sector discussed above occurs at both high and low degrees of centralisation. But at high degrees of centralisation, a decrease in union coverage also means that the extent of internalisation of

various externalities (see Section II) is reduced (Holden and Raaum, 1991). Hence one might expect the wage reduction in the union sector due to a fall in union coverage to be larger under decentralised than centralised bargaining, and one could not even rule out an increase of the wage in the union sector in the latter case (though the average wage in the economy may still fall because the non-union wage is lower than the union wage) (10). This might go some way towards explaining why both economies with centralised bargaining in the union sector and high union coverage (such as Austria and Sweden) and economies with decentralised bargaining and low union coverage (such as the US) have performed well with respect to employment in the past (Layard, 1990; Layard & Nickell, 1991).

V. Multi-level bargaining

The above analysis has implicitly assumed that wage setting occurs at one level only. It does not take into account that the centralised systems of the Nordic countries have in effect involved multi-level bargaining, since national and/or industry wage agreements have regularly been followed by local bargaining about their implementation. These subsequent local wage negotiations have consistently resulted in wage drift, i.e. local money wage increases in excess of the ones agreed at higher levels of bargaining.

The interaction between central wage agreements and wage drift in the Nordic countries has long been a neglected research area, where most of the work has been purely empirical with unsatisfactory theoretical foundations. In recent years, however, more promising game-theoretical models, which analyse wage drift as the outcome of local bargaining (e.g. Holden, 1988; 1990a,b; Holmlund & Skedinger, 1990; Calmfors, 1992a) have been developed. A basic conclusion from this literature is that wage drift is always likely to occur if the subsequent local bargaining takes place under a peace clause, which has typically been the case (once the contracts at higher bargaining levels have been concluded). The reason is that the bargaining positions of the parties at the local level then become asymmetrical. On the one hand, employers are obliged to pay workers the centrally agreed money wage, but on the other hand workers can inflict damage on the employer if the local parties fail to reach an agreement through informal conflict actions (by working to rule, by go-slow actions or just by individually providing less effort).

These asymmetrical bargaining positions mean that the employees can always obtain extra wage increases in the local negotiations. As a consequence, wage setters at higher levels must be able to adjust the money wage increases there to the subsequent wage drift, if the wage moderation they desire is to be achieved (see, e.g. Calmfors and Forslund, 1990; or Rødseth and Holden, 1990). At least at low rates of productivity growth this is likely to mean real-wage cuts as a result of the bargaining at the central level. Whether these will be large enough for the central real wage target not to be exceeded is likely to depend upon the rate of price inflation. The reason is that it is hard to envisage central money wage decreases, since higher-level wage earner organisations need to show their members that they do something for them. The central wage setters may also need a certain "nominal room" for influencing relative wages according to their preferences (e.g. by pushing up

wages for those who do not obtain local pay additions). Hence there may even be a certain minimum rate of average wage increase at the central level. It is true, of course that it is hard to explain such money-wage rigidities in the light of from traditional assumptions about rational behaviour. Still, it does represent a "stylised fact" that we need to take into account, even though we may not be able to explain it in the way we would like to (11).

A possible hypothesis is therefore that high inflation may be a necessary prerequisite for a multi-level bargaining system to deliver real-wage restraint (Holden, 1992; Calmfors, 1992a). On the one hand, central bargainers may strive for real-wage moderation because of the various internalisation effects discussed above. On the other hand, they may be unable to achieve it, unless inflation is high enough to make central money wage increases consistent with moderation when there is local wage drift. This may explain the coincidence of high inflation and real-wage restraint which characterised the Nordic economies in the 1980s (Calmfors & Nymoén, 1990; Calmfors, 1992a).

The above reasoning is illustrated in Figure 5, which shows the central money wage increases that are consistent with a given final real-wage outcome under different rates of inflation. If price inflation falls below π_0 , the restriction of a minimum central money wage increase becomes binding, and it becomes impossible to achieve the real-wage target of wage setters at higher levels of bargaining, unless higher unemployment lowers drift (12).

It thus appears that the rate of inflation may affect the relationship between the degree of centralisation and real wages. The implicit assumption is then that centralised wage setting involves bargaining at several levels, whereas decentralised bargaining does not. At low rates of inflation, the hump-shaped relationship from Figure 2 ought to be shifted more upwards the further to the right one is in the diagram. It may shift to II or III in Figure 6, according to which the ranking in terms of real-wage restraint has been reversed between national and firm-level bargaining (C and C' are above A, whereas B is below). As I have drawn the curves, decentralised wage setting thus produces more real-wage restraint than centralised bargaining at low rates of inflation. It does not, however, produce as much real-wage moderation as centralised bargaining with high inflation, but in the diagram this real-wage outcome is not a feasible alternative in a low-inflation society.

A possible conclusion from my analysis is that the number of bargaining levels may be as important as the extent of formal centralisation for the determination of aggregate real wages and employment when there is low inflation. This may put, for instance, the Japanese, Austrian and German bargaining systems in another perspective. A plausible hypothesis is that the success in achieving both low inflation and reasonable employment growth in these countries may have something to do with the fact that bargaining takes place only at one level. In Japan, the level is the individual enterprise, even though there appears to be strong informal co-operation in wage setting across firms (Soskice, 1990; Andersson, 1992). In Austria and Germany, there seems to be little bargaining at the local level about the implementation of the wage agreements at industry level (Hellström, 1982; Flanagan et al., 1983; Bröms, 1992). Instead, employers seem to be mainly responsible for the interpretation of the higher-level wage contracts at the level of the enterprise. An important explanation why industry agreements are better

Figure 5: Nominal wage increases consistent with real wage moderation under multi-level bargaining

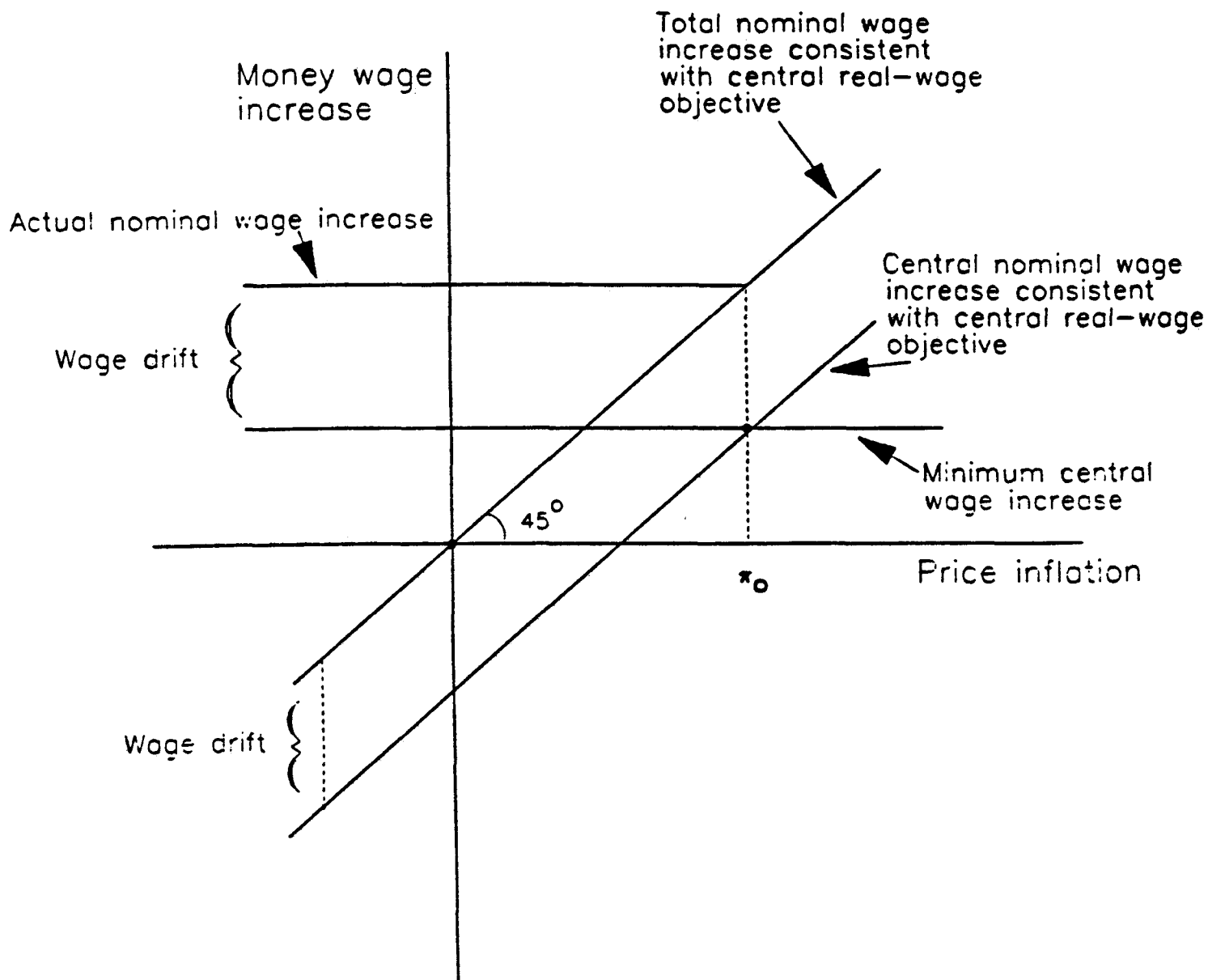
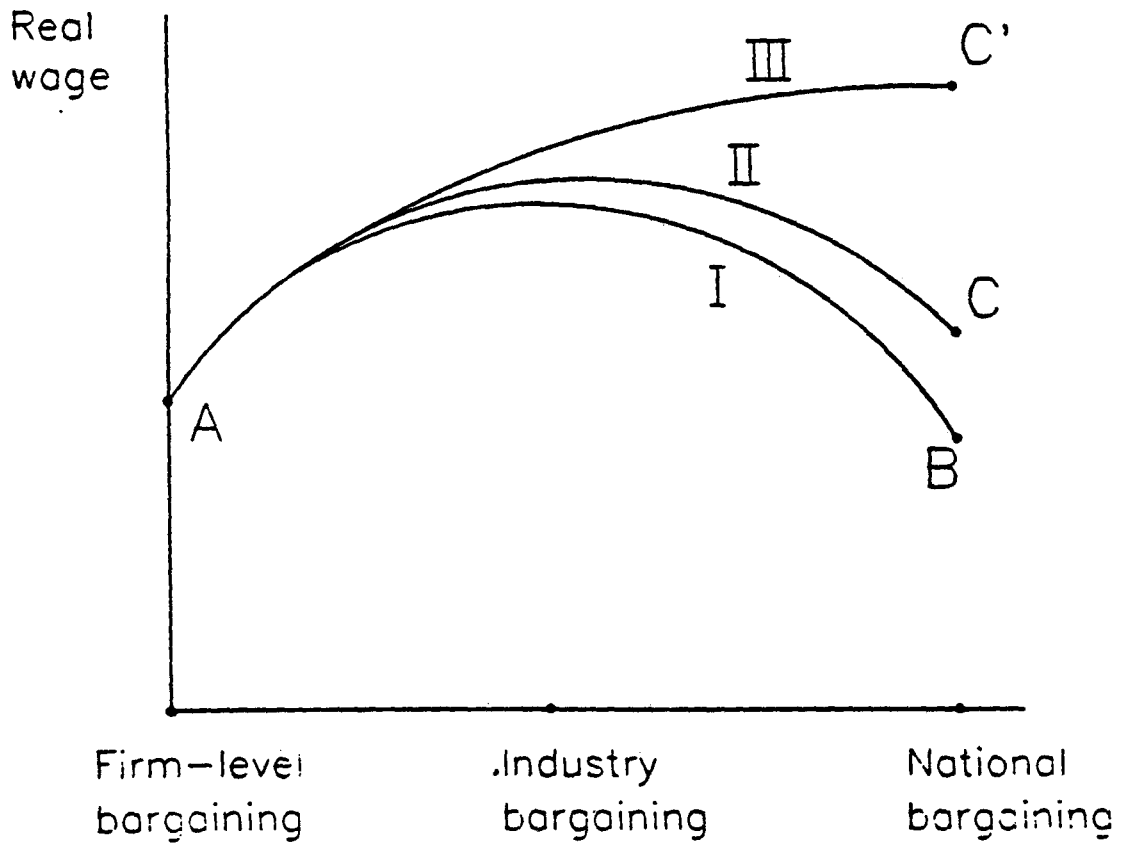


Figure 6: The extent of centralisation and the aggregate real wage under multi-level bargaining and low inflation



respected in these countries and do not result in the same wage drift as in the Nordic countries may be that they are concluded at the regional level, which permits more adjustment to local conditions than when they apply to the whole economy.

An important factor influencing the functioning of multi-level bargaining systems also appears to be the ambitions of higher-level organisations to influence relative wages. The difficulties of reducing money wages mean that the higher the central ambitions of affecting the wage distribution, the more "nominal room" is needed at the central level and the more wage drift may be induced at the local level in order to counteract the "distortions" that have been imposed on the wage structure. This has been highlighted as a serious problem in Sweden (Calmfors, 1992b). Hibbs & Locking (1991) have presented empirical evidence in favour of the hypothesis that an increased central push for wage equalisation seems to have raised both central and total money wage increases in Sweden.

It is interesting to compare the Swedish experience with the Austrian and German ones, where central attempts to even out wage differentials have been almost non-existent (Flanagan *et al.* 1983; Bröms, 1983). In the German system, industry negotiations are not about actual wages but about minimum wages that are only binding for but a few workers: the minimum wage increases agreed at the industry level, however, act as guidelines also for the actual wage increases, but unions do not seem to interfere in the distribution within firms as long as the total wage increases there conform to the norm. This may be a necessary prerequisite for combining bargaining at the industry (or central level) with low inflation.

VI. Wage setting as a co-ordination problem

The above analysis has focused on how the internalisation of various externalities, market power and nominal wage rigidities are likely to depend upon the extent of centralisation. Yet another way of looking at the centralisation/decentralisation issue is as a co-ordination problem, where bargaining systems may differ in their ability to handle information on the aggregate economic development and to co-ordinate the behaviour of various wage setters. Such aspects were very much stressed in connection with the oil price shocks of the 1970s and the disinflation of the early 1980s (e.g. Bruno & Sachs, 1985; Jackman 1986). The argument was made that decentralised bargaining systems cannot adjust to adverse employment shocks as fast as centralised systems. One reason may be overlapping wage contracts, another the uncertainty about the wage behaviour of other groups.

One way of analysing this issue is to assume that there may exist multiple equilibria in an economy with uncoordinated wage formation. Bhaskar (1990) has recently provided an interesting analysis of this possibility. He claims that there is likely to be a strong tendency for wages of individual groups to adjust to the expected wages of others. Different expectations of aggregate wage behaviour may therefore result in different equilibria, which all will be consistent with rational expectations, since behaviour may be influenced in such a way that ex ante expectations are fulfilled ex post. This

argument is cast in the monopoly-union framework, according to which unions set wages unilaterally. They are assumed to be concerned about both real and (expected) relative wages as well as employment. The crucial assumption is that preferences are asymmetrical in the sense that the dissatisfaction from being paid less than identical workers in other sectors is greater than the benefit from being paid more. This is motivated by references to both social and experimental psychology (Akerlof, 1980; Kahneman & Tversky, 1979).

The analysis is illustrated in Figure 7, which shows the wage goals of the individual union. The diagram pictures the labour-demand schedule as well as indifference curves indicating how each union is willing to trade off higher real wages against lower employment and vice versa. If preferences were to be symmetrical, so that a wage increase is valued as much independently of whether the own wage is higher or lower than the expected aggregate wage, the individual union would choose the point A with the real wage w_A and employment N_A . But if a wage increase is valued more when the own wage is below the expected aggregate wage than when it is above, the indifference curves will have a kink at the expected aggregate wage. The reason is that the individual union is willing to accept a larger loss of employment when the own wage is below the expected aggregate wage than when it is above. Hence the indifference curves are flatter below than above this comparison wage.

Depending upon which aggregate wage is anticipated, the individual union will choose different wages. If w_A is the expected aggregate wage, the union will, of course, still choose w_A as the own wage (note that the "valid" segments of the indifference curves have been indicated by the continuous line curves). But if the expected aggregate wage is instead w_C , the union will be better off by matching this wage. Indeed, it will match any expected aggregate wage between w_A and w_B (where B is the "tangency point" between the "flatter" indifference curve, which is valid below the comparison wage, and the labour-demand schedule) but not those outside this interval. To understand why, assume that w_E is the aggregate wage that is anticipated. As can be seen more clearly from Figure 8, E will clearly be inferior to B, since the indifference curve I is below the indifference curve II. Hence w_B will be chosen in this case as well. The upshot of the analysis is, in the terminology of Bhaskar, that there will be a natural range of employment (between N_A and N_B in Figure 7) instead of a given natural rate. Which equilibrium is realised will depend only upon the perceptions of the wage behaviour of others. All the employment rates within the natural range are consistent with rational expectations, because the actual wages chosen will conform to expectations if all wage setters behave in the same way (13).

Figure 7 illustrates the risk that the economy may end up in a "bad" equilibrium (with expectations of high wages for others), such as B, instead of in a "good" equilibrium, such as A, because of lack of co-ordination. This result is not dependent on the specific choice of the monopoly-union framework. It would go through also in an explicit bargaining model, provided that union preferences are "kinked" as above, or in an efficiency-wage model, where worker effort depends upon the expected relative wage in a discontinuous way.

Formal or informal co-operation in wage bargaining between different groups is one way to avoid a co-ordination failure and to ensure that a "good" equilibrium is chosen. If so, the benefits of co-ordination will be added to the benefits from co-operation that follow from the internalisation of the

Figure 7: The natural range of employment and real wages

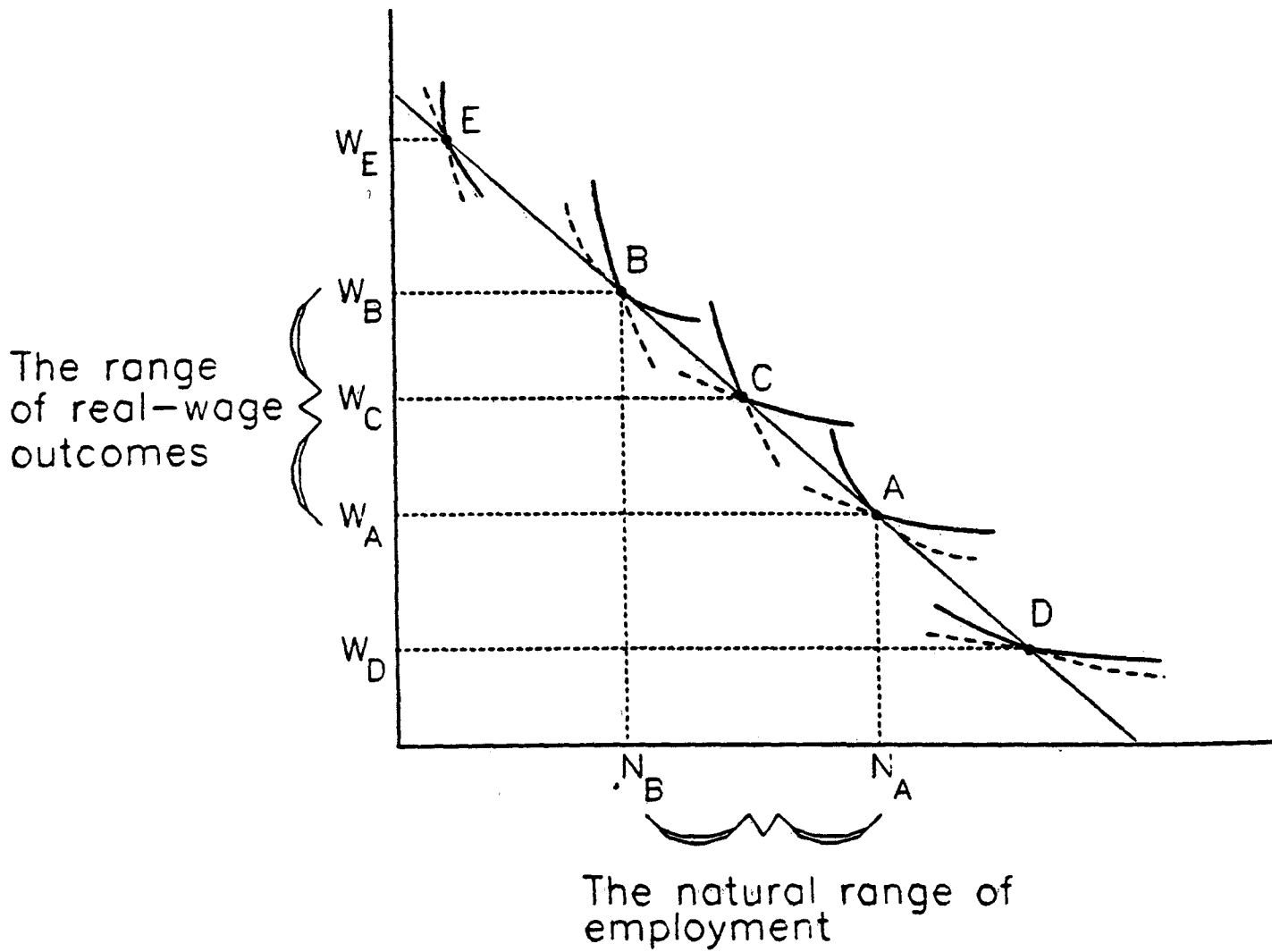
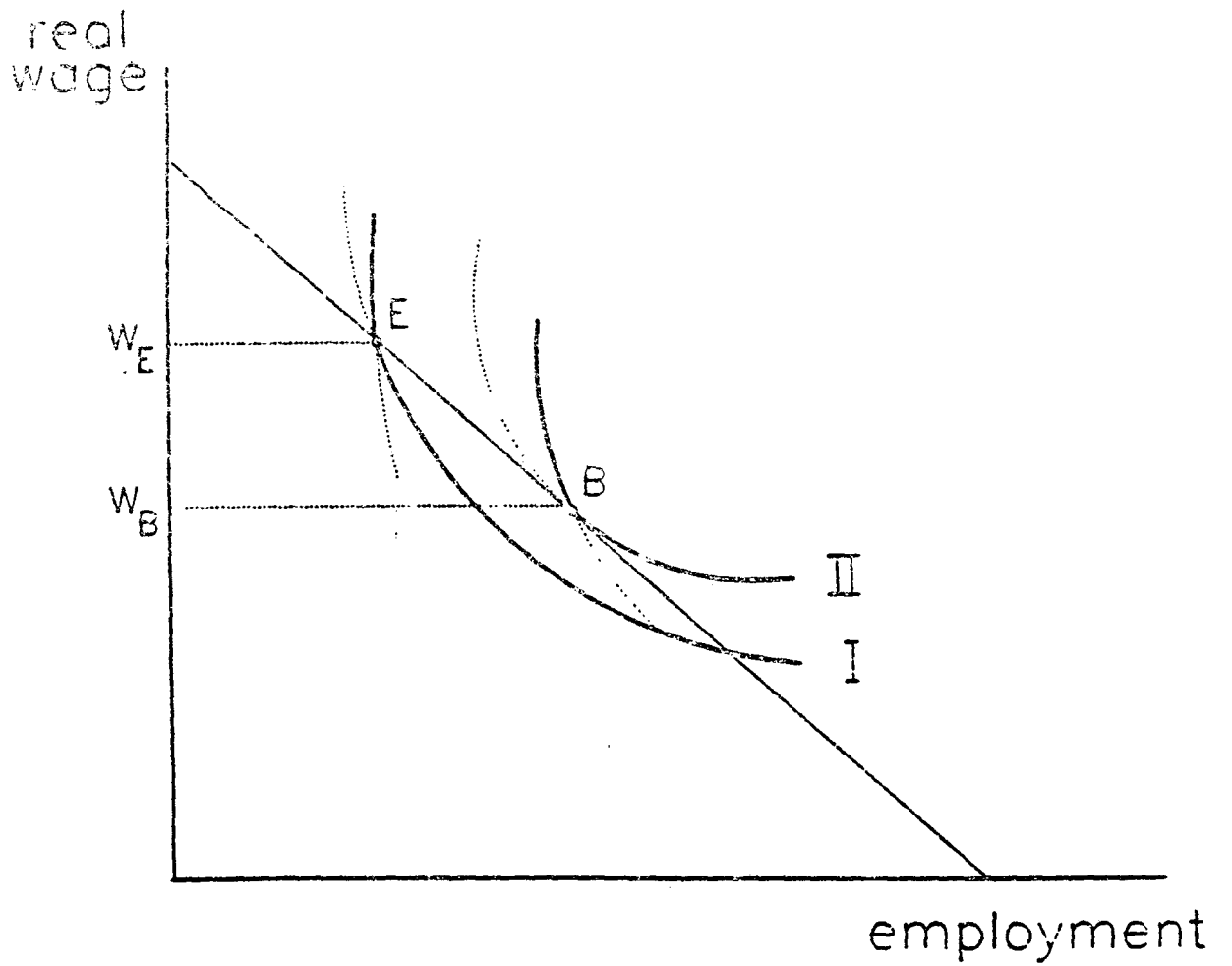


Figure 9: Wage determination and the aggregate supply



various externalities discussed in Section II. Pattern bargaining of the form discussed in Section IV may be another way of co-ordinating the behaviour of the various individual wage setters, if the wage agreement of the key sector sets a norm for the subsequent wage deals. Government income policy interventions can also be seen as a measure designed primarily to solve the co-ordination problem, especially when they are of a more informal character, as seems to have been the case in recent years in countries like, e.g. the Netherlands, Denmark and Sweden.

Somewhat paradoxically, adaptive expectations with respect to the aggregate wage as well as staggered wage setting of the British or the US type may facilitate co-ordination in the sense that they remove the ambiguity introduced above by the possibilities of a range of self-fulfilling rational-expectations equilibria (Bhaskar, 1990). But such a lack of synchronisation, of course, makes it impossible for the economy to react swiftly to a change of macroeconomic conditions. It is well-known that a slow speed of wage adjustment in the case of adverse shocks is problematic, because it causes prolonged deviations from the new equilibria to which the economy will be converging (see, e.g. Jackman, 1986; Jackman *et al.* 1991). The relevant conclusion from the above analysis is probably that synchronisation of pay deals with respect to time is not necessarily favourable in the absence of a mechanism of co-ordination.

VII. Other channels of influence

Sections I to V have discussed how various degrees of centralisation in wage bargaining affect the incentives and constraints of wage setters and thus the aggregate real wage. The consequences for employment have then been derived from the aggregate labour-demand schedule. It is, however, also possible that the behaviour of firms and unions may be affected by the bargaining system in other respects, as well. Since wage bargaining at the level of the individual firm can be interpreted as a method of implicit revenue sharing between the capital owners and the employees, these may seek to influence the outcome of the subsequent wage negotiations in various ways. The possible implications of this for i) employment; ii) investment; and iii) productivity will be discussed in the following sections.

A. The employment decision of firms

The implicit assumption in the discussion so far has been that the individual firm maximizes profits by employing workers to the point at which the marginal revenue product of labour equals the wage. This condition defines the labour-demand schedule. It does not, however, take into account that the employment decision of firms may have an effect on wage bargaining. If this is the case, wage-setting considerations might influence the way firms choose the level of employment. This issue has been analysed by Moene (1988) and Moene *et al.* (1993).

The basic idea is that the wage will depend on labour productivity in the individual firm under decentralised bargaining. If this is the case, an

increase of employment in the firm by one unit will not only raise profits with the difference between the marginal revenue product of labour and the wage. In addition, average labour productivity also falls, which lowers the wage. Hence there will be stronger incentives to increase employment than in the case of an exogenously given wage, or rather one that is not affected by the employment decision of the firm.

The above argument has been illustrated in a simple bargaining model. Assume that firms try to maximize profits and unions to obtain as high a wage as possible. If one assumes the fall-back levels of income for the two bargaining parties to be zero during a conflict, the wage bill under decentralised bargaining at the level of the firm can be shown to be a constant fraction of output that will depend only upon the relative time preference of the union and the employer (the patience to wait for an agreement) (14). Hence profits are also a constant fraction of output. Local wage bargaining thus results in revenue sharing, according to which the capital and labour shares are independent of the size of the work force. The usual assumption is that employment is determined after wages have been set. Now, reverse this assumption and assume instead that employment is determined before wages. It then follows that the individual firm has an incentive to raise employment above the point at which the marginal revenue product equals the wage. Since in this model the wage bill and profits are constant fractions of output that do not vary with employment, the profit-maximizing level of employment under decentralized bargaining will, in the simple example be the one which maximizes output, i.e. which gives a marginal revenue product of labour equal to zero.

The above considerations do not apply to centralized bargaining. Since the wage determined then will depend upon the aggregate conditions in the economy, the employment decisions of individual firms have only a marginal effect. Therefore there are no incentives in this case for firms to expand employment beyond the point at which the marginal product equals the wage.

The example given above is, of course, extreme. If one instead assumes that employees have a certain fall-back level of income in the case of a conflict, its magnitude will affect the way in which revenue is shared between the capital owners and the work force. The firm, however, still has an incentive under decentralised bargaining to expand employment above the point at which the real wage equals the marginal revenue product of labour. The profit-maximizing employment level in this case instead becomes the one at which the marginal revenue product equals that alternative income. Moreover, the assumption that employment cannot be changed once the wage contract has been written is, of course, unrealistic. However, there do exist large adjustment costs for employment, so that the above considerations may have some role to play (15). At least, they are suggestive of why employment may be high in economies with decentralised wage bargaining even though there may be less wage restraint than in countries with centralised bargaining (Moene et al. 1993).

B. The investment decisions of firms

Firms' incentives to invest in physical capital can be analyzed in a similar way as the employment decisions. This has been done by, e.g. Grout (1983), Hoel (1990), Moene (1990) and Moene et al. (1993).

The argument can again be based on a simple bargaining model. Since investment in capital means higher fixed costs in the case of labour-market conflict, the fall-back level of profits is reduced. Therefore the relative bargaining position of the employer side is weakened and the outcome will be a higher wage. These considerations will not affect the investment decision of individual firms under centralised wage setting, since the effect on the aggregate bargaining strength of employers is negligible. But under decentralised bargaining, the individual firm has an incentive to hold back investment in order to achieve lower wages. The reason is that the implicit cost of capital is raised when the wage repercussions are taken into account (16).

Although there appears to be a strong presumption that investment is decreased with local bargaining, a complete analysis of this question is quite complex. The reason is that the productivity of capital is also affected by employment. The attempts that have been made to analyse the simultaneous determination of investment and employment usually fail to come up with unambiguous results on investment and employment levels, although it appears to be generally true that capital-labour ratios become lower with decentralized bargaining (Hoel, 1990; Moene et al. 1993). The reasoning in this Section does, however, add a mechanism -- holding back investment -- through which local wage setting may tend to give lower wages than centralised bargaining.

C. Labour productivity and bargaining

Finally, the productivity of employees may also be affected by the bargaining system. The reason is that the amount of effort provided to some extent is decided collectively at the firm level. This holds, for instance, with respect to the organisation of work, the adoption of new techniques that increase productivity but may demand greater effort on the part of the employees, rules about manning, etc. One would expect the local union to have a large influence on these aspects of productivity. It has been pointed out by Moene et al. (1993) that in analogy with the reasoning above, wage bargaining at the level of the firm ought to increase the interest of unions in more effort. The reason is again the local revenue sharing implied by this form of wage setting (17). Since higher output in the individual firm will in this case increase wages, the incentives for more collective effort are strengthened as compared to the case of centralised bargaining, when wages will be influenced by the aggregate output of the economy.

Moene et al. (1993) also show that these productivity-raising incentives remain with multi-level bargaining when centralised (or industry-wise) wage agreements are followed by local negotiations (cf. Section V). As long as there is the possibility of wage drift, local unions can obtain extra wage increases by accepting organizational changes that lead to higher productivity. This points to an advantage of the Nordic systems of mixed bargaining -- as compared with the Austrian or German ones where there appears to be less scope for wage drift -- that must be weighted against the risk that the real-wage moderation of central wage setters may not be achieved at low rates of inflation (see Section V).

There may, however, also be obstacles to productivity increases under decentralised bargaining. One obvious reason is that bargaining at the level

of the firm may encompass both wages and employment (McDonald & Solow, 1981; Oswald, 1986; Jackman et al. 1991). Local labour unions may be reluctant to accept changes in working practices that reduce employment. With more centralised bargaining, negotiations on employment do not occur because of the apparent difficulties of breaking down central employment agreements on the individual firm. Needless to say, horizontal decentralisation according to profession (trade), as discussed in Section IV.A -- the traditional British picture -- is not likely to be conducive to high productivity, because the total effects of changes in work organization and practices on the firm will not then be internalised.

VIII. Centralisation and relative wages

Most of the literature on the consequences of various degrees of centralisation of wage bargaining has emphasised the effects on aggregate wage determination, and a well-specified theoretical framework to discuss these issues has been developed, as discussed in Sections II-VI. There does not exist a similar consensus on how the relationship between the extent of centralisation and relative wages should be analysed. Yet, it has, of course, been noted that unionisation in itself seems to reduce wage differentials (see, e.g. Freeman & Medoff, 1984, for the United States, or Simpson, 1985, for Canada), or to preserve the existing wage structure (e.g. Gundlach, 1986, for West Germany). There also appears to be a negative correlation across countries -- although not overwhelmingly strong -- between the extent of centralisation and wage dispersion (Freeman, 1988; Rowthorn, 1992). The most clear-cut examples of how a high degree of centralisation and low wage dispersion go hand in hand are probably the Nordic countries, and especially Sweden, where egalitarian wage policies have been explicitly adopted by the central union confederations (see, e.g. Flanagan et al. 1983; Flanagan, 1987; Siven, 1987; or Nilsson, 1987), and where the trend towards reduced wage dispersion was not broken until wage negotiations became more decentralised in the early 1980s (Hibbs & Locking, 1991). Austria, however, provides a counterexample of how a high degree of centralisation may very well be consistent with large wage differentials (Flanagan et al. 1983; Rowthorn, 1992).

A. Theoretical considerations

The most common argument why a higher degree of centralisation should reduce wage dispersion, is perhaps that "the distribution of wages enters the utility function of unions and their members" (Flam, 1987). Distributional concerns can then be seen as a restriction on the attempts to trade off wages against employment that we discussed in Sections II-VI. This may explain why unions sacrifice aggregate wage goals in order to achieve greater wage equalisation (see Richardson, 1991). A problem with this explanation is, however, that it is unclear how these aggregate union goals with respect to the distribution of wages depend upon the preferences of individual members, and hence how and why behaviour should change with the degree of centralisation.

An alternative is instead to focus on the political decision process that determines union behaviour. Suppose that union wage policy is decided by the median union member. Then if productivity differs between members and a majority find themselves at the lower end of the productivity distribution, one should expect a compression of wage differentials (Freeman, 1980).

Agell & Lommerud (1992) have provided an insurance rational for wage equalisation. Their argument is that individual workers face uncertainty regarding their future place in the wage distribution: they do not know today whether they will be high-productivity or low-productivity workers in the future. If they are risk-averse, they may therefore be willing to trade off some unemployment (for low-productivity workers) against reduced wage differentials between the two categories of workers. Although one can discuss the importance of the uncertainty considered by Agell & Lommerud, the insurance motive for wage equalisation could be of more general importance: presumably, one could analyse wage differentials between sectors in the case of uncertainty about relative-demand shifts in a similar way.

Yet another explanation has been put forward by Rowthorn (1992), who has noted that more decentralised wage bargaining appears to be correlated with greater asymmetries with respect to the size of bargaining units between the "centralised" and "decentralised" sectors: in continental Europe, with an intermediate degree of centralisation, industry wage negotiations occur in some sectors and bargaining in small firms in others, whereas, in North America and Japan, with more decentralised wage setting in general, bargaining at the level of the firm takes place in some parts of the economy at the same time as there exists a large non-unionised sector. In a framework similar to that of Calmfors & Driffill (1988), Rowthorn shows how these asymmetries with respect to the size of bargaining units between sectors may lead to wage dispersion.

Surprisingly, no theory of how wage differentials are affected by the extent of centralisation has been built on the basis of the models discussed in Section II, which focused on how various externalities of wage increases can be internalised with co-operation between various bargaining units. I know of only two attempts: Rasmussen (1992) who, shows that co-operation between unions in an open economy reduces wage dispersion, and Uddén Jondal (1992), who in a model with envy effects (see Section II) and labour-demand spillovers, finds that the wage differential between skilled and unskilled workers can go either way. One would, however, expect it to be possible to draw some more general conclusions from this framework. Suppose we have two unions: a high-wage one and a low-wage one. If there is a change from independent wage setting to co-operation between them, there might be a systematic difference between the incentives for the two unions to reduce wages when the effects on the other union are internalised. Provided that the two unions are large enough, one could argue in terms of the consumer price externality discussed in Section II. Because of decreasing marginal utility of real wages (consumption), the utility gain for the members of the low-wage union from the price decrease (real-wage gain) that will be induced in the case of a wage reduction by the high-wage union ought to be larger than the corresponding utility gain for the members of the high-wage union when the low-wage union reduces its wage. Hence the incentives to reduce the wage ought to be larger for a high-wage than for a low-wage union.

A similar argument could be made in terms of envy externalities in the example above. One has then to assume that the utility loss for the members of the own union of a wage increase for the other union is increasing in the other union's wage and decreasing in the own wage (which are common and reasonable assumptions, see Oswald, 1979; and Uddén Jondal, 1992). Then again, the utility gain for the members of the low-wage union from a wage decrease by the high-wage union ought to be larger than the corresponding utility gain for the members of the high-wage union from a wage decrease by the low-wage union. Therefore, co-operation between two such unions ought to provide incentives to reduce both the average wage level and wage dispersion (18).

B. Wage dispersion and flexibility of relative-wages

In most discussions of the effects of reducing wage dispersion and relative-wage flexibility, the implicit norm of comparison is one where wages adjust both to maintain full employment in general and the equality of supply and demand in different sub-markets for labour (with respect to industry, region, profession/skill and age group). It is, of course, a standard conclusion that any compression of the wage structure relative to this norm will create simultaneous excess supply and excess demand situations in various sub-markets. This need not necessarily reduce the incentives for labour mobility, since worker decisions to move are likely to depend upon expected income differentials (taking the probability of employment in various job markets into account) rather than actual wage differentials for employed workers. Hence both quantity signals (differences in excess demand/excess supply between different job markets) and wage signals matter for mobility decisions, and it has indeed been discussed whether the former "push factors" or the latter "pull factors" are the most important mechanisms (see, e.g. OECD, 1965; OECD Employment Outlook, 1985; and Pissarides, 1978). It is, however, clear that the reallocation of labour will be associated with more temporary unemployment when relative wages are prevented from adjusting to temporary imbalances. The point has also been made that when reliance is put on quantity signals to perform the reallocation of labour -- which in practice will mean that it is mainly unemployed workers that move -- the individual employee loses the freedom to choose between moving or staying on with a lower relative wage (e.g. Hansen, 1961; Skedinger, 1992).

There are very few studies analysing the general-equilibrium effects of reduced wage dispersion. A few examples are provided by Kierzkowski (1982, 1984), Flam (1987) and Knies & Herberg (1988), who all analyse the impact of a rise of the relative wage between unskilled and skilled labour (above the competitive one) in an open economy where the relative factor intensities of the production sectors differ. The conclusions are, not unexpectedly, that such a relative-wage distortion is likely to create unemployment among unskilled workers and that the sector which is intensive in the use of skilled workers will expand at the expense of the other sector(s). In the long run, egalitarian wage policies of this type may even be counterproductive in the sense that the (absolute) wage of unskilled labour may fall at the same time as the wage structure is compressed (Flam, 1987).

A weakness with the above contributions is that they do not provide any rationale for egalitarian wage policies. Hence they do not allow an explicit welfare analysis, in which the costs can be weighed against the possible

welfare gains for at least some groups in society. Another weakness is that the relative-wage distortions are not analysed simultaneously with "aggregate real-wage distortions" of the type discussed in Sections II-VI. These deficiencies seem to identify potentially relevant areas for future research.

In the next sections some recent research that has stressed different partial effects of reductions of wage dispersion which have been assumed to follow from centralised bargaining are summarised. They deal with i) effects on structural change; ii) efficiency-wage considerations; and iii) wage setting as an instrument of regional policy.

~~i) Structural change~~

One of the traditional motives in the Nordic countries for centralised bargaining with the aim of evening out wage differentials (the so-called solidaristic wage policy -- see, e.g. Flanagan *et al.* 1983; or Flanagan, 1987) has been to promote structural change and productivity growth. The idea is to enhance the profitability of new production units with high productivity and to reduce the profitability of old units with low productivity by setting wages equally across all firms. The desired outcome is a process of "creative destruction" in the sense of Schumpeter (1942) with simultaneous entry of new plants and closing-down of old ones.

This link has recently been analysed more formally by Moene *et al.* (1993) and Moene & Wallerstein (1992) using the simple bargaining models described in Section VII, according to which wage setting is seen as revenue sharing between employees and capital owners. With centralised bargaining at the industry or national levels, the wage in each firm is taken to depend on average labour productivity across the whole bargaining area; with decentralised bargaining at the level of the individual firm the wage depends instead only on firm-specific labour productivity. Hence it follows that wages in modern high-productivity plants will be lower under centralised than under decentralised bargaining. But with centralised wage setting, wages in a given production unit will gradually increase over time as labour productivity increases elsewhere when more modern production techniques are introduced in new plants. As a consequence, wages in old low-productivity plants will be higher under centralised than under decentralised bargaining (19).

An obvious conclusion from the above analysis is that centralised bargaining appears to reduce the operating time of each vintage of capital, i.e. that the economy will at each instant be characterised by a more modern production structure. The welfare consequences of this are not, however, self-evident, since it is ambiguous whether aggregate output will increase or not. This depends upon how investment in each vintage of capital is affected. Here there will be effects working in opposite directions. On the one hand centralised bargaining increases the immediate profitability of new vintages of capital, but on the other hand future profitability is reduced because wages grow over time in response to aggregate productivity growth. It is not clear which is the net effect on the discounted value of profits over the life span of a vintage of capital, even though Moene & Wallerstein (1992) claim that the most likely outcome is a positive one. One might, however, also take into account that wage setting which is not influenced by the profitability of the

individual production unit increases the risks of investing in productive capital. This should have a negative impact on investment (Calmfors, 1992b).

~~ii) Efficiency-wage considerations~~

Another way of looking at wage differentials is from the point of view of the efficiency-wage hypothesis, according to which firms trade off the losses from a rise of the wage bill against the gains that a higher relative wage may mean in terms of reduced labour turnover and/or more effort on the part of the employees (cf. Section II). It has been stressed that such efficiency-wage considerations may be a main explanation of wage differentials between sectors, because the possibilities to affect profits in this way are likely to be very different (e.g. Katz, 1986; Krueger & Summers, 1988).

Ramaswamy & Rowthorn (1992) argue that efficiency-wage considerations have important implications for the decentralisation/centralisation issue. Suppose that centralised bargaining means a reduction of wage dispersion (in the extreme case an elimination of all wage differentials). Then the individual firm faces a trade-off. On the one hand, it may benefit from centralised bargaining to the extent that it reduces the wage level because of the internalisation effects discussed in Section I. On the other hand, it may suffer a loss because it may have to accept a large deviation from the profit-maximising relative wage. There will be two types of firms that prefer decentralised to centralised bargaining: those with a strong wage-effort-profit link, which desire high relative wages, and those with a weak such link, which want low relative wages. The importance of such efficiency-wage considerations depends upon the heterogeneity of firms. The more heterogeneous they are, the greater is the probability that a majority of firms will choose decentralised bargaining.

It is difficult to assess quantitatively the importance of the above effects (and to compare them with the productivity-enhancing effects of the induced structural change discussed in the preceding section). However, in general one would expect wage incentives gradually to have become more important over time, since there has been a strong long-run trend in the direction of less and less standardised production, with the consequence that the difficulties of monitoring employee effort through hierarchical methods have increased. Production methods have changed from "Fordist" to "non-Fordist ones" (see e.g. Piore & Sabel, 1984; or Milgrom & Roberts, 1990). Hence incentives for acquiring skills, for innovations and for adaptability in general are likely to have gained in importance.

The combination of a gradual change in production methods and the trade-off between efficiency wages and internationalisation effects stressed by Ramaswamy & Rowthorn offers one possible explanation of the general trend towards more decentralised wage bargaining in many Western European economies (Britain and the Netherlands since the early 1960s; e.g. France, Italy and the Nordic countries in the 1980s). It is not surprising that these decentralisation tendencies currently appear to be very pronounced in, e.g. Sweden, where wage differentials have been strongly compressed (Siven, 1992), whereas the bargaining system seems much more stable in, e.g. Germany and Austria, where wage relativities have been fairly constant over time.

Since one would expect efficiency-wage differentials to be more important between than within industries, the above discussion seems mainly to provide an argument for decentralisation at the industry level: the efficiency-wage gains of moving from bargaining at the national to the industry level are likely to be larger than those of moving from industry- to firm-level bargaining. This conclusion is further strengthened to the extent that industry bargaining permits the development of different "compensation packages" tailored to the needs of the individual sector. Since the possibilities of affecting productivity through wage incentives may also differ very much depending upon the type of work, efficiency-wage considerations might also provide an argument against centralisation across professions (white-collar and blue-collar workers) advocated in Section IV.B. Finally, one would not expect efficiency-wage considerations to motivate large wage differences between regions.

It is an open question how important efficiency-wage differentials between industries (and firms) are relative to wage differentials and steep wage profiles within firms in order to promote individual effort (see, e.g. Lazear, 1979, 1981). Nor is it clear to what extent this intra-company wage dispersion is related to the extent of centralisation in general. In the Scandinavian countries, centralised bargaining has been claimed to reduce wage differentials between different employees in general (e.g. Flanagan et al., 1983; Flanagan, 1987; Siven, 1987, 1992; Nilsson, 1987), whereas this does not appear to have been the case in Austria or Germany (e.g. Hellström, 1982; Flanagan et al. 1983; Soskice, 1990; Bröms, 1992). All that can be said is that the potential efficiency-wage losses of centralised bargaining will be larger if both the intra-industry (intra-firm) and the inter-industry wage structures are compressed.

~~iii) Wage restraint as regional policy~~

A final aspect of relative-wage flexibility concerns regional imbalances. Most OECD countries are characterised by substantial regional unemployment differences and it is usually an explicit policy aim to even these out. However, just as there are numerous constraints limiting the effectiveness of national employment policies there are also many constraints on regional policies. For instance, a serious time-inconsistency problem is created because policy-makers may have an incentive to withdraw various subsidies once these have induced firms to invest in stagnating regions (e.g. through changes of the rules governing subsidies or of the definitions of the areas entitled to support). The consequence is that the effectiveness of such regional policy measures is reduced.

These credibility problems in the case of government policy measures designed directly to promote employment may be an important reason why regional policies often take the form of subsidies for capital investment (see, e.g. Torsvik, 1990; or Skedinger, 1992). These do not give policy-makers the same possibilities of time-inconsistent behaviour. However, capital subsidies are not likely to have large employment effects either, because they reduce the cost of capital relative to labour and therefore induce capital-labour substitution (e.g. Folmer & Nijkamp, 1987).

The above restrictions on government regional policies serve to illustrate the importance of relative-wage flexibility across regions, if large unemployment differences are to be avoided. Regional wage restraint in the case of unemployment operates directly on the cost of labour, thereby stimulating labour demand. At the same time, a system of wage bargaining that allows for regional differentiation is likely to be liable to smaller problems of time-inconsistency than government policy measures to reduce labour costs, since institutional systems in the labour market are usually slow to change. Finally, to the extent that wage bargaining is decentralised to the level of the individual firm, wage setting is likely to be a cost-effective regional policy, since one can to some extent avoid the "windfall profits" in the most profitable firms in a region that general government subsidies will usually give rise to.

IX. Policy conclusions

This survey of the relationship between the extent of centralisation and macroeconomic performance provides a vivid illustration of the complexities of the issue. A high degree of centralisation has advantages in some respects and disadvantages in others. There are many aspects to consider: the impact on the average wage level, on relative wages, on hiring and investment decisions of individual firms, on employee effort, on the amount of structural change, and on regional imbalances. Our knowledge as to the relative magnitude of these effects is at best tentative. Changes in the extent of centralisation are also likely to have different effects depending upon whether they refer to sectors, professions, regions or rates of unionisation.

The diversity of effects discussed in the paper makes it hard to arrive at unambiguous policy conclusions. Any policy recommendation has to be based on a more or less subjective assessment of the relative importance of various factors. It may, however, not be very meaningful to formulate the question as whether bargaining ought to be centralised or decentralised. Rather it may be more fruitful to discuss how features of centralisation and decentralisation can be combined in a well-functioning wage-setting system. One has then to acknowledge that various trade-offs must be made, of which the one between aggregate real-wage restraint and relative-wage flexibility may be the most important one. Keeping these caveats in mind, the preceding analysis leads to the following tentative policy conclusions:

- ⇒ It is unrealistic to expect one universally optimal set-up of bargaining institutions to exist for all countries. Because of historical traditions and varying structural characteristics of different economies, quite different wage-setting institutions may contribute to good macroeconomic performance in different places. This survey has illustrated that there are good reasons why both "co-operative" and "competitive" solutions may work. In countries, like, e.g. the United States, with strong traditions of local wage bargaining and low union density, co-operative solutions, such as practised in Germany or the Scandinavian countries, are just not relevant. In the latter countries competitive solutions might be equally irrelevant. Since

wage-setting systems change only slowly over time, any proposals for change must by necessity build on existing institutions and traditions.

- ~~ii)~~ Horizontal co-operation in wage setting across different occupational groups when there are high rates of unionisation, appears likely to be advantageous from the point of view of aggregate real-wage restraint. This applies independently of whether bargaining takes place at the level of the firm, industry, region or nation.
- ~~iii)~~ In centralised bargaining systems with inter-union and inter-employer co-operation across firms (industries), it appears essential that the extent of "formalisation" is not driven so far that excessive rigidities are imposed on the relative-wage structure. This would seem to speak in favour of the Japanese or Swiss systems of informal co-operation rather than the earlier Scandinavian ones of bargaining at the centralised level. Pattern bargaining provides another form of such informal centralisation that may not interfere too much with relative-wage flexibility. In any system with formal or informal inter-union and inter-employer co-operation it appears crucial that a consensus is developed on the need for differential rates of wage growth between firms and sectors depending upon the employment situation.
- ~~iv)~~ The Scandinavian bargaining systems, where centralised wage setting has in effect meant multi-level bargaining, seem problematic from the point of view of combining real-wage moderation with low inflation. The Japanese or German (Austrian) set-ups with bargaining in effect only at one level despite high degrees of inter-union and inter-employer co-operation appear superior. In order to stimulate employee effort, bargaining at the enterprise level, as in Japan, might be preferable to bargaining at the industry level, as in Germany and Austria. The possibilities of combining co-operative solutions in wage setting with actual bargaining only at the level of the firm ought to be larger in economies, where there exists a small number of very large corporations that can act as national trend setters.
- ~~v)~~ The effects of wage bargaining at the level of the industry, such as occurs in many European countries, are likely to depend upon the extent of international competition. The forces restraining wages may not be much weakened as compared to decentralised wage setting at the level of the individual firm in sectors exposed to fierce competition from abroad. If this is not the case, increased international integration represents a powerful method of moderating wages and stimulating employment. However, in private non-tradeables sectors, where this is not possible, the best solution may be independent decentralised bargaining at the level of the individual firm in order to strengthen the competitive forces restraining wages. In countries with bargaining mainly at the industry level and where it is not possible to develop inter-industry co-operation, this appears to be the direction into which one should try to change the

wage-setting system. This does presuppose, however, that there are sufficiently many competing firms. I would not even rule out the possibility that it might be advantageous in systems that are currently characterised by a high degree of centralisation to try to combine inter-union and inter-employer co-operation in sectors exposed to international competition with decentralised bargaining in non-tradeable sectors characterised by many small firms.

- ~~vi)~~ Wage bargaining in the public sector is an area where little research has been done. One could, however, make an argument that local bargaining in the public sector might alleviate the credibility problems that face governments which try to achieve wage restraint. Under centralised public-sector bargaining, strict cash limits may be impossible to adhere to when pay rises threaten to cause politically unacceptable cut-backs of government services.
- ~~vii)~~ One possibility of striking a compromise between aggregate real-wage restraint and relative-wage flexibility might be to put increased emphasis on the region as a suitable bargaining level. The motivation is the importance of flexible relative wages across regions in order to reduce regional labour-market imbalances and the fact that many of the negative externalities of wage increases can be internalised already at the regional level. Solutions of this kind would, however, seem to require some thinking about the optimal size of the region in wage bargaining: on the one hand it should be large enough to permit enough internalisation of wage effects, on the other hand small enough to provide relative-wage flexibility and sufficient inter-regional competition.
- ~~viii)~~ Finally, one could question the -- sometimes legislated -- practices in many Western European countries to extend the collective agreements in a sector to all firms there. In effect this means that potential competition from non-unionised firms is eliminated, with less wage restraint and likely adverse effects on employment as a consequence. It is less clear whether the practice of extending collective agreements also to non-unionised employees within a unionised firm is wage-raising or not. On the one hand, wage competition from "outsiders" is prevented, but on the other hand the possibility of "free riding" may reduce union membership and bargaining strength.

A problem with all policy recommendations on wage-setting institutions is that it is not clear to whom they are directed. Indeed, our knowledge on how wage bargaining systems change over time is very unsatisfactory. The bargaining set-up is certainly not a policy variable under the government's control, although it can exert some influence via different routes: its role as an employer, the choice of incomes-policy discussion partners, legal rules on strike action, the extension of collective agreements, etc. However, the main influence of any policy recommendations in this area must be on the thinking of all those individuals involved in wage setting, who by their slow interaction can gradually change bargaining institutions. Experience suggests, however, that the gap between economic theorising in this field and the more day-to-day considerations of the practitioners is huge.

Notes

1. This study was prepared when Professor L. Calmfors from the Institute for International Economic Studies, Stockholm University was a Consultant in the Resource Allocation Division of the OECD Economics Department. The author would like to thank ...
2. See Technical Annex, note I, for a formal treatment of this issue.
3. See Technical Annex, note II.
4. In practice, only employed member of local unions elect the union officials that take the decisions on co-operation between different unions or enter into bargaining with employers at higher levels of aggregation. It is therefore not obvious that larger attention is paid to the interests of unemployed outsiders under centralised than under decentralised wage setting.
5. In a simulation exercise, Calmfors & Driffill (1988) show that a change from one to two bargaining areas in a model economy will raise wages much more than a change from two to four, etc.
6. Technically, pattern bargaining can be analysed as a so called Stackelberg equilibrium, which arises if the wage leader optimises against the reaction functions of the other agents. The non-co-operative (decentralised) bargaining case discussed in the text corresponds to a Nash equilibrium, in which each agent optimises taking the action of others as given, so that the solution is given by the "intersection" of the various reaction functions.
7. This conclusion differs from that of Wallerstein (1990), who analyses a case where a wage increase for one group of employees leads to a wage reduction for other groups at the same time as there is a negative externality. This case would seem less probable than the one discussed in the text.
8. See, e.g. Ekberg (1984) for such a result for blue-collar and white collar workers in Sweden. Most empirical studies seem to indicate that production and non-production workers are Hicks-Allen substitutes, i.e. that the output-constant cross elasticities of demand are positive (e.g. Hamermesh, 1986; Risager, 1993). This does not rule out, of course, the possibility that these two group of workers may be gross complements, i.e. that the output effect dominates the substitution effect.

9. For this to occur, different types of labour must be sufficiently complementary in production in the sense that the marginal revenue product of one labour input is increasing in the other. As is well-known, complementarity in this sense does not have to mean that the two factors of production are Hicks-Allen complements (Layard and Walters, 1978). See also footnote 8.
10. Holden and Raaum (1991) have also pointed to how co-operation between unions in a repeated-game situation may be sustained by the threat that non-co-operative behaviour of one union will lead to "punishment" from the others, causing utility losses in some future periods. It might be the case that lower union coverage, by reducing the potential utility losses that other unions can inflict on a non-co-operating union, causes co-operation to break down.
11. One way of rationalising money-wage rigidity also at the central level is to recognise that the alternative to agreeing about a new wage is not necessarily a full labour-market conflict, but perhaps more often that production continues (with some minor disturbances that may increase over time) and that the employees continue to receive their earlier money wage. The latter may therefore serve as the "threat point", below which the central union will not go, much as the central wage in the local negotiations above (Holden, 1991).
12. The diagram has been drawn so that the objective of wage setters at the higher bargaining level is a constant real wage (the line indicating the total money wage increases consistent with the real-wage objective passes through the origin), which may be taken to correspond to a moderate recession.
13. As the diagram has been drawn, any expected aggregate real wage between w_A and w_B leads the individual union to match this wage. A is the tangency point between the labour-demand schedule and the segments of the indifference curves that apply above the kinks at the expected aggregate wage. B is the tangency point between the labour-demand schedule and the segments of the indifference curve that apply below the kinks. The points between A and B -- such as C -- represent corner solutions. Points on the labour-demand schedule below A (such as D) and above B (such as E) will always be inferior to points between A and B. The indifference curves have been drawn under the assumption that the marginal rate of substitution between the real wage and employment is not affected by a change of the aggregate expected real wage. See also Technical Annex note III.
14. See Technical Annex note IV for a formal treatment of this issue.
15. In general, the importance of the above consideration will depend upon the magnitude of adjustment costs and the time preference of employers. More also that multi-level bargaining can be shown to give employment outcomes that are intermediate to those when bargaining occurs only at the central or local levels (Moene, et al., 1993).

16. See Technical Annex note V for a formal treatment of this issue.
17. See Technical Annex note VI for a formal treatment of this issue.
18. See Technical Annex note VII for a formal treatment of this issue.
19. Note, however, that these conclusions are based only on considerations with respect to relative wages. They do not take the arguments about aggregate-wage determination in Sections II-VI into account.

Technical Annex

MAXIMISING BEHAVIOUR IN WAGE BARGAINING: A FORMAL TREATMENT

I. The "hump-shaped" relationship

It is common to assume that the bargained wage for a representative firm is the one that maximises the Nash bargaining product:

$$(1) \quad B = (U - U_0)^\alpha (\pi - \pi_0)^{1-\alpha},$$

where $U = U(w_C^i)$ is the utility of the union attached to firm i , U_0 its fall-back level of utility in the case of a conflict, $\pi = \pi(w_C^i)$ the firm's real profit (measured in terms of the consumer price index), π_0 its fall-back real profit level in the case of a conflict, $w_C^i = W^i/P_C$ the real consumption wage in the firm, W^i the nominal wage in the firm and P_C the consumer price index. Maximisation of (1) with respect to w_C^i gives the first-order condition:

$$(2) \quad \alpha U' / (U - U_0) + (1 - \alpha) \pi' / (\pi - \pi_0) = 0.$$

Assume then that the union is utilitarian, so that $U = Nv + (M - N)\bar{v}$, where $N = N(w_P^i)$ is employment in the firm, $v = v(w_C^i)$ the utility of an employed union member, $M =$ union membership, $\bar{v} =$ the utility of a laid-off union member, $w_P^i = W^i/P^i$ the real product wage, and P^i the output price of the firm. From the definition of the real product wage it follows that $w_P^i = w_C^i/p_r^i$, where $p_r^i = P^i/P_C$ is the relative output price of the firm. From the system of equilibrium conditions for the various goods markets (output = demand), one can derive a price equation $p_r^i = p_r^i(w_C^1, \dots, w_C^i, \dots, w_C^n)$, where the subscripts denote the different firms (the total number of which is n). When bargaining is centralised for several firms, the same wage w_C is assumed to be set in all of them. Hence it will hold that:

$$dp_r^i/dw_C = \sum_{j=1}^k \partial p_r^i / \partial w_C^j,$$

where k is the number of firms encompassed by the same bargain. In general, dp_R^i/dw_C will be larger, the more firms that bargain together within a sector (which in the simplest case can be defined as those perfectly competitive firms that produce the same homogeneous output). dp_R^i/dw_C will be smaller the more sectors (producing outputs that are imperfect substitutes for each other) that are encompassed by the same bargain.

We can derive that $U' = \partial U/\partial w_C^i = \partial U/\partial w_C = N(\partial v/\partial w_C) + (\partial N/\partial w_P)[p_R^i - w_C(dp_R^i/dw_C)][(v(w_C) - \bar{v})/(p_R^i)^2]$. U' will be larger, the larger is dp_R^i/dw_C . Moreover, we can write the real profit of a representative firm as $\pi = p_R^i Y - w_C^i N$, where $Y = Y(N)$ is the output of the firm (the capital stock is assumed fixed). Since $\pi' = \partial \pi/\partial w_C^i = \partial \pi/\partial w_C = Y(dp_R^i/dw_C) - N$, it also follows that the profit loss is smaller, the larger is dp_R^i/dw_C . From (2) and the "dynamic stability condition" $\partial^2 B/\partial w_C^2 < 0$ we can therefore conclude that the larger is dp_R^i/dw_C , the higher will be the real consumption wage.

II. The effect of "openness"

Price equations are usually estimated as $\Delta P = m\Delta W + (1 - m)\Delta P_f + \dots$, where ΔP is the percentage change of the domestic output price, ΔW the percentage change of the nominal wage and ΔP_f = the percentage change of the foreign output price. Moreover, we have that $\Delta P_C = g\Delta P_m + (1 - g)\Delta P$, where ΔP_C = the percentage change of the consumer price index and ΔP_m = the percentage change of the import price. If we assume that $\Delta P_f = \Delta P_m$, we can derive that $\Delta p_R = \Delta P - \Delta P_C = mg(\Delta W - \Delta P_C)/[1 - (1-g)m] + \dots = mg \Delta w_C/[1 - (1-g)m] + \dots$, where Δp_R = the percentage change of the relative price for domestic output (in terms of the consumer price index) and Δw_C = the percentage change of the real consumption wage. If I choose Sweden as an example, $m = 0.5$ and $g = 0.25$ seem to be reasonable values (see, for example, Bosworth and Lawrence, 1987 or *OECD Economic Survey of Sweden*, 1989). This gives $\Delta p_R = 0.2\Delta w_C + \dots$. It appears likely that such a relative-price change in the case of a uniform wage increase across the whole economy may be as large as the relative-price change in the case of an isolated wage increase in a separate monopolistically competitive firm.

III. Asymmetrical preferences

The representation of union preferences in Figures 7 and 8 assumes that union utility U can be written $U = \bar{V}(w, N) + Z(\bar{w})$ for $w \geq \bar{w}$ and $U = \underline{V}(w, N) + Z(\bar{w})$ for $w \leq \bar{w}$, where w is the union wage, \bar{w} the expected aggregate wage, N employment, $\bar{V}(\bar{w}, N) = \underline{V}(\bar{w}, N)$, and $\underline{V}_1(w, N) > \bar{V}_1(w, N)$.

IV. Employment decisions and wage bargaining

Suppose that the outcome of wage bargaining in a representative firm is given by the wage that maximises the Nash bargaining product $(w - \bar{w})^\alpha (\pi - \bar{\pi})^{1-\alpha}$, where w = the wage, \bar{w} = the fall-back level of income for workers during a conflict, π = the profit (including the return to capital), and $\bar{\pi}$ = the fall-back profit level in the case of a conflict. $\pi = Y(N) - wN$, where Y = output and N = employment. Capital is an additional production factor, but it is not written out since the capital stock is assumed fixed. It is also assumed that firms determine employment before the wage is set. If $\bar{\pi} = 0$, the outcome of bargaining is $w = \alpha Y(N)/N + (1 - \alpha)\bar{w}$. Hence $wN = \alpha Y(N) + (1 - \alpha)\bar{w}N$, and $\pi = (1 - \alpha)[Y(N) - \bar{w}N]$. Profit maximisation with respect to employment then gives $Y'(N) = \bar{w} > w$.

V. Investment decisions and wage bargaining

Assume again that the wage set in a representative firm under decentralised bargaining is the one that maximises $(w - \bar{w})^\alpha (\pi - \bar{\pi})^{1-\alpha}$. Let $Y = Y(N, K)$, $\pi = Y(N, K) - wN - rK$ and $\bar{\pi} = -rK$, where in addition to the symbols defined above, K = the capital stock and r = the rental price of capital. It is assumed that the capital stock is determined before the wage is set. The bargained wage becomes $w = \alpha Y(N, K)/N + (1 - \alpha)\bar{w}$, and hence $\pi = (1 - \alpha)[Y(N, K) - \bar{w}N] - rK$. It follows that profit maximisation with respect to capital gives $Y_K = r/(1 - \alpha)$, which should be compared with $Y_K = r$ under centralised bargaining, when the individual firm can take the wage as given.

VI. Productivity when bargaining is affected

Assume that the utility of an employed worker is given by $u = w - v(e)$, where v is the disutility from providing effort and e the level of effort, which is assumed to be determined prior to wage setting. Let then the bargained wage under decentralised wage setting be the one that maximises $u^\alpha \pi^{1-\alpha}$, where the profit of the representative firm is $\pi = Y(eN) - wN$. Maximisation gives $w = \alpha Y(eN)/N + (1 - \alpha)v(e)$, from which it follows that $u = \alpha[Y(eN)/N - v(e)]$ and $\pi = (1-\alpha)[Y(eN) - Nv(e)]$. If the local union determines effort, it will be chosen so that $Y'(eN) = v'(e)$ if there is decentralised wage bargaining, i.e. the level of effort will be the socially optimal one. The level of effort chosen by the union will in this case coincide with the profit-maximising level for the employer, which turns out to be given by the same marginal condition. The reason why employers do not try to extract a maximum amount of effort under decentralisation is that more effort makes work less attractive and hence improves the bargaining position of the union and raises the wage: in this way the individual employer shares the cost of increased effort by the employees. In contrast, with centralised bargaining the wage will be determined by aggregate conditions in the economy, which means that there will be no link between the level of effort and the wage as above. Then unions will strive to provide a minimum amount of effort and employers to extract a maximum amount.

VII. Union co-operation

The argument concerning co-operation between a high- and a low-wage union can be made formally in the following way: let w be the (real) wage of union 1, r the (real) wage of union 2, $N = N(w)$ employment for union 1 members, $L = L(r)$ employment of union 2 members, M union membership (equal for the two unions), $v^1 = v(w, r)$ the utility of an employed union 1 member, $v^2 = v(r, w)$ the utility of an employed union 2 member, and \bar{v} the utility of an unemployed union member (equal for both unions). Assume that union 1 maximises:

$$(3) \quad U = N(w)v(w, r) + [M - N(w)]\bar{v} + \mu[L(r)v(r, w) + (M - L(r))\bar{v}]$$

and that union 2 maximises:

$$(4) \quad V = L(r)v(r,w) + [M - L(r)]\bar{v} + \mu[N(w)v(w,r) + (M - N(w))\bar{v}],$$

$\mu = 0$ corresponds to the case of separate wage setting (a Nash equilibrium, in which each union sets its wage taking the other union's wage as given). $\mu = 1$ can be taken to represent centralised wage setting, i.e. the case when the two unions co-operate and each union therefore (fully) internalises the effects of its own actions on the other union. The first-order conditions for utility maximisation are:

$$(5) \quad \phi = \phi(w, r, \mu) = N_1(v - \bar{v}) + Nv_1 + \mu Lv_2^2 = 0$$

$$(6) \quad \lambda = \lambda(w, r, \mu) = L_1(v - \bar{v}) + Lv_1 + \mu Nv_2^1 = 0,$$

where subscripts denote partial derivatives with respect to the i :th argument. v_2^1 denotes the marginal utility for union 1 of a wage increase for union 2, i.e. $\partial v(w, r)/\partial r$, and v_2^2 the marginal utility for union 2 of a wage increase for union 1, i.e. $\partial v(r, w)/\partial w$.

I start out from a situation of separate wage setting, i.e. $\mu = 0$. It is assumed that union 1 then receives a higher wage than union 2, i.e. $w > r$. If it is assumed that $v_{21} > 0$ and $v_{22} < 0$ (the marginal disutility for a member of one union with respect to the other union's wage is decreasing in the own wage and increasing in the other union's wage), it then follows that $-v_2^2 > -v_2^1$ (the marginal disutility with respect to the other union's wage is higher for union 2 members than for union 1 members). I then study the effects of increased centralisation by differentiating (5) and (6) totally with respect to w , r and μ . This gives:

$$(7) \quad \phi_w dw + \phi_r dr + Lv_2^2 d\mu = 0$$

$$(8) \quad \lambda_w dw + \lambda_r dr + Nv_2^1 d\mu = 0,$$

where $\phi_w < 0$ and $\lambda_r < 0$ are second-order conditions for a utility maximum, and $A = \phi_w \lambda_r - \phi_r \lambda_w > 0$ a "dynamic stability condition". I also assume that $\phi_r > 0$ and $\lambda_w > 0$, which ensures that the "partial" effect of a rise of one wage is to increase also the other wage. We do not know anything about how the relative

magnitudes of ϕ_w , λ_r , ϕ_r and λ_w are affected by the assumed wage differential (this depends, i.a., on the third derivatives of the v-function). Hence to focus on the importance of the difference between v_2^1 and v_2^2 , which we do know something about, I simply let $\phi_w = \lambda_r$ and $\phi_r = \lambda_w$. Finally, I assume that employment is equal for the two unions, i.e. that $N = L$. Then we obtain:

$$(9) \quad dw/d\mu = - (\phi_w v_2^2 - \phi_r v_2^1) / A < 0$$

$$(10) \quad dr/d\mu = - (\phi_w v_2^1 - \phi_r v_2^2) / A < 0$$

Both wages thus fall when the degree of co-operation increases because of the internalisation effect. The condition that the wage of union 1 will fall more than that of union 2, so that wage dispersion is reduced, is:

$$(11) \quad v_2^2 (\phi_w + \phi_r) > v_2^1 (\phi_w + \phi_r).$$

$v_2^2 < v_2^1$ ensures that this will hold, provided that $-\phi_w > \phi_r$, which follows from the "dynamic stability condition" that $A = \phi_w \lambda_r - \phi_r \lambda_w = (\phi_w)^2 - (\phi_r)^2 > 0$.

The internalisation of the consumer price externality discussed in the text can be analysed in a similar way.

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